

**AT THE
TIPPING POINT
HOW TO SAVE US FROM
SELF-DESTRUCTION**

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DEDICATION

Dedicated to my children-Emma, Mark, & Breanna, my wife-Lynne, and my parents-Mildred & Earl.

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SELF-DESTRUCTION

As a species we are quite unique in our capacity to act in ways that ironically hurt us. Even though in the short range some of these behaviors seem advantageous, in the long run a much different picture often emerges. This occurrence is perhaps not all that surprising, given that during evolution short-term benefits typically trumped longer-range costs. It all seems to happen in the present, and who knows or cares about the future. Our intelligence plays a major role by fostering countless creative actions that go far beyond what nature has instilled in us. However, in many instances these actions raise the question, Are we really that stupid for an intelligence species? As a psychiatrist, I have seen many instances of self-destructive behavior, and have become quite adept at discerning and managing the problem. Shifting my focus to a societal level, the realization dawned on me that we are all hurting ourselves by supporting and partaking in endeavors producing highly adverse consequences. One example is our hyper-consumption of high calorie food, contributing to the obesity epidemic of first world nations, that is spreading to third world nations faster than just on time delivery. The health consequences of all this excess weight provides a graphic example of how we are hurting ourselves, despite how pleasing that high calorie food is in the moment.

The current endless growth economic model characterized by greed and hyper-growth provides another example of how we are damaging ourselves. Now, you might say, "It's only the financial elite that are responsible for this system ensuring that they the privileged 1% get 99% of the resources." However, without all of us supporting hyper-growth through hyper-consumerism, the system would collapse overnight. We seemingly cannot resist all those consumer products driving 70% of hyper-growth. Linked to hyper-consumerism and hyper-growth, is the unsustainable depletion of key environmental resources, such as fish, forests, readily available oil and natural gas, certain minerals, and fresh water supplies. We have already consumed about a third of the natural capital of the planet, and this is with only approximately 1.5 billion of the current world population of 7 billion able to hyper-

consume. Once our self-destructive hyper-consumption illness fully spreads to the third world, we will be in a race to the ultimate bottom.

In addition to our unique ability to engage in self-destructive behavior, we have a well-developed capacity to detach from problems, and/or spin them to make it “all good.” As you are reading this you might be thinking in line with this capacity, What we are doing is not really hurting us, and the system works for most. The tip-off that this is not the case came to me from seeing increasing suffering amongst my patients that is unquestionably related to the economic model of our times. Certainly as a psychiatrist I see much suffering, but something more was going on that has been building over the last several years. My exposure to environmental problems as a senior level volunteer for a major environmental charity, with all the research that went into it, helped tie the pieces together—The economic world that we all play a role in is severely damaging us directly, and also indirectly via ongoing degradation of the environment. Brief clinical case examples will help illustrate how one aspect of this world, the current endless growth economic model, impacts people like you. Names have been changed to protect those already suffering.

Tim in his mid 40's worked in the packaged goods industry as a senior level manager earning a very solid salary. Due to corporate purchases of smaller companies and mergers, he was let go from three jobs. Although his fourth initially appeared fine, history repeated itself with the company being bought by a large packaged goods corporation. He was able to keep his position, but with reduced staffing he ended up doing the job of three people. Under the enormous stress of this job he became depressed. Sensing that he was going to be let go and unable to find it within himself to improve his performance, he went off on sick leave. I entered the picture at this point. Tim was completely demoralized by the endless rounds of lay-offs, and now what seemed to be an even worse fate of having to persevere in an incredibly stressful position. He could not see any hope for improvement in his industry, and in fact a repeat of the same scenario was almost certain given the never-ending mergers and buy-outs. During our discussions he realized that he wanted control over his life and was interested in real estate sales. He negotiated a settlement with the

company he worked for, and retrained in real estate. The hope this provided greatly augmented the antidepressant and psychotherapy treatment, and his mood fully recovered. A year or so later he returned feeling depressed, because despite his best efforts he could not gain any ground in real estate, largely due to the high number of people that have flocked into this occupation as stable employment for reasonable pay has evaporated. So-called, "corporate refugees," gravitate to any potential source of income, and with ever increasing numbers of these refugees it does not take long for promising areas to become saturated.

Illustrating how first world skilled technical jobs are vanishing to the third world, in line with our endless growth economic model, is the example provided by Dirk, a middle-aged man finding himself with almost no options. An engineer by training, Dirk worked in a highly scientific area involving physics. A conflict with a more senior employee resulted in anxiety and depression. When the problem escalated, despite his efforts to resolve it, he had to go on sick leave. With the assistance of a lawyer he negotiated a settlement and left, expecting to find employment, given his impressive qualifications and experience. Despite numerous resumes sent out, he has only had two interviews for an engineering position, and one job offer. Although the pay was barely half his former salary, he tried the job but left after a month unable to stand the relentless demands for even more work for no extra pay. Understandably, his mood worsened further as he envisioned no hope for employment beyond a low-level service sector job. These "precarious" jobs are steadily replacing stable employment, and I even see people competing for part-time minimum wage positions offering no benefits. Although Dirk's age plays some role, I also have a mid-20's engineer who is also struggling to find work, and is planning to move back to his homeland, India, where he can find a job. With manufacturing disappearing from the first world faster than corporations can say, "It's cheaper to hire someone in a third world country," there is ever diminishing opportunities.

While corporate revenues have typically been advancing, public funds are decreasing, often with profound consequences for the less fortunate. An elderly patient-Susan-lives with her husband in an apartment. They had to retire early from their jobs to look

after aging and ill relatives on both sides. Income from the government with pensions and the like sufficed for quite a while, although their lifestyle has been restricted. Susan has struggled with depression throughout her life, but when she first came to see me the condition was much worse. Due to government cutbacks, combined with escalating costs for rent and food, they are barely able to get by, and have zero luxuries. Neither is employable given their ages, time away from the work force, and competition for service sector jobs. It appears that they might not be able to stay in Toronto, given the higher costs in this city than in outlying areas. However, both have significant medical conditions and their doctors are all in the Toronto area, as are all their social supports. Marie has been in tears stating how she worked for so many years with no sick leave, and only retired early to assist aging relatives that could not afford care, and now treated like this. She has considered ending her life several times, as she sees little hope for the future.

A person with seemingly much better prospects is, Scott, an early 30's very bright man nearing the end of his PhD in literature. Despite his youth and intelligence he is demoralized, depressed, and anxious regarding the reality facing him, as are many PhD's. In early times such a degree would have meant comfortable employment as a professor teaching and conducting research. Now PhD graduates face almost no chance of obtaining such a position, and many like Scott are very discouraged and demoralized. With a science PhD there might be opportunity in industry, but with many science jobs leaving the first world this option can be limited. Samantha, a PhD graduate I treat was unable to get a tenure track position, but teaches at a university for about \$8,000 per course, meaning that she earns approximately \$32,000 per year, assuming she works hard. She considers herself to be one of the "lucky" PhD's able to secure such a position, knowing many who drift into even lower paying service sector work. So-called degree inflation and the resulting employment limitations impact on students at all levels. Graduating from a Bachelor program in his early 20's is John, who after two years out of university has only succeeded in finding jobs in coffee shops and volunteer intern positions, so far leading nowhere. These young, bright, and vigorous people are finding themselves with large amounts of student debt, and no

opportunity for a solid future, depriving them of hope. Without hope they are discouraged, depressed, and anxious.

It appears that we have now reached the tipping point, due to the highly unbalanced and unstable distribution of resources, and how the natural environment is passing a point of no return regarding the declining availability of key resources and rising carbon dioxide (CO₂) levels. As stated by Friedrich Hegel, "The only thing we learn from history is that we learn nothing from history." Perhaps it is time that we learn that the current state of financial imbalance and environmental degradation is not endlessly sustainable, and if it progresses revolution is unavoidable. History shows that as valued resources become depleted and concentrated in the hands of the few something has got to give, and revolution often discharges the pressure. Unfortunately, the discharge can take many forms, some worse than maintaining the status quo. The Occupy Movement and Arab Spring, both ultimately arising from suffering induced by great resource imbalance, are warning flares of what I believe is around the corner, and such signs are not to be ignored, at least by the wise. I write this book in the hope that we can avert self-destruction, and in the process avoid the scenario of widespread revolution.

Major forms of self-destruction are examined—Greed, irregular regulation, unsustainable development both urban and resource, global warming, research bias, and obesity. In the Greed: More Is Never Enough chapter, we investigate the all-important role that greed plays in how we are hurting ourselves. As it turns out we are all greedy, it is just that some of us are better at it than others. I propose that beyond general and emotional forms of intelligence, there is FQ (financial quotient), representing a type of intelligence facilitating the acquisition of resources. Wealth has become concentrated in the hands of corporations and members of the financial elite, consisting of senior personnel of corporations, wealthy shareholders, and others with high financial intelligence. While this very small percentage of the populations is advancing in prosperity, suffering for the many is steadily increasing, such that a revolution is in the making, an event that will almost certainly target the financial elite. Consequently, the excessive wealth accumulation of this privileged few will ironically end up

damaging them. The many faces of greed are covered including traditional crime, financial fraud, corruption, and individual and corporate activity. The frightening and prominent role of tax havens and the offshore shadow economy is revealed. Greed has become the new world religion transcending physical, political, and historic religious boundaries. The fascinating story of how greed evolved based on resource acquisition in a social context, deceit, and the power of hierarchies, is also described.

The Irregular Regulation chapter examines the pivotal but typically under-valued role that regulation plays in our wellbeing, and the damage that ensues from degraded regulation. The importance of solid regulation for ecosystems, and our own physical and mental health, is presented to demonstrate how nature relies extensively on it. Progressing to man-made forms, we look at how essential regulation has been to financial stability. A period of extensive deregulation ensued from 1980, culminating in the massive financial meltdown of 2008. The shock waves from the ultimate financial weapon of mass destruction-derivatives-are still echoing around the world. Although it would be nice to believe that we just forgot history and let regulation slide, deregulation was actually carefully orchestrated by an elite segment of the population, in their quest for levels of wealth difficult to realize with tight financial regulations designed to protect the people. They were able to achieve this remarkable result, demonstrating high financial intelligence, by of all things “capturing” politicians and regulating agencies to ensure that their own needs, and not those of the larger population, are looked after. Politicians are captured by lobbying influences involving campaign contributions, consulting contracts, and in some instances cash bribes. Regulators are captured by revolving door employment opportunities of various forms. With politicians and regulators working for corporations and the financial elite, democracy has essentially ceased to exist beyond a pretense, an occurrence that hurts us all in the long run.

Problems of urban and resource development are presented in the chapter—Taking The “Devil” Out Of Development. Urban developers have hijacked municipal politics via their funding of politicians, who in turn reciprocate by voting in favor of the developer’s projects. Consequently, we end up with car dependent

urban sprawl replacing fertile farmland and urban forests, leaving us vulnerable to food shortages and depriving us of urban forest benefits. Meanwhile, non-urban resource development is rapidly depleting the natural capital of the planet. The influence of the resource development industry on politicians and regulators ensures that the deck is fully stacked in favor of corporations and the financial elite, while ecosystems and people incur the costs. Unsustainable resource development supports hyper-growth that is relied on by corporations and shareholders to generate wealth. We learn how hyper-growth is impossible both mathematically and practically, and is fully dependent on of all things, a major accounting error. All of us play a pivotal role in supporting hyper-growth through hyper-consumerism. Despite the short-term allure of this endless economic growth model, it will end up destroying us all, rich and poor alike.

Hyper-growth supported by hyper-consumerism contributes greatly to global warming. We all love energy derived from fossil fuels, and the world is heating up as a result. In the *Too Hot To Handle: Global Warming* chapter, we examine this glaring example of our self-destructive tendencies. Impacts such as ocean acidification, melting of land and sea ice, forest fires, and extreme weather events, are covered, keeping in mind the tendency of media and some global warming scientists to exaggerate these effects. The ultimate result of global warming is evidenced by what transpired 56 million years ago during the Paleocene-Eocene Thermal Maximum (PETM), a story that should motivate all of us to take the problem seriously. Many interventions have been proposed to stop and reverse global warming, but all fail largely due to the so-called iron law—Whenever, economic growth and global warming concerns counter each other, economic growth always wins. However there is a winner that is completely natural and will return the planet to how it was prior to the advent of agriculture. This intriguing option actually aligns with the iron law because it saves money, and could be a reality in even 20 years. However, resistance from agricultural and biotech companies earning huge profits from the current system, might well block this incredible option from becoming a reality.

Biotech innovations applied to genetically modify crops comprise a major component of current agricultural practices. Research conducted by the biotech industry consistently finds that

genetically modified organisms are safe for human consumption. Meanwhile, research funded by other sources often finds the reverse. These inconsistent findings underscore a major problem—research bias—that is compromising our health, and draining financial resources that might otherwise be diverted to interventions that truly help people in need. In the chapter, *A Conflicted World: Research Bias*, we learn how bias in biotech and medical research is so extensive that we are led to believe that genetically modified organisms are safe, when they actually might be very harmful, and prescribed pharmaceutical products that are often not effective, or have side effects that exceed benefits. Health outcomes are jeopardized, and countless taxpayer dollars wasted on biased and hence meaningless research. While some of the bias involves outright manipulation for profit, most of it is much more subtle and largely unconscious. The “publish or perish” world that research scientists live in plays a key role by establishing a “distort or despair” reality. Amazingly, due to a major statistical error that few research scientists are even aware of, most medical research results are likely false! Medical and biotech research bias represents a form of self-destruction, because it is jeopardizing the health of everyone including those who profit financially.

Health is also worsened by the modern day epidemic of obesity. In the *Weighing Down The World: Obesity* chapter, we learn how weighty a problem it truly is. Essentially, we are killing ourselves with food! Highly processed and energy intensive packaged food contributes to the problem, while generating major gains for corporations producing, marketing, and selling it. To counter the obesity epidemic, an extensive weight loss industry has arisen yielding great profits for many providers. Unfortunately, weight loss is a losing proposition. Virtually everyone who loses weight ends up gaining it back, and the small percentage who manage to avoid this outcome are likely only those able to resist our natural homeostatic mechanisms prompting us to regain lost weight. As we discover, the whole emphasis on weight loss and dieting is entirely misdirected, necessitating that we lose the focus on weight.

A key force serving to maintain our self-destructive behavior is of all things, our own psychological defenses. In the *Defending The Indefensible* chapter, we learn how psychological defenses have evolved to safeguard mental health. Two major

categories of defenses consist of, positive cognitive distortions and dissociation. Although these defenses help keep us sane so to speak, they work against us by attenuating or blocking awareness of negative reality. It seems that it is all about positive spin as media is well aware of. For example, even today many people distort the overwhelming evidence for global warming and our role in it, viewing the problem as just a natural fluctuation that will self correct. People tend to believe that medical research results are valid and take medications on this basis, a positive cognitive distortion relative to the reality that medical and biotech research is largely characterized by bias. Many individuals see themselves as being fitter and safer from disease than they are, even as the weight piles on. Dissociation is evident in how people simply detach from distressing or disturbing viewpoints, finding it more comforting to focus on positive scenarios. If we are to avert self-destruction, it is crucial that we check our defenses, as painful as that might be in the short-term, and work with the realities facing us.

A theme throughout the book is the role that money plays in our self-destructive behavior. In the Enlisting Entropy: Ordering Disorder chapter, the question is raised, "It's all about money, but what is money all about?" It is all about the purchase of sources of highly ordered input to counter the ongoing natural slide of everything to disorder. Entropy is a measure of the disorder in a system, with low entropy representing order, and high entropy disorder. We require highly ordered fuel to power our cars and heat or cool our homes. Everything we build requires ordered materials, and must be maintained with skilled ordered intervention. Our bodies naturally decline over time and health products help slow the decay to disorder, or at least provide the comforting positive cognitive distortion that we are maintaining order within our physical selves. By applying low entropy resources we can maintain greater order and slow the slide to disorder. Although we all seek these resources, monopolization by the elite few provides an order suited to them, namely one characterized by the quest for endless economic growth. To support this pursuit, low entropy sources are extracted from society and the environment. However, despite the social and environmental justice costs endless economic growth ends up being impossible due to entropy.

A limitation of many books and articles discussing major problems of the world is that they present the concern without providing workable solutions, or at best only partially viable interventions. This type of presentation leaves readers feeling discouraged and hopeless. My experience as a clinician has instilled in me the importance of providing workable solutions, circumstances permitting, even when facing very challenging problems. Patients cannot just be given a diagnosis and sent away. Workable solutions are formulated and implemented, assuming that the patient is willing to cooperate. This crucial theme is applied in the form of effective solutions for the major ways that we are damaging ourselves, thereby providing realistic hope. The thinking is big, but this is no time to think small given that we are all on course to go over a very steep cliff. Major course corrections are required to avert what appears inevitable if we maintain the status quo. A world with less suffering and environmental degradation is indeed possible, if people are motivated to both adopt and advocate for the proposed solutions. Although changing the status quo will be challenging, the effort is worthwhile because it will save us from self-destruction. Ultimately, though, it will be up to you to decide!

GREED: MORE IS NEVER ENOUGH

QUESTION:

Which of these statements most accurately characterize the world's economy?

- A. Almost everyone contributes to its welfare through taxes ensuring that economic and social justice prevails.
- B. The taxman takes far too much and it is our duty to ensure this does not happen.
- C. A shadow economy exists involving trillions of dollars not subject to fair taxation.
- D. Austerity measures are absolutely necessary to solve our economic problems.
- E. Many of our economic and related social problems could be solved, or improved, if money in the shadow economy was applied for this purpose.

Answer A indicates a very rosy picture of the world, that undoubtedly helps those holding this perspective sleep better at night and not worry so much. Unfortunately, it appears very inaccurate beyond even a cursory examination of the world's economy. Answer B is a common rationalization for hiding money in the shadow economy, but with all the money hidden away from taxation the average person is taxed unfairly. Answer C is very accurate as there are trillions of dollars circulating around the world in the shadows where the taxman cannot reach. Answer D is very interesting because if you do not believe that there is a shadow economy, then the only option is to squeeze the already squeezed even tighter. Answer E, however, offers hope of another alternative if only we can get the shadow economy money into the sunlight.

HOW GREEDY ARE WE?

The short answer is tremendously so, and when I say we, I mean WE! This is not about a few greedy individuals flaunting social justice. No, this is about, We The People. Based on my knowledge of people as a psychiatrist and theoretical researcher, I strongly suspect that at least 70-95% of those in the Occupy movement would amass money if only they could, at least if they did not have to engage in the effort and responsibility that is typically involved. To act in a more moral fashion the remainder would have to resist our natural propensity to be greedy. I hope to show you the reader that this scenario is a reality, because if we do not understand it and appreciate how greed characterizes us, we will always be lagging far behind when it comes to social and environmental justice.

It has been estimated by the Tax Justice Network that a staggering \$3.1 trillion in tax, representing 5.1% of the global Gross Domestic Product (GDP) is evaded. According to Alain Deneault in his revealing book-Offshore Tax Havens and the Rule of Global Crime-half of the world's money supply ends up in tax havens. Hence, an incredible number of exchanges are conducted without any control by legitimate governments. Beyond so-called legitimate money made by individuals and corporations, a staggering \$1.5 trillion or so enters this shadow economy from traditional crime such as illicit drugs, illegal gambling, extortion, and prostitution. If crime-based money was under the control of one body that entity need be invited to join the G8, as it is in the same class. This dirty money is "cleaned" by being mixed with "legitimate" money. A recent study by the Tax justice Network estimates that \$20-\$32 trillion dollars, approximately 10% of the world's total wealth is hidden in offshore accounts. Furthermore, this money is held by 1.4% of the population. Regardless of the precise amounts the numbers involved are difficult to grasp mentally, and even a superficial image suggests that something is severely wrong.

To understand what is going wrong we have to look at the sources of money in the shadow economy. The presence of tax havens has allowed financial assets from diverse origins to be hidden away. The diversity of these sources alone testifies to our propensity to be greedy. Although somewhat arbitrary and with significant overlap between different forms, they can be divided into traditional crime, financial fraud, corruption, and individual/corporate activity.

Traditional Crime:

When it is considered that \$1.5 trillion dollars enters the shadow economy from crime, it is clear that crime really does pay and pay well. The problem that all big-scale criminals have is what to do with the money. I would wager that most of you wish you had that problem—"Honey, I just don't know what we should do with all this money." Now that is quite the problem to have. Crime at the street level is mostly done in cash, and as it filters up the ranks the figures are mountainous in proportion. If you just hang on to it there is that problem of no honor amongst crooks, and someone will get the idea to steal your stash. Of course, criminals like the rest of us also like to have their money make money. So the big issue becomes how to transform the "dirty" money into "clean" money, so-called money laundering. This can involve either buying outright or into legitimate businesses. When in Panama several years ago, I spoke to a bar owner who told me how a couple of Colombians approached him, and offered to buy his bar for \$500,000. They showed him the money neatly stacked in a briefcase. He refused, but if his offer had been accepted that dirty money would have been cleaned, and the profitability of the bar meant that the dirty money would continue to make more money, and in a legitimate fashion.

Panama sits next door to Colombia and the border is somewhat porous, so briefcases full of money can work at times, but for \$1.5 trillion? That's a lot of briefcases. If money laundering had to work this way I suggest investing in briefcase company stock. Obviously another method is required to launder the dirty money, and this way is tax havens and the shadow economy. Dirty money enters into offshore bank accounts, holding companies, and corporations, and then is mixed with money from more legitimate sources. This occurrence is very interesting, because the money in many instances ends up being loaned to countries like the United States (US) from offshore banks, to fund programs such as the war against drugs. Drug money is then in a sense being used to fund the war against drugs, but if the laundering of drug money was blocked the business would be far less profitable and viable. It is indeed a crazy world. Efforts have been made to block the flow of dirty money into the offshore banking world, and there is a policy of "Know Your Customer," whereby offshore banks are expected to

have detailed information on clients such as their name, address, passport photocopy, and source of money. In line with their deviousness and cunning, criminal elements circumvent this speed bump by utilizing so-called straw men. Legitimate individuals are set up as the owners of accounts, holding companies, and corporations, providing a clean identity and rationale for the money invested. This does not always work and the game is getting more complex, but dirty money forms a major component of the pool of investment money circulating, and as such one has to wonder how determined authorities are to eliminate it entirely.

Financial Fraud:

One thing I frequently tell patients who are prone to conspiracy theories, is that this type of perspective often gives more credit to the perpetrator than is warranted. For the most part people are not very organized and efficient, largely because this state of affairs is difficult to achieve and sustain. Organizations can be even less “organized” than individuals, due to all the interactions and coordination required. Hence, true conspiracies are quite unlikely to occur. In researching this section of the book I have come to see that my optimistic statement to patients might not be entirely warranted, and have come to believe in a third form of intelligence—The FQ or Financial Quotient. We all have heard of IQ, or the Intelligence Quotient, measuring general intelligence. Many are also aware of EQ, or Emotional Intelligence, covering a person’s awareness of their emotional state, that of others, and how the two interact. Those with high EQ tend to do significantly better in any occupation involving a social component, and EQ can trump IQ when it comes to success. FQ is proposed to be a different form of intelligence reflecting a person’s ability to accumulate wealth and valuable resources. Given the vast amount of consumer debt out there, frequently involving credit cards with interest rates just south of those offered by loan sharks, it is obvious that the FQ of many people is quite low. However, the FQ of quite a number of people is very high, enabling them to master finances and accumulate great wealth. One such group with an antisocial bent is fraudsters.

The amount of financial fraud occurring out there is almost beyond comprehension, and this is the tip of the iceberg. A great deal of borderline legal activity occurs daily, such as the financial adviser

who recommends and sells higher risk products to elderly clients, simply to enhance commissions. As phrased to me by one person in the investment sector, "Two out of three ain't bad," referring to how the financial advisor and investment firm, frequently owned by the advisor, gains while the client loses. In the History Of Greed by David Sarna, many fascinating forms of financial fraud are covered, with great examples provided. A read will convince you that FQ can be very high amongst fraudsters, and will hopefully activate or intensify your deception radar. It appears that if there is a way to defraud people someone will seize on it. One of the classics is the Ponzi scheme, named after Charles Ponzi (1882-1949), who set up an elaborate scheme based on differences in international postal rates. The structure of a Ponzi scheme is that money from new investors is used to pay off longer-term investors who are cashing out. No or little legitimate investing occurs, and the whole scheme relies on a steady flow of new investor money exceeding payouts. A Ponzi scheme fails when there is a period of high redemptions, because there is not enough money to pay them off.

The ultimate Ponzi Schemer is Bernard Madoff, who for decades took billions of dollars from clients, while providing financial statements showing that their investments were making consistently high returns. Wanting to accumulate wealth most of his clients kept their money in, until the crash of 2008 when people began cashing out. At this point new investor money fell far short of payouts, and the whole structure collapsed. The FQ involved in Madoff's manipulations was extremely high. He promised and appeared to return rates of 10-13% per year, high but not high enough to alert too much suspicion. He largely targeted the Jewish community using their trust given that he is Jewish. Interestingly, the hardest hit group for financial fraud is orthodox Jews, because of the trust they place in the Jewish advisor. Madoff used pass-through vehicles that gave most or all of their clients' investments to Madoff, but purported to actively manage the investments. Certain people connected with the feeder funds appear to have been bribed to keep the money flowing. By setting his business up as an investment-advisor, Madoff could avoid regulatory scrutiny that would have occurred if he used an independent broker. Client money from the investment-advisory business in New York was transferred to the London office, and then back to the United States

as money seemingly earned from investments. Much of the money made by Madoff appears to have made its way to offshore accounts for safekeeping, nothing less would be expected from someone with such a high FQ.

Another type of financial fraud is the so-called Pump and Dump. A company issues shares and through a concerted media campaign, and frequently the assistance of cooperative brokers, pumps up the value of the stock. Owners of the stock who are part of the scheme then sell the stock, usually placing the profit in an offshore bank to safeguard it from creditors or litigation. Countless instances of this type of fraud have occurred, and many more imaginative variations are undoubtedly to come. One only wonders how far some of these individuals could go if they used their high financial intelligence in a constructive fashion. Another common form of financial fraud is accounting fraud. One of the classic cases is Enron where debts, losses, and unprofitable enterprises, were put into offshore entities, thereby accounting them out of the equation on reports. The company then appeared profitable when it was anything but. As another example, WorldCom propped up stock prices by underreporting line costs (interconnection expenses with other companies), and inflating revenues with bogus accounting entries. If these examples are not enough to convince you that fraud is as extensive as the imagination dares venture, then I encourage you to read a History Of Greed.

Corruption:

Research by the World Bank Institute indicates that corruption in the form of bribes occurs to the tune of more than US \$1 trillion dollars per year! This figure is based on 2001-2002 data when the size of the world's economy was estimated at just over US \$30 trillion dollars. Corruption is indeed a very large industry, and the proceeds of that industry typically end up in offshore accounts. As with fraud there are some spectacular examples demonstrating high FQ. One of the most striking is by Vladimiro Montesinos, the intelligence czar for Alberto Fujimori during his 10-year presidency of Peru in the 1990's. As the spy chief he used massive amounts of embezzled money to bribe judges, politicians, bankers, and journalists. To keep track of all the bribes and obligations he videotaped the exchanges providing proof that these events

occurred. Many of the individuals paid off became rich, and Montesinos in return controlled the show. Needless to say, significant embezzled funds were kept for himself. As a trained lawyer he maintained detailed records and ensured that everything was precise. Often he would write the news stories to appear on television, and had daily meeting to okay the ones he did not write. It has been estimated that \$8.5 billion dollars were lost to the Peruvian economy to essentially buy wrong decisions. According to Peter Eigen of Transparency International, a bribe really amounts to buying a wrong decision, and based on the faultiness of the decision, there is a cost to the system.

The example of Vladimiro Montesinos highlights how funds are often embezzled and used to promote the agenda of a given individual or group. Transparency International believes that the former Indonesian leader, Haji Muhammad Suharto, embezzled between \$15-\$35 billion from his country, while Ferdinand Marcos in the Philippines, Sese Seko Mubutu in Zaire, and Sani Abacha in Nigeria, embezzled \$5 billion each, and these examples occurred in countries where most people live in poverty. In many instances funds are embezzled from international charity aid, being diverted from the have-nots needing them, to the haves desiring even more but never satisfied with what they have. Bribes are commonly used in business in many countries. For example, oil and mineral companies routinely pay bribes to ensure favorable decisions in countries where the given resource is located. These payoffs rarely if ever make it to the average person, instead going to the elite members of the society. Indeed in many countries being in a position of power is really being connected to the bribery pipeline and profiting from it. In some sad examples, bribery dominates because people are not paid enough to survive. For example, in Georgia a position ensuring bribes, such as traffic policeman, has traditionally been a meal ticket, because salaries alone are far too low to feed a family. Under new leadership the country is changing, but the system of bribery and corruption runs so deep that even Georgian President Mikheil Saakashvili admits it will be hard to eliminate.

There are a number of misconceptions about corruption, such as that it only effects third world countries. In first world nations it is alive and well but takes different forms, the

predominant one being consulting contracts. Frequently, an individual or company supportive of an elected politician or political party will be awarded a lucrative consulting contract. In many cases these contracts seem to be a license to print money, or have it printed for you and delivered by the government. Elected politicians frequently receive contracts after they leave public office from companies they have supported the interests of. For example, Canada's former Prime Minister Jean Chretien, who along with other Canadian leaders supports the mining industry throughout the world, ended up representing Vancouver Tenke Fungurume Mining in the Congo. In several instances there is really no need for the consulting contract, and in others the contract would be awarded to another person or company if tendered and judged in a fully fair fashion. Either way a wrong decision has been paid for with an associated cost.

Another misconception is that bribes enable a country to get things done. Yes, for the individual who pays the bribe certain favors do occur, but overall it amounts to a lot of bad decisions setting the overall state of affairs back. Furthermore, massive amounts of money leave the country ending up in offshore bank accounts, and not where the funds are needed. The Washington based think-tank, Global Financial Integrity, estimates that during 2009, \$903 billion were lost to developing countries due to corruption. An additional and major misconception pertaining to corruption, is that a country has to achieve a first world status before the problem can be resolved, although of course it does not really end, instead shape shifting into a different form in first world countries. Several developing nations are tackling corruption and the results are very encouraging. The World Bank has found that countries improving their control of corruption can expect in the long run a four-fold increase in per capita income. The business sector also benefits with greater growth of perhaps 3% per annum. National income growth rates differ 2-4% between countries with poor and moderate control of corruption, and a further 2-4% between moderate and good control. So the possibility and benefits of controlling corruption in terms of embezzlement, bribes, preferential contracts, and the like is definitely there for developing countries.

Individual & Corporate Activity:

Individual and corporate activity have been grouped together, because they both often involve “legitimate” money, and corporations now legally have the rights of individuals, although with some very special privileges making them favored citizens. Prior to 1886 private companies were in the service of governments, and not the opposite as has evolved over time. The colonial model consisted of monopolistic companies supported by the Crown, such as the Dutch East India Company. Small enterprises were not favored in this system. An alternative model arose largely in the United States, whereby governments authorized the incorporation of companies setting strict limits, including a time period and specific purpose, such as construction of a dam or railway. The charter issued to the company was tailored to its size and mandate, and was revocable if the validity was in doubt. Of great significance, the shareholders were held personally liable for losses incurred by the enterprise they co-financed. By fulfilling a necessary (or perceived to be necessary function) and having personal liability the company was acting in the service of the government and people.

Over time incorporated entities gained in power in the US, a major step occurring in 1886 when the Supreme Court granted corporations rights until then allotted to people. Absolutely brilliant making corporate entities real beings with rights! Judges soon began protecting corporations against any harm suffered from governments or citizens, such as strikes. Public measures aimed at protecting workers and employees in the private sector were declared unconstitutional. Effectively, the judiciary and government shifted to being in the service of companies, a full 180-degree turn around. Using their financial resources and rights as individuals, corporations applied great lobbying and legal pressure on governments and the judiciary to ensure their protection and growth. Consequently, rates of taxation for corporations have dropped steadily over time, such that they now pay far less tax than individuals for the portion of corporate activity registered in first world nations. In addition, tax havens allowed and even supported by governments and the judiciary, have enabled corporations to pay no taxes. These tax havens have evolved to the current state where half of the money in the world ends up in these dens of inequity. Tax

havens are actually part of a much larger system enabling wealth to flow uphill to the elite few—The shadow economy.

THE SHADOW ECONOMY:

The information presented here is not for the faint of heart, as it is downright frightening and only too true. The financial intelligence of many players is very high placing them in a league apart from the masses. Most of the material is derived from two books—Offshore: Tax Havens and the Rule of Global Crime (Alain Deneault), and Tax Havens Today: The Benefits and Pitfalls of Banking and Investing Offshore (Hoyt Barber). These books are fascinating to read in their own right, and even more so when done so back-to-back. The former presents a well-researched perspective on the nature of the current financial world, while the latter is essentially a “how to” book, with a rally-call for why it is the right, and even duty, of every citizen to resist taxation and benefit from economic freedom. As it turns out though the economic freedom that comes with the shadow economy is typically only for corporations and very rich individuals, as the average or even above average person cannot really benefit. For example, if you work in a first world country and are paid a regular salary, there is no real possibility of hiding this money from taxation. Many individuals who are able to enter into this shadow economy set up a corporation or holding company, blurring the lines between rich individuals and corporations.

Tax havens are an essential feature of the shadow economy. Although the nature of tax havens is complicated at one level, it is simple at another—The purpose is always to minimize, or better yet eliminate taxes. There is a race to the bottom in terms of tax competition, so advanced now that there is really no need for a corporation (or a wealthy individual who can set up as an international business) to pay tax. Those in business are oriented to saving costs, and what better way than to avoid taxes, the most evil of all costs. To place a positive spin on this behavior, a favorite rationale is that we all should have the right to financial freedom. A fatal flaw with this argument is that no one, individual or corporate, earns money in isolation. There is always a societal context to the money earned. For example, the high-level drug dealer relies on users, growers, processors, street-level sellers, and

enforcers. A fraudster must have victims and typically depends on accomplices, or at least the naïve who assist in the deception. Corporations must sell their services or products to people, and usually have employees. Hence, all money is made in a societal context and never in isolation. Giving back to that society for services provided, such as roads, waste removal, water, health care, and the like is a very important aspect of a social justice.

So assuming that social justice is not a priority, or even a consideration, how can taxes be avoided or minimized? The starting point is to realize that all incorporated entities pay the taxes of the location they are registered in. Even if a corporation is registered in a first world country with higher taxes, subsidiary companies or shell companies can be set up where taxes are nil or low, reducing the overall tax burden. Another key issue is double taxation treaties, or more appropriately, “double non-taxation” treaties. These widespread treaties ensure that an incorporated entity cannot be taxed twice, so if the taxation (or lack thereof) occurs in a tax haven, it cannot take place elsewhere. If you are a wealthy individual who does international consulting work and set up your corporation in a tax haven, then you will be taxed at that rate, typically zero, and cannot be taxed anywhere else. Income earned by you that is drawn from your corporation might or might not be taxed, based on the country you reside in. The US ensures that any money made by individuals anywhere in the world is taxed, but other countries do not have this requirement. Taxation is of course only on money that you draw from your corporation as an employee. A holding company or asset protection trust might be set up where assets can be held with no or little tax, and no one will learn the identity of who owns the assets. These assets can be repatriated to your country without incurring tax. Luxembourg has 15,000 holding companies. Another way might be to purchase a plane, boat, or property, and make it a corporate expenditure such as a rental unit. You hopefully get the idea that incorporated entities can avoid or minimize taxes. The cost of incorporating in most tax havens is about \$2,000-\$3,000 US, with a maintenance cost of \$1,000 per year. A favorite form of incorporation is the International Business Corporation (IBC).

A common procedure is to register a company in a tax haven with no taxes, and preferably one with limited or no treaties

regarding legal infringement. Two such treaties consist of: Tax Information Exchange Agreement (TIEA) with the US to of course exchange tax information, and the Mutual Legal Assistance Treaty (MLAT) to help law enforcement in criminal matters, but not tax evasion. If you are a US citizen and wish to evade taxes, tax havens who have signed a TIEA with your government are to be avoided, and if you are a criminal laundering money the MLAT ones are best to avoid. Tax Havens Today lists the countries that have signed these treaties. Banking services are available in these tax havens, and an interesting arrangement that is often utilized is the back-to-back loan. Basically it consists of the money in your offshore account being used as collateral for a loan. This makes a profit appear as a loan, and hence a debt. It is magic how such transformations occur in the shadow economy, but we are learning some of the magic tricks. If a person or corporation is not comfortable with the banks in the given offshore no or low tax haven, money can be shifted to a bank in say Switzerland. Swiss banking is top notch and there is great liquidity, meaning that cash assets cover all potential withdrawals. US banks are often not highly liquid. Half of all financial transactions in Switzerland involve another offshore jurisdiction.

So far then taxes have been avoided, secure banking arranged that can amongst other things make a profit look like a debt, and assets protected in a holding company or asset protection trust. Is that all that tax havens and the shadow economy can provide? Actually, there is a lot more. Offshore insurance companies can insure your business for a very attractive rate. What happens if you need to manufacture or warehouse something? Special economic zones exist where there are no labor standards, minimal pay for long hours of work, no environmental regulations, and no taxes. In 1975 there were only 79 of these special economic zones, but the number increased to 2,600 by 2006. Products likely have to be shipped if manufactured or warehoused in special economic zones. Flags of convenience for shipping vessels become very important. Nations such as Panama and Malta are ideal to register ships in, because there are no or minimal taxes, and no standards worth mentioning for the boat or crew. It would seem that pretty much everything has been covered so far, but could still there be more? Yes, there certainly is.

Beyond offshore entities funding themselves from offshore banks, in certain circumstances investment funds are required, and this often comes from so-called hedge funds. These funds are restricted to a limited number of investors and the entrance amount is huge. Being so small in regards to the number of contributors there are far fewer regulations, making them a favorite vehicle for fraudsters and those operating in the shadow economy. Legal, although of questionable ethics, these hedge funds are commonly based in the offshore world where the capital can be applied to fund all sorts of enterprises, including those in the “grey” zone. In the event that truly illegal and highly immoral enterprises are required, like crushing strikes or labor unrest in third world countries where first world corporations extract resources, then there are still other strategies—These enterprises can be funded from secret accounts and holding company money in the offshore world.

Additional illegal or highly dubious practices that also occur include: Price transfers whereby a company sells its own products to itself at cost through its offshore subsidiary, so that the profit is recorded in its offshore accounts, meaning no or little tax; false insurance payments on alleged product defects concealed offshore; fake lawsuits; transfers of funds from illegal to legal entities with no apparent connection; false winnings from casinos; concealment of dirty money in stock exchange transactions; false loans secured by dirty money through offshore shell corporations. Indeed very high financial intelligence (FQ)! The tax havens of Cayman Islands and Turks and Caicos housed about 800 shell companies used by Enron to conceal its losses. So fraud and related criminal activity is facilitated and maintained by these offshore tax havens.

Readers might be wondering why the transactions, accounts, corporate entities, holding companies etc., cannot be identified in this day and age of advanced electronic communication. Here enters the story of the two major “black box” clearing houses, Clearstream and Euroclear, set up in jurisdictions that ensure banking secrecy—Luxembourg and Belgium, respectively. These clearing houses record international banking transactions in an encoded fashion. Funds can be transferred from one bank account to another in complete confidentiality, enabling money from all sources to be mixed. The record does not appear in any public account, and the

system is both legally and technically protected. A decade ago Clearstream recorded annual transactions of \$65 trillion. A hundred countries are involved many of them tax havens. So there is no need to worry about nomadic money being traced. In one court case involving illegal activity, the judge was able to secure records of a transaction that took 5 minutes to complete after 10 years of effort. Secrecy is further facilitated by legitimate states not requiring companies to prepare balance sheets distinguishing amongst its various components. "Consolidated" balance sheets list only overall profits making it impossible to see what use of tax havens they engage in.

Okay, maybe some very wealthy individuals and businesses utilize the shadow economy, but it cannot be too widespread, right? Wrong, dead wrong! Grand Cayman alone has 14,000 companies registered, 450 banks, and 270 insurance companies, more than one financial institution per resident! This small island has more deposits from US citizens than are held in California banks. Numerous locations throughout the world serve as tax havens, a thorough list with contacts and attributes is found in the book, *Tax Havens Today*. Beyond the impressive array of features covered so far there are some fascinating additional perks, such as the possibility of buying citizenship with a valid passport in the Caribbean tax havens of Dominica and St. Kitts & Nevis. This is a useful feature if you are from the US and prepared to renounce your citizenship. Some tax havens, such as Cook Islands and Belize, are particularly great for asset protection offering hard to penetrate asset protection trusts. Interestingly, the excessively litigious nature of the United States, fueled by an excessive number of lawyers, does provide an understandable aspect to asset protection in select instances.

Many believe that it is only small tropical paradises that house offshore tax havens. This perception is once again completely wrong. Although authorities in the US seem to be on the attack against tax havens, it appears to be a matter of selective focus, as one of the biggest tax havens in the world is the onshore offshore entity of Delaware. Represented by Vice-President Joseph Biden in the Senate for 36 years, Delaware houses 850,000 corporations, including more than 50% of all US publicly traded companies, and 63% of Fortune 500 companies. Not bad compared

to a population of 800,000 residents. Secrecy is guaranteed, such that public authorities are not aware of business activities or the state of accounts, as long as the company is not publicly traded. Advantages include, no corporate taxes, anonymity of directors and shareholders, fast incorporation (a day or so), and cost effective to both open and maintain. Approximately \$5 trillion in undeclared funds are in Delaware accounts, and Americans have about \$1.6 trillion hidden from US tax authorities in Delaware. Other impressive tax havens include the City of London, where 40% of the world's offshore money converges and finds protection, and Hong Kong linked to China.

In many ways it seems that first and third world nations are complicit in this, dare I say conspiracy, or perhaps we should just say high FQ (financial intelligence) behavior. Beyond not requiring companies to provide balance sheets indicating what precise use of tax havens has been engaged in, exchange controls on capital and other regulatory measures have been all but eliminated, allowing shadow economy nomadic money to flow around the world. The secret nature of this money ensures that dirty or grey money can be mixed with legitimate money, giving the appearance and reassuring spin that it is clean. As it turns out the nations of the world are highly dependent on this money as loans, and will do what it takes to get even a bit of it. Nations now bow down to corporations and the offshore banks. The financial elite lobbies for laws favorable to their activities and needs often using offshore money. In addition, they engage in other forms of influence peddling, and in third world countries have been known to control the police and military, or employ mercenaries to achieve desired results. These activities pay well. For example, Heritage Oil of Calgary was founded by Tony Buckingham, a former partner of Executive Outcomes, well known for its mercenary activities in Angola and Sierra Leone.

Alain Denault (Offshore) indicates that there is a triangular structure existing in the financial world. Occupying the apex controlling position are offshore interests with their nomadic capital, and at the two bottom points are first and third world nations. First world nations are desperate for nomadic capital to fund public services they can no longer afford, and third world nations badly need it to cover huge debts they can never repay. Of

course, the money loaned represents a tremendous debt as well, that likely can never be repaid much beyond interest charges. In third world countries the costs of corruption ensure that nomadic money is required, despite intense resource extraction. Between 1970 and 2008, \$854 billion to \$1.8 trillion dollars left Africa with little or nothing returned, ensuring that nomadic capital was required to fund their debt. Financial support is paid from taxpayer dollars in first world nations, in support of corporations that exploit the resources of third world nations, without giving back beyond bribes to select individuals. Canada for example backs the mining industry, and most mining companies of the world have a legal presence in Canada. Taxpayer money and forced pension contributions assist many of these mining companies, who routinely exploit the resources of third world countries, and who the Canadian government and legal system fully protects. For all these reasons first and third world nations are then permanently indebted, and hence subservient, to offshore banks and the nomadic capital of the shadow economy.

Tax havens are sometimes defended on the basis that they provide money for the small nations where they reside. This positive rationalizing spin is without substance, because in the vast majority of cases very little of the money involved trickles to the citizens. Money earned in the tax haven is to be taxed at a reasonable rate; it is just that money earned abroad is not. This system acts as a disincentive for a wealthy individual or corporation to actually invest in the affairs of the tax haven. Grand Cayman represents the 5th most influential financial center in the world managing \$5.3 trillion in funds, and has an advanced tourist and scuba diving infrastructure as well. When hit by a hurricane, plus a minor financial setback induced by a downturn in the economy, the government asked Britain (Cayman Islands are an overseas territory of the United Kingdom) for aid money and received it. These offshore nations often cost a great deal to live in, and import duties can be very high. So the wealth does not really distribute to the average ranks within these offshore nations, although the bankers and corporate lawyers certainly do extremely well.

A valid question pertains to how effective tax havens are for individuals and corporations? Perhaps many of them exist but without much of an impact. The very high number of tax havens

and banks associated with them strongly suggests that it is very profitable for corporations and wealthy individuals. One measure might be the percent of taxes paid by corporations. In the US, corporations paid as a percent of federal tax 50% during World War II, 21% in 2001, and now less than 10%. A third of the largest US corporations pay no tax in one out of three years, due to tax havens. Even the amount of money exposed to "fair" taxation is taxed at a rate far below that of individuals, and can be deferred by corporations by means such as accelerated depreciation. In Canada many people pay 30-40% or so of their income in taxes and corporations about 15%, with plans to lower the rate even further for corporations. Judging by the financial compensation Chief Executive Officers (CEOs) of corporations receive, the low or no tax system must be very profitable indeed. The medium pay for CEOs at 200 large corporations was \$10.8 million dollars in 2011, up 23% from 2009, while unemployment was 9%. According to the Canadian Centre For Policy Alternatives, the average Canadian CEO earned in the first 1.5 days of 2014, what the average Canadian worker brings in throughout the entire year! Income disparities as measured by the Gini coefficient are increasing worldwide; the rich are getting richer and the poor poorer, in large part due to the shadow economy and hoarding of money offshore away from reasonable taxation.

Offshore tax havens and the shadow economy are very effective agents in the service of wealth accumulation, freeing income from taxation and other costs. Much of the money in the world has managed to become free of taxation for the benefit of corporations and privileged individuals, and to finance activities such as lobbying and bribes that help sustain the system. A monster has indeed been created, but one that is very friendly to the financial elite, while leaving the 99% or so of have-nots wanting. Like all monsters, the system is difficult to control with the euphoria of financial conquest feeding more greed that in turns drives more financial manipulations to get ahead, and so on and so forth. One has to wonder why we are so greedy? We must be careful not to assume that it is only the 1% or so that is now in control. The problem lies in our very nature as human beings, seemingly obsessed with resource accumulation; the elite 1% are just those possessing a very high financial intelligence (FQ), and a

very limited or non-existent sense of social justice in many instances. To have any hope of changing the system we need to learn why we are so prone to greed and extreme resource inequities. Based on this knowledge, and an acceptance that it is a problem of “we the people,” and not just of the elite few, it is possible to design a new system beneficial to all. To understand why we are so greedy we must first look to our evolution.

THE EVOLUTION OF GREED:

Greed can be viewed as an excessive desire or motivation to acquire important resources. Money has value because it can be applied to purchase a wide range of resources deemed valuable to the individual. In this way money enables a person to accumulate far more resources than would ever be feasible in say a barter system. However, money was not present during much of our evolution, and exists as a modern creation facilitating resource accumulation. To understand the evolutionary roots of our desire to amass important resources, we must first consider resource acquisition in a social context, deceit, and social organization based on hierarchies.

Resource Acquisition In A Social Context:

In order to survive and reproduce every organism needs to acquire resources that facilitate those aims. Humans arose approximately 200,000 years ago with essentially the same brain capacity of modern humans. Life was often short and brutal, with most people not surviving beyond 30 years, and 40 years being quite old. Resources such as water, nutritious food, hunting implements, shelter from harsh elements, and safe sleep settings were essential. Survival, reproduction, and successful rearing of offspring, required all of our ancestor’s intellectual abilities. Given that we lacked the natural physical defenses possessed by many other animals, our ancestors had to rely on a hunting-gathering form of social organization, whereby about 20-100 individuals moved about seeking game and nutritious vegetable matter. This hunting-gathering form of social organization fostered greater success for individuals based on shared defense, food acquisition, and rearing of offspring. Knowledge of the region was crucial, such as where game of particular types was most likely to be found, where

vegetable food items grew, and where the safest shelters were located. Conscious, and even unconscious thought processes, derived from our intelligence enhanced the acquisition of these crucial resources. For example, the conscious analysis of where the best locations for finding particular types of game at a given time of year, would have aided in the hunt.

Hence, a combination of superior intelligence and the hunting-gathering form of social organization resulted in optimal resource acquisition. However, certain features of the environment and hunting-gathering way of life placed tremendous limits on how many resources an individual could possess. Given that there was no refrigeration, meat and vegetable matter had to be consumed quite quickly. Mobility to seek out food and safe shelter in different locales, also greatly restricted what could be kept because it all had to be carried. Sharing and reciprocity within the hunting-gathering group was essential, and obligations and entitlements were carefully noted and responded to, as revealed by researchers such as Glantz and Pearce. For example, these researchers indicate how among the modern day hunting-gathering Kung Bushmen of the Kalahari, exchange relationships can last a lifetime, and even beyond being passed onto a person's children. Reciprocity was and still is a crucial feature of the hunting-gathering way of life. For example, if your hunt goes well and you share, then when your hunt fails those who you previously gave to pay you back. Failure to adhere to reciprocity and honor debts results in ostracism, meaning either exclusion from receiving important resources or rejection from the group in severe instances. Sharing and reciprocity then greatly restricts resource accumulation by individuals. So important was reciprocity to our survival that our social cognitive capacities are very attuned to it, such that we expect fairness and reciprocation.

Given that the accumulation and hoarding of resources was not viable during the 95% of our evolution in hunting-gathering groups, the negative consequences of a strong motivation to acquire important resources was largely nil. Success induced by a high resource acquisition capacity, combined with sharing, often resulted in a person becoming more popular and assuming a leadership role. Such a role typically facilitated further success in acquiring important resources, because leaders would likely claim and receive the best cuts of meat in a group hunt, secure the safest sleeping

locations, and have more success acquiring a mate or mates. Then we move ahead to an agricultural form of social organization that arose about 10,000 years ago, whereby people started adopting a way of life characterized by raising crops and animals in defined areas. In this form of social organization resource retention starts to become viable and advantageous. For example, land with better quality soil produced superior crop yields, some capable of being stored. With each family responsible for their own land sharing becomes less essential, although still important.

The real jump in the ability to amass resources occurs as we progress to an industrial form of social organization. Sharing is much less valued, and the monopolization of resources is not only allowed, but also rewarded. Since bartering is not a viable exchange system given the diversity of resources, money is relied on as an exchange vehicle. Applying our superior intellectual capacities to the acquisition of money allows resource accumulation to go wild so to speak. All of the natural constraints present in a hunting-gathering form of social organization are removed, and with the application of financial intelligence (FQ) facilitating resource accumulation, unprecedented success in this regard becomes a reality. I suspect that our advanced capacity to acquire important resources, combined with the feasibility of amassing them in an industrial form of social organization, plays a major role in hoarding as a mental health issue. The public has become aware of how severe this condition can be by watching reality television shows documenting it. Although viewers see no value in the items retained, the hoarder places value on their acquisitions, as evidenced by the emotional connection, and cannot let go of them. The hyper-consumerism and widespread focus on acquiring material items present throughout the world, is understandable given our natural motivation to acquire resources, the enhanced resource acquisition capacity provided by intelligence, and how our industrial form of social organization removes constraints and rewards successful resource accumulation.

Deceit:

In considering resource acquisition in a social context, you might get the impression that it is based on equitable exchanges and fairness. True during much of our evolution features of the hunting-gathering way of life provided strong sanctions for

reciprocity and fairness, but deceit has value in that by giving less and receiving more, we can rapidly advance our success in the quest to acquire important resources. If you take choice cuts of meat from another person when your hunt goes poorly, and return poor cuts when their hunt goes badly, then you ensure the most nutritious food for yourself and family. By giving less food in exchange for a farm implement than was bargained for, you retain more food for yourself and benefit from the tool to further enhance productivity. If you deceive tax authorities regarding your income and avoid fair taxation, you keep more money for yourself. In other words, deceit pays when it comes to resource acquisition and retention.

Many animal species demonstrate deceitful behavior strongly suggesting that it is genetically based. Bird species, once thought to be monogamous, show quite advanced deception with the male seeking further reproductive opportunities while out searching for food, and the female allowing the advances of a physically superior male, to improve the chances of her next brood surviving and reproducing. Given how deceit can enhance resource accumulation, that in turn augments survival, reproductive success, and care of offspring, it is understandable that the capacity to deceive is genetically based. Ah, but perhaps humans are somehow superior and free of this genetic motivation. Well, a look at deceit in children before they have time to learn enough from caregivers shows that we are also genetically endowed with a capacity for deception. A very unique study by Chandler and colleagues in 1989 demonstrates this capacity.

These researchers tested two, three, and four year old children using a unique game, involving a board, five plastic containers with lids, a treasure, and a puppet on a movable wheel studded with feet that left clear sets of inky footprints. The children had to hide the treasure in one of the containers, and were instructed to do it in a way that would make it difficult to find. Potential strategies for deceiving as to the location of the treasure included, destroying evidence by wiping out ink tracks to the appropriate container, lying about the location of the treasure by directing the experimenter to search in another container, falsely nominating one or more of the containers by laying down additional ink tracks, and destroying evidence plus laying down

false tracks. These strategies entail progressive degrees of complexity. Amazingly, they found that fifty percent of two year olds applied the most advanced strategy, and a full ninety percent of two and three year olds took some action to deceive. Furthermore, there were no significant differences between children of the three age groups in their choice of deceptive strategies. What did differ was the percentage of children who were able to give anything that could pass as an understandable reason for their actions, as only fifty percent of two year olds, compared to eighty-five percent of four year olds provided a rationale. This latter result suggests that the ability to deceive even precedes our capacity to consciously understand and express the concept of deceiving.

With growth and development deception becomes more sophisticated and conscious. For example, students in university frequently purchase essays from online sites and claim that they wrote the paper. A contractor promises the job will be done to a high standard using good materials, but ends up providing lesser work with lower quality materials. Rationalizations for deceitful actions, representing self-protective positive cognitive distortions (see *Defending The Indefensible* chapter), are commonly generated to manage guilt and other negative emotions. For example, a university student buying an essay might rationalize his or her deceit by claiming that a similar quality paper could have been written, if they were not so busy. Deceptions and rationalizations of such actions are enacted everyday by people of all ages, races, and vocations.

Circumstances play a major role in whether or not, and to what extent, acts of deception occur. When parties interact on a regular basis and have to maintain a certain reputation, deception is attenuated. In the barter system of days gone by many of the players knew each other interacting regularly. If one person deceives during a trade word will quickly spread damaging that individual's reputation, and hence chances of engaging in successful trades in the future. Reputation highly influences whether or not an individual is selected for reciprocal exchanges, because a good reputation increases the chances of success and reduces the odds of deceit, while a bad reputation results in the opposite outcome. The bartering process is an ideal reciprocal

system because it enables both parties to provide information and gravitate to a fair exchange. When interactions are between strangers and not face-to-face the chances of deceit are much greater. In our modern computer world many exchanges take place online, and there is no knowledge of who the other party is. Understandably, many people have been duped, and those who are cautious only deal with reputable organizations.

The ultimate in deception capacity occurs in the form of Antisocial Personality Disorder, such people also known as psychopaths or sociopaths. These individuals demonstrate an enhanced ability to acquire resources through deception. An experimental procedure, referred to as the Prisoner's Dilemma, illustrates how a psychopathic deceiver strategy can facilitate the acquisition of resources. The procedure consists of a two-person game with repeated plays, during which each participant either cooperates or defects. If both participants cooperate they maximize their joint long-term gains, but if one defects while the other cooperates, the former individual gains while the latter loses. A defection strategy, highly preferred by psychopaths, pays off very well when players are unlikely to encounter one another again, and memory for cheaters is not perfect.

Both research studies and mathematical models, have shown that antisocial behavior can be adaptive when the following criteria are met: Psychopaths are infrequent relative to more honest and cooperative individuals, it is possible for them to move on from one group to another, and when there is some cost or difficulty in recognizing cheaters. If psychopaths are too common they are less able to manipulate others, because cooperators are more wary of them and interactions with fellow psychopaths occur more frequently. While not uncommon, psychopaths comprise a distinct minority of the general population, compared to 20-25% of prison inmates. Failure to move on to a fresh group of cooperators will also increase the risk of detection. Psychopaths frequently move from one area to another, and rarely sustain relationships in the long term. Costs and difficulties detecting cheaters exist, because most of these individuals are very smooth, superficially appealing, and highly manipulative.

Further evidence for the adaptive success of antisocial behavior comes from indications of their reproductive success and

low fluctuating asymmetry, according to Harpending and Sibus. Male psychopaths are renowned for their ability to impregnate women, while allowing other men to expend resources raising their offspring. In addition, they frequently do not maintain child support payments unless forced to do so. Female psychopaths can be very skilled at manipulating men to assist and provide resources, even when the child is not his own. Although somewhat cold-blooded, these strategies entail adaptive resource-enhancing behavior. Fluctuating asymmetry refers to the degree of asymmetry between the right and left sides of the body. In humans, men with low fluctuating asymmetry (highly symmetrical), including many psychopaths, have been found to report more sexual partners and start intercourse at an earlier age, and their female partners report more orgasms. High fluctuating asymmetry is associated with schizophrenia, birth prematurity, intellectual impairment, developmental delays, and lower IQ among university students.

Psychopathic behavior is beneficial in that it assists a person in cheating others to enhance resource acquisition. It can also be adaptive in violent settings where having the ability to hurt others and kill without remorse is adaptive, such as during periods of warfare where behavior such as raping and pillaging can be adaptive, at least from a resource acquisition perspective. For most people, engaging in elaborate and intense deceptions and violent acts generates too much fear, guilt, and remorse. Psychopaths are relatively free of these disturbing emotions, enabling them to act in ways that others find difficult to engage in and live with the knowledge of. Imagine such a person holding a position of power and influence, or controlling an investment fund. All sorts of deception can and are engaged in on a routine basis enhancing the resource status of these individuals. Even if deception takes a milder non-antisocial form, the deceiver often gains an edge in the quest to acquire important resources.

Power Of The Hierarchy:

When you envision the social landscape do you naturally think of it being flat, with everyone equal and entitled to the same resources? No, we naturally conceptualize it as being hierarchical with an uneven distribution of resources. To some extent that is because we are familiar with this system, but we are familiar with it because it

is a natural organizing principle of humans and certain other species. Whenever two or more people come together for any length of time, a hierarchy invariably seems to emerge. This phenomenon has been demonstrated in diverse groupings including, preschool children, early and middle adolescents at summer camp, inmates of penitentiaries, and psychotherapy groups. Hierarchical social structures also characterize armies, governments, educational institutions, corporations, and businesses, and are independent of political and national boundaries. The cardinal feature of hierarchies is graded positions of dominance and status. Dominant, high status positions typically confer an advantage in terms of resource accumulation. For example, senior managers earn more and receive larger bonuses than junior managers, and we are all familiar with the insane salaries and bonuses awarded to CEOs.

Why would we organize ourselves in a hierarchical fashion when it guarantees inequity, and is likely to deprive us of resources, unless we happen to be at the top? The short answer is that throughout most of our evolution a hierarchical form of social organization was adaptive for the group, and hence individual members. As expressed by Stanley Milgram, "Through the ages, hierarchy has increased group members' ability to cope with environmental threats and reduced conflicts between them." Unfortunately, modern day dominance hierarchies can be quite damaging at times, particularly for those in subordinate positions. Furthermore, the very nature of a system based on dominant-subordinate rankings ensures that inequalities will exist. It might even be said that hierarchies exist because those in dominant positions enforce participation overtly or covertly. While this perspective might apply to some hierarchies, it cannot possibly account for how this form of social organization unfolds naturally, even when participation is strictly voluntary, such as in a hobby club, or when the costs of enforcement exceed the benefits for dominant members. Our natural propensity to form hierarchies ultimately motivates politics, both "small p" between people and at a societal level. We seemingly cannot resist our motivation to organize into hierarchies, even when the minuses outweigh the pluses.

The formation of hierarchies with dominance rankings occurs in several social primate species other than humans. Gorillas,

macaques, langurs, vervet monkeys, rhesus monkeys, baboons, and chimpanzees, for example, demonstrate clear-cut dominance hierarchies. Chimpanzees have very complicated social structures with an alpha-male at the top. In order to achieve a position of dominance, a male has to recruit support from dominant members of the female hierarchy. Strength and knowledge of the local environment are important factors qualifying an individual for the alpha-male position. The alpha male typically has the capacity to protect the group while securing valuable resources. As demonstrated by Sapolsky, hormones play a role in that higher status is associated with increased testosterone levels, resulting in a cycle of superior rank producing higher testosterone levels, fostering dominant behaviors that enhance status, stimulating further increases in testosterone, and so on and so forth. Dominant males also appear to be less adversely effected by stress hormones, enabling them to cope better with the challenges of life.

Savannah baboons are important to consider because their evolutionary context is similar to that of humans. Like our hunting-gathering ancestors, savannah baboons travel in small bands in areas often lacking tall trees capable of providing refuge. Once a dangerous predator appears on the scene, the group instantly mobilizes according to the hierarchy. The dominant male/s remain in the center guarding the juveniles and females, while the lower ranking males assume defensive positions towards the periphery. This arrangement is extremely effective in repelling predators without any damage being inflicted on the juveniles or females.

Hierarchies are adaptive for the individual members of hunting-gathering groups, even when they occupy subordinate positions. An established dominance hierarchy enables the group to effectively defend against predators, and other such groups. Even in modern times this arrangement has value in certain circumstances. Imagine two platoons of soldiers under attack; the first has a clear-cut chain of command, while the second lacks any dominance rankings. The former will be able to instantaneously mobilize into a coherent and uniform defense guided by superiors. Amongst the second group, confusion will prevail as members respond to the challenge in their own way. In the final analyses, the former group will fair much better, optimizing physical health and other important resources for even the lowest ranking members.

We must keep in mind that while wounds in modern day soldiers can often be treated effectively enabling them to survive, this luxury has not been available to baboons and other primates, nor to humans until the second half of the nineteenth century, when the Red Cross and other humanitarian organizations formed. Prior to this, wounded soldiers would often lie for days on the battlefield until they died of their injuries. In short, a significant wound equaled death. In addition to defense, a hierarchical structure permits a more effective offense. The attacking force will fare much better with a clear chain of command and everyone adhering to their respective ranking.

An effective defense and offense ultimately share one common feature; they optimize resource status. Attackers, including predators and competing groups, clearly seek to acquire resources. Predators are in search of food, and often focus their efforts on young vulnerable members of the group. Competing groups can be after a wide range of resources, including food, desired territory, money, valuable possessions, and females for reproduction. Until recent times, the Yanomamo Indians of the Amazon routinely attacked competing groups to acquire women. While the attackers are striving to accumulate resources, the defenders are attempting to retain the ones they have. Of particular importance are children who represent the continuation of both individual members and the group as a whole. Predators represent an obvious threat, but competing groups are equally dangerous as they might either inadvertently damage the young, destroy them to weaken the group as a whole, or take females many of whom are mothers as prospective mates. Hunting-gathering groups failing to adopt a hierarchical form of social organization tend to fare much worse. Both their defenses and attacks are more likely to fail, resulting in a diminished resource status for individual members. Hierarchies, on the other hand, typically enhance resource status within this social context.

Due to the resource enhancement derived from hierarchical systems, genes influencing the bearer to participate in hierarchies were more likely to be passed on than genes encouraging alternative strategies. This selection process has progressed over much of primate evolution, endowing humans with an overwhelming predilection to organize into hierarchies, and view

the social landscape in this fashion. Hence, even today we naturally think in terms of rankings and automatically assess the attributes of others to determine their status. In addition, we reflexively adopt behaviors consistent with our rank. A dominant person tends to be more outspoken and less worried about the impact of his or her behavior. Dominant positions are desirable, because they do aid in the ongoing struggle to optimize our resource status. For males higher status has traditionally translated into greater reproductive success. An interesting study by Mealey examined the reproductive success of early Mormon males. Higher status was based on church rank, wealth, and kinship support. The study revealed that higher status was associated with more offspring. In modern times it is no secret that those with higher status typically earn more, own nicer homes in safer areas, drive better cars, and send their children to more prestigious schools. Even in a population of female psychiatric patients, Sassin and colleagues discovered that higher dominance rank confers greater access to desired resources.

Given the natural tendency of humans to organize into hierarchies, it is little wonder that attempts to flatten social systems usually fail, or at the very least require an ongoing expenditure of resources to maintain. Even then successes in creating a level playing field often ignore the less visible dimensions of the setting. For example, a re-engineered factory might dispense with different rankings and assign equal responsibility to each employee. At a superficial level it appears that there is a flat system. However, at a more substantial level there are informal hierarchies, with some individuals ranking higher in knowledge and skills, and others in social popularity. The everyday actions of most employees are more likely to reflect the informal hierarchies than the formal flat system. A less competent employee will defer to a more skilled higher-ranking colleague in matters pertaining to the task at hand. Socially dominant individuals will prevail in lunchroom discussions, and often set the work pace.

On a more global scale, communism can be viewed as an attempt to flatten out the hierarchy that naturally emerges in terms of economic success. Even in the theoretically egalitarian system of communism, hierarchies rapidly form. Members of the communist party have more prestige than most nonmembers, and within the party there are numerous rankings. Those with higher ranks obtain

more privileges, such as better schooling for their children or themselves, superior apartments, and higher quality food and clothing. Theoretically egalitarian systems naturally drift towards inequality. Capitalism prevails in part because it is in synch with our tendency to form hierarchies and accumulate resources, two mutually compatible endeavors. However, unrestrained capitalism creates enormous stress and suffering for many individuals, namely those at the lower end of the economic spectrum. Hence, populations with greater income differences tend to have higher mortality rates, mainly due to the negative effects of lower social status, such as increased vulnerability to violence, as reported by Wilkinson in 1999.

The power of the hierarchy is so enticing that those rising up in dominance rankings often enter into an addictive unrelenting upward cycle of success producing reward, leading to more effort and success, generating further reward, and so on and so forth. Judgment and decency can easily become impaired in the process. This is one reason why more is never enough in the business world. If a million in profits occur one year, then it should be two million the next year, and four the year after. It is easy to become engrossed in this escalation and blind to the plight of the less fortunate. Greed is justified, such as by the “rational” free-market approach to economics, viewing greed and the aggressive accumulation of wealth as a driver of economic growth, effectively disconnecting followers of this view from the enormous and mounting social and environmental justice costs. Ironically, the excesses of a capitalist system seem to create an environment ripe for alternative systems, such as communism. Although now viewed as a failed social experiment, communism arose largely in response to the suffering of the lower classes. Countries that switched to communism were often the ones with the most inequality, such as Russia, China, and Cuba. Recent times are witnessing a rise of another extreme form of social organization-fascism-as in Greece and other areas hard hit by austerity measures. A rise of fascism is the last thing that most members the financial elite want, a motivation to be more open to changes, even if somewhat costly to them.

Given the power of the hierarchy we are too accepting of inequity, even to the point of justifying the obscene salaries of CEOs. Those in senior positions feel entitled to riches, and the

population at large generally supports this entitlement. However, outside of our hunting-gathering context free of predators and competing groups, hierarchies are only required in very limited scenarios and settings. Unquestionably there has to be a hierarchy and chain of command in complex organizations, but there is no justification for the enormous disparity in resource standing between the higher and lower levels occurring nowadays. This degree of disparity is accepted, largely because we view the social environment in a hierarchical fashion, and automatically believe that those at the top are entitled to more resources. By correcting this natural distortion, and regulating both our strong propensity to acquire important resources and the tendency to engage in deceit to achieve this aim, we will be better able to right the wrong of resource inequity and control greed.

WHAT WE NEED TO DO:

An insightful examination of the world's financial health reveals a patient in critical condition. Many wonder why the economy is so bad, but the real question is why is it not worse? With-rampant and highly profitable (for the few) crime, fraud, and corruption; much of the world's money hidden from fair taxation in offshore tax havens; corporations claiming the rights of individuals, but paying far less tax than ordinary citizens in first world nations, and essentially no tax in offshore havens; the wealthy being largely able to avoid taxes; special economic zones; additional entitlements provided by the shadow economy-how could it go well for anyone other than the financial elite? It really is a rhetorical question. The system is deeply flawed, and brushing off the skin is not going to work. The US and other countries seem fixated on the war on terror, although for all its likely impact terrorism is an annoying fly compared to the monster that is the shadow economy. Furthermore, terrorism can be and often is funded from the shadow economy. The financial intelligence involved in the shadow economy is very high, and in line with this level of intelligence, very well paid spin-masters craft a picture for the masses distracted by hyper-consumerism. The shadow economy is portrayed as a limited entity only used by a few bad characters, whereas it actually is a major instrument of corporations and the financial elite designed to monopolize wealth. The changes that I

suggest here will undoubtedly be spun another way by these spin-masters, but I hope that readers will see beyond the defensive spin. If the changes suggested below are followed, we will end up with a system that is vastly better for the average person, and still very reasonable for the more fortunate, although everyone will have to swallow their greed. This system might best be referred to as social justice capitalism.

Appreciating Who We Are:

Greed is not what distinguishes the financial elite from the rest of the population, as we are all greedy based on our evolution. It is just that the financial elite seem to have higher financial intelligence (FQ), and often limited or no adherence to the values of social justice. Antisocial individuals with high FQ do very well, at least until handed out one of those 100+ year prison sentences. However, they always seem to be caught when they are over 50 or 60 years old limiting the impact of the prison experience. If we simply target the successful greedy, then their successors just assume the greed-privileged role, and nothing really changes. No, the changes must factor in our inherent tendency to be greedy. On the optimistic side we are capable of making sweeping changes to society when the will is present, as history demonstrates. Alain Deneault (Offshore) points out that people often assume that experts are required to produce change, but experts do not make history, people do. People have the power and experts can guide, assuming that those experts are not imbedded and invested in the system that needs changing.

About seven years ago I predicted that a revolution would occur due to the enormous financial disparity that has only gotten much worse, and how mass aggression tends to arise when resources are scarce for a large segment of the population. Most of those I mentioned this to rejected, or at least strongly doubted it. I suggested that the revolution might arise in 20-30 years, but it came much earlier than I thought, and not where I imagined. Revolution against economic disparity swept Arabic dictatorships (the Arab Spring) starting in late 2010, where the perfect storm of a small and brutal financial elite, widespread poverty, massive youth unemployment, and social media blew the lids off. Media in the western world often portray the Arab Spring as an issue of

democracy, but these nations have no experience with this form of government. The real issue is a staggering disparity in resources between the very few haves and the many have-nots, and how the latter have had enough of this gross inequality. When I point this reality out to people and say it could happen in first world nations, the answer is usually, "It can't happen here," reflecting a positive spin to feel safe. With the 1% financial elite said to control 99% of the wealth (or even if it was 10% controlling 90%), rising disparity, over-whelmed taxpayers, increasing youth unemployment (now 50% in Spain), an economic system that feels like a sinking ship, increasing awareness of the problem as evidenced by the Occupy movement, and excellent social media, could a revolution occur throughout the world? Of course not, it will all be okay. A sense of humor helps because without it you have to cry. It could indeed occur as a worldwide event. May we be so unfortunate as to live in interesting times.

As with most revolutions though the outcome cannot be fully predicted, and instead of ending up with a better society emphasizing social and environmental justice, we could end up with something much worse than the status quo, given that extremes such as fascism gain a foothold in very trying circumstances. Those who value democracy and a capitalist system need be worried, as some are starting to. As Winston Churchill told the British House of Commons so many years ago, capitalism, "is the worst economic system in the world except for all the others that have been tried." The complexity of society necessitates specialization, and exchange of goods and services, with private ownership (capitalism). Even going back to our hunting-gathering evolutionary context, specialization occurred with men tending to hunt and defend, and women raising children and gathering vegetable foodstuffs. Within those roles specializations occurred, as some individuals might be more skilled at childrearing and others at finding the best vegetable items.

Move ahead to our current society where there are countless roles. We can only be good at so many things, and have to rely on others exchanging goods and services. Capitalism supported by democracy is the best system so far devised for facilitating this exchange network. Unfortunately, the version created did not factor in our inherent propensity for greed, and has instead been

designed to facilitate the monopolization of wealth by those with high financial intelligence. These individuals through lobbying pressure and influence on lawmakers have designed the system to suit their own needs. By paying heed to warnings, and very obvious current circumstances, and over-hauling the capitalist system such that it transforms into social justice capitalism, we the people will be much further ahead and revolution can be avoided.

Transparency or Bust:

As it stands now the economic system is as transparent as swamp water. Economic liberalism maintains, that all rational agents in a market share the same information that they are likely to interpret, and on the basis of which they can make enlightened decisions. Denault points out that economists and investors necessarily have a blind spot due to the way things are structured. Of course the last thing that players in the shadow economy want is the powerful search beam of transparency to shine down. You can just imagine all the scurrying motion that would take place. What needs to become transparent could fill several books, so by necessity the coverage here will be limited. Perhaps a good starting point is with corporations publicly reporting all financial details of their profits, costs, turnover, employees, assets, accounts, holding companies, trusts, offshore businesses, and taxes, in every jurisdiction where they have a presence, instead of the current consolidated reports. Their entire financial transactions must be completely clear. This step applies to all incorporated entities, including individuals who set themselves up as corporations. Multilateral and automatic tax information exchanges must be set up throughout the world, ensuring that there is full transparency of tax information.

Transparency must also cover the entire shadow economy so that it is bathed in radiance. Owners of all bank accounts, corporations, holding and trading companies, trusts, foundations, and the like, must be clearly identified. If no one comes forward to claim ownership, it must be assumed that ownership is linked to traditional criminal activity, fraud, or corruption-bribery. Information from tax havens must be compared to the financial records presented by corporations to ensure accuracy. The secretive financial transactions processed by Clearstream and Euroclear (anything but clear) must be made public or at least exposed to the

relevant authorities. Financial exchanges between governments, businesses, and potential intermediaries, must be fully clear to prevent bribery or at least identify it.

As pertains to financial markets, complex financial products, such as derivatives and other instruments bundling debt, lack transparency in that no one understands the implications if and when things go south or sideways. Systematic removal of regulations pertaining to these instruments played a massive role in the financial collapse of 2008 (see the Irregular Regulation chapter). Furthermore, almost no one that played a role has been held responsible, and many walked away much richer and with nice perks. For example, Senate banking committee chairman Chris Dodd received a V.I.P. reduction on mortgages for his homes (plural) from Countrywide Financial Corporation, with a special note from CEO Angelo Mozilo "F.O.A." (For friends of Angelo). As the head of Countrywide Mozilo was a key player in the subprime lending that derivatives were so tied into. For his role Mozilo was fined \$67.5 million, and although that sounds like a lot, it represents only 10% of this man's staggering wealth and a tiny fraction of what people lost in life savings. If complex products largely designed to be unclear persist, more of this market madness and corruption will continue, hence they must be eliminated. At the very least, they must be redesigned to be fully transparent regarding their impact on the system at large, and those who design and use them must be held financially liable if things go wrong. The lack of transparency of hedge funds allowing for both fraud against investors and the use of these funds for less than ideal purposes in some instances, need be remedied as well.

End Tax Havens & Other Instruments of the Shadow Economy:

To ensure full transparency and bring about social justice capitalism, tax havens and the black box clearing houses supporting them must be eliminated. Major players in the world like the US and UK claim that they cannot touch these tax havens because they are independent. A very interesting position considering that three-quarters of them are dependencies of these two countries, and Delaware and the City of London are right onshore. Of the remaining quarter of tax havens not dependent on these two superpowers, several are reliant on other first world

nations, such as Cook Islands on New Zealand. Even if force is required I doubt that the navies and armies of St. Kitts & Nevis and Belize, for example, would fare well against those of the US or Britain. The two black box clearing houses are owned by US and European interests, and are based in Belgium and Luxembourg, making for easy access if legislated.

There should be no doubt that these tax havens and the instruments of the shadow economy could be easily penetrated and dismantled if there is a will to do so. However, do not count on the United Nations (UN) as the policy expressed is: The battle against tax evasion is internal to legitimate states to pass through legislative changes adopted by individual states. In other words, no action will be taken by this organization, not surprising given that many member states are associated with tax havens, or are tax havens themselves. Would you expect the foxes to voluntarily remove themselves from the chicken coop? Given the highly political nature of the UN and interests backing the shadow economy, it would likely take several decades of costly negotiations to arrive at even the first step of many towards dismantling tax havens. Can you just imagine the political negotiations over time ensuring that nothing constructive occurs beyond window dressing? The inertia of systems like the UN to do anything about the problems, other than some steps against money laundering, is why I fear that revolution might end up being the only way social justice capitalism ever occurs.

Strong Regulatory Controls & The Enforcement Of Them:

Within a hunting-gathering form of social organization greed was naturally regulated, in that it was impossible to hoard items, and sharing in a reciprocal fashion was crucial to survival. Deceit was present but had to be limited, or the perpetrator faced severe ostracism. In our modern industrial form of social organization these natural restraints are almost completely absent. The only remotely natural restrictions operating are guilt and remorse, but these feelings seem to be limited amongst much of the financial elite, and are completely nonexistent in psychopaths. Even when these feelings are experienced a positive spin is often generated to rationalize greed. For example, "The economy depends on people like me who get it done," or "This is what business success is all

about." Each of these spins has a logical counter-spin, such as for the latter, "If business success requires the deception of the shadow economy, then truly legitimate businesses stand little chance and it is indeed time to overhaul the entire economy." In select but notable instances, such as with the Bill & Melinda Gates foundation, a large amount is given to charity, philanthropy to a great extent being a way the financial elite manage their feelings of guilt and remorse.

Given that we lack sufficient natural restraints for managing greed in the current environment, external restraints are essential. To maintain and advance their aims it is in the best interests of the financial elite to weaken or eliminate regulatory controls. This small segment of the population, possessing high financial intelligence, systematically lobbied the Bush administration to remove regulatory controls pertaining to derivative markets, ensuring enormous profits for key players and the massive financial meltdown of 2008. After the stock market crash of 1929, it was realized that regulatory controls were essential and many were put in place. Consistent with the saying by Friedrich Hegel, that the only thing we learn from history is that we learn nothing from history, the system later gave up on regulatory controls. Many financial frauds are able to occur due to poor regulation. Madoff for example was able to get away with his high FQ Ponzi scheme for years, due to wholly inadequate regulation by the Securities and Exchange Commission (SEC). An insightful investment professional Harry Markopolos ran the calculations and realized that Madoff was engaging in fraud. He spent from 1999 to 2008 writing detailed letters to the SEC explaining what was transpiring. The feeble investigations with junior staff led to no result, and Madoff's scheme only came to an end in 2008 when many investors tried to cash out.

In the case of Madoff it has been argued that regulations were in place but not enforced. This is a major issue in that regulatory controls are useless if they are not enforced. It is like posting a speed limit but having no traffic police ever attempt to catch speeders. Regulations against money laundering exist, but the success rate in enforcement is a staggering .5%! Only 99.5% of perpetrators get away with it, despite this being about the only even reasonably serious effort on the part of first world nations to

deal with the tax haven issue. Switzerland has solid laws against money laundering, but is very sluggish in applying them. According to the UK Financial Services Authority, the City of London shows, "Brazen disregard for the rules to stop money laundering." The key point being that regulatory controls and full enforcement must necessarily go together; if the latter is not going to occur then why waste time and money setting up the former. The people involved in regulating have to be free of bribes, be well educated, receive a good salary so that they will be less vulnerable to bribes and more likely to stick with the job, and as Harry Markopolos suggests, some should have grey hair. Experience really counts, but is often discredited in this day and age of favoritism toward those who are younger and cheaper. The presence of highly experienced professionals who know a song and dance when they see one is crucial to solid regulation.

Regulatory control and enforcement pertaining to the highly secretive shadow economy will be an essential component of a shift to social justice capitalism. Secretive societies risk losing their identity, distinction, and in this instance tremendous wealth, if they are no longer operating in the shadows and are subject to robust regulation. The full financial activities of all corporations must be evident, and manipulations such as turning profits into loans and hence debts (back-to-back loans), and intra-company transfers to inflate costs and deflate profits (transfer mispricing), must be scanned for and prosecuted. Financial transactions that are now in black box clearing houses need be visible and carefully regulated. The spin-doctors working to support the secretive status quo, will most certainly attempt to paint a big brother picture emerging from the changes suggested. As it stands now, big brother in the form of the financial elite in league with the political powers they influence, have crafted a system where the rich get richer and everyone else poorer. Major media corporations, often with a solid offshore presence, craft a limited and softer perspective on tax havens and the shadow economy that is served up for public consumption. A social justice based system is one that does not discriminate and unjustly prosecute. If activities are transparent and ethical with fair contributions to support social justice, then there is nothing to be feared other than an end to rampant greed.

People often reject the notion of regulation and controls, in part due to a wish to become rich. According to this perspective, it is better to leave things as they are because change will deprive me of hope to become wealthy—The American dream. However, the “American dream” is actually the “American disappointment” for the vast majority of people. This dream demonstrates our propensity for cognitive biases (See Defending The Indefensible chapter) altering probability calculations, that might be referred to as probability distortions—By far and away the best chance for financial success comes from improving the system for the majority, rather than by maintaining the status quo, and having a slim-to-none chance of rising into the ranks of the financial elite. Correcting this probability distortion will enable those engaging in it, to see that the best way forward is one that gives each person a greater share of the overall pie.

Fair & Global Taxation:

With perhaps a quarter to half the money in the world subject to essentially zero taxation, and corporate tax rates very low (along with deferred tax) for the portion registered in first world nations, it is not surprising that everyone else is taxed too heavily. A rationale for seeking no or very low tax havens is that taxes are too high. However, if taxation is avoided, then those who cannot avoid it end up paying too much, justifying the position that taxes are too high, leading to more tax evasion. The average person is not getting ahead, and is in fact sinking with a decline in the middle class, only maintained by being indebted to the nomadic capital flowing through the world from tax havens. This is a ludicrous scenario, and the only way to remedy it and advance social justice for all is to establish a global system of taxation, and have corporations taxed at the same rate as individuals. Corporations as citizens deserve to pay the same rates.

The owners of tax haven bank accounts, corporations, holding companies, trusts, and foundations need be identified. If no one lays claim to the entity, then it is to be assumed that the money is from traditional crime, fraudulent activity, or corruption-bribery, and be confiscated for the advancement of social justice. With at least \$1.5 trillion from traditional crime, \$1 trillion from corruption, and a similar amount likely linked to fraud, these amounts alone could

enormously advance social justice. The Tax Justice Network estimates world healthcare costs to be about \$5.7 trillion, with a significant portion due to excessively high US costs. Assuming an affordable worldwide healthcare system costing perhaps \$4 trillion dollars, the offshore tax haven money associated with traditional crime, fraud, and corruption-bribery alone comes close to covering it. Add to these staggering sums the minimum \$3.1 trillion dollars from "legitimate" tax evasion, plus the massive amount of money that will come from taxing corporations at individual rates, and true social justice is definitely feasible. Furthermore, the latter monies will represent an ongoing source of revenue, unlike some of the proceeds from traditional crime, fraud, and corruption-bribery, that will diminish over time as those involved try to find other ways to hide their earnings (although with trillions at stake there might not be another way). While the spin doctors working for the financial elite will have all sorts of fun attacking these figures, the bottom line is that the astronomical sums involved will ensure social justice in terms of universal health care, support for the elderly (certain to become a major issue in and of itself with an aging population in first world nations), daycare, and affordable education. The current scenario where legitimate governments cannot cover basic costs, let alone pay for these social justice concerns, necessitating (or rationalizing) the imposition of austerity measures, will be replaced by a system where costs can be covered and social justice advanced.

A hallmark of social justice capitalism will be global taxation. Given the international structuring of corporations, nomadic capital flowing throughout the world seeking investment opportunities, and outsourcing of work to the cheapest setting, the economy really is global. Why not global taxation as some people have suggested? Indeed if the money in tax havens is to be dealt with properly and subject to fair taxation, it must be done in an international context. Money appropriated from unclaimed entities will be used for the global good, while fair taxation proceeds from claimed entities will be transferred to the country where the owner resides. In the event of corporations or citizens having residence in more than one country, the proceeds are to be distributed to each country involved.

Currently a mapping of the world based on assets reveals a grossly distorted picture, with for example Grand Cayman being

100 times the size of Portugal, and tiny Luxembourg 1000 times the size of the entire continent of Africa. A global taxation system would correct this massive distortion. Fair taxation rates and regulations can be set and enforced. Taxation departments in each country will no longer establish their own rules, but be part of the international tax system. Global taxation has been discussed within the context of the UN, but if that organization is unwilling to deal with tax havens, only leaving it up to individual countries, it is not feasible that the UN head international taxation. Hence, I suggest that a new international body of social justice capitalism be established, to ensure full transparency, eliminate tax havens and entities supporting them, create a system of global taxation, set and enforce regulatory controls, and advance social justice.

Establishment Of A Merit-Based System:

A major issue related to social justice is the gross inequity in pay between the upper and middle, let alone lower, sectors of organizations. CEOs and other senior executives of corporations make obscene incomes considering salaries, bonuses, and stock options, and that is only for what appears publicly. Let us not forget those offshore bank accounts that might or might not be present. A middle level manager of a major corporation typically earns \$80,000 or so per year, where senior executives take home several times that amount, and CEOs commonly make in excess of a million dollars. The power of the hierarchy influences our psyche, such that those at the top feel entitled to these earnings, and the majority of people are okay with it. However, the greed has gotten to the point where an equivalence in the hunting-gathering world would consist of the CEO eating the entire animal, other than for stringy tendons and bones, although the nutritious bone marrow would be removed first. People are now saying enough, but it appears as if nothing is changing for the better with the median pay of CEOs rising by an incredible 23%!

In many other sectors of the economy inequities arise, such as women and ethnic groups often being paid substantially less for the same work. An example that I am personally familiar with is the gross inequity in physician pay within Ontario and Canada more generally. Psychiatrists, rheumatologists, and pediatricians, to name a few specialties, commonly earn about half of what

radiologists, cardiologists, and other “high-flying” specialties make. The reason is largely historical control of the system that set up the payment structure. Several years back when an attempt was made to slightly equilibrate pay, radiologists responded by suing our medical professional organization in Ontario (the Ontario Medical Association). Yes greed is everywhere as it is part of our nature. One method to advance social justice and achieve more fairness is to place a very high tax (for example 70-80%) on income earned over about \$500,000, or in other words tax the rich on the portion of their income that makes them extremely wealthy. Another strategy consists of establishing merit based pay structures.

Merit is routinely used in many organizations when hiring and promotion are considered. For example, in academic departments merit criteria consist of number of articles and books published, first authorship status, impact factors of the journals published in, conference presentations, and teaching. In corporations employees typically have objectives and targets, and are evaluated on how well these are met. Establishing a global system of merit-based pay to accompany the global taxation system, will greatly aid in fairness and social justice. Criteria for pay will consider many dimensions such as, education level required, ongoing education requirements, years of experience, hours worked, shift work, evening shifts, physical demand, injury or death risk, responsibility for the welfare of others, and number of people reporting to the person. These and other merit criteria can be established and applied to all occupations. So for example, in my area (medicine) merit criteria might consist of, amongst others, specialty training (extra years of education), years of experience, the presence of evening and weekend call, and hours spent seeing patients or engaged in research. Since there will be some variability in each of these criteria, as for example experience, there will have to be some range for each occupation, and pay will vary within that range. Ethical individuals will find a meritocracy to be secure and rewarding; manipulators and political schemers perhaps less so, but it will advance social justice for all.

In a merit-based system CEOs and senior executives will do very well, but be much more in synch with the rest of the working world. Of course such a system will not cover some sectors of the

work world, such as entrepreneurs and performers, but high taxation on the portion of their income over \$500,000 or so, will ensure that they do their part for the greater good. A motivation for this contribution will be the realization that there is no successful entrepreneur or performer who succeeds in isolation from the social community. Entrepreneurs who are successful rely on many others, first and foremost customers, and if a performer is fortunate to become a star it is by the grace of fans. Besides how many fancy cars, jets, yachts, and houses can any one person really make use of?

A very interesting component of a merit-based system is social and environmental justice credits, for corporations and individuals who act in a fashion that truly advances such causes. These earned credits can be used for tax deductions. As an example, a mining company that actually adheres to strict environmental guidelines, established by fully independent non-biased agencies, could earn credits. The impact on the environment would have to be assessed independently and full carry-through required, such as cleaning up all tailings and other damage ongoing even years after the mine is closed. Corporations that hire and retain employees, without trying to outsource work to some remaining special economic zone, could also earn credits and apply them to reduce taxes. As with the other steps provided here, setting up a merit-based pay plus social and environmental justice credit system will prove challenging. However, merit is already a consideration in organizational settings and templates exist for it, and tax credits are already in place in many jurisdictions. Hence, these changes are definitely feasible.

Emphasis On Social Justice:

Currently there is an emphasis on greed, but as I hope you appreciate more is never enough, and in the process social and environmental justice suffers. Some people believe that we make our own way and that is all there is to it. However, no one chooses to be poor or not have access to health care. We all want to feel secure in terms of healthcare, support in our old age, daycare, education, and other parameters of social justice. Even those who advocate greed and personal entitlement are only too willing to rely on the social good when it suits them. We are all interconnected and reliant on one another, very much as we were during our hunting-gathering evolution. Social justice entails an appreciation that we are all part of

an interconnected system involving other people and the environment. No matter how we might delude ourselves in the process of rationalizing greed and entitlement, we do rely on others and the physical environment around us. Hence, we must all give back to the system that supports us.

Taking more and more and more ensures that someone or some aspect of the environment suffers. If corporations get rid of as many employees as they can in first world nations, and outsource all the work to special economic zones, where workers are taken advantage of and the environment suffers, the only ones who really gain are the financial elite. People in first world nations who lose their job are out of luck, particularly when the practice is so widespread it is difficult to find an equivalent job. In the southern Ontario region, barely 50% of working adults have full-time employment with benefits and some degree of job security, the rest finding themselves with highly “precarious” employment, according to a 2013 landmark report by McMaster University and the United Way of Toronto—It’s More Than Poverty: Employment Precarity And Household Wellbeing. The report also reveals that precarious work has increased by 50% in the region during the past 20 years. Even worse off are workers in third world special economic zones who would prefer not to work 12+ hours, 6-7 days a week, in deplorable and often unsafe conditions, for little pay and no benefits.

If we are to transform the current greed and inequity based system to social justice capitalism, everyone must appreciate how prone to greed we all are, advocate for change, and be vigilant that the changes persist (we can never take our eye off the ball). Motivation for those who are not members of the financial elite and shadow economy include, lower taxes, fair pay, accessible health care, old age support, daycare, and affordable education. An incentive for the highly privileged is too avoid revolution that might sweep away everything of value to you, and replace it with a system far less favorable than social justice capitalism. Those who are thinking, “That could never happen,” have clearly learned nothing from history. History shows that change for the better (or worse) can occur by the people, for the people, suggesting that social justice capitalism could become a reality whether peacefully or by revolution.

IRREGULAR REGULATION

QUESTION:

What statement or statements most accurately characterize regulation?

- A. Regulation is unknown in nature, and is only a man-made creation.
- B. The only people who need to be regulated are criminals, and the vast majority of us can be fully trusted to do the right thing.
- C. Regulation hurts the economy.
- D. Financial regulation works well for controlling economic excesses.
- E. Regulation is a fact of life, and if administered properly will advance the good of the many.

Answer A indicates that biology was not your strongest subject in school, given that regulation is integral to nature. Humans following the example of nature have created regulatory systems, but despite our best efforts they often fall far short of natural systems. Those of you who selected answer B cannot say that psychology was your best subject, because even a cursory study of human nature reveals that people are prone to self-serving behavior that can damage others and even themselves, ironically. Criminals just demonstrate more intense self-serving behavior. Answer C is promoted by those who favor deregulation of the economy, but regulation is essential if the economy is to be healthy. While answer D sounds solid it turns out that the whole process can be hijacked only creating the illusion of regulation, a scenario that is often worse than no regulation. Answer E best characterizes regulation as it recognizes the fundamental role that it plays in nature, and also the value of sound regulation.

NATURAL REGULATION:

Biological:

All biological systems rely on regulatory control over essential processes. Within our own bodies physiological parameters such as electrolyte composition, blood sugar levels, temperature, and blood pressure are tightly controlled. When this regulation falters disease occurs, as with diabetes involving deficient control of blood sugar levels, and hypertension sustained high blood pressure. Even the growth of cells is controlled by various signals to keep the system in balance. Cancer arises when cells remove themselves from this regulation, and divide without restraint. To reestablish control the immune system attempts to destroy the rebels and in most instances is successful. When this process fails, cancer manifests and the animal dies along with the rebel cancer cells. So even these regulatory free cells would have been better off with regulation. All of these regulatory processes are essential to survival, and occur so naturally we are not even aware of them. They are referred to as physiological homeostasis.

Another form of natural biological regulation arises from the interconnectedness of life. All biological entities are linked to one another, a reality that humans often seem to forget, or conveniently ignore, believing that we are above it all. The interconnectedness provides essential balancing regulation. For example, if deer populations increase due to abundant vegetation, wolves will eat well diminishing the deer population. Competition between wolves will in turn limit their number in a given area. Salmon mature in rivers, and then enter the sea where they live for a few years before returning to the same river system they grew up in. After spawning they die, their bodies providing a crucial source of nitrogen and carbon for their developing offspring, and other animals such as bears that eat the salmon. Partially eaten salmon and the feces of animals that eat them, return minerals to the soil enabling the growth of trees and plants, that in turn shade the river cooling the water so that salmon can survive. Indeed, a highly interconnected system that self-regulates.

For the approximately 3.5 billion years of life on the planet, bacteria and microorganisms ruled for 2 billion years. During this lengthy time period the ground rules of biological regulation were

worked out, such as bacteria evolving cell walls to assist in controlling internal processes, and the trading of genes beneficial to survival. Although we now think in larger terms when considering life, it is really the smaller guys that are in control. Even within our own bodies bacteria outnumber our cells by a ratio of 10:1. This so-called microbiome works in our favor, while providing a home and nutrients for bacteria. Bacteria in our gastrointestinal track break down the complex carbohydrates found in many plants, transforming them into simpler and easily digested sugars. These bacteria are actually key players in regulating our internal environment. For example, *H. Pylori* actually adjusts stomach acid such that the level is suitable to both itself and us. If the acid level is too high strains with a gene called *cagA* start producing proteins that signal the stomach to reduce the flow of acid. In some individuals *cagA* can promote ulcers, but for most of us it helps regulate acidity levels protecting against ulcers. Gut bacteria also provide us with vitamin B12, essential for cellular energy production, DNA synthesis, and the manufacture of fatty acids. It is only bacteria that can synthesize the enzymes required to form this vitamin. So without the assistance of gut bacteria we would simply not survive.

With all these bacteria in the gut and in other tissues, ongoing battles between the immune system and bacteria, and different forms of bacteria against each other, would seem to be the norm but this is not the case. Somehow the whole microbiome has learned to work in synch, providing for a mutually beneficial and self-regulating system. A common organism within us, called *Bacteroides fragilis*, is one of the players in this regulation. Immune responses often involve T cells designed to attack foreign entities. The chemicals T cells release produce the well-known swelling, redness, and temperature increase that comes with inflammatory reactions. *Bacteroides fragilis* has evolved a substance called polysaccharide A that signals the immune system to produce regulatory T cells. True to their name, the regulatory T cells reduce activity of T cells, diminishing the immune system response to a reasonable level. Aside from the advantage of this process to *Bacteroides fragilis* enabling it to survive immune system attacks, the dampening function helps us control immune responses that would otherwise severely damage tissue. The reduction of some

organisms, such as this helpful one, within our bodies due to excessive antibiotic use and intensely sterilized food, has been proposed as a cause of autoimmune disorders, where various tissues are attacked by our own immune system.

Psychological:

Given that regulatory control is essential for biological integrity, it might not come as a surprise that it is also needed for psychological functioning. The role of regulatory processes in mental health and illness is a key focus of my own research. Much as with physiological functioning, psychological homeostasis is crucial. Two of the most common psychiatric problems—depression and anxiety disorders—both involve deficient regulation of emotional responses. These conditions entail excessive negative emotional responses arising in the limbic region of the brain, linked to deficient regulation by higher regions such as the prefrontal cortex. This crucial structure occupies a third of our cortex (the outer region of the brain largely accounting for intelligence), and is the brain's master controller. Contributing greatly to excessive limbic system emotional responses is the evolution of emotional information processing and intelligence. Sadness and fear comprise the root emotions of depression and anxiety, respectively. Sadness arises when conscious or unconscious, so-called cognitive activating appraisals (thoughts), detect a loss. Fear occurs when threat or danger is detected. Many mammals and certainly primates demonstrate sadness and fear, indicating how essential this emotional information processing has been to survival.

A key difference between us and other primates, and also mammals, is our much greater level of intelligence. This is not to say that intelligence is lacking in other animals, and indeed we have tended to discount other creatures in this regard. Based on the mirror test of intelligence, consisting of recognizing oneself in a mirror, it appears that dolphins, higher primates, elephants, and even magpies (a species of bird) are quite intelligent. However, humans have evolved a much greater level of intelligence, evidenced by our conceptual reasoning. I asked myself what would happen when human intelligence was superimposed on the emotional information processing that had already evolved? A key aspect of theoretical research is to ask the right question. The

answer I came up with (Psychological Defense Mechanisms: A New Perspective published in the American Journal of Psychoanalysis in 2004—See the Centre For Theoretical Research In Psychiatry & Clinical Psychology at theorypsychiatry.com or psychiatrytheory.com), was that human intelligence amplifies these emotions by making the cognitive activating appraisals more intensive and extensive, and providing an expanded temporal dimension. For example, losing a partner results in thoughts about associated losses, such as not being able to do shared activities, thereby intensifying the loss. The loss often produces thoughts about prior and future breakups, extending the circumstance beyond the current scenario. In addition, we tend to think about the loss over days, weeks, months, and even years recapitulating it. Consequently, feelings of sadness become amplified both in term of severity and duration.

This Amplification Effect pertaining to sadness and fear underlies our propensity to depression and anxiety disorders, respectively. The emotional component of depression can be viewed as amplified sadness, and anxiety as amplified fear. The similarity of circumstances contributing to loss and threat provides a partial explanation for the overlap of depression and anxiety—Circumstances that involve loss frequently also entail threat, such as when a person is bullied. Interactions between these amplified and repetitious thoughts and emotional responses create mutually reinforcing cycles of negative thoughts and emotional responses. For instance, amplified thinking about a threatening boss makes you feel more anxious, and this feeling state lends itself to more anxious thoughts, that in turn produce stronger feelings of anxiety, and so on and so forth. As a result limbic system emotional responses become excessive in some people.

Cognitive regulatory control processes intervene in most people and dampen excessive limbic system emotional responses, a topic covered in my 2013 article Cognitive Regulatory Control Therapies, published in the American Journal Of Psychotherapy. One way that this regulation works is via activation of psychological defense mechanisms of various types, such as dissociation (detachment) from the experience. Detachment often occurs via absorption in a more positive activity, such as tuning out a stressful input and becoming immersed in a pleasing fantasy or

focus. By absorbing oneself in computer games, books, television programs, and the surfing of websites, many people tune out negative input. Emotional numbing is a way we often dissociate from stressful experiences that we must still focus our attention on. For example, those who deal with emergencies, such as nurses, doctors, and paramedics, frequently cope and function effectively by unconsciously numbing their emotional responses. If they experience the full intensity of emotions, such as disgust, sadness, and anger, their attention and capacity to cope is impaired. Another defense mechanism consists of positive cognitive distortions. Cognitive activating appraisals for sadness and fear are negative in orientation, producing negative feelings. By altering the perception in a positive direction, positive cognitive activating appraisals can occur. This positive shift reduces or eliminates negative emotional experiences, and can generate positive feelings such as happiness and interest. People who naturally place a positive spin on experience, such as by seeing things through rose-colored glasses, and putting a self-enhancing twist on events rarely end up needing psychiatrists. They are resilient to the mutually reinforcing cycles of negative thoughts and emotional reactions, and instead tend to have positive upbeat cycles.

A psychiatric condition linked to depression is bipolar disorder (often commonly known as manic-depressive illness). Depression involves inhibited mental, physical, and social behavior that impairs functioning. A depressed person often cannot remember things as well and reason out problems. It is difficult to get out of bed and be physically active, and withdrawal from social activities is common. To override depressive inhibition in the moment and temporarily restore mental, physical, and social activity to levels compatible with adaptive functioning, I proposed that hypomania evolved in humans (*Hypomania: A Depressive Inhibition Override Defence Mechanism*, published in the *Journal of Affective Disorders*, 2008). Hypomania is characterized by increased mental, physical, and social activity, and occurs on a one-to-one ratio with depression, in line with it representing a defensive compensation for depression. To offset depression, hypomania increases mental, physical, and social activity. Functioning during hypomania is often enhanced, and certainly compared to the dysfunctional state of depression. Life occurs in

the brief now, and by restoring adaptive function in the moment the impact of depressive inhibition can be greatly diminished or negated.

When hypomania transforms into mania, functioning is typically diminished and contact with reality can be severely impaired. Mania involves markedly increased energy, greatly reduced need for sleep, rapidly shifting attention, intense irritability, and psychosis. While hypomania and depression are quite common, actual mania occurs in only about 1% of the population. In the vast majority of instances hypomania does not progress to mania, and even when a person has experienced manic episodes hypomania not advancing to mania is common. The question then arises as to why hypomania progresses to mania only in some people in some instances? The answer appears to involve deficient cognitive regulatory control. I proposed that a cognitive regulatory control mechanism exists, whereby when the costs of intensifying the hypomania defense exceed the benefits the system is deactivated. When attention starts to shift so rapidly that adaptive functioning declines and contact with reality is diminishing, the costs are exceeding the benefits and the defense is dampened or turned off. When this cognitive regulatory control mechanism fails, hypomania can progress to mania. The mechanism is likely weak in some people due to genetic vulnerabilities. Environmental factors such as antidepressant medication, alcohol, and illicit drugs, in combination with each other and genetic vulnerabilities, further impair the cognitive regulatory control mechanisms, resulting in dysfunctional mania.

Mania involves psychosis, the latter also apparently arising from deficient cognitive regulatory control processes. Psychosis consists of extreme cognitive distortions (delusions), thought form variants, and sensory-perceptual experiences (hallucinations). The evolution of human intelligence has endowed us with an extensive range of these cognitive capacities. Thought content alterations consist of cognitive distortions, with milder versions slightly altering reality, such as by placing a self-enhancing or diminishing spin on experience. Moderate cognitive distortions consist of excessive fantasy involvement, magical thinking, and over-valued ideas. More extensive cognitive distortions represent actual psychosis, namely delusions. In regards to thought form, a natural

range exists from highly logical thinking to very loose or fragmented associations. The intensity and quality of sensory experiences also vary within the general population, such as illusions, hallucinatory experiences at the border of sleep, and seeing concrete images in abstract forms like clouds, the latter representing a distortion of our pattern recognition abilities. Research evidence supports psychotic experiences as being on the extreme end of a normal continuum.

If psychotic type cognitive events are a normal part of human nature derived from the evolution of intelligence, then why do we not routinely experience them? During sleep while dreaming we actually do with bizarre thoughts, loose thought form, and sensory perceptions not based on any external stimulus. However, they are largely absent from the conscious and awake state. The reason for this difference hinges on how important reality congruency is for adaptive functioning while we are in this state. If we fail to perceive and work with reality, we simply cannot function well in the vast majority of instances. Imagine believing that your boss and coworkers are plotting your execution, and hearing them discuss plans to end your life, even though no one is actually doing so. Are you likely to function well at your job and during meetings? No, if anything you will hide from them or attack. The over-abundance of guns, particularly in the United States, obviously does not mix well with these distorted thoughts and perceptions. To ensure that reality congruency is maintained to facilitate adaptive functioning, I proposed (A Cognitive Regulatory Control Model Of Schizophrenia published in Brain Research Bulletin, 2011), that cognitive regulatory control mechanisms block extreme cognitive variants from the conscious and awake state. During sleep when reality congruency is not an issue, the cognitive regulatory control mechanisms are relaxed and these extreme thoughts and perceptions can manifest. The cognitive regulatory controls can also be deactivated to facilitate psychological defensive functioning. For example, when a person loses someone very close to them, it is common to hear, see, or feel the presence of the person. The cognitive regulatory processes are deactivated to restore the lost sensory and related emotional input.

Supporting this perspective on psychosis are findings from neuroscience research. A primary site of the cognitive regulatory

processes pertaining to psychosis, is likely the prefrontal cortex, and frontal areas of the brain more generally. During dreaming the prefrontal cortex is less active, and the bizarreness of the dream is inversely related to the degree of activity in this region (lower activity equates with more bizarre dreams), according to research by Solms and Turnbull in 2002, and Hobson and colleagues in 2000. Creativity has also been linked to reduced activity of the prefrontal cortex, and related regions, allowing more varied content to flow, while actual implementation of creative ideas involves enhanced activity of the same regions. Psychedelic drugs were long thought to work by increasing brain activity, but the effect actually involves reduced activity in the prefrontal cortex and other cortical regions involved in regulation, as discovered Carhart-Harris and colleagues in 2012, with their research focusing on the psychedelic agent psilocybin. The greater the reduction in activity within these control regions, the more intense the self-reported psychedelic experiences. Elevated dopamine (a neurotransmitter allowing neurons to communicate with each other) occurs with psychosis, and sustained dopamine levels have been linked to deficient regulatory activity of the prefrontal cortex.

Psychosis commonly occurs during the conscious and awake state with schizophrenia. This severe condition involves both positive symptoms (psychosis), and negative deficit symptoms. Deficiencies occur in terms of absence or “a” symptoms, such as amotivation and apathy. Impairments in basic and social cognition also contribute greatly to the deficiencies in schizophrenia. Basic cognition consists of abilities such as flexibly shifting attention, inhibiting inappropriate responses, working memory, planning, and multi-tasking, capacities known as executive functions. Social cognition involves understanding the self, others, and interactions. Schizophrenia consists of a lengthy prodrome of progressively worsening negative symptoms, followed by psychosis. It is feasible that the neural damage underlying negative symptoms impairs or damages the cognitive regulatory control processes, normally blocking extreme cognitive distortions, thought form variants, and sensory-perceptual experiences from the conscious and awake state. Consequently, these psychotic experiences routinely and persistently intrude into that state. With schizophrenia impaired regulation of impulses, urges, wishes, and emotional reactions resulting in bizarre

behavior is common, indicating a deficiency of regulation pertaining to reality congruent behavior. In psychologically healthy people these regulatory processes prevent inappropriate behavior.

Intact cognitive regulatory control clearly plays a major role in maintaining good mental health. Excessive emotional reactions are kept in check, psychological defensive functioning is optimal, hypomania compensating for depression is likely prevented from progressing to dysfunctional mania, and reality incongruent cognitions are apparently blocked from the conscious and awake state. When these cognitive regulatory control processes fail, we end up with depression, anxiety disorders, mania, and psychosis. Given the importance of intact regulation to biological and psychological functioning, and our propensity for greed and self-serving behavior, it follows that regulation is essential for society to function in a reasonable fashion. When regulation is inadequate we end up with various forms of societal cancer completely incompatible with social justice and the health of the environment.

MAN MADE REGULATION:

When we consider regulations designed by man to manage our own behavior, it usually comes down to financial concerns. The quest for valued resources and the intermediary agent of money is seemingly limitless. Environmental regulations exist largely to ensure that natural resources, wild places, and species at risk are protected from damage inflicted by resource extraction and urban sprawl expansion, both highly financial in nature. Considering the central role that resources and money play in the need for regulation at a societal level, the focus in this section will be on financial regulation and deregulation. The term deregulation can be taken as a reduction or removal of regulations, or as a shift from public to private ownership. The former application is used here, as the latter does not really reflect regulatory control. In some instances of deregulating in terms of shifting from public to private control, regulations can actually increase. For example, in Ontario Canada a shift from government to private ownership of electricity delivery services to consumers, involved a substantial increase in rules amounting to a document hundreds of pages long.

An examination of financial regulation clearly reveals some major findings. First, there are always forces pushing for

deregulation, and without constant vigilance and support for regulations a deregulated environment comes to pass. Second, solid regulatory controls promote stability of the overall financial system, including real estate prices, currency exchange rates, and the safety of investments, while a deregulated environment is more akin to a wild-west scenario characterized by volatility. Third, in a deregulated environment the financial elite and corporations tend to get much richer, and the many poorer, although initially it might appear that all are gaining. Fourth, as has been said, the only thing we learn from history is that we learn nothing from history—The past shows that financial regulations work well for the vast majority, but so many people seem willing to sell them down the river, such as by electing politicians who promote financial deregulation. Fifth, the rhetoric that “markets know best” supporting liberalization of the economy, is akin to saying that foxes know best how to regulate a chicken coop; the market is a man made creation that can be as risky or risk averse as we design it to be, and without adequate regulation the risk component is too great.

The markets know best perspective aligns with a “rational” free-market approach to economics, viewing greed as a driver of the economy. Despite how noble this perspective sounds, it only constitutes a rationalization for greed and the monopolization of wealth, comfortably detaching those who follow it from the enormous social and environmental justice costs of an unregulated economic world. To illustrate these findings I will examine financial regulation and deregulation focusing on the United States, as it has been the engine that seems to drive the financial world.

Regulation & Deregulation:

In the late 19th and early 20th centuries many industries in the United States became regulated. Monopoly scenarios arose such as with electricity, water supply, communications, and transportation, requiring price and economic controls to protect the public. Presidents Theodore Roosevelt, William Howard Taft, and Woodrow Wilson instituted financial regulation, during what is known as the Progressive Era (1890-1910's). These regulations pertained to many aspects of the economy, including trust-busting (elimination and banning of monopolies), consumer protection laws, federal income tax using a progressive structure with

especially high taxes on the wealthy, establishment of the Federal Reserve, shorter work hours and higher wages, banning of unfair labor practices, protection of the rights of strikers, improved rights and privileges for unions, and the delivery of social services advancing living conditions and providing a safety net for unemployed workers. All of these steps added to the stability of the financial system and protected people. The Federal Reserve Act of 1914 was established to better control the nation's money supply and prevent banking panics, common when banks could just go under and take depositor's money with them. Under the Federal Reserve Act member banks were required to register and hold reserves at the Federal Reserve.

During the freewheeling 1920's, under Presidents Warren Harding (1921-23) and Calvin Coolidge (1923-29), more relaxed economic policies dominated. Then disaster struck with the financial market collapse of 1929 and ensuing Great Depression of the 1930's. Unstable banking and investing practices contributing to runaway speculation triggered the market collapse. Banks invested depositor's assets in the stock market and other risky ventures, such as unsound loans to companies that the bank also invested in. Following the collapse, President Franklin D. Roosevelt implemented many economic regulations designed to stabilize banking and investing, and prevent a repeat of the 1929 market collapse. The Glass-Steagall Act of 1933 (officially known as the Banking Act of 1933) mandated a separation of banks according to the type of business they conducted. Banks could either engage in simple lending and deposits or investing, but not both, thereby protecting the former safer activity from riskier investing. In 1956 the Bank Holding Company Act advanced Glass-Steagall by preventing banks from underwriting insurance, a potential source of financial risk. The Glass-Steagall Act further established a system of deposit insurance for consumers with the creation of the Federal Deposit Insurance Corporation (FDIC). The FDIC guaranteed consumer deposits to a certain level to reduce fears of bank failures. Additional bank-related regulations were enacted such as the Federal Home Loan Bank Board, established by legislation in 1933 to oversee savings and loan associations, known as thrifts. The Bureau of Federal Credit Union was created by similar legislation in 1934 to regulate the operation of credit unions.

Some of the financial regulations directly targeted the investment sector. The Securities Act of 1933 required investment businesses to register the initial offer, or subsequent sale of any security, with the government to improve disclosure and transparency in the primary securities market. The Securities Exchange Act of 1934 established the Securities and Exchange Commission (SEC) to oversee secondary trading of securities, by regulating stock exchanges and enforcing fraud charges. The Commodities Exchange Act of 1936 established rules for exchanges of commodities and futures trading. These progressive and well reasoned Acts added much needed regulatory control to the financial system. They strengthened banking and capital markets, making them the so-called twin engines of American growth. A useful rule of thumb in life is that if it isn't broken don't fix it, and the regulatory framework established in the Great Depression remained intact for four decades. Then the lessons of the past were all but forgotten with an era of deregulation starting in the late 1970's and 1980's.

Even though bankers tried over many years to overturn the Glass-Steagall Act, arguably the start of financial deregulation involved Usury laws. These laws established in the early 1900's imposed interest rate ceilings. With the increase in inflation in the 1970's the interest rate ceilings became an important constraint, particularly for credit cards growing in popularity. A landmark Supreme Court case in 1978 (*Marquette National Bank versus First of Omaha Service Corp.*) resulted in a major deregulatory change. This case settled the question of which state's Usury laws applied to national banks lending across state lines—The banks home state or the borrower's home state. The Supreme Court ruled in favor of the bank's home state. Immediately Citibank aggressively pushed for South Dakota to overturn their existing Usury Laws with the promise of setting up headquarters there. Citibank executives made phone calls to the Governor and other forms of influence were exerted. Eager to boost a weak economy, South Dakota complied and overnight became a regulatory haven for the credit card industry. Say hello to those credit card interest charges just south of loan shark rates. Following South Dakota's lead other states, notably Delaware (the onshore offshore tax haven) followed suit in

overturning existing Usury Laws, and eliminating the ceiling on interest rate charges.

Inflation played a further role in the process of financial deregulation. With inflation running a 10-11% bank deposit returns of 3-4% were not enough. A complex financial product-money market funds—that we now consider simple relative to ultra complex derivatives, was created by investment firms and sold to consumers bypassing banks. They operated without reserve restrictions or restrictions on rates of return. To allow banks and savings and loan entities to compete with money market funds, President Jimmy Carter brought into law the Depository and Monetary Control Act of 1980. This law resulted in interest rate ceilings being abolished. Depository banks could now offer accounts with competitive rates of return. Alongside this deregulation were added regulatory components with the Act, such as increased federal deposit insurance from \$40,000 to \$100,000, and all banks being required to provide reports and hold reserves at the Federal Reserve. So even though there was some deregulation, perhaps understandable based on changes brought about by inflation, important regulatory components counterbalanced them. Next came the major deregulation of the 1980's without the addition of counterbalancing regulatory controls.

“Reganomics” named for the deregulation policies of President Ronald Regan elected in 1980, dominated during the following decade. Regulators were urged to avoid intervention and be lenient to private markets. The supervisory structure of several regional banks was decentralized, and bank board staff were often underpaid and poorly trained. The Federal Savings and Loan Insurance Corporation and Federal Home Loan Bank Board, were often referred to as the “doormats of financial regulation.” In 1982 came the Garn-St. Germain Depository Institutions Act, essentially deregulating savings and loan institutions. Thrifts were allowed to make commercial loans up to 10% of assets, and invest in non-residential real estate up to 40% of their assets. Not surprisingly the money flowed with intense speculation in sectors that thrifts had little experience with—Commercial investments and non-traditional housing, namely condominiums. Then came the Tax Reform Act of 1986, whereby President Regan's tax cuts eliminated many of the tax shelters that made real estate such an attractive investment. Money flowed out of thrifts as fast as it flowed in, and

the real estate bust of the mid-1980's occurred. The savings and loan industry shrank by 50%, with an estimated cost to taxpayers of \$210 billion! Hopefully, readers will see the relationship between financial deregulation and volatility, and also how we fail to learn from history.

A major impediment to deregulation remained in the Glass-Steagall Act. Imagine yourself as a member of the financial elite at the head of a major bank, investment company, or insurance firm. The Glass-Steagall Act prevents your firm from indulging in the other activities forming a barrier to even greater wealth. It was akin to chicken wire around sections of the chicken coop, and the sly foxes looking in at all the potential meals. The prospect of combining depository/loan banking with investments and insurance underwriting made them salivate. No Glass-Steagall had to come down in this enlightened (or not) era of deregulation. A major player in this effort was Alan Greenspan, who was appointed Chairman of the Federal Reserve in 1987. Greenspan strongly supported deregulation during his three decades and four presidencies at the helm of the Federal Reserve. Early on he reinterpreted Glass-Steagall to allow banks the option of dealing in certain debt and equity securities, as long as it did not exceed the 10% rule. Later in 1996 the Federal Reserve made a ruling allowing bank holding companies to own investment banking operations, that could account for as much as 25% of their revenues. This ruling effectively made Glass-Steagall obsolete, because virtually every institution would be able to stay within this limit.

A further major step towards eliminating the Glass-Steagall Act came in 1998, when Travelers Insurance Group merged with Citicorp, the parent of Citibank. Executives of both companies placed personal calls to Alan Greenspan, Treasury Secretary Rubin, and President Bill Clinton. With the understanding that the bank was to have two years to divest itself of the insurance business, the merger went through making Citigroup the world's largest financial services company, a merger representing the biggest in the world to that time. Consolidation and mergers of banks and financial services companies had been underway for a while, but Travelers Insurance Group and Citicorp was outstanding given the combining of insurance underwriting and banking, and the size. Seemingly as if the major players were aware of the future, the

walls of Glass-Steagall came tumbling down a year later in 1999 (prior to the two year time frame to divest the insurance portion with the Travelers-Citicorp merger), with the Bramm-Leach-Bliley Act. This act repealed all restrictions against the combination of banking, securities, and insurance operations for financial institutions. The foxes of the financial world were well fed with this Act and the complete collapse of the Glass-Steagall Act.

The story of deregulation is not complete without a consideration of complex financial products. We have already seen how money market funds contributed to the abolishment of interest rate ceilings in 1980. Through a process of securitization, assets could be pooled and repackaged into securities. The first of these securitized assets, mortgage loans, were packaged into mortgage-backed securities in 1979 with the Government National Mortgage Association. To encourage home ownership, the Federal Home Loan Mortgage Corporation and the Federal National Mortgage Association followed suit. Mortgage loans were bought up by these government-sponsored agencies, with the securities holding an implicit guarantee from the federal government. They also had to conform to underwriting standards to ensure loan quality and limited risk. During the 1980's the mortgage market became more complex. The Alternative Mortgage Transactions Parity Act of 1982, lifted restrictions on classes of mortgage loans with exotic features, such as adjustable-rate and interest only. These more complex mortgage products carried low "teaser" rates during the first few years, followed by interest rates resetting much higher. Consumers only focusing on the positive side of the offer did not fully understand them, and many got caught in a difficult situation once the rates reset to a higher level. This problem was worsened by the mortgage industry aggressively targeting lower income, higher risk borrowers, resulting in a fairly high percentage of sub-prime borrowers. These more complex and higher risk mortgage products contributed to the mid-80's real estate bust, by fueling a high octane housing market not sustainable based on real assets and debt carrying capacity.

The star player in the world of complex financial products is derivatives. Warren Buffet has described them as financial weapons of mass destruction. Naturally though, financial firms and much of the financial elite place a more positive spin on what they

represent. But what are these odd entities? Derivatives comprise financial instruments that derive their value on their claim to another asset. Since they do not involve the actual transfer of assets, a buyer does not own the underlying asset. Buying air does not sound all that wise, but starting in the 1990's a wide range of derivative instruments were developed by the financial industry. The most important type of derivative is the credit default swap, a form of bond insurance where the issuer pays the loss in the event that a bond defaults. In the late 1990's Brooksley Born, the Chairwoman of the Commodity Futures Trading Commission, expressed concerns regarding the risks of an unregulated market in derivative instruments. With stocks, bonds, and options there existed a clearinghouse, but not so for derivatives. Federal Reserve Chairman Alan Greenspan strongly opposed these words of caution, as did Treasury Secretary Robert Rubin, and his successor Lawrence Summers. Born resigned her position in 1999, and later that year Greenspan and Rubin, along with Born's successor, issued a report recommending no regulations on derivatives. Senator Phil Gramm, co-sponsor of the Gramm-Leach-Bliley Act terminating the Glass-Steagall Act, pushed hard for legislation that would formally deregulate the financial markets, including for derivatives. The day after the Supreme Court decided the fate of the 2000 federal election, the Commodity Futures Modernization Act of 2000 passed in Congress. This legislation passing without debate or review, exempted derivatives from regulation, and made an additional special exemption for energy derivative trading that became known as the "Enron loophole."

With these and other deregulation steps, a perfect storm was brewing for the massive financial crisis of 2008. In 2004 the SEC allowed investment banks to hold fewer reserves and take on more debt. The net capital rule was relaxed after only 55 minutes of debate, and the Consolidated Supervised Entities program for investment banks was created—Brokerage firms would voluntarily submit reports to the SEC regarding their activities. Essentially, the task of risk monitoring in a climate of reduced reserves and increased debt was outsourced to the firms themselves. Meanwhile, interest rates were kept low, and these rates in combination with new forms of mortgage lending and securitized trading, fueled a housing bubble. At the peak housing prices increased by more than

70%, and in some regions by more than 100%. The opportunity for profit was everywhere and the mortgage industry was no slacker. Complex derivative based mortgage instruments were labeled as safe, while the underlying mortgage assets based on subprime lending were weak. Government regulators continued their no regulation approach. It truly was a massive positive cognitive distortion with virtually no one seeing where all this was going.

All wild parties must come to an end at some point, and this one was no exception. Adjustable rate mortgages began to reset to higher levels and housing prices started to decline, putting intense pressure on many borrowers. Shortly, many homeowners began to default unable to pay the high mortgages on over-valued properties. Mortgage-backed securities linked to these loans began to lose value, and many investors across the world were hit hard, countering the spin that was often placed on these derivative based products, namely that spreading the risk out over many investors would ensure minimal impact if things failed. A widespread decline in capital ensued followed by financial institution failures, not surprising given the low asset and high debt position allowed by deregulation. In the spring of 2008 financial markets performed in a fashion not seen since the Great Depression. Bear Stearns, a prominent investment bank, was sold to JP Morgan Chase at fire-sale prices. Lehman Brothers, another major investment bank went belly-up. The other major investment banks merged, or changed their status to become investment holding companies. Stepping in was the federal government with massive bailouts to Bank of America, Citigroup, and AIG. The Emergency Economic Stabilization Act of 2008, authorized the Treasury to spend \$700 billion to purchase troubled assets and inject capital into the nation's banking system, under the Troubled Assets Relief Program.

Who will ultimately pay for the mess created by massive financial deregulation? Yes, you the already stressed taxpayer. Have we returned to tight regulation over the financial sector to prevent another catastrophe? There currently is debate regarding the merits of regulation, with many pushing for more deregulation claiming that enhanced regulation is not the answer. At the present time we are definitely not seeing a return to Glass-Steagall type restrictions adapted to the modern world. Investors and shareholders, who drive a lot of the speculation with their desire

for double-digit profits and demands on corporations to produce these returns, need to really consider this whole process. It is like a tortoise and hare scenario, where the cautious non-greedy investor gets ahead over time and does well, while the investor fixated on high returns often crashes and burns. There is a lesson here, and it is lesson for the world not just the United States. Even though this discussion has been of US regulation and deregulation, the same scenario was repeated around the world, largely because the US is the engine that has driven the financial world, and financial products such as packaged high risk subprime mortgage debt are sold across the globe. Investors in many countries lost their shirt so to speak.

There are other lessons to be learned as well. The forces pushing for deregulation won out, gutting regulations put in place after the Great Depression, and even though words of caution were spoken the positive spin on deregulation carried the day. With regulation came financial stability for decades following the Great Depression era, but with deregulation financial volatility became the order of the day. The housing boom and bust of the mid-80's was a warning flare that was totally ignored, with the new millennium housing bubble and subsequent 2008 subprime mortgage financial collapse, reminiscent of the wild speculation and ensuing stock market crash of 1929. In the period leading up to 2008, many of those in the financial service sector became much richer, while the average person ended up with over-priced homes and debt that could not be serviced. When the crash came many of the financial elite experienced some setbacks, but with large accumulated personal assets, corporate mergers, and government assistance for their corporations, they fared relatively well. The lessons of history provided by banking practices pre-1929, stock market collapse of that year, and the regulation era promoting long-term financial stability, were completely ignored showing that we learn nothing from history other than that we learn nothing from history. Given the post-2008 debate regarding the merits of regulation, it appears that we might learn nothing from both longer and shorter-term history—Do we have a real life sequel to the movie *Dumb And Dumber* here? Another key lesson to be learned is that the market does NOT know best, and that liberalization while sounding noble, only ensures a massively unregulated state

found nowhere else in nature. Like unregulated cells in the body, a form of financial cancer ensues causing massive suffering.

To this point our examination of regulation and deregulation has only concentrated on the financial sector. There are other forms but they ultimately end up having financial ramifications. Perhaps the most important one is access of corporations to natural resources around the world, and the associated flow of money in and out of various countries. The topic of resource development will be covered more thoroughly in the Taking The “Devil” Out Of Development chapter, so the discussion here is limited. Prior to the fall of communism, corporations had to be somewhat careful regarding resource exploitation, because communism offered an alternative to capitalism and one that would be death to corporations. So although resource exploitation occurred, there was some restraint. With the death of communism it became a resource grab free-for-all, with corporations and the financial elite gaining and citizens of most of these countries losing. Many non-renewable natural resources are becoming depleted, and plant and animal species wiped out at a rate not seen since the demise of the dinosaurs.

In large part due to both urban and resource development, legislation to protect endangered species was required. The Endangered Species Act passed by the United States Congress in 1973, mandated that species meeting specified criteria have to be protected. Similar legislation was enacted in many countries including Canada (Species At Risk Act), to ensure the protection of all non-pest species. Within a specified time period, steps must be taken to protect the habitat of creatures ranging from beetles to bears that are at risk of going extinct. The theme underlying these powerful environmental regulations is known as the Noah Principle—All species are fundamentally equal and should be saved, even if of little or no importance to humans. From the start this legislation was challenged in court, but has stood up very well generally. What has happened, though, is that reduced funding to the government agencies responsible for species protection has had the effect of deregulation. This story has unfolded in Canada with the Conservative Party led by Stephen Harper.

Much like the Republican Party in the United States, the Conservative Party is very pro-corporation. However, the current

Conservative Party is really in effect the Reform Party, a western Canada party all about maximum liberalization of the economy, and unfettered access of companies to natural resources. This party also led by Stephen Harper could not foster enough support in the rest of Canada to rule, and actually divided the right wing vote. In a strategically smart move the Progressive Conservative Party and the Reform Party merged into the Conservative Party. The new party quickly came to be dominated by Harper and his followers, pursuing their Reform Party objective of opening Canadian resource doors to corporations. The Liberal Party in power at this time was very supportive of the mining industry with government subsidies, full court protection, and corruption in the form of consulting contracts for several of those in government who supported the mining industry. The Liberals have not been angels when it comes to the environment, but at least there was protection for endangered species, so long as it did not cross the interests of the mining industry. The Liberal Party was voted out and the Conservatives in, but for several years they were restricted to a minority status, ensuring that they had to recruit the support of other parties to pass legislative changes. Lacking control in this regard they instead cut funding for natural resource protection by two-thirds, ensuring that little in the way of species protection could actually be accomplished, even if protection laws were still on the books.

Now with a majority government, the Conservative Party has announced to the world that the door is open to rapid resource development. To facilitate this goal species protection is undergoing formal deregulation, a major step in this regard being the removal of time limits for protecting endangered species. If there is no time limit then what is the point? By the time that the government eventually gets around to doing something extinction has likely occurred. An additional deregulation step has been to alter the rules such that endangered species on private land do not have to be protected. If a species close to the evolutionary dustbin happens to live on private land then too bad, unless the owner wishes to take steps. Of course what this means is that the land could be sold to developers (or might already be owned by them), who would decide to do nothing to protect the species.

In the United States Endangered Species legislation has stood up somewhat better, largely due to successful lawsuits launched by environmental organizations, and an administration under President Barack Obama that seems sympathetic to environmental concerns. However, funding cutbacks have limited the ability of government agencies and non-for-profit groups to protect endangered species. Moving away from the Noah Principle what has emerged is the Triage Principle—Not all species can be saved and must be divided based on priority, with efforts directed only at the most valued. Of course the big question is what organisms are most valuable? One perspective is the “functions first,” with those species whose own survival ensures the survival of others faring best. For example, the Rocky Mountains high-altitude whitebark pine, stressed by high temperatures and associated pine-beetle outbreaks, whose nuts support grizzly bears, is favored based by the “functions first” criteria. Saving whitebark pines saves grizzly bears. Another perspective is EDGE (Evolutionarily Distinct and Globally Endangered), focusing on the uniqueness of genetic traits. According to this perspective the two-humped Bactrian camel, long-nosed echidna, and Chinese giant salamander will all be protected, but the whitebark pine would not be.

These approaches have pluses and minuses, such as the “functions first” perspective letting important genetic diversity slide, and EDGE allowing whole ecosystems to collapse while supporting animals at the end of an evolutionary path. Furthermore, neither approach takes into account the needs of indigenous people. Consequently, a blended approach is coming to be favored that was evident when the Wildlife Conservation Society met in 2008, with experts voting on species they felt should be saved. A blended mix of criteria was applied to determine the most valuable species. It is a sad state of affairs when species survival hinges on votes cast, but that is where we are now. Perhaps if corporations paid their fair share of tax, the financial elite paid high taxes on income over say \$500,000, and much of the world’s money currently hidden away from any taxation became fairly taxed, then the Noah Principle could be upheld. But how did we get to a point where species (and for that matter people) have far less value than corporations and profit? To answer this question we must consider why we have shifted from a position of

regulation to deregulation. Perhaps it is the case that governments and regulatory bodies are simply asleep at the wheel. Unfortunately, the answer is far less pleasant and involves an unhealthy dose of the high financial quotient (FQ) form of intelligence, mentioned in the Greed chapter. In short, corporations and the financial elite have come to control the regulatory process. The name applied to this scenario is regulatory capture.

REGULATORY CAPTURE:

Could there possibly be more irregular regulation than those who are supposed to be regulated, regulating the behavior of the regulators? Most people are unaware of this process and the ramifications, but it is of profound significance in understanding why corporations and the financial elite rule. George J Stigler in a paper-The Theory of Economic Regulation-indicates, "...as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefits." In essence, industry uses (abuses) the power of regulation designed to protect the public to enhance private benefits. Regulatory capture can and does extend beyond political agencies and organizations to controlling anything that has power over industry, such as the media, academia, and popular culture. This extension is known as "deep capture." An example pertaining to the media is that most major media sources are owned by a handful of tycoons or corporations, having some business interests registered offshore to avoid or minimize taxes. Consequently, media coverage of the offshore shadow economy is typically highly restricted to examples of the seemingly rare "bad guy" as an exception to the rule of decency. There is almost no mention of how virtually all corporations and members of the financial elite are drinking from the same greed well, and using the offshore shadow economy to maximize their wealth.

Academia is heavily influenced by corporations, such as pharmaceutical giants providing much of the funding for drug research, particularly in an era of cutbacks to public funding of research. In the past, even thirty or so years ago, most research was conducted in universities with public funding. Now a sizable percentage of research is performed by industry, and most of the research in academic centers ends up being funded by industry. If an academic researcher comes up with something promising, they

often end up forming a company or linking with an existing one, furthering their research in this context. An example being the countless biotech startups over the last several years established by university scientists. The impact of industry funding on research is presented in the chapter, *A Conflicted World: Research Bias*.

Popular culture is also highly influenced or even controlled by corporations, with hyper-consumerism and the value of pursuing material wealth being relentlessly promoted via advertising, television shows, movies, video games, and even rap songs. The latter is quite amazing because many rap singers started with very little, being well outside of the 1% controlling so much of the wealth, and now they are singing the virtues of being a billionaire and acquiring all sorts of material goods. Many major performers have a reason to protect the status quo regarding the financial elite. For example, the Irish rock group U2 is allegedly registered offshore, paying approximately 2% tax while they are putting themselves forward as helping the unfortunate of the world. Everything is interconnected and minimal tax and excessive personal wealth has a social justice cost on society. Given their alleged involvement in the shadow economy, we cannot expect them and other like-minded entertainers to oppose this system.

So deep capture is very much a reality, and it appears that the game is rigged—With the powerful message that you are important, if and only if, you have wealth demonstrated by material goods, people are overly focused on these acquisitions striving for better cars, bigger houses, more expensive furniture, and the like. With perhaps a quarter to half the wealth of the planet not taxed or barely so, the tax paid by corporations outside of tax havens much less than what individuals pay, the average person's taxes too high in order to compensate for the inadequate amount paid by corporations and the financial elite, how can people possibly have the money to achieve these material goals? Well, unless there is a rich and generous relative, they do not. The answer is debt fueled by low interest rates set by the Federal Reserve and similar institutions in other countries. With cheap money the material goods can keep flowing, but now people have to work harder to service all that debt. There is no time or energy left to focus on what the underlying problem is, and how you have been “captured” so to speak.

While those with an open mind can see how “deep capture” is influencing them, it might be harder to understand how corporations and the financial elite can actually regulate the regulators. After all, we expect regulatory bodies to protect the public. In many regards the process of regulatory capture is very straightforward, although it can transpire through several paths. One very obvious one is that regulators can share the same value as those regulated. For example, pro-corporate regulators favor the interests of industry, and so can be expected to be lenient or directly supportive of industry activities, even if this support is in conflict with their role as regulator. Often people of like mind become friends and the relationship can impair regulatory judgment.

Another major route to regulatory capture is the “revolving door,” as it has been named. Regulators have often worked in the industry they regulate, and later leave their position as a regulator to work in industry again, hence the revolving door. Multiple paths of influence can act on regulators via the revolving door. Regulatory agencies often employ industry people given their knowledge of the business. Once in the role of regulator, a person commonly realizes that if they are supportive of industry a higher paying job awaits them back in industry. In many instances this is implied, or even expressed outright by industry representatives. Even if no actual job unfolds lucrative consulting contracts (a major form of corruption in first world nations) will follow their employment as regulators.

Other paths to regulatory capture have been identified, such as pressure from above to ensure that regulators are lenient to industry, as in the era of deregulation when senior levels of the United States government seemed to structure things in a top down manner in support of industry. An over-zealous regulator is often reprimanded in this context. In third world countries another form has been identified, namely direct threats of harming or discrediting the person in their community. Threats are the stick and the carrot is often bribes. Resource industries have largely acquired what they want via bribes paid to senior government personnel and regulators in third world countries, an occurrence not denied by many of the companies involved. Imagine yourself in the role of regulator of the mining sector in a third world country.

You know your bosses are being paid off, and if you accept bribes than you keep your job, have extra cash, and are also safe from being harmed or suffering a damaged reputation in your community. What do you do? For the vast majority of people there is no real choice. As a regulator in a first world country you are unlikely to receive a direct bribe, but that is not required. Instead you are offered a well paying job in industry, followed by the chance to further the interest of industry as a regulator, leading to an even more lucrative job with industry.

Lobbying is another major path to regulatory capture when conducted in a less ethical fashion. Politicians and legislators are often made aware of issues via meetings, and lobbying is a method of producing awareness. It aligns with freedom of speech, and as such is fine. A local environmental issue might be brought to the attention of a politician, allowing the possibility of constructive action. Where it crosses a line into regulatory capture is when there is excessive influence. One form this takes is assisting with campaign financing. Professional lobbyists frequently arrange fundraisers, and solicit donations for those in the US Congress, for example. If a person is elected to office in large part because of the financial contributions arranged by a lobbyist, they are going to be very sympathetic, or even indebted to the cause that person is representing. Although often not illegal, such actions on the part of lobbyists play a key role in regulatory capture. The connections made can usher in revolving door deals, and how this has been noted to work, is that high ranking aides to say a congressperson are promised future employment if they allow access to their boss and champion the cause.

Most professional lobbyists are lawyers. A successful lobbyist is very well paid and can have a very stable career. Even though figures of 12,000 or more lobbyists in Washington have been suggested, the actual number of influential and effective ones is quite a bit smaller. However, regardless of numbers the amount of money spent is staggering, and the role it plays in politics around the world is increasing. JP Morgan Chase has an in-house team of lobbyists who spent \$3.3 million in 2010. Between 1998 and 2010, finance, insurance, and real estate combined spent over \$4 billion dollars in the US on lobbying. A trade group representing hedge funds spent more than \$1 million in one quarter to influence

the government regarding financial regulations, with a focus on changing a rule that might demand greater disclosure requirements for these funds. As instruments of the shadow economy, hedge funds play a key role in so many of the financial problems that we face, and transparency is not something that those who run these funds want to see occur, despite the risk of fraud arising from their secrecy.

With all that money spent results are expected, and no better result could be lobbyists writing the actual laws. Impossible you say, not in a democracy. Maybe in some dictatorship where the leaders are bribed to the hilt and lawyers for resource companies are allowed to do so, but never at home. As bizarre as it sounds the practice is widespread in the United States. One reason why so many lobbyists are lawyers is that they are trained in legal jargon, and know how to write laws. In many instances lobbyists write the actual text of the proposed law, and then more specialized lawyers hired by them perfect the language. This thoroughness safeguards the legislation from loopholes that might give opponents an edge in fighting it. From the perspective of a legislator this process can make sense, because it is time consuming and expensive to research a bill, draft the text, and then perfect the legal language. To have someone else do it for you is much easier, but is this what democracy is about? Sponsored bills drafted by lobbyists are becoming more and more common. Through this process those who are supposed to be regulated are able to write the laws they want to see in place—A “graphic” example of regulatory capture.

So far we have seen how regulatory capture works in general, but it is worth looking at specific examples to appreciate how common and potent it is. The SEC has been accused of acting in the interests of Wall Street banks and hedge funds, and of either outright refusing to investigate complaints or dragging its heels. Based on his decade long attempt to get the SEC to realize that Ponzi fraudster Bernard Madoff could not be legitimate, Harry Markopolos called the agency, “nonfunctional, captive to the industry.” The US Senate Committee on Finance, the Senate Judiciary Committee, and a federal district court, all found that the SEC had illegally dismissed an employee in September 2005 who was critical of superiors’ refusal to pursue Wall Street titan John Mack. It was believed that John Mack had provided insider

information to Arthur J. Samberg, head of Pequot Capital Management, one of the largest hedge funds around. The SEC did not take any action against John Mack or Pequot, until years later when the former employee acquired SEC records via the Freedom of Information Act, and filed them in court. The next day the SEC announced they had now filed charges against Pequot. An interesting coincidence!

There is a long list of SEC officials who have entered the revolving door of SEC-industry employment. Those who have left senior roles in the SEC for very lucrative jobs in the financial industry include, Arthur Levitt, Robert Khuzami, Linda Chatman Thomsen, Richard H. Walker, Gary Lynch, and Paul R. Berger. A staggering 219 former SEC employees sought to represent clients before the SEC between 2006 and 2010, according to a May 13, 2011 report by The Project on Government Oversight (POGO). 789 statements notifying the SEC of their intent to represent outside clients to the commission were filed, in some instances only days after leaving the SEC. The SEC is an agency designed to protect the public from Wall Street, but really has protected Wall Street from the public. This agency provides a classic case of regulatory capture according to reporter Matt Taibbi. He found that in July 2001 then SEC enforcement director Richard H. Walker derailed a preliminary fraud investigation against Deutsche Bank. Walker began working for Deutsche Bank as general counsel a few months later in October 2001. Darcy Flynn, an SEC lawyer who was the whistleblower for the Walker issue, revealed how for twenty years the SEC was routinely destroying all documents pertaining to thousands of preliminary enquiries, that were closed instead of moved to formal investigation. The destruction of these files deprived investigators of important background information on the suspected firms. According to SEC rules the files were to be kept for 25 years, and destruction was to be done by the National Archives and Records Administration. The names associated with some of these destroyed records is very incriminating, the list including Bernard Madoff, Goldman Sachs, Lehman Brothers, Citigroup, Bank of America, and other major Wall Street firms that played key roles in the 2008 financial fiasco.

Okay, but maybe the SEC is one rotten apple in an otherwise healthy barrel. Unfortunately, it appears to be one rotten

apple in a barrel of mostly rotten apples. The Commodity Futures Trading Commission (CFTC) appears to have been “captured” as well. This capture involves Wendy Gramm, wife of Senator Phil Gramm, co-sponsor of the Gramm-Leach-Bliley Act terminating the Glass-Steagall Act, and the Senator who also pushed hard for legislation formally deregulating the market, including for derivatives. One of the two CFTC judges, George H. Painter, reported regarding the other judge, “On Judge Levine’s first week on the job, nearly twenty years ago (in the early 1990’s), he came into my office and stated that he had promised Wendy Gramm, then Chairwoman of the Commission, that he would never rule in a complainant’s favor.” Painter further wrote, “A review of his rulings will confirm that he fulfilled his vow,” and “Judge Levine, in the cynical guise of enforcing the rules, forces pro se complainants to run a hostile procedural gauntlet until they lose hope, and either withdraw their complaint or settle for a pittance, regardless of the merits of the case.” Wendy Gramm has been accused of helping Goldman Sachs, Enron, and other large firms gain influence over the commodities markets. She joined the board of Enron after leaving the CFTC. Gary Genslers, a former Goldman Sachs executive later headed this commission.

The Federal Reserve Bank is not immune from regulatory capture either. The Federal Reserve Bank of New York (New York Fed), is the most influential of the Federal Reserve Banking System, and as such plays a key role in the US economy and the financial state of the world. The New York Fed’s role includes regulating Wall Street, but its president is selected and reports to a board dominated by the chief executives of the banks it regulates. Timothy Geithner was president in the period leading up to the financial collapse of 2008. The New York Fed under his leadership failed to stop banks and hedge funds from pursuing the investment strategies that caused the financial collapse, something attributed to his overly close relationship with the heads of Wall Street Banks. When disaster struck Geithner became the “bailout king” of a recovery plan highly favorable to Wall Street banks, with the cost landing on taxpayers. He engineered the New York Fed’s purchase of \$30 billion of credit default swaps from American International Group (AIG). These contracts were sold to Goldman Sachs, Merrill Lynch, Deutsche Bank, and Societe Generale, giving them a “back-

door bailout” of 100 cents on the dollar for the contracts. It is so easy to be generous with other people’s money. If AIG just failed the contracts would have been worth much less, lowering the bailout costs to taxpayers. Geithner defended this use of the taxpayer money to bailout banks for their own mistakes, by spinning it that threats to the financial system would be too great. This bailout fiasco making the taxpayer pay for the mistakes of banks represents a striking example of regulatory capture. The New York Fed entrusted to regulate Wall Street banks to protect the public, actually protected Wall Street banks and penalized taxpayers.

Regulatory capture extends beyond the investment sector. Control of the media by industry was mentioned under deep capture. People often assume that cultural preferences just happen, but a wise person realizes that they are crafted and cultivated by media sources. The value and allure of packaged high calorie food low in nutritional value is everywhere in the media. Much less promoted by major media is the value of consuming community grown highly nutritious food. Strategic product placement in television shows and movies, paid for by industry, reinforces the value of packaged high calorie food and beverage products. Now if we assume that media can craft and cultivate culture, then it logically follows that corporations and the financial elite might try to control major media to block alternative messages. This is precisely what occurs, with a very limited number of tycoons and corporations having ownership of major media, a scenario that is repeated throughout the first world. One potential problem facing those in control of media is that regulators might take steps to favor local independent stations, and media sources, that express and promote viewpoints antagonistic to hyper-consumerism. This is where regulatory capture comes into play, with legal scholars suggesting that the Federal Communications Commission (FCC), and other media regulating agencies, have been captured by media conglomerates. One such scholar, Peter Schuck of Yale Law School, has indicated that the FCC is subject to capture by the media industries’ leaders, reinforcing the operation of corporate cartels in the form of corporate socialism serving to, “regressively tax consumers, impoverish small firms, inhibit new entry, stifle innovation, and diminish consumer choice.” The FCC grants

communication licenses to major radio and television stations, excluding citizens and smaller stations from having access to the public.

One of the most amazing aspects of the message crafted by major American media is how individual values dominate, with freedom, choice, and hope, while the reality is that corporations and the financial elite have effectively captured the public. Life for the average American, and for that matter those throughout the first world, is eroding in many ways—Jobs are being shipped to special economic zones at an alarming rate to increase corporate profits; the healthcare system run by corporations leaves many people without access to good (or any) medical care, at least prior to “Obamacare”; massive debt is the only way most of the middle class can hold on to its status; the average person is taxed too much because corporations pay essentially no tax in the offshore world, and far less tax than individuals for the portion actually taxed in the first world; taxpayers’ money is used to subsidize corporate activities, such as industrial agriculture, and also to “save” industries such as the banking system from their own costly mistakes; young people are sent to fight and die in wars, such as in Iraq, designed largely to further corporate resource acquisitions at taxpayers expense (as opposed to private corporate armies). The capture is so successful that some readers will see this perspective as anti-American socialism. If anything what is happening now is un-American as the founders of the Constitution seem to have envisioned things.

To craft the right message for public consumption pro-corporate interests must control the media, and not surprisingly regulatory capture appears to be involved. The revolving door path to regulatory capture seems to play quite a role with the FCC. Michael K. Powell, Chairman of the FCC for four years, was appointed president and chief executive officer of the National Cable & Telecommunications Association, a lobby group. He became the chief lobbyist and the industries liaison with Congress, the White House, the FCC, and other federal agencies. Meredith Attwell Baker, a FCC commissioner, who approved the controversial merger between NBC Universal and Comcast, announced a mere four months later that she was resigning from the FCC to work for Comcast’s lobbying office in Washington. Even though she is

restricted by law from some lobbying actions her knowledge of the FCC and connections have been well paid for. In Canada, the powerful Canadian Radio-Television and Telecommunications Commission (CRTC), has been accused of being unduly influenced by “Big Telecoms” lobbying efforts. Critic Steve Sanderson has said, “The CRTC’s stubbornness in the face of a mass public outcry demonstrates the strength of the Big Telecom lobby’s influence. While government officials have recognized the need to protect citizens’ communication interests, the CRTC has made it clear that their priorities lie elsewhere.” What is particularly interesting about this example is the CRTC was initially set up in large part to protect the small Canadian market from being overrun by America media messages, thereby protecting Canadian culture. Major corporations are now international, and hence the only way to protect what remains of local culture is to support small independent stations emphasizing Canadian content. To give into major corporate media means that the CRTC will fail in one of its major objectives.

Most readers by this point will agree that regulatory capture by industry is a real occurrence, and also see how revolving door employment and lobbying are key paths to its realization. However, some in trying to maintain a positive spin that the world is actually fair and good by nature, might be thinking that the examples provided so far do not really hurt anyone physically, other than perhaps those young people going off to war to support corporate interests. Shattering this positive cognitive distortion is the reality that regulatory capture by industry extends to sectors that have life-threatening consequences. Very life threatening if it goes wrong is nuclear power. Back in 2007 then-candidate Barack Obama said that the five-member Nuclear Regulatory Commission (NRC) had become, “captive of the industries it regulates,” and Joseph Biden indicated that he had absolutely no confidence in the agency. The NRC has granted a license to every single reactor requesting one. Only ten days after the catastrophic 2011 Tohoku earthquake and tsunami damaging Japan’s Fukushima Daiichi plant, the NRC granted a 20-year extension to Vermont’s Yankee Nuclear Power Plant, despite the Vermont state legislature voting overwhelmingly to deny the extension. As it turns out the Vermont plant uses the same GE Mark I reactor design as the Fukushima Daiichi one. Furthermore, the plant was leaking radioactive

materials through underground pipes, an occurrence that Entergy (the company running the plant) denied under oath. The 104 existing nuclear plants in the US were designed to last for 40 years only, due to accumulated radioactive damage to metal components. The NRC has been extending the licenses to 60 years, and is now considering increasing them to 80 years.

Scientists have expressed their doubts about NRC performance. For instance, the Union of Concerned Scientists released a study in March of 2011 that was critical of NRC activities. The report indicated that NRC enforcement of safety rules through the years has not been timely, consistent, or effective, and cited fourteen “near-misses” at US plants in 2010 alone. The revolving door path to regulatory capture comes into play, with for example Jeffrey Merrifield who was on the NRC from 1997 to 2008, taking an executive position at The Shaw Group, a corporate entity with a nuclear division regulated by the NRC. More recently, Gregory Jaczko, the NRC’s Chairman, resigned due to intense pressure from his four fellow NRC members led by William D. Magwood. Magwood has been a zealous promoter of nuclear energy, as have many on the NRC throughout the years. Although a supporter of nuclear power with a Ph.D in physics, Jaczko urged the NRC to apply the lessons learned from the Fukushima disaster, and refused to give the go-ahead for two plants in Georgia as if nothing happened. This moderate and cautionary stance deeply upset the four other members of the NRC, despite their job being to regulate the nuclear industry.

In Japan, a society well known to not question authority and show respect, a 641 page report by The Fukushima Nuclear Accident Independent Investigation Commission, found that the accident was the result of collusion between the government, regulators, and Tepco (Tokyo Electric Power Company), the owner of the six Fukushima plants. The report states, “They effectively betrayed the nation’s right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly man-made.” It also indicated that nuclear regulators, “all failed to correctly develop the most basic safety requirements,” and “It was a profoundly man-made disaster that could and should have been foreseen and prevented.” The Fukushima regulatory problems involving regulatory capture by industry, demonstrates how this

problem plays out beyond the US, even with industries that can have lethal effects on people.

People cannot expect regulators captured by industry to protect their safety. Nor can anyone expect that the environment will be protected in the absence of costly legal challenges. The Environmental Protection Agency (EPA) indicated in 2004 that hydraulic fracking for natural gas or oil (invented by Halliburton in the 1940's), poses little or no risk. The seven-member review panel has been accused of conflicts of interest by whistleblower Weston Wilson and others. Hydraulic fracking is a controversial procedure and the safety of it has certainly not been proven. Even if the EPA wanted to regulate fracking, it is blocked by a clause added to the energy bill in 2005 exempting the oil and gas industry from the requirements of the Safe Drinking Water Act. This clause is called the "Halliburton Loophole," as it was added at the request of then Vice-President Dick Cheney, who had previously been CEO of Halliburton.

Turning to resource extraction on the oceans we find another instance of regulatory capture with the Minerals Management Services (MMS), and its change to the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE). The MMS allowed British Petroleum (BP), and many other companies, to drill in the Gulf of Mexico without first attaining permits to assess threats to endangered species, as required by law. These companies were also given blanket exemptions from having to provide environmental impact statements. In 2009, a year before the BP Deepwater Horizon catastrophic oil spill, the National Oceanic and Atmospheric Administration (NOAA) accused the MMS of, understating the risks and impacts of spills and playing down the fact that spills had been increasing. MMS staff scientists complained that their reports were overruled and altered if they found high risk of accident or environmental impact. Kieran Suckling of Biological Diversity stated, "MMS has given up any pretense of regulating the offshore oil industry. The agency seems to think its mission is to help the oil industry evade environmental laws." Following the 2010 BP Deepwater Horizon "accident," Ken Salazar became the new Secretary of the Interior. He orchestrated the change of MMS to BOERME. Even though his stated task was to end coziness with

industry, that very industry supported his appointment, an improbable occurrence if they anticipated a tough go. In the aftermath to the disaster Salazar said he would delay granting any further drilling permits. Three weeks later at least five such permits were issued, followed by even more in March 2011.

A particularly frightening example of deficient regulation, and actual regulatory capture with very international implications, involves the Food and Drug Administrations (FDA) and other regulatory agencies, support of genetically engineered plants and animals (see the Research Bias chapter for a more complete coverage of genetic engineering). Perhaps the best way to conceptualize genetic engineering is to see it as the new resource frontier. Like gold, silver, and oil, genes are now a resource to be developed by industry for profit, and to protect their investments patents on life are issued. All a corporation (or individual) has to do is alter a single gene in a living organism and claim it is as a new organism. A patent is granted and anyone wishing to work with that gene or organism faces a potential lawsuit if they attempt to do so. This is a particularly interesting scenario considering that genetic engineering capacity and in some instances preliminary work on specific genes, was conducted by research institutions utilizing public funds (taxpayer money). The public pays much of the overall cost and the corporation modifying the gene profits—Now that sounds fair doesn't it? The corporations and even regulating agencies connected with the process seem to have no problem with this cognitive distortion.

In the earlier years of genetic engineering individual countries could decide whether or not they would accept the patent claim. Move ahead to the present and every signatory to the World Trade Organization (WTO) must accept these patent claims, incurring costly penalties for violations. The race is on to patent genes in multiple organisms, and benefit from the amazing 20-year patent protection. The vast majority of patent holders are first world corporations, and the vast majority of the organisms being patented are third world—First world corporations own third world organisms in effect, with so-called “intellectual property rights.” Several countries such as India, Ecuador, and Thailand, have been drawn into expensive legal battles to protect their

indigenous plants and animals. A Texas biotech company even tried to patent basmati rice, traditional to India for eons.

Intellectual property rights are a very contentious issue with free trade agreements, such as the North American Free Trade Agreement (NAFTA) and Free Trade Area of the Americas (FTAA). The US is pushing for intellectual property rights over local resources, and fortunately many third world countries largely led by Brazil are pushing back, delaying any all-encompassing FTAA agreement. Further serving the needs and desires of corporations, US negotiators have also pushed for liberalization of services such as water supply, education, health, and the like. If ever allowed by the countries involved, corporations could end up running essential services within every country that signs on. In many ways the US is following the lead of the WTO and this organizations pro-industry agreements. There are Trade-Related Intellectual Property Rights (TRIPS), binding agreements that assist companies like Monsanto, Novartis, Syngenta, and others to patent life forms and ensure that nobody uses their seeds without paying royalties. Trade-Related Investment Measures (TRIMS), that most countries have signed onto, dictate what countries can do in terms of limiting foreign investment, such as setting ecological sustainability standards for purchases that might “discriminate” against a cheaper product. Then there is the Agreement on the Application of Phytosanitary Standards (SPS Agreement), constraining government policies pertaining to food safety and plant and animal health, thereby ensuring that trade disrupting prohibitions on pesticides and genetically engineered products are minimal. There are several other WTO agreements benefiting industry at the expense of individuals within the country that signs on, and no agreements that truly benefit people over corporations.

Other distorted aspects characterize the whole genetic engineering scenario, one being that if something goes wrong it is not the patent holder, producer, or distributor that is liable, but the country that imported the product. This is based on the International Biosafety Protocol negotiated under the auspices of the United Nations Biodiversity Convention. With this scenario in place regulatory agencies should theoretically be hyper-vigilant, but such is not the case. The FDA has decided that genetically engineered products should not be labeled, and that they do not

even have to go through a safe certification process, a basic requirement when a new element enters the food chain. There is genetically engineered soy in cereal, canola in mayonnaise, and potatoes in fries and we are prevented from being aware of it. The US Department of Agriculture has allowed pigs with genetic modifications, involving the inclusion of human genes and crippled viruses, to be sold for human consumption. Neither Congress nor the public was made aware of it. When the story broke and it became clear that this has occurred on several occasions, regulatory control was dumped on the research institutions in possession of the pigs. Apparently the public cannot rely on the Department of Agriculture or the FDA for protection, as these institutions appear to have the interests of industry in mind. In Europe and much of the world, genetically engineered products are either banned or have to be labeled. An important lesson here is that people can be heard given that governments influenced by industry, such as in Britain and Germany, were often supportive of these products, but massive public opposition won the day.

FDA support of industry extends beyond genetic modification to hormonal and drug modification of livestock. A classic example of this support involves Monsanto's growth hormone, rBGH, fed to livestock, but found to promote cancer in cows and humans. Numerous countries have banned it, but in the US it is unlabeled and legal, and this regulatory deficiency is from a body (FDA) that is supposed to protect the health of US citizens. A striking example of the revolving door path to regulatory capture is found with rBGH. Margaret Miller, a chemical laboratory supervisor at Monsanto, wrote a scientific report that was to be submitted to the FDA to obtain support for rBGH. Just before the report was submitted, she quit Monsanto and took a position at the FDA, where her first job was to approve the report she had just written for Monsanto. The FDA's Deputy Commissioner For Policy, Michael R. Taylor, wrote the labeling guidelines for rBGH. He was previously employed as a staff lawyer for Monsanto, where he worked on rBGH legal issues. The revolving door between the FDA and industry extends to genetic engineering as well, with people going between the FDA and biotech firms.

A key issue with genetically engineered organisms, hormonal manipulations, and other life-altering modifications, is

that there is at most limited short-range testing. The assumption is that if one thing is changed nothing else will be affected, but this is not how life works. Everything in the biological realm (and likely the universe for that matter) is highly interconnected. Change one thing and other things are altered. In some instances it can take years for changes to manifest. At the very least extensive long-range testing to ensure that auxiliary changes are benign is essential. However, the FDA and regulating bodies in Canada and Australia do not see it this way. Monsanto's genetically engineered Roundup Ready crops tell an interesting story. Monsanto scientists have modified crops such as wheat so that their glyphosate-based herbicide called Roundup can be sprayed on the crop all growing season long—Roundup Ready (and able). Even the thought of all season long herbicide dosing should raise some regulatory eyebrows. Glyphosate has been linked to non-Hodgkin's lymphoma, a type of cancer you definitely do not want to get. Perhaps more relevant to the larger public, and reflecting the interconnectedness of nature, is how glyphosate results in the growth of a toxic fungus, called fusarium. Wheat treated with Roundup can be affected by fusarium head blight. This blight produces a toxin making it unsuitable for animal or human consumption. Two of the most damaging forms of the fungus grow faster when glyphosate herbicides are added to the nutrient medium.

Essentially, the herbicide is producing a soil imbalance allowing fungus normally kept in check by other organisms to grow excessively. In 2002 fusarium contributed to an 80% breeding failure of sows on four Iowa farms, and contamination with fusarium was responsible for thousands of human deaths in Russia during the 1940's. Monsanto's response has been that they are highly confident that Roundup does not have any negative impacts on soil microbes. What a relief, now no one has to worry! Clearly, the FDA and regulatory agencies around the world need insist on full and independent testing of glyphosate, other herbicides, hormonal manipulations, and genetically modified organisms. In 1999 the Canadian Broadcasting Corporation (CBC) Radio reported that Monsanto offered Agriculture Canada 1-2 million dollars to approve rBGH without further testing, and Agriculture Canada agreed to allow Monsanto to conduct its own testing at government research facilities for an undisclosed amount.

We have examined regulation in nature, man-made regulation and deregulation, and learned how financial based regulations developed after the market crash of 1929 had such a beneficial impact on the growth of the US economy. Forgetting the lessons of history, a period of deregulation followed starting in the 1970's that contributed heavily to the real estate bubble and bust of the mid 1980's, and the catastrophic financial meltdown of 2008. The question that any reasoning person has to ask, is why institutions and agencies that are supposed to protect the public, are actually serving the needs and desires of corporations and the financial elite? The answer as we have seen is regulatory capture of these regulatory bodies by industry, through paths such as corrupt lobbying practices and the revolving door of employment between industry and regulatory bodies. The question that now comes to mind is, given how bad the situation truly is for the public (and how incredible it is for corporations and the financial elite), can anything be done about it? The answer is definitely yes but it will require a real change from the status quo.

ENDING IRREGULAR REGULATION:

There are numerous steps that can be taken to produce regular regulation, the starting point being to appreciate the value of regulation. As you have hopefully realized from the information presented, robust regulation is crucial for biological and psychological health, and for the healthy functioning of society. Solid man-made regulatory control is required to fully protect the public. However, even ideal regulations will fail if regulatory capture by industry is successful. To end the current status quo of potent regulatory capture by industry and block the various forms of societal cancer arising from this scenario, regulatory capture must be dealt with, and fully so. One component of this process is full disclosure and transparency by regulatory agencies, including all interactions with those regulated. When everything is out in the open it is less likely that an industry will capture the regulator, and the regulator is less likely to allow capture. However, as it currently stands disclosure and transparency does not prevent regulatory capture, as with lobbyists openly writing legislation for those they represent. Furthermore, revolving door employment deals made in private will never see the light of day. Another step is to adjust the

employment guidelines to reduce the revolving door path to regulatory capture. Longer regulatory tenures and enhanced restrictions on crossing over from one side to the other can be helpful. Unfortunately though there are really no “sides” with regulator and regulated being blended in a cozy arrangement. In addition, overly tight restrictions on revolving door transitions might end up violating labor and employment laws.

When it comes to politicians being “captured” by industry there is a great need for clear restrictions. No politician should be allowed to accept a consulting contract or employment with any industry they have advanced the interests of, for a minimum of ten years after leaving office. It is simply too great a conflict of interest for them to take lucrative employment after their term. This change alone will reduce the number of opportunistic politicians, and increase the number of more ethical ones. As it stands now politics can be very financially rewarding after the term ends, due to these consulting contracts. All financial contributions from industry and lobbyists to campaigns need be made illegal, as should the writing of laws by lobbyists or other industry representatives. These steps will help ensure that those elected to office represent the interests of the public and not industry, in line with the principles of democracy.

Ongoing public vigilance and opposition to regulatory capture of various forms is essential, but a public that has been deeply captured by industry and corporate media is unlikely to do so, at least until the “light comes on” and people see how fully captured they have been. One promising option is the creation of consumer advocacy groups to watch over the regulatory process. However, the possibility remains of these groups being captured as well. So far then we have some promising and helpful options, but none that will really alter the irregular regulatory status quo. For that we have to address the actual business of regulating. Regulators can be rotated to reduce the likelihood of corrupt deals, and two regulators might need to be involved in meetings and decisions pertaining to those being regulated. Regulators also need to be better paid to reduce the advantages of shifting over to industry. These steps will improve the quality of regulation in many or most instances, but are not foolproof. Imagine a regulatory

agency staffed by pro-industry minded individuals. Would it really matter if these regulators were rotated, paired, or paid well?

The best solution to regulatory capture lies with layers of regulation. Regulatory agencies need to be regulated by an independent level of regulation that oversees them. I propose that two types of high-level regulatory bodies be set up with the responsibility of overseeing on the ground regulatory agencies. The first type is to be staffed by highly qualified regulators who must first pass through a tight screening and training process. As part of the screening process they must demonstrate and the record reveal that they are oriented to doing the right thing, with a focus on issues as opposed to party affiliation. Given that actions speak louder than words there can be no evidence of corrupt dealings or criminal charges, with ethical actions repeatedly demonstrated. Formal training programs must be established that these high-level regulators need to pass with flying colors. The pay for these positions must equal or surpass that of probable industry compensation, and the terms of employment must prevent or greatly restrict revolving door movement. In other words, these high-level regulators must be committed to the role in the long haul. Penalties for corrupt dealing need be severe given the trust that society is placing in them, and full protection by police and other agencies must be provided in the event of any threats to their safety, or that of family and friends.

Of crucial significance staffing of the agency charged with regulating regulators must be done in a non-partisan way. All candidate interviews and hiring procedures should be transparent to reduce the likelihood of bias on the part of those charged with doing the hiring. Screening and training must ensure that biases favoring industry result in disqualification. Punitive actions against regulators should be voted on by committees of high-level regulators highly knowledgeable of a given area, such as financial sector activity or genetic engineering. An uneven number of committee members will prevent deadlocks that can result in inaction. If this high level regulatory body has no power to take action against regulators they oversee, then the system will fail. Hence, this body must have power to deal with corrupt and deficient regulators in a timely fashion, with a limited and

streamlined appeal process. All of the above strategies need be fully transparent including to consumer advocacy groups.

The second type of regulatory body I propose is computer-based. Regulatory capture is revealed in patterns demonstrated by regulating agencies and individual regulators, such as for example decisions by individual regulators that show a consistent bias in favor of industry. Software programs can be designed to monitor and flag aberrant behavior for investigation. These two bodies must be independent to prevent the possibility of full capture—If the person-based regulating body ever did become captured by industry, then computer flagged patterns of irregular regulation could easily be ignored, or rationalized, if it is under the same system. An independent computer-based regulatory body, with equal powers to the person-based regulatory body, ensures that all suspected instances of regulatory capture are investigated and dealt with. Equal power also enables the computer-based body to identify possible irregular regulation in the person-based body, and take action. With these two higher-level regulatory bodies sufficient oversight will be present to ensure that irregular regulation is brought to an end, or greatly curtailed. Simply having this system in place will provide a solid incentive for ground level regulators to tow the line and regulate in a more non-biased fashion.

One of the last things that industry, corrupt politicians, and regulators in bed with industry will want, is the regulatory system proposed here, given that the regulatory capture status quo works very for corporations, the financial elite, politicians, and revolving door regulators. Despite “regulation” being in place, regulating agencies for the most part do as industry wishes, explaining why the system always seems to work for corporations and the financial elite. Attempts to discount the proposals made here will largely focus on the costs—How much will the proposed regulatory system cost, and will it be worthwhile? Currently vast sums of taxpayer money are wasted due to regulatory capture. Consider the estimated \$210 billion loss to taxpayers when the savings and loan industry shrank by 50% in the 1980’s, and the \$700 billion to purchase troubled assets and inject capital into the nation’s banking system, under the Troubled Assets Relief Program in 2008. How much did the BP Deep Horizon oil spill cost the US everything taken into account, and how much will subsequent ones cost? What

will be the cost if and when one or more one of those nuclear reactors designed to last for 40 years, but extended to 60 or 80 years, has a massive meltdown leaking radiation in a populated area? How about the cost of genetically engineered plants causing widespread crop failure or human disease outbreak?

The costs of the proposed higher-level regulatory bodies are insignificant compared to the potential and actual costs of deficient regulation arising from deregulation and regulatory capture. As it stands now, taxpayers' money is completely wasted on regulatory agencies serving the needs of those that are supposed to be regulated. Despite the money spent, we end up with various forms of societal cancer due to deficient regulation. Ending the most irregular form of regulation-regulatory capture-will greatly enhance public safety, and save vast sums of money over time by reducing the likelihood of major disasters. These savings can even be used to advance social and environmental justice. Another critique of the regulatory system proposed will be that it represents a "big brother" scenario. Perhaps for on the ground regulators to ensure that they do their job and protect the public, but not at all for the average person. Currently, we are in a big brother controlled environment dominated by corporations, as well as captured regulators and politicians. If properly implemented the proposed regulatory changes will free us from this control. Providing for regular regulation is one of the key things that will help save us from self-destruction.

TAKING THE “DEVIL” OUT OF DEVELOPMENT

QUESTION:

What statement or statements represent a fair assessment of development?

- A. Any comprehensive discussion of development must consider urban and non-urban forms.
- B. Development usually occurs in synch with the needs of society.
- C. Those involved in urban and resource development are solely responsible for the problems associated with unbalanced development.
- D. People as consumers can strongly influence how development proceeds.
- E. The quality of products is unrelated to development concerns.

Discussions regarding development are typically focused on resources, without much or any consideration of urban development, but as we will see the two are related in many ways. Hence, A is correct. Statement B is generally false, but if desires crafted to a large extent by development related entities are equated with needs, then it can be argued that there is some balance, although not a healthy one. Those who oppose urban developers and resource development industries will be disappointed to learn that C is wrong, based on the fact that people play a major role in supporting the profit-seeking behavior of urban and resource developers. Statement D is definitely true, because via several routes people can have a tremendous influence over how both urban and resource development proceeds. The last statement is false, and insights into why yield some very powerful

and interesting information regarding both how corporations operate, and why so much of resource development is unnecessary.

When we consider major problems of the world, such as greed with the shadow economy and irregular regulation involving regulatory capture, there is much that operates below the radar of the vast majority of people. Although many aspects of development are not entirely clear, such as the actions of mining and oil companies in third world nations, it would be difficult not to hear about excessive harvesting of fish and lumber, and dwindling easy to access oil reserves. Nor can those living in urban areas miss the extent of sprawl development, or the transportation struggles arising from it, given that most people experience this reality every day. Furthermore, there is widespread media discussion of both urban and resource development issues. Unfortunately, awareness of these development issues does not seem to have any appreciable impact on the problems. To a large extent this occurrence is due to limited understanding of what guides urban and resource development. Learning more about both processes reveals what is so “evil” about them, and what we can do to take the “devil” out of development.

URBAN DEVELOPMENT:

Doing senior level volunteer work focused on urban forestry for several years, I came to appreciate how “evil” the urban development process can be, and why “devil” fits so well into the term developer. It seemed appropriate to shift the popular saying, “Kill two birds with every stone,” to, “Kill two developers with every brick.” Killing birds seems cruel. In virtually every instance developers got their project approved by municipal councilors, supposedly elected to represent the interests of citizens in the municipality. Likewise, projects that were opposed by citizens and taken to the Ontario Municipal Board (a legal body with the right to rule on all development issues) rarely seemed to result in a loss for developers, unless the project was the rare version that was very poorly planned out. The deck truly seemed stacked in favor of developers. Readers familiar with urban development issues will not be surprised with this outcome, as it seems to occur throughout the world. Although the players and specifics of the game vary, the substance essentially remains the same, with developers winning in

the vast majority of instances. Hence, even though I will focus on urban development in the Toronto region as an example, the process almost certainly applies equally well to your own area. One difference between first world and third world settings, though, is that in the former cash bribes are less common, although still very prevalent, but in the third world this form of corruption often rules. If a developer wants a project passed the right payments to the right individuals can get it done. The influence of developers in first world urban development is every bit as potent but more subtle.

Toronto represents a prime example of poorly planned urban sprawl. Situated on the northern shore of Lake Ontario, the downtown core is set in a nice area with picturesque islands. It is easy to see why the site was selected by First Nations people as a meeting area, and later by colonists. For many years the boundaries of Toronto were quite limited and farmland was a very short horse and buggy ride away. In the 1900's with an influx of immigrants the city boundaries really began to expand west, north, and east. This expansion gathered momentum after World War II with small homes being built in monotonous subdivisions. The entire expansion process has largely been developer and automobile driven, with no proactive insightful planning pertaining to what might actually work in the long run. A very viable option that existed, at least until the 1930's, was satellite communities connected by electric trains. Although we now think of these clean energy trains as modern, a system of electric "inter-urbans" existed back then linking some cities. Within a given city streetcars completed the electric train based transportation network. Inter-urban trains were quite common, and there was an elaborate streetcar system in many cities, such as the capital of Canada, Ottawa, where none currently exist. If you mentally travel back to this time when cars were quite rare, you can see why planners had to think outside of the car box. But what happened to this sensible system and why did it not expand?

As it turns out the growing automobile industry was very well organized and lobbied politicians to favor car over rail. Undoubtedly, there was money provided for campaigns to ensure that car-friendly politicians won. Governments agreed to pay for roads and the maintenance of them (it could have been set up that

car manufacturers had to), while train companies had to cover the costs of their own tracks and maintenance. The growing system of inter-urbans fell apart, and most cities abandoned their streetcars, with only a few such as Toronto and San Francisco possessing even remnants of the once great streetcar system. People largely became dependent on cars, and the expensive and extensive road system paid for by taxpayers. Imagine a downtown core and satellite communities, each with a center consisting of a train station, shops, restaurants, and offices. The inter-urban shuttles people between the downtown core and the satellite communities when required, and then streetcars move them within the given area. With some office capacity and hence jobs in the satellite communities, many people would not even have to travel daily to the downtown core. As a further benefit of this urban design, farms situated between the core and satellite communities provide local produce, particularly important considering that the Greater Toronto Area (GTA), and many major cities, are built on some of the best farmland; in the beginning with limited transportation cities had to be located near produce. A utopian dream perhaps but it could well have been a reality with proactive planning and an emphasis on rail over road.

With a road-based system in place urban sprawl was ready to roll. Communities did not have to be set discrete distances apart to facilitate inter-urbans and train hubs. Houses could be built anywhere that the municipality was willing to supply with roads, and other services such as water, sewage, and electricity. Enter the modern urban developer motivated by great profit and rigging the planning game in their own favor. But how can developers possibly rig the game? Research by Professor Robert MacDermid of York University in Toronto, focusing on the 2003 and 2006 municipal elections reveals how it all works. Given the extent of urban sprawl over the years in the GTA, 10 municipalities exist. In the municipality of the city of Toronto, there is no possibility of horizontal sprawl and hence development is necessarily vertical. This is a crucial consideration when it comes to urban development and developers—When space for sprawl development is exhausted the emphasis is on vertical development, the taller the better.

A starting point in considering MacDermid's research is to realize that all politicians in a democracy need to be elected, and

campaigns require money. In contrast to federal and provincial elections attracting significant voter interest, citizen involvement in municipal elections is frequently very limited. In such a context, solid financial contributions by an industry can often make the difference between being elected and having a well-paid job, or a much lesser option. While many citizens are apathetic regarding the outcome of municipal elections, urban developers are anything but. The development industry is very reliant on municipal government to create its product and generate a profit. To turn agricultural land into subdivisions developers need approval of municipal politicians. Zoning changes are required to allow the land to be developed into a housing area, and the municipality must agree to provide sufficient infrastructure in terms of roads to the subdivision, water, sewage, and electricity. In addition to the actual developer, there exists an extensive developer related industry, including planners, surveyors, architects, lawyers, realtors, construction trades, building material suppliers, road builders, property managers, and marketing companies. Each of these industries rely heavily on sprawl development, and so also have a keen interest in the results of municipal elections.

Given that their financial success relies on development, both developers and those in development related industries are naturally going to support municipal politicians that are pro-development. In seeking election or reelection, these politicians realize that by being pro-development they will draw in more campaign funding, and also in some instances have a block of local voting support, assuming that a segment of those connected with the larger development industry are local. It even appears that developers seek out pro-development municipal candidates and groom them for the job. Consultants or employees of a developer are contracted to find pro-development candidates, organize their campaigns, and fundraise for them. The results of MacDermid's research support how potent developers are in the election of many municipal politicians. In the 2003 election pro-development candidates for the head position of Mayor that were well supported by developers, won in 5 out of 9 suburban municipalities. In one of the others-Mississauga-the candidate (Hazel McCallion) is so popular she does not even campaign, and the municipality is highly pro-development. In another-Whitby-the popular major

(Steve Parrish) refuses to take developers money and is an opponent of poor planning, although it seems to continue unabated in this area. The candidate running against him was well funded by developers but still lost.

A particularly revealing aspect of MacDermid's analysis focuses on the percent of corporate compared to individual contributions, and the percentage of corporate contributions from the development industry. In the 2003 elections corporate contributions made up two-thirds of the funding in suburban municipalities, and in 3 of the 9 it was over 70%. More than two-thirds of these corporate contributions came from the development industry. About 45% of corporate contributions in the City of Toronto came from the development industry. In this region 16 of 28 wards where the candidate that received the most money from the development industry won, the losing candidate received no money from developers. MacDermid indicates that the financial contribution figures are an underestimate, because they do not include contributions from individuals who are also developers, family members and friends of developers, and other individual contributors who are connected in some way to the development industry. In the 2006 elections, 43% of total election funding (excluding contributions as individuals) came from the development industry, similar to the 2003 election. 33% of all candidates in the 2006 elections had 50% or more of their funding coming from the development industry. In both elections it was clearly the dominant source of funding.

Perhaps it is the case that despite the funding there is really no impact and the development industry is wasting its money. In the Durham region, including Pickering and Whitby, 41% of funding for the 2006 election came from the development industry, with Whitby at 60%. This region had their Official Plan challenged by the provincial government for using inflated growth and population numbers to support unnecessary development. A brief drive through this area confirms the out-of-control development, with subdivisions and strip malls mushrooming where prime farmland existed a few years back. In York region, where 47% of the 2006 election funding came from the development industry, some of the best remaining farmland has been slated for development. The City of Vaughan, with one of the highest rates of

development industry funding, is expanding its urban boundaries despite no evidence that it is necessary to accommodate growth. In these and other municipalities where candidate funding is largely derived from the development industry, the story is the same with developers getting their way by capturing the development process.

In contrast to these pro-development municipalities, those with low development industry funding of campaigns have taken a much different course. Halton Region, with the lowest developer funding at 12% in the 2006 elections, proposed a Natural Heritage System that will preserve 36% of land potentially exposed to development. This heritage proposal is based on sound ecological principles designed to protect natural cores and corridors, and reduce the possibility of ongoing sprawl. In a region outside of the GTA, the Town of Oakville with an amazingly low 4% developer funding of municipal candidates, was the first municipality in Ontario to request that a Greenbelt region be expanded into their area. The results clearly indicate that municipalities with high development industry funding end up with sprawl development, whereas those with very low funding of this type opt for more green space. But exactly how does funding by the development industry translate into development?

In many ways the process is very straightforward. Municipal politicians open to development based on their belief system, or desire for a good job with status in the community, are the ones that the development industry focuses on. If elected the politician feels indebted to developers, and realizes that reelection hopes ride largely on continued support from the development industry. Their belief in the value of development, or in their own career aspirations over ethical principles, makes it easy for them to be pro-development when it comes to voting on projects. In Ottawa a very controversial development project was approved by 16 of 19 elected municipal politicians. Any guesses as to the 16 who accepted development industry funding, and the 3 who did not? There is also the possibility of revolving door employment and consulting contract options in the development industry, for politicians when they leave municipal office. The problem of developers funding municipal candidates, and then getting the okay for projects they want, is so extensive and corrupt that it can

be said that many municipal politician essentially work for the development industry, with taxpayers picking up their salaries! Indeed, a very good deal for developers, less so for citizens wanting their politicians to look out for the needs of the larger community.

A positive cognitive distortion that many of these municipal politicians spin to themselves and others is that the community needs the increased tax base. This rhetoric is also strongly propagated by the development industry. However, when the true costs of sprawl development are considered, it is a losing proposition for everyone but the developer. The community takes on numerous costs of a development project, most extending over time. Roads to a subdivision have to be built and maintained, with the costs of upkeep being a major drain on tax revenues. In our Canadian climate with cycles of freezing and heating, roads do not last long without costly maintenance. There is also infrastructure to be built and maintained for sanitary sewers, water, and electricity. One of the most interesting hidden costs to the tax system pertains to strip malls that invariably accompany sprawl development. Few people realize that the parking lots these stores rely on are either not taxed, or taxed at an incredibly low rate. With fair taxation applied to parking lots, the costs of goods would rise to a level where small independent community owned shops could compete. Local community shops might be something that people could walk to and get the exercise they need to combat the obesity epidemic (see the *Weighing Down The World: Obesity* chapter), but strip malls require a car ride for the vast majority of people.

Cars and the reliance of sprawl development on them create further problems and costs. The burning of fossil fuels contributes greatly to global warming. In suburbs it is common to see three and even four cars to one house. With few destinations within walking distance people become addicted to their cars, adding further to the global warming problem. Most people who are fortunate enough to have a good job often have to travel into the city core or to a manufacturing area, and this is typically by car. The main highway leading into Toronto (the 401) has been assessed to be the busiest in North America, giving us a distinction Los Angeles thought they had wrapped up. Gridlock on major arteries like the 401 is the norm, and considering how inadequate the rail system currently is,

there are no solid options but to sit in the car and burn fossil fuels for an hour or more each way every working day. The city is currently trying to improve public transportation, the debates and political wars providing quite a spectacle. Part of the problem is that there is no ideal solution given that much of the city and surrounding municipalities were designed strictly on the basis of the car. We cannot just go back to the inter-urban dream. All options are limited and very costly, with taxpayers likely to be asked (and expected to pay), approximately \$2 billion per year over several years to realize an expanded subway, light rail, and bus system, that will almost certainly prove to be inadequate for many in sprawled out communities. If readers outside of the Toronto area are thinking that this sounds familiar, it is because the same scenario applies to most cities.

Another major cost of urban sprawl is the loss of greenery. A healthy city should ideally have 30-40% tree cover, according to urban forestry experts. The city of Toronto has 19%, and some of the outlying pro-development municipalities have 4%, or even less. Mature trees provide numerous benefits with real cost savings in many instances. They absorb carbon dioxide (CO₂), the major contributor to global warming, and by doing so help compensate for the CO₂ emissions from cars. Trees also absorb pollutants, such as nitrous oxides responsible for smog, and sulfur dioxide causing acid rain. The medical costs associated with asthma and other respiratory problems linked to air pollution are enormous and growing. In Ontario that cost is about \$1 billion per year, and trees can help diminish it by absorbing pollutants. A single mature tree provides enough oxygen to sustain four people. Shade from even three well-placed trees can reduce air-conditioning costs by 40%, and wind blocking can save 10% on heating costs. The value of a single tree in an urban setting in financial terms runs into the hundreds of dollars.

Working against healthy urban forests are modern construction techniques. Utilizing heavy machinery, the name of the game is leveling the grade and clearing all the trees. Frequently signs for new housing developments make reference to forests, such as, "LIVE NEAR THE FOREST," but what the signs never mention is that all forests the developer can buy will eventually be treeless. When all the trees are cut down, topsoil is removed

leaving rock and clay that has remained buried for thousands of years. This highly compressed oxygen deprived soil is known as "hardpan." With further compression by heavy machinery it acquires the consistency of concrete. The topsoil that has been removed is often piled up to the side of the construction site where it becomes anaerobic (without oxygen), thereby ensuring that organisms die off. One of these organism in particular, mycorrhizal fungi, stands out because it enables trees to absorb essential minerals, namely nitrogen and phosphorous. Mycorrhizal fungi live in the roots of trees and plants and without them there would be no vegetation. When construction has been completed builders will add back about 20 centimeters (8 inches) of this anaerobic topsoil, known as "builder's loam." Besides the oxygen and hence mycorrhizal fungi depleted nature of this topsoil, tree growth requires a solid 60 cm (2 ft) to be successful, far more than builders typically add back.

Worsening matters even further, the heavy machinery used to place the topsoil compresses it such that the hair-like initial tree roots cannot spread. Not surprisingly, many of the relatively few trees planted fail to thrive and end up dying. Even if they do manage to survive it takes years for them to mature and provide any significant benefit. There are ways to improve this outcome, but they add cost to the project and hence are rarely used. Machines called "sub-soilers" cut a meter down with a giant vibrating tooth to break up compacted soil. Adding peat moss or sand to the soil, and mulch on top, also helps. Combining these approaches greatly increases the chances of healthy replacement tree growth. Pressure from homebuyers, local citizens, and municipal politicians not working for developers, could ensure that all new housing developments incorporate these soil regeneration strategies to "spruce up sprawl," a term I applied to improving sprawl development.

The changes that are occurring with sprawl development are horrific, but many people seem to not even care, despite those lengthy commutes to work and other costs to the community and citizens. It has been estimated that 85-90% of coastal wetlands on the lower Great Lakes have disappeared, largely due to sprawl development. Wetlands are crucial for migrating birds, many species helping to keep insect numbers down, and serve as

nurseries for juvenile fish to replenish stocks. They also help absorb CO2 and pollutants. Another major casualty of developers controlling the process is that local farmlands have all but vanished in and around most major cities. Consequently, cities are entirely reliant on just on time delivery by corporations. Most cities now have only three days supply of food on hand, including very remote ones, such as Thunder Bay Ontario. In the event of a crisis, such as severe flooding or a prolonged ice storm, three days is very risky. Having a local system of agriculture, with good storage capacity and diverse smaller markets, could go a long way to ensure food safety, thereby providing an invaluable service.

In the city core sprawl is vertical as there can be no or little horizontal growth. Once again, developers almost always seem to get their way with aggressive condominium development. In Toronto there is an acute shortage, or even crisis, in affordable family homes. At the same time it seems that a sea of cranes has taken over the city reminiscent of a Transformer movie. Most of the units in these new condominium buildings are one or two bedrooms, many starting at close to half a million dollars, hardly compatible with affordable family homes. In a number of instances, older affordable homes are purchased by the developer and knocked down. Even more intriguing is how much of the condominium development is speculation driven, with nomadic offshore capital flowing into the relatively safe and stable haven of Toronto to fund these projects, and many units being purchased sight unseen by offshore investors hoping to resell for a profit. To say the least, the new condo market is not driven by the demand of Toronto citizens, and we might be facing a massive bubble and bust scenario. Supporting these conjectures in October of 2012 condominium values in the city dropped 20% based on the flood of new units on the market, and this is when perhaps only 1-10% of proposed units have been sold. Meanwhile, young families are forced to move far out to the suburbs in order to afford a family size home.

Pro-development municipal politicians within the City of Toronto play a key role in this fiasco. I have attended some community meetings regarding proposed developments and the orientation is generally that it is a done deal, but you lucky citizens might influence the height. The developer who wants 50 floors,

makes a pitch for 60, citizens go for 40, but settle for 50. Can you hear the laughter of developers? If city politicians were to set a very high bar for proposed condominium developments ensuring that the community really needs them, then excessive condominium development could be headed off at the pass so to speak. Problems such as traffic, dust, and noise disruptions over years to communities arising from these unnecessary projects, could then be avoided. Back in the mid 1990's a major economic slow-down left many office buildings near empty, and at the same time some areas within the City of Toronto had almost no condominium buildings. Many of these deserted office buildings were transformed to condominiums, thereby filling a real need. Now there is no such need in the vast majority of areas and no valid reason for these developments, beyond developer and largely offshore investor wealth accumulation.

In shifting the blame City of Toronto politicians often point to the Ontario Municipal Board (OMB), where many contentious development proposals end up being tested. There is even a movement to remove Toronto development from this provincial court process, but with many municipal politicians receiving most of their funding from developers, it is highly doubtful that this will ever come to pass. Most cases heard by the OMB do end up favoring the developer as some Toronto politicians indicate, so citizens rarely believe that this avenue will work. One reason why developers typically win, aside from the possibility of revolving door employment, seems to be that there is an inequitable playing field, with vast financial resources for skilled planners, lawyers and other professionals on the side of developers. Citizen groups can rarely compete against the wealth and organization of developers. Hence, with many municipal politicians in a sense working for developers at the expense of taxpayers, and developers with all the big guns at the OMB, citizens must swallow excessive development, with perhaps only slight modifications and/or compensation to the community. The question arises, is there any way to change the process to favor more reasoned development and right some of the wrongs? The answer is yes, but it will require major legislative changes that must be demanded by voters.

Apathy is often the norm with municipal elections, creating an ideal scenario for a highly motivated industry to control the

outcome. If most citizens eligible to vote insisted that their politicians be developer-free, and scrutinized their voting once elected, developers would have a very difficult time getting their way. However, to ensure ongoing voter concern and involvement when people are so absorbed with hyper-consumerism seems unlikely. Instead change must be formalized and the recommendations made by Robert MacDermid are well reasoned. He recommends that corporate and union donations be banned. The Vote Smart 2010 initiative surveyed about 1,400 GTA candidates, and found that 67% were in favor of this ban, indicating that it could definitely be legislated. As it currently stands, the development industry provides much of the funding for municipal elections, and certainly does not represent more than a small fraction of the electorate. Hence, their influence over municipal politics far exceeds their numbers in the community. In most instances the development industry is not even part of the community, and is interested only in how that region can serve its financial interests. Given this scenario, MacDermid recommends that only qualified electors in the municipality where a candidate is running should be allowed to contribute to the candidate's campaign. If these changes alone were legislated, the financial influence of most developers and related industries would be greatly curtailed in virtually all municipalities.

According to MacDermid the total amount that each citizen can give should also be limited, and reduced from the current \$5,000 to \$3,000. These donations should be further restricted to a maximum of four candidates in one municipality. Part of his rationale for these recommendations is that developers, and those in development related industries, contribute as individuals, in addition to corporate entities. Consequently, the very prominent role played by the development industry in municipal campaign funding, based on corporate contributions, greatly underestimates their true influence. If financial contributions by individuals are considered the true influence might rise above 70%. I suggest that for donations over \$50 there must be a full and comprehensive listing of those making donations, with the information taken from passports, driver licenses, or other official documents. This list must be front and centre on the politicians website and updated weekly. I further propose that a regulatory body for municipal

elections be set up to monitor these lists, and other relevant information, for signs of bias. For example, if 230 of 500 individual financial contributors to a candidate's campaign work for a construction materials company in the region, then there is an obvious source of bias. Voting on issues relevant to that company must see the full light of day, and be investigated with the information fully available for public viewing. This suggestion will ensure full transparency and accountability in municipal elections and politics.

MacDermid's fourth recommendation is that if employers contribute to a candidate's campaign with labor, it be counted as a financial contribution. So if an employer enlists an employee to work on a campaign, that person's pay represents a financial contribution subject to the limits set. Hence, if the employee is not a citizen of the municipality where the candidate is running, then the employee cannot participate, and even if they are the pay will rapidly reach the \$3,000 limit for each citizen. If these well thought out changes are all put in place, the ability of any one industry or union to influence the outcome of municipal elections will be greatly reduced, and even negated in many instances. Anti-development candidates and those that favor sensible development will then stand a much greater chance. In addition, citizens who sense that the game is rigged and back away might start to believe in the process and become more involved.

Many people feel powerless to change the status quo, an understandable feeling given how financial interests such as developers rig the game in their own favor. However, change is definitely possible with municipal politics and the community development flowing from it. Back in 2006 when I was directly involved in urban forestry volunteer work, I attended a small meeting in the Pickering area. The people present were all very environmentally conscious and deeply resented the never-ending march of sprawl development. Of particular concern to many was the Oak Ridges Moraine, a region to the north of Toronto. Moraines are deposits of sand and gravel left behind by retreating glaciers. Buried under soil these deposits store and filter groundwater, providing an incredibly valuable source of clean water for public consumption, agriculture, and the remaining forests. Developers not interested in ecological services wanted to see sprawl grow

over the moraine, but many concerned citizens and environmental groups opposed it. A deal was reached to preserve this area while allowing sprawl development to proceed on less sensitive land. However, several developers were trying to nibble away at the margins of the Oak Ridges Moraine, threatening the safety of this highly sensitive ecological region.

The meeting took place just before the 2006 municipal elections. In an attempt to block the election of pro-development candidates, and facilitate the election of those opposed to sprawl development, various complex proposals for tracking candidates past and future behavior were proposed. Sensing that these proposals, while often solid, were too weighty given the time frame before the election and our limited resources, I suggested simply labeling municipal politicians as either developer-free or not. This caught on even across the GTA, with many candidates coming forward to say that they were developer-free. Some of these candidates won and it seemed to help preserve the Oak Ridges Moraine, although sprawl development continues unabated in most areas. The point being that even fairly simple and inexpensive steps by concerned citizens can make a difference. An example though of how developers and municipal politicians essentially working for them at taxpayers expense still rule, comes from an amazing recent suggestion by several municipalities—It has been floated that what we need is more sprawl development to pay for the costs of sprawl development! Say What? Yes, you heard that right, and does insanity and capture of those supposedly entrusted with the public good know no limits?

Assuming that municipal politicians start working for citizens within the municipality, and stop working for developers, what changes are feasible? Obviously it is very difficult to reverse sprawl development, but two general categories of steps can be taken, the first being to ensure that further development is both ecologically and community minded. The preservation of remaining forests, wetlands, and agricultural areas must be a priority. Forests provide a reprieve from the stresses of society, with people often reporting a calming influence when they visit them. In addition to psychological benefits, mature forests absorb CO₂ and airborne pollutants while providing oxygen. Local agricultural produce adds an important safety component to the

food delivery system, and provides an alternative to corporation based high calorie packaged food products contributing to the obesity epidemic.

Proposals for new development must also meet objective community growth needs, and incorporate an electric rail transportation system. For example, if a region is indeed growing in terms of population numbers, a feasible proposal might consist of the following. An area is selected for major development that involves already deforested land lacking wetlands and the potential for good farming. An electric rail system is to be built from the train system currently in place (in Toronto the Go system along the lakefront) to the new community, with a central train station and adjacent shops, restaurants, and offices being a priority in the design process. Housing radiates out from this central core, with an electric light rail system providing access. Note that this type of development proposal runs completely counter to the current piecemeal sprawling subdivisions, and involves real community planning on a large and ecologically sound basis. With solid electric rail connections from the new community to the main train system for the larger area, many people who have to work in the downtown core would leave their cars at home, assuming they even felt the need for a car. With shops, restaurants, and offices set up in the center of the new community, local jobs will reduce the need for long work commutes.

The second category of steps that must be taken is to "spruce up sprawl." Several innovative strategies can be applied, and there is room for creativity. A crucial strategy is the planting of as many trees as possible to raise the urban forest cover to 30-40%, from the near abysmal 4% or so occurring in highly pro-development municipalities. The trees planted need be of different species to reduce susceptibility to pathogens. Commonly tree plantings are limited to a single type, leaving the whole system vulnerable. Between 1930 and 1970 the epidemic spread of Dutch elm disease killed approximately 77 million elms in Canada and the United States, leaving many urban forests that were reliant on this species decimated. The emerald ash borer has destroyed ash trees in Windsor, a city that relied heavily on them. This disease is progressing eastward and is now infecting Toronto region ash

trees. By ensuring a diverse range of urban forest species the entire urban forest gains protection—In nature diversity is strength.

Another “sprucing up sprawl” strategy is to revisit the tax structure of strip mall parking lots. The zero or low tax structure greatly favors big box corporate stores to the disadvantage of local community shops, that are far more likely to carry local produce and goods not based on just on time delivery. Some robust big box stores will likely survive fair taxation, but others only propped up by this unfair advantage will go out. In their place affordable family housing designed to include substantial greenery can be built, along with community shops and businesses. Of course developers are not the only industry influencing municipal politicians, and it has been found that the impact of corporate big box stores can be highly significant. However, with the changes to municipal elections suggested here, industry in general will lack influence over the municipal political process. Business often prides itself on “survival of the fittest,” while at the same time making the most of any unfair advantage. If big box stores are truly strong they can pay their fair share of taxes for the parking areas.

Some of the money collected from this fair taxation can be used to plant trees and pay for local farmland. Running a farm is an expensive and risky proposition, and even more in an urban region where land costs are high. If a community sees the value of locally grown produce not subject to just on time delivery, then the community needs to compensate local farmers. This should not be taken as support for farm subsidies applied to crops exported outside of a local area. These subsidies can actually reduce or wipe out produce in local areas given the unfair advantage derived from the subsidy, and are a major issue of contention in free trade agreements. Support for local produce consists of reduced or no taxes for farmland, payments or low interest loans for supplies and equipment, and the creation of local markets where the produce can be sold. If the farmer attempts to export crops outside of the local area, then all financial support is to be rescinded with repayment required.

By taking steps to ensure sensible development that is highly ecologically and community minded, and spruce up existing sprawl, municipalities and major cities will transform urban development, such that it meets the needs of communities and the

people within them. The development industry will suffer, but segments of that industry that can adapt and participate in sensible development based on true need, and not greed, will prevail and even thrive. Of course the starting point is the voter who must demand the changes outlined here. In this instance people truly do have power at their fingertips, although they must first take their hands off the remote control boxes and other goods of hyper-consumerism and start to take action.

RESOURCE DEVELOPMENT:

Development outside of urban regions is mostly resource focused. Resources are often divided into renewable and non-renewable. Renewable resources are those such as fish and trees that can reproduce and grow. Non-renewable ones include oil and minerals, such as gold, characterized by a finite quantity within the earth. A characteristic of resource development that has been progressing over time, is how corporate interests are gaining while local communities where the resources are located are losing, both in terms of reduced number of jobs and diminished habitat. For example, a hundred years ago forestry was a labor-intensive process with many men (few women were employed) manually sawing trees down, stripping the branches, carting the trunks to a sawmill, and processing the wood. Nowadays sophisticated machinery has replaced most forestry workers, and of the relatively few employed, many are skilled industrial machine operators brought in from outside the region. The capacity of heavy machinery to rapidly remove trees frequently leaves a denuded forest in its wake, that is of no benefit to the local community, and in fact often costs the community in terms of mudslides and silt-clogged waterways. This story is repeated within both first world and third world nations. In the latter the presence of valuable resources is ironically the last thing that local communities want and need. First world resource companies and bribed leaders within the third world country do very well, while the community almost always suffers. In this section the various type of resources developed in non-urban settings will be focused on.

Mining:

The word mining automatically conjures up an image of people, usually men, working away in a tunnel buried far underground. Until fairly recently this has been how mining typically worked, but with the advent of powerful industrial machines more streamlined approaches have arisen, such as mountaintop removal mining. For example, to help satiate America's insatiable need for energy, coal is extracted in the Appalachian Mountains using mountaintop removal mining. The principle is to expose coal seams by first removing the overburden (soil and rocks lying above). Up to 400 vertical feet (120 meters) of overburden is dislodged with explosives, and is then placed in fills. Overburden fills are often valleys with streams in them, and are known as "holler fills," or "valley fills." Burying streams that otherwise might be pristine is a gross form of environmental damage, and even limited numbers of such fills have been found by an Environmental Protection Agency (EPA) study to raise mineral levels in waterways and decrease aquatic biodiversity. The same study also found that an incredible number of streams were buried between 1985 and 2001 alone—724 miles (1165 kilometers)! As of 2010, approximately 1.4 million acres (5,700 square kilometers) of land, equivalent to the state of Delaware, have experienced mountaintop removal mining.

The impact on Appalachian valleys, streams, and mountains, is something we might only expect in a third world country. Of particular concern, the burial of headwater streams causes a permanent loss of whole ecosystems downstream, including endangered species. Appalachian valleys possess some of the highest diversity of species in North America. In December 2008, the Bush Administration removed Stream Buffer Zone protection allowing coal companies to place mining waste directly into headwaters or waterways. Adding to the problem, Federal Endangered Species Act reviews are waived for new mining permits, leaving these ecosystems completely without protection. Water supplies for human and agricultural needs derived from these previously clean Appalachian streams are no longer fit for use. Attempts to mitigate the damage have largely been restricted to stabilizing soil and rock from erosion, using non-native grasses that compete with native tree seedlings and reduce biodiversity.

Environmental damage from coal mountaintop removal mining extends well beyond the waterways. For instance, the forests involved are cut down, and if the wood cannot be sold it is burned, adding CO₂ to the atmosphere. The heavy machinery used in this form of mining also adds a great deal of CO₂ to the atmosphere. Coal burning itself is one of the dirtiest sources of energy spewing out massive amounts of CO₂ and pollutants. Scrubbers are available and seem to work quite well, but the cost for CO₂ is considered prohibitive by the industry. Mountaintop removal mining does aid in the retrieval of low-sulfur coal that is cleaner burning than other forms of coal. However, this advantage is outweighed by the CO₂ emitting nature of coal compared to other forms of energy generation. Blasting and overburden removal allows dust containing sulfur compounds to drift into areas inhabited by people. Sulfur is corrosive and rates of chronic pulmonary disorders and mortality from lung cancer have increased in these areas.

What about social benefits/costs of this mountaintop removal coal mining, given that much of the region is known to be disadvantaged financially? In the days of underground coal mining many workers were employed providing valuable income to these regions. With mountaintop removal mining more than 2.5 times as much coal can be extracted per worker, than in traditional mines. In Kentucky the number of workers decreased over 60% from 1979 to 2006, and 10,000 jobs were lost in the period between 1990 and 1997 alone. In addition, several of the jobs involved in mountaintop removal mining require specialized training, such as the operation of large machinery. Many of those qualified for these jobs come from outside the region where the mining occurs, taking even more work away from the people who live there. Hence, fewer jobs and more local environmental damage accompany mountaintop removal mining for coal. Who benefits? Of course the coal mining companies with greater profits given the lower costs. But what if they had to pay for all the environmental and health damage left in the wake of mountaintop removal coal mining? Absorbing the full costs produces a much different story to be sure, and one that we will get to.

Coal mining is generally a messy process with a poor environmental record. The solid and liquid waste of mining and preparing coal, known as coal slurry, contributes to the problems.

Coal slurry contains chemicals use to wash the coal, with the list of potential compounds exceeding fifty. A common procedure with coal mining is to use the massive amount of rock and dirt solid waste that is generated to dam an opening between adjacent mountains, and then pore the coal slurry into it. This impounded liquid waste can amount to billions of gallons in a single facility. Gravity and the weight of coal slurry work to weaken the dam, and toxic floods have occurred. In Logan County, West Virginia in 1972, three dams failed in succession releasing 130 million gallons of toxic water. This Buffalo Creek Flood was very costly—125 people killed, 1,121 injured, 4,000 homeless of a population of 5,000, and 50 million dollars in damage. Those affected could take solace in knowing that it was an, “Act of God,” according to executives of Pittston Coal Company, who owned the dam. A very obvious cognitive distortion to ease their guilt and hopefully mitigate damage claims. Demonstrating that not enough lessons were learned to prevent a follow-up to the Buffalo Creek Flood, another massive coal slurry dam gave way in Lyburn, West Virginia in 2002, destroying several cars and homes. Fortunately no one was injured.

Toxic waste is common to all mining operations, a major component referred to as acid mine drainage, or acid rock drainage. Acid mine drainage arises from two main sources. The first being mineshafts when operations cease and the tunnels fill with water. Sub-surface mining typically occurs below the water table and water must continually be pumped out. Hence, when operations end and pumping stops mines fill with water. Exposure to air and water results in oxidation of metal sulfides generating acidity. Extreme environments contain bacteria known as extremophiles that have adapted to harsh conditions, such as within rocks. A class of extremophiles known as acidophiles thrive in acidic abandoned mine shafts. These organisms further the process of acidification. The second source of acid mine drainage is the piles or ponds of tailings from a mine.

When the acidic discharge from flooded mineshafts or tailing ponds enters into streams and rivers, ecosystems are disrupted from the change in acidity. In some countries, such as Canada and the United States, acidic water is supposed to be neutralized before being released, but the processes used are

complex and not always fully successful. Frequently the contaminated water just remains in the mineshafts or tailing pond, where it can and does seep into surface and groundwater. Canadian mines use upwards of two billion cubic meters of water per year, and 70% of operations contaminate surface water, while 65% pollute groundwater. High concentrations of some chemicals, such as arsenic, sulfuric acid, and mercury, frequently occur in nearby surface and groundwater, impairing local ecosystems and impacting negatively on human health. For example, fish in these regions often have elevated mercury that enters into the bodies of First Nations people consuming them, with adverse health effects.

Given problems such as toxic coal slurry and acid mine drainage, the environment is always at risk with mining. We have seen how in the US coal mining comes well before environmental considerations, with devastating results for natural ecosystems. In Canada the story is much the same, not a surprising scenario for a country that protects mining companies to such an extent that most have a legal presence in Canada. In Northern Ontario, a 10,000 square kilometer area known as, "The Ring of Fire," has approximately 4,600 mining claims. With the development of even a fraction of those claims there is no possibility of fully independent environmental assessments being conducted, particularly when both the federal and provincial governments have downsized departments dealing with environmental issues, and both levels of government are opening our resource doors to the corporate world streamlining assessment processes. The mining companies will provide their own "independent" assessments that will largely be rubber-stamped and given the go-ahead. More than 30 mining companies from Canada, the US, and China have staked thousands of claims in the far north. The Ontario government even provides financial assistance, as evidenced by \$60 million dollars set aside in the 2012-2013 budget for resource development companies to build roads into pristine wilderness, while at the same time reducing capacity to protect species and natural habitats by cutting \$65 million dollars from the Ministry of Natural Resources budget.

The Ring of Fire region lies in the boreal forest, one of the most pristine wilderness areas left on the planet. An intricate web of waterways characterize the boreal forests of northern Ontario, and one can only imagine the impact that all those mining operations

will have on this ecosystem. The same applies to the Yukon, also currently seeing intense incursion from the mining industry. In 2010-11, 190,000 mining claims were registered in the Yukon, representing 10.8% of the total area, the same size as the national and territorial parks combined. Perhaps if the number of mining operations in these regions is minimized, with full environmental assessments and solid plans pertaining to acid mine drainage, the impact would be limited. However, with the vast number of mines that will eventually go ahead, limited environmental assessments, and poor or non-existent regulation, the potential for damage to the environment is enormous.

In Canada about 650 million tons of waste material is generated by the mining industry each year. Valuable metals represent less than 1% of ore bodies typically, and hence over 99% is waste, in addition to the “waste rock” that must first be removed. Who will likely end up picking up the costs to the environment? Of course the taxpayer once again, with the profits going to the mining corporations, their shareholders, and several politicians in the form of consulting contracts after they leave office, and regulators with revolving door employment. In fairness there are exceptions, and in some areas mining developers are required to post bonds for eventual road and mine-site reclamation, although it has been noted that in many instances the bond rate is set at levels established decades ago. Furthermore, in the past many mining companies just claimed bankruptcy instead of paying for the clean up, leaving a toxic mess and costs for taxpayers. To date the history of mining companies has definitely been one of taking the profits, and walking away from the environmental and social costs.

The game is rigged in favor of mining corporations worldwide, and certainly in Canada where a free entry to minerals policy has ruled. A full 58% (1,646) of the world’s publicly traded mining companies are listed on the Toronto stock and venture exchanges. Nearly half of their 9,300 exploration projects and mines are situated outside of Canada providing a global reach. In Ontario prospectors have the right to stake claims and undertake exploration on private property, Crown (government) land, and First Nations’ territories, because the Province owns the underlying mineral rights. A prospector can walk onto your property, stake a claim, and move in heavy equipment to explore for minerals.

Imagine a prospector showing up at your door with equipment designed to tear apart what you have worked so hard to acquire. All you get by law is a 24 hours notice, although nothing can be done to stop the prospector. Nor is the government interested in changing the legislation to protect citizens and ensure that their property rights come before a mining claim. The rights of mining corporations come first. Governments throughout North America and much of the world, have the right to minerals and other resources underlying private property, a reality that few people are even aware of.

The corporation first principle also applies to mining in the third world, not surprising considering how bad it is for the people and the environment in first world nations. In most instances, those unfortunate enough to have mineral resources desired by mining companies just have to take whatever the companies dish out. A good example is found with Cambior, a Canadian gold mining company operating in Guyana. Local people alleged they were poisoned when effluent from the Cambior mine contaminated their river and estuary, a reasonable assertion considering what we know about the impact of mines on local water systems. The people involved could not get legal standing to try the case in their country. A Quebec advocacy group headed by Dermot Travis took up their cause and moved to have the case tried in Canada. Right away they were hit with a Strategic Lawsuit Against Public Protest (SLAPP), preventing them from discussing the situation with the press—SLAPP's constitute an affront to freedom of speech and democracy, and serve as a potent weapon used by corporations to stifle opposition. The defendants were accused of terrorism (against a mining company?). Then a Quebec court adhering to the Canadian tradition of governments and courts fully supporting the mining industry, ruled that the company despite being registered in Canada could not be sued in Canada. The local Guyanese people were left with contaminated waterways and no possibility of any resolution.

A similar situation has occurred with Canadian gold mining companies in the Philippines involving the Igarot, an indigenous mountain people. Over centuries they have lived in harmony with their environment and panned for small amounts of gold released from the mountain. The Philippine government fully backing foreign mining companies has opposed their own people, ensuring

that protests by these people go unanswered. Employees of one of the gold mining companies have apparently threatened civilians who say that they only want to control their own lands. Even if brought to a Canadian court it is doubtful that the case would be heard. As we have seen, even in Canada and the US local people have no say relative to the mining industry, something that these third world citizens might or might not take comfort in knowing.

One of the main reasons why the interests of mining corporations win out over citizens and the environment is that these corporations influence politicians, high-level government employees, and regulators. Via intense lobbying efforts often involving generous campaign contributions, mining companies gain favor with those who make the laws and decide whether or not a given project moves ahead. In return for their support, leaders frequently end up acquiring consulting contracts with the resource company. This influence extends to the highest levels, as evidenced by Canada's former Prime Minister Jean Chretien representing Vancouver Tenke Fungurume Mining in the Congo after leaving office. Revolving door employment (see the Irregular Regulation chapter) between regulating agencies and the resource industry ensures that these agencies are "captured" by industry, blocking them from regulating in a fashion that impedes the industry. In third world countries direct cash bribes and threats of physical harm and/or the spreading of bad rumors in the community, ensure the cooperation of local leaders and high-level government employees. Resource extraction companies have acknowledged these cash payments, and are even keeping open records of them in some instances. Through these various pathways mining and other resource extraction companies largely control those who are supposed to be representing the interests of citizens, and it is only by ending industry influence and control that the problems can be resolved.

It might be suggested that tax revenues from mining and resource extraction of various types is so great that politicians and senior government officials feel obliged to support the industry. In third world countries almost no money makes its way into public coffers for the good of the average person, and hence this suggestion is totally without merit when applied to these countries. In first world countries some tax revenue is realized, with the Canadian government now indicating that 15-20% of the Canadian economy

depends on resource extraction, but the corporations involved pay no or little tax for the portion of their business registered offshore, and far less than individuals for that registered in first world countries. Subtracting significantly from any tax income, are the substantial subsidies at taxpayers expense provided to mining companies by first world governments. In addition, when adverse effects on the environment, health, and local communities are considered, costs often exceed tax benefits. Unfortunately, politicians and regulatory bodies are not factoring in these costs as they act on behalf of the resource extraction industry. When the overall picture is considered it becomes clear that corporations, politicians, and regulators are mostly those who benefit.

Oil & Gas:

Life is based on the element carbon. Oil and gas, as well as coal, are fossil fuels, meaning that they are derived from long dead organisms. A lot of life has come before us given the estimated one quadrillion metric tons of organic carbon locked up in the earth. To date we have only burned one twentieth of 1 percent! That leaves a lot more oil, natural gas, and coal that we can burn spewing CO2 and pollutants into the atmosphere. The key issue is how difficult and costly the fossil fuel is to extract relative to the value. As we have seen coal is highly economically feasible to retrieve by mountaintop removal mining, as long as costs born by the environment and communities impacted are not a consideration. Easy to access deposits of light crude and natural gas are diminishing, and we are turning to more challenging and costly sources.

Tar sands in Alberta hold vast amounts of oil, but with extraction relying on costly technology and the presence of easy to access light crude in other regions, this source was not economically viable until the last few decades. Now production is flowing at a staggering rate, and the Canadian government is so eager to sell it that environmental impacts are barely a consideration. A 1,200-kilometer long Northern Gateway pipeline to the Pacific coast is proposed that will run through British Columbia's coastal temperate rainforest. This rainforest represents the most intact ecosystem of its kind in the world, and contains four bear species—Grizzly, black, Haida black, and white spirit, the

latter being rarer than panda bears. The pipeline will bisect the rainforest crossing about 800 fish-bearing streams and rivers. Massive oil tankers will have to navigate narrow ocean channels with orcas, humpback whales, fin whales, and salmon to reach the filling station. The potential for environmental catastrophe is enormous, but the government is moving full speed ahead.

Oceans represent one of the major sources of oil and natural gas. With global warming the new frontier for these resources is the Arctic region. Rising temperatures in the Arctic mean that there is less ice and more open water, affording the possibility of drilling year round. A feedback cycle will benefit the industry in that by burning more of these fossil fuels temperatures will rise, particularly at the poles, melting more ice allowing access to more deposits. Of course there are challenges to working in such a hostile region with full-day darkness in winter, cold, ice, and Arctic cyclones, but as easy to access reserves dry up and technology improves, the cost/benefit ratio will and even now is favoring development. ExxonMobil has finalized a deal with Russia to invest up to \$500 billion in developing their offshore reserves.

The amount of oil and natural gas in the Arctic region is immense. The US Geological Survey in a 2008 study estimated that the Arctic holds 90 billion barrels of oil, and 1,669 trillion cubic feet of natural gas, 13% and 30%, respectively, of the world's estimated undiscovered reserves! Over 84% is thought to be offshore, with the continental shelves of the US, Canada, and Greenland holding the most oil, and Russia and Norway the most natural gas. The International Law of the Sea (LOS) allows countries to claim an area of seabed beyond the usual 200 nautical miles, if they can demonstrate that it is an extension of their continental shelf. Despite the potential this sets up for intense competition, the level of cooperation between countries and rival companies has been impressive. Considerations such as the desire to keep non-Arctic nations out of the oil and natural gas hunt in the region, the high cost and complexities of operating in the Arctic, and search and rescue needs, play a key role. This spirit of cooperation if applied in the right fashion might assist in environmental standards being set and adhered to, a need made glaringly clear from the Deepwater Horizon and Exxon Valdez spills.

Despite the potential for cooperation and solid environmental standards in the Arctic, the history of the oil and gas industry has not been stellar to say the least. Profits of the industry come first, and impacts on the environment and local people are rarely a consideration, beyond legal liability concerns. In third world countries there are no liability issues, because bribes to high-ranking politicians and regulators ensure that the industry gets what it wants, without any consequences. A classic example of this is found with Royal Dutch Shell, the parent company of Shell Oil, regarding its operations in the Niger Delta of Africa where it has been drilling for the past 50 years. Approximately \$30 billion US worth of fossil fuel resources have been extracted from the region. Of even greater significance is the enormous profits reaped by Shell, in large part because hardly any money is given back in terms of taxes, equitable wages, human welfare services, or compensation for waste and environmental damage.

The major auxiliary cost to Shell has been bribery-corruption money paid to Nigerian dictators, politicians, and regulators, to ensure that the oil keeps flowing. Shell has admitted that throughout the 1980's and 90's it purchased weapons for the Nigerian military, and maintained a private "security force" of its own. In 1995, Ken Saro-Wiwa, a Nobel Prize winning author, was executed by the Nigerian military for protesting Shell's activities. In 1993 he organized one of the largest peaceful protests to date, with 300,000 people blocking access to Shell's oil-flow stations, pipelines, roads, and airports. Oronto Douglas, the lawyer for Ken Saro-Wiwa, in retaliation for defending his client in court was arrested, flogged with an electric cable, and further tortured. It is believed that more than 2,000 people have been killed, and more tortured, for protesting the actions of Shell. Two-thirds of Nigerians live in absolute poverty, meaning that they are just able to survive. So much for the local people, but has Shell's record been more favorable regarding the local environment? Streams in the Niger Delta have been found to have 300-700 times the hydrocarbon contamination level the European Union considers safe. In Alberta the level of released gas that is flared (burned off) is 4%, a level that is considered to be dangerous and unacceptable by many countries and is illegal in the US, but perfectly acceptable to the Canadian government.

In Nigeria more than 70% of released gas is flared, causing toxins to be released directly into the air to later rain down on vegetation, soil, water, people, and animals. Crop yields have diminished, such as for yams a staple of the local diet, and skin rashes are common. The standard industry practice is to re-inject the gas down the drill hole instead of burning it, but that costs more, and with the right bribes to Nigerian politicians and regulators, massively excessive flaring is allowed to continue. The example provided by Shell in the Niger Delta region demonstrates what can happen when an industry lacks regulation and “captures” those who are supposed to be regulating the industry. In the third world this capture often occurs via bribes. Without the greed of Nigerian politicians and regulators the actions of Shell could never have occurred. However, as we have seen in the Greed: More Is Never Enough and Irregular Regulation chapters, greed and regulatory capture are everywhere.

In the movie *Blood Diamond*, an old man seeing the devastation wrought by the presence of diamonds in his country, comments how thankful he is that they do not have oil as well. This line really summarizes the situation in the third world where the more resources a country has, ironically, the worse off they are! Valued resources mean that first world industries will exploit the given resource/s, damage natural ecosystems the people rely on, and not give anything back other than bribes to leaders and regulators, ensuring that the devastation continues. According to David Suzuki and Holly Dressel (From *Naked Ape To Superspecies*), nations fortunate enough to be resource impoverished (is this not insane?), such as the West African countries of Senegal, Ivory Coast, and Benin, have been quite peaceful relative to culturally similar Nigeria. Algeria with natural resources has sunk into tyranny and civil war, while neighboring Morocco with camels is peaceful. Angola, at one time Portugal’s richest African colony, is left with a legacy of poverty, violence, and corruption, while neighbors with fewer resources have done better. Given how the system in third world nations operates with resource development companies getting what they want through bribery, there is a need for first world monitoring and regulation, including full protection for whistleblowers and prosecution of the guilty, with robust repayments to people and the rehabilitation of

environments adversely impacted. Given the nature of things this compensation will naturally flow uphill into the pockets of greedy third world politicians, who will then be gaining from both the bribes and compensatory payments. Intense regulation, control, and monitoring of the compensation will be necessary to ensure that local people and environments are the only ones who will benefit.

Fishing:

Despite being a renewable resource given that they reproduce, fish populations have been nearly decimated in recent times. It has been estimated that we have already consumed about a third of the biological production of the oceans, and the practices involved are bringing many fish species such as Bluefin tuna, sailfish, and sharks, close to extinction. Although difficult to calculate precisely, it appears that we might be down to remnants, perhaps in some instances as low as 10%, of large ocean fish stocks, and that 70% of fish species are either fully exploited or depleted. We reveal our nature as a top predator (the hunting part of hunter-gatherer), and a smart one at that, by the diverse and ultra-effective ways that marine organisms are harvested. Fishing often conjures up images of the fisherman in his (or her) boat with a line dangling in the water waiting for that nibble. If only it was this benign. Modern day fishing frequently involves factory ships where thousands of fish are processed and frozen. Long lines baited with numerous hooks extend for miles catching anything that takes the bait. Massive nets scoop up quantities of fish that olden day fishermen could only dream of, but interestingly enough might well have been disgusted by, given the waste. Merely a fraction of the catch is suitable for processing, and so-called by-catch dead and dying is disposed of. In addition, air breathing marine animals, such as dolphins and sea turtles, are frequently snagged only to drown when they cannot reach the surface for air.

Progress in parts of the world has been made in producing and using nets designed not to trap dolphins and sea turtles, but vastly more needs to be done. Currently all eight species of sea turtles are at risk of becoming extinct. Part of the problem in regards to saving these animals is World Trade Organization (WTO) agreements. Take the well-known US law banning the sale

of tuna caught in drift nets that kill dolphins, known as “dolphin-free tuna.” Mexico challenged that ruling several years ago at the WTO and won, bringing an end to dolphin-free tuna. More recently, a law to protect sea turtles in Southeast Asia from drift nets for shrimp was struck down by the WTO. This organization appears to be all about what benefits industry, and nothing about the welfare of people and environmental protection.

One of the cruelest examples of resource plundering involves shark fining, whereby sharks are caught, their fins sliced off, and bodies pushed back in the water to die a slow death being unable to swim, hunt, or defend themselves. The practice is well depicted by Canadian Rob Stewart in his award winning 2007 documentary *Sharkwater*. The “shark fin mafia,” as he calls them, is systematically ridding the oceans of sharks to service a lucrative shark fin soup industry. Stewart filmed hundreds of hammerheads dying on long-lines. In 2003 a confiscated fishing boat contained the fins of about 30,000 sharks! It has been estimated that perhaps 26-73 million sharks are harvested for their fins per year! These fish are more like mammals, in that they are slow to reproduce with several years passing before reproductive maturity, internal development of offspring involving long gestation periods for many species, and relatively small litters. Given that most bony fish capable of much faster reproduction, are unable to tolerate modern day harvesting practices, sharks really have no chance, and it has been estimated that perhaps upwards of 95% are gone. Encountering sharks numerous times while scuba diving, I can attest to how peaceful they are relative to the two-legged predators decimating them. Protests in many parts of the world have occurred, and several cities have banned shark fin soup, but from what I have heard shark fining is still occurring with the protection of many governments in Central America, where they are often caught, and in Southeast Asia where the product is consumed. Rays, related to sharks with cartilaginous bodies, are now being targeted to provide a shark fin substitute. The gills of these animals are also valued in the Asia market, and fishing pressure on rays is greatly reducing their numbers as well.

A key reason why fish stocks are so depleted relates to how the fishing industry is focusing on areas where these animals reproduce and grow. Many species of fish congregate in spawning

grounds, where they release eggs and sperm that mix in the water column. Shortsighted fishing interests targeting spawning grounds remove fish before they have a chance to reproduce. Hence, succeeding generations will inevitably be diminished. Many larval fish produced in spawning grounds settle on coral reefs to complete their development. These reefs are cities for young fish, where they can hide, feed, and have a chance to grow. Unfortunately, in most parts of the world coral reefs are vastly overfished, often being devoid of mid-to-large size fish.

In some regions, such as areas within Southeast Asia, very destructive methods of acquiring fish from coral reefs are practiced. For example, reefs are “dynamited” using crude mixtures of petrochemical products and fertilizer. The explosion ruptures swim bladders within fish, stuns, or outright kills them, resulting in many floating to the surface where they are scooped up. Needless to say, a dynamited reef is a dead reef. I recall a live-aboard dive boat based in Thailand conducting exploratory dives throughout Indonesia. The crew and passengers began naming the reefs, Hiroshima I, II, III, IV, and so on. As if explosive charges are not enough, cyanide fishing is also done on the reef. Cyanide mixtures in pop cans and the like are sprayed over the reef, killing or weakening fish making them easier to harvest. A seemingly more progressive form of marine harvesting—shrimp farming—found throughout Southeast Asia and other tropical regions, is also very damaging to fish development. Many shrimp farms involve the removal of mangrove forests that provide important ecological services. These trees with roots adapted to salt water, anchor the shoreline preventing erosion and minimizing the impact of violent storms. Juvenile fish and other marine organisms commonly mature in the protection of the tree roots. By devastating mangrove forests for shrimp farms these ecological services are greatly impaired, and there are fewer mature fish.

Reefs of a different sort are found on continental shelves, and even deeper in the oceans. Like with tropical reefs, juvenile organisms frequently mature in these havens. Considering the depth we might expect them to be safe from harvesting, but not so as made clear in a National Research Council examination of the practice (Effects of trawling and dredging on seafloor habitats, 2002). Welcome to the world of bottom trawling, where draggers with

massive nets dredge everything from the bottom in wide swaths. The amount of the ocean floor cleared annually by this technique is 150 times greater than the total amount of land cleared for logging! 95% of the damage to underwater seamounts has been linked to this form of marine harvesting. As with long-lines and drift nets, only a fraction of the catch is kept, while the rest is tossed away like trash. Bottom trawling has operated for over a century now in heavily fished regions such as the North Sea and Grand Banks.

Beyond the devastation to marine organism resulting directly from bottom trawling, a problem known as resuspension occurs. With bottom trawling sediment is stirred up that drifts in solid plumes for even tens of kilometers. These plumes increase turbidity and reduce light levels, thereby impacting negatively on the growth of kelp. Sediment comprises a sink for many organic pollutants, such as DDT and PCB. When stirred up by bottom trawling these toxic chemicals spread and are taken up by plankton, and then by larger organisms consuming the plankton. In other words, they re-enter the food chain. Phosphorus, found in high concentrations in ocean sediment, is also stirred up producing phytoplankton blooms. As these plant organisms die off and sink to the bottom, bacteria feeding on them proliferate. These bacteria are so numerous that they frequently deplete the region of oxygen, causing the death of marine organisms that somehow managed to survive dredging. Dead zones are rapidly spreading in number and size throughout the world. Bottom trawling is not regulated, other than in the Antarctic, and it is currently a resource free-for-all that is contributing enormously to the depletion of marine species.

With bottom trawling the ocean bed is taken care of, and with surface nets, long lines, and reef fishing, the surface is exploited, but what about the mid-water region? Mid-water (pelagic) trawling ensures that this level of the ocean is fully harvested as well. A net towed in the mid-water column catches species such as cod, squid, and shrimp. These nets, and those used for bottom and surface fishing, not uncommonly break free and drift on their own. "Ghost nets" as they are known ensnare many fish, sea turtles, dolphins, and even animals such as crocodiles, dugongs (related to manatees), and seabirds. Unattended attached gillnets are another major source of unnecessary marine devastation. These nets are fixed to the bottom of the seafloor, with

buoys spreading them out to form a vertical wall hundreds of meters long. If they are not retrieved the weight of the catch will cause them to sink to the bottom, where crustaceans and other organisms feed on the catch. Relieved of weight the nets float up again to repeat the process. Both drifting ghost nets and fixed unattended gillnets exert great damage on diverse marine organisms, and without the benefit of any harvest.

If fish were a non-renewable resource they would have vanished a long time ago, and even being renewable many are at risk of extinction. With China alone continuing to harvest marine resources at their current and ever expanding rate, there is little hope of averting complete decimation in the future. But why is the situation so bad? A key issue is the lack of regulation over fishing. One cause of this problem is that many fishing vessels sail under flags of convenience, a feature of the offshore shadow economy allowing owners to pay no or next to no taxes, maintain vessels in poor shape (although many fishing factory boats are very sophisticated to maximize catches and processing), pay workers next to nothing and not bother with safety standards for them, and escape all forms of regulation over catches. For ships sailing under flags of convenience, illegal, unreported, and unregulated fishing is the norm, making a mockery of any quotas set. Then there are bribes paid to politicians and regulators in locations where fish are illegally harvested. Bribery has contributed to shark finning in Central American countries where for cash payments officials look the other way, an occurrence well documented in Rob Stewart's *Sharkwater*. With a reputation as evil creatures of the sea it is easy for those taking bribes to spin it that sharks deserve to die, or at least do not warrant protection. Shark finning boats have been observed departing from "protected" waters when scuba diving boats arrive, and returning once the dive boats leave. In many of these countries there are few resources allocated for patrolling protected areas, a reality that when combined with cash bribes, ensures that sharks and other marine resources will suffer.

Subsidies, particularly to deep-sea fisheries, are another major contributor to the demise of fish and marine organisms. Beyond 200 nautical miles from coastal countries lie international waters, where most fisheries are unregulated. Bottom and mid-water trawling in these waters is often subsidized by various

countries to cover the costs of fuel and equipment. Fisheries scientist, Daniel Pauly, and economist, Ussif Rashid Sumaila, have calculated that \$152 million US per year is paid to subsidize “legitimate” deep-sea fisheries, and without these subsidies the industry would operate at a loss of \$50 million per year. Hence, the profitability of the deep-sea fishing industry is largely based on government subsidies. For this to be occurring the industry must be exerting influence over politicians in the subsidizing countries. If this influence ceased and subsidies ended, many deep-sea fisheries would be abandoned, or at least far less exploited giving them a chance to regenerate. However, with deep-sea corals taking hundreds, or even thousands of years to grow, and many fish living at these depths such as Orange roughy slow to reproduce, it is unlikely that they can avoid bottom trawling for long enough. By redirecting the money used for subsidies to setting up protected zones, marine life will have an even better chance to recover. Currently, only about 2% of oceans are protected from fishing, drilling, and dumping of trash. Marine scientists believe that we need about 20% protected to maintain marine life. Fish and other organisms growing in these protected zones seed other areas, thereby helping to preserve our oceans.

Lack of consumer awareness and informed actions on their part, is another contributor to the problems of marine resource over-harvesting. If those who consume shark fin soup stopped doing so, the market would dry up overnight. Likewise, if consumers take an interest in how fish and marine resources are harvested, they might make different choices. This could be hindered though by WTO rulings preventing people from having the option to consume only dolphin-free tuna, or fish and shrimp captured in such a way that sea turtles do not die. Fortunately, there are organizations, such as the Marine Stewardship Council (MSC) and Friend of the Sea, that certify fisheries as sustainable. MSC has developed a standard for sustainable fisheries, and responsible fisheries are able to use their label. As of 2010 about 4,000 MSC labeled products are available in over 60 countries. Environmentally conscious consumers can restrict their seafood purchases to ones achieving this type of certification. Some restaurants are following this progressive step and only using fish harvested in a sustainable fashion. Fish farms also provide an

alternative to over-harvesting of marine resources, but there are a number of issues such as the removal of mangrove forests for shrimp farms and the spread of disease to wild stocks, as has occurred with Atlantic salmon farmed in Pacific waters. However, fish farming if conducted in ecologically sound ways does offer at least the potential for environmentally conscious harvesting of marine resources.

It has been said that doing something is better than doing nothing, and when it comes to the harvesting of marine organisms, so little has been done that sustainable fisheries certifications and fish farms can have a significant impact. By fully addressing the shadow economy internationally (see the Greed chapter), fishing vessels will no longer sail under flags of convenience, increasing the likelihood that they will become subject to regulations and quotas. Politicians and regulators in first world nations must stop being influenced by the fishing industry, based on lobbying efforts, campaign contributions, consulting contract offers, and revolving door employment. Due to these influences research by scientists is ignored, even within government departments employing the scientists, until fish stocks collapse and it is too late, as with the North Atlantic cod fishery. Although more difficult to manage, bribery of third world politicians and government officials has to be stopped to eliminate illegal harvesting of marine resources, such as shark fins. By removing these industry influences the current scenario of industry protection will shift to resource protection.

Forest Removal:

Forests are removed for different reasons, including subsistence agriculture (48%), commercial agriculture (32%), logging (14%), and fuel wood removal (5%), according to the United Nations Framework Convention on Climate Change. These percents highlight the impressive role that agriculture plays. As the population expands so have agricultural needs, with forests suffering. Forested areas have largely vanished throughout the world, with large tracts only remaining in the Boreal region, found mainly in Canada and Siberia, and the rainforests of the Amazon. Over more recent times the removal of rainforests has accelerated with close to 90% of West Africa's, two-thirds of Central America's, 90-95% of Brazil's Mata Atlantica region, and 90% of Madagascar's

eastern rainforests gone. In virtually every tropical region most of the forests have been removed, and in Haiti where there has been zero regulation, a staggering 99% are gone. Many forests in the Amazon are being cut down for sugar cane to supply crop-based fuel, and in Southeast Asia for palm plantations to supply palm oil. These commercial agriculture ventures remove vast amounts of trees, and as with resource development throughout the world tend to benefit industry far more than the local area. In several instances indigenous people are pushed off their land to satisfy the needs of industry, such as in the Amazon. On the large Indonesian island of Sumatra, extensive forests are burned out during the dry season, supposedly illegally but often supported by companies, to grow palm trees for lucrative palm oil. These fires are so extensive that the island of Singapore, located 156 miles (251 kilometers) away, is often blanketed in dense smoke, as in June and July of 2013, with negative impacts on health and tourism.

To provide a mental image of the rate and extent of deforestation, environmentalist and author Alan Durning, asks us to picture a 10-minute film of Earth, with each minute representing 1000 years extending 10,000 years to the present. For the first seven minutes the film looks like a still photograph with blue oceans and land covered in forests. Then at 7.5 minutes a small clearing appears around Athens. At 9 minutes, a thousand years ago, a little more happens with forests starting to thin in parts of Europe, Central America, China, and India. Then at 12 seconds before the end the action really sets in with more forest thinning in Europe and China. Six seconds from the end eastern North America is deforested. The movie goes out with a bang because in the final 3 seconds, representing post-1950, vast tracts of forest vanish from Japan, the Philippines, mainland Southeast Asia, most of Central America, the Horn of Africa, western North America, eastern South America, the Indian subcontinent, and sub-Saharan Africa. Forests recede and fires rage in the Amazon, while forests in Central Europe die poisoned by pollution. In the final second forest clearing spreads to Siberia and the Canadian North. Citizens of another planet watching the film conclude that either a pathogen is destroying this unfortunate world, or the "intelligent" life form of the planet is intent on self-destruction. Sympathetic viewers suggest sending rescue spacecraft, but concerns over the spread of

the pathogen or destructive behavior to their own planet prevail, and we are left to our suffering. Of course viewers might fall asleep and miss the ending given that little happens for 99.9% of the film.

While the envisioned film might seem like science fiction/horror, it is really a documentary. The second part to this documentary is what secondary effects the deforestation is having. Forests absorb a large percentage of the CO₂ that we produce in the process of consumption, and without these forests global warming accelerates (see the Too Hot To Handle: Global Warming chapter). When trees are cut down decay processes set in releasing CO₂ into the atmosphere. Agricultural techniques such as slash and burn, common throughout the third world, add substantially to the CO₂ problem. Forests are major stabilizers of the soil, a function that is particularly important in sloped regions. In mountainous settings that have been heavily deforested, such as Haiti, mudslides are a major problem causing loss of life and property damage. Even when soil erosion occurs in a less dramatic fashion damage still transpires. For example silt flowing into the sea clogs coral polyps, and runoff of agricultural fertilizers favor the growth of algae allowing them to dominate already weakened corals. With the demise of coral reefs around the world, the many fish and other organisms that rely on coral reefs suffer. Soil runoff also damages freshwater river and stream ecosystems.

Intact forests also play a key role in what is known as, the hydrological cycle. Trees extract groundwater through their roots and release 99% of it into the atmosphere, where it contributes to rainfall downwind. With deforestation areas downwind become much drier, as has occurred in northern China, where massive tree removal between 1950 and 1980 reduced rainfall by a third. In addition to decreased evapotranspiration and its negative impact on rainfall, trees trap water and funnel it into the ground. The leafy canopy holds moisture, some of it evaporating, while the rest passes down the tree. Leaves, branches, trunk, and litter slow surface runoff, and the roots create pores allowing water to sink into the ground. Organic residue alters soil properties enabling the soil to retain more water. Deforested areas are prone to flash floods, as the amount of rainfall more often exceeds the capacity of the ground to absorb it. Of great significance, tropical rainforests

produce about 30% of our planet's fresh water, and help recycle it for repeated use.

Then there is the incredible impact of deforestation on life forms. About 80% of the world's biodiversity likely occurs in tropical rainforests. The extent of deforestation in this region is such that we might be losing 137 plant, animal, and insect species per day, or about 50,000 species per year! For mammals and birds the rate appears to be about 1%, or 23,000 species per year. As with all such estimates there is a lot of debate regarding the precise figure, but even if halved the numbers are still totally unacceptable and irresponsible. At least three things are certain when it comes to species loss—First, we are in a period of man-made mass extinction equivalent to the demise of dinosaurs, second, that given the interconnectedness of life we will eventually suffer from these extinctions, and third, that highly specialized and hence less adaptive species suffer the most. Few would doubt that raccoons can survive whatever we throw at them, as they are generalists like ourselves and very adaptive. Koala bears surviving on Eucalyptus leaves are another story. Much of the forest they require has been cut down and cars, dogs, and other urban challenges are rapidly diminishing their numbers in cities. Even more specialized animals, such as a type of salamander adapted to a particular river system, have little chance with deforestation. People also suffer greatly from deforestation, despite our adaptive qualities. Approximately three billion people rely on local wood for heating and cooking, as well as for housing, and with vanishing forests they suffer enormously. In many third world countries protected parks are being deforested to supply fuel needs, after the area outside of the park is stripped of timber.

Considering the enormous value of trees it is amazing that such extensive deforestation occurs. However, food comes ahead of trees for most people in the third world, as it did for early Europeans and colonists spreading out from there. Trees come down and agriculture replaces forests. People also need fuel and trees are a major source of it for many of the estimated 1.5 billion people not connected to the modern power grid. Industrial agriculture and commercial logging round out the picture of deforestation. As with other forms of third world resource extraction bribery-corruption plays a major role. Industry bribes

politicians and regulators, thereby capturing those who should be regulating industry and protecting resources for the people. In several third world instances a carrot and stick process is applied, with bribes the carrot and threats of physical harm or rumors designed to damage one's reputation in the community the stick. The stick can even be a gun that is used to enforce cooperation.

Being more "civilized" in the first world, we have industry capturing the process via revolving door employment, and lucrative consulting contracts for those who are supposed to be regulating. The campaigns of pro-logging politicians receive generous support from the forest industry, assisting them in getting elected and ensuring that the politician acts on behalf of industry. Campaign contributions, consulting contracts, and revolving door employment, comprise a big carrot eliminating the need for a stick. However, at times companies threaten to pull out of an area such as British Columbia and take jobs with them. What they do not say is that the number of jobs in the forestry industry has shrank dramatically over time, while profits have typically increased. Conjure up an image of an old black and white photograph with two men sawing down one tree at a time, and then jump forward to modern day logging with only a few men (or women) inside monster machines, tearing down, stripping, and removing all the trees in an area to form a clear-cut.

Further reducing the overall financial benefit of logging to the people, the government routinely provides subsidies from taxpayer money to the forestry industry. Incredibly low stumpage rates are charged in many or most cases, that in effect amount to additional subsidies for the forestry industry. Beyond leaving scars on the landscape in the form of ugly clear-cuts, logging and the roads required have a very negative impact on wildlife. For example, many songbirds are declining in number because both the northern and tropical forests they migrate between are being removed. Caribou in boreal forests are also disappearing in many areas because of logging. These animals are very sensitive to disruption in their environment, and the logging roads bring many more wolves into the deeper regions. With low reproductive rates of at most one calf per year the ecosystem is out of balance.

What about just protesting and opposing the logging industry? If protests are mounted the forest industry typically

responds aggressively against those challenging their entitlement, while governments either back off or support the industry. For example, back in 1989 three Toronto students organized a protest against Daishowa, a Japanese timber company awarded logging rights to a huge area of Alberta for bargain basement stumpage rates. The government even added multi-million dollar incentives from taxpayer money to build a pulp mill. Daishowa made paper bags bought by big chains, such as Roots, A & W, and Kentucky Fried Chicken. The land they were logging was traditional territory of the Lubicon Cree, who sought control over it. The three young protestors were able to convince a number of companies and people to boycott Daishowa products. When the case made it to court, the wealthy corporation targeted the students accusing them of, "political guerilla warfare and economic terrorism," and sought \$12 million in damages from them. These students faced a lifetime of near slavery trying to pay \$4 million each and massive legal bills. Fortunately, the Sierra Club Legal Defence Fund (independent of the Sierra Club) successfully defended them. Even though industry lost they won, because the reality of being sued for an amount of money that would effectively bankrupt the average citizen for several lifetimes, had a chilling effect across Canada, and even the US, reducing the likelihood of further such protests against industry.

Is there anything that can be done to mitigate deforestation from logging and other sources? Indeed there is and combined the effect will be profound. A starting point is the people of third world nations who use slash and burn agriculture and wood as fuel. Alternative farming techniques can and are being taught in various regions. One technique is slash and biochar, whereby waste vegetation is added back to the soil, in line with practices used by indigenous peoples of the Amazon to maintain soil quality. Organic waste is set on fire and covered with soil allowing it to burn slowly in a low oxygen environment. Mixing this biochar with the biomass of the soil creates terra petra, one of the richest soils in the world, and the only one that regenerates itself. As it stands now, approximately 1.5 billion people are not connected to the power grid. Providing them with energy will reduce the need for wood burning, although the environmental cost of providing the electricity might diminish this benefit.

As pertains to logging there are many steps that can be taken to improve the situation. A strategy that is both very creative and practical consists of high-yield forest plantations. Growing high-yield trees providing 10 cubic meters per hectare annually on 5% of the world's existing forests, could supply all of our timber needs. Natural forests only produce about 1-2 cubic meters per hectare annually, requiring 5-10 times more forestland. Converting select forest regions around the world to these plantations, using a diversity of high-yield trees, will allow the wealth to be spread out while providing a range of product options suitable for different purposes. Meanwhile deforested areas could be reforested. Of course illegal logging will still occur and reduce the positive impact of forest plantations. Given how easy and fast it can be with modern equipment to remove trees, and also marine resources, the amount of illegal resource extraction is very significant. The World Bank estimates that illegal logging costs timber producing countries \$10-\$15 billion Euros per year, compared to \$10 billion Euros in aid to these mostly third world countries. About 88% of logging in Indonesia is illegal, and in Brazil approximately 80% of logging in the Amazon violates government controls. Finding a way to stop or reduce illegal logging, while shifting to high-yield tree plantations could greatly reduce the current devastation associated with logging.

To regulate both illegal and legal logging and deforestation for industrial agriculture, we return to the principles applied to industry influence more generally. The problem comes down to industry controlling those who are supposed to be looking out for the welfare of the public and environment. In the third world, industry bribes those in positions of power who might otherwise make decisions for the people, such as saving land for traditional agriculture instead of for logging or industrial crop plantations. These payments ensure that officials turn a blind eye even to illegal activities. If the sums of money are large enough, as they often are to senior politicians, the money ends up in the offshore world where the shadow economy can make even more money for them. By targeting the shadow economy and bribery directly (see the Greed chapter), much of the resource extraction in the third world benefiting industry, politicians, and regulators over people, will end. In first world nations it is campaign contributions enabling

industry supportive politicians to get elected, and lucrative consulting contracts and/or revolving door employment for regulators, senior government officials, and politicians ensuring that industry is well looked after. Dealing with these problems (see the Irregular Regulation chapter) will ensure that the resource development industry operates without such support, and the needs of citizens and the environment are better looked after. Likewise opposing any trade agreements, such as Free Trade Area of the Americas (FTAA), that can remove the rights of a country to oppose the interests of foreign and international industry will help preserve forests.

An interesting aspect of the role of business in logging is how socially and environmentally conscious practices can be a winner. Increasing in popularity are forest products certified to be sustainable by agencies independent from industry, such as the Forest Stewardship Council (FSC). At one time these products were very difficult and expensive to obtain, but are now both more available and reasonably priced, as environmentally conscious citizens purchase and outlets offer them. By appreciating the enormous benefit to ecosystems and local communities forest products achieving FSC certification are compared to many others, more people will hopefully be willing to opt for them. If a major shift occurs in the buying habits of citizens, the forest industry will change to meet this demand. In line with sustainable and responsible forestry practices, trees damaged in North America by the mountain pine beetle, but still of suitable quality, should be harvested (see the Global Warming chapter). These trees will die, and harvesting them for use is sensible, given that the dead trees release massive amounts of CO₂ into the atmosphere, unless processed into lumber or pulp and paper. Initiatives between governments in Canada and the US and the logging industry to harvest these trees are in place.

Both tropical and non-tropical forests are severely depleted as it currently stands. We are drawing on the natural capital from these forests in a fashion that is unsustainable. By shifting to sustainable practices including high-yield forests for timber it is even possible to reforest instead of deforest. Benefits derived from healthy forests, such as CO₂ absorption, species protection, soil stabilization, and water retention, will then be realized much more

fully. To bring about this change, as well as effectively manage other instances of resource exploitation, there will have to be shifts on both the production and consumption sides of the equation. On the production side, hyper-growth, and on the consumer side, hyper-consumption, must be addressed.

HYPER-GROWTH & HYPER-CONSUMERISM:

Hyper-Growth:

When it comes to resource extraction, at least for fishing and logging, sustainable practices are crucial. As things currently stand these industries are based on unsustainable extraction levels, with marine species and forests diminishing worldwide. A key reason for unsustainable resource extraction is the unsustainable growth objectives of industry. The target is endless growth even quarterly, and ideally double-digit at that. Imagine if you kept growing and by at least 10% per year. If so we would have little to fear from major predators, although they might also follow our lead in endless growth. Imagine forty feet tall Bengal tigers, and several hundred foot long pythons. This insanity is demanded in industry and the investing world. Shareholders often motivated by greed want their money to grow endlessly returning at least 10%, even though a temporary reduction in financial growth objectives has been forced on them due to the 2008 economic meltdown, and corporations strive to achieve endless growth. CEOs and senior personnel of these publicly traded corporations, earn bonuses in the millions (in addition to obscene salaries) for trying to achieve the impossible.

Did I say impossible? Yes, endless growth is impossible, and certainly at double-digit levels. It is really not a matter of should we or shouldn't we, it is simply IMPOSSIBLE. Anything and everything that grows endlessly necessarily grows exponentially. For growth to be endless the percentage growth must remain constant or increase, because if it declines eventually growth will cease, and hence not be endless. Let us assume that you are 24 inches at 1 year old (although children of this age are somewhat taller), and grow 10% per year, the minimum desired by shareholders and corporate heads. By 5 years of age you are only 2.93 ft tall, and by 10 years 4.72 feet. Growth at this rate seems

pretty reasonable. Should we conclude that endless growth really works? By 15 years, as the exponential part really starts kicking in, you are 7.60 feet tall, followed by 12.23 ft at 20 years old. You are now far taller than any person in the world, but this is nothing compared to how tall you are going to be. Your 30th birthday sees you reach an impressive 31.72 ft, and your 40th 82 ft. At 50 years old you are 213 ft, at 60 you are 554 ft, at 70 years old 1,436 ft, at 80 years 3,724 ft, and at 90 years 9,960 ft tall! Such is the result of endless growth at the minimum percent sought by shareholders and corporate heads. According to Mathis Wackernagel, originator of the ecological footprint concept, our resource utilization is 35 percent above the ecological carrying capacity of the planet, meaning that we are tapping into not just interest but principle. Forests, soil, freshwater tables, marine resources, and biodiversity, are all declining as we dig into this natural principle. Imagine if the economy kept growing exponentially and at a rate of 10%? We would exhaust the natural capital of the planet in no time at all. Fortunately for the planet and animals, us included, such growth is impossible helping to explain why there are always “corrections” in financial markets.

In some instances CEOs and industry leaders do manage to pull off the impossibility of endless growth, for at least a limited time, but how can they do it? Maybe they are the Gods they are revered to be and deserve all the wealth. As it turns out they are not Gods and do not actually achieve the impossible. To approximate these impressive results in at least some years, they have to cut and cut and cut costs. First, a lot of workers have to be let go often through mergers and downsizing, and the lucky remaining ones get to do the work of two, three, or even four people, adding greatly to the stress felt by so many people. You often have to work evenings and weekends and for no extra pay, and you better not even think of turning off the cell phone or text messaging device until very late at night (or not even then), as by not responding to a message you demonstrate unworthiness to the corporation.

Despite being devoted above and beyond the call of duty, holding onto a job is only a matter of time, because senior personnel are figuring out and implementing the outsourcing of your job to a third world country, where workers are paid very

little compared to you. In many instances the third world setting is a shadow economy special economic zone, where the corporation pays workers next to nothing having them work long hours in substandard conditions. The 2013 Bangladesh disaster, whereby a shoddily built factory collapsed killing 700 workers, highlights how poor conditions can be. As an added benefit to aid in the double-digit returns, little or nothing in the way of taxes are paid in these special economic zones, that have mushroomed in number over the last several decades (see the Greed chapter). If you are fortunate to dodge the outsourcing bullet age will get you, because industry wants rid of people 40+ years of age (or certainly 50+), as they cost more in salaries and insurance premiums, and might only handle the work of one person. A more recent and rapidly expanding twist, is for corporations to import cheap third world labor to the first world, when a given job cannot be outsourced overseas. Cheap labor is imported, with first world governments supporting this cost saving strategy, designed to further advance corporate profits at the expense of well paying first world jobs. An accountant and management consultant I spoke to who has been heavily involved in outsourcing jobs to the third world, expressed that he believes things will only change once the roles reverse, such that China is so successful and North America/Europe so impoverished, that it makes economic sense for corporations to source labor to the new third world. Of course, we will then be one of those special economic zones with low wages, no benefits, and no safety standards.

So far cost cuts involving employees are helping achieve double-digit growth in at least some years, but more is required. Any environmental waste or cost has to be dispensed with cheaply, meaning that someone else, namely the taxpayer and local citizens, must absorb these impacts. Good, but more is needed in the form of government and regulator cooperation to provide subsidies at taxpayers' expense, and ensure that all impediments to resource extraction and production are removed. This is achieved via regulatory capture by industry over those who are supposed to be regulating and protecting the public (see the Irregular Regulation chapter). Now we have a situation whereby industry is getting closer to the impossible, but even more is needed to realize double-digit growth a percentage of the time. The extra item required is

much lower taxes, and in some scenarios tax breaks, for the portion of business interests registered in the first world, plus the support of first world nations for shadow economy benefits, including no or little tax for entities registered offshore. With all these components in place that work against social justice, environmental justice, and the principles of democracy, CEOs and corporate heads can manage double-digit profits in some years when the economy is good. When the economy is weak they manage to lose, sometimes even in the double-digits, incurring the wrath of shareholders. No we are not seeing Gods at work, just those who feel entitled to the salaries of Gods.

Let us consider a family business where substantial profits are present most years, providing enough income to raise kids and afford retirement, even though there is no real overall growth in the business. From my perspective, and I suspect that of most readers, such people are winners. They provide a service that is needed and paid for, and do not rely on taxpayers. How though are they to be evaluated according to the prevailing sentiments in high finance and the governments supporting the corporate system? They must be seen as winners, right? Wrong, they are LOSERS because they do not grow endlessly, and certainly not at double-digit rates. Now how messed up is that? However, despite being losers, governments mainly go after these mom and pop businesses auditing them intensely when short of revenue. Of course, the revenue shortfall largely arises from corporations paying far lower tax rates than individuals for the portion of their business registered in first world countries, tax deferral so they can sit on large piles of money instead of invest it in the economy, subsidies from taxpayers money, and no or little taxes paid for the portion of their business registered offshore. So that corporations and the financial elite can prosper, the average person is weighed down, and even crushed in many instances, by excessive taxes, and costs pertaining to healthcare, childcare, and old age support. By allowing this system to exist and persist we are damaging ourselves enormously and unnecessarily.

The emphasis on endless economic growth has another very undesirable consequence for society, in that it contributes to monopolization of wealth. Something in the order of 450 billionaires sequester 80% of the world's wealth, and 200 large

corporations control a quarter of sales in the world. The international scope of the problem is evident in the number of prominent agencies throughout the world that support endless economic growth. In addition to the 100% pro-industry WTO, others such as United Nations agencies dealing with development, the International Monetary Fund, and World Bank, support the notion of endless growth, assuming the economy needs it to survive. Highly intelligent people are so embedded in this thinking that they have blinders on to any other option. Of course within the context of shareholders expecting ongoing double-digit returns, and CEO compensation largely based on it, nothing will change. However, much more sustainable options involving limited or even no growth are feasible. Imagine a forest, such as in British Columbia, where approximately 3% of the trees can regenerate per year. If the harvest is kept to 3% per year the entire forest can be removed in about 35 years, and still leave an intact forest. This rate of harvesting is sustainable and involves growth, but it does not even come close to the double-digit profit expectation. Hence, it must necessarily be rejected by the current endless double-digit growth economic world. The irony of course being that such growth is impossible, and even with all the strategies working against social justice, environmental justice, and democracy it is only achieved in some years.

Limited or zero economic growth will assist in spreading resources out more equitably, because money will no longer flow uphill to senior executives of corporations and shareholders. Without their double-digit returns shareholders will go elsewhere, or learn the value of a tortoise strategy to financial security, and senior executives will no longer be rewarded to the same extent. Shareholders and senior executives often rationalize high returns and income on the basis that wealth is needed to maintain their lifestyle into retirement, but if people learn to rely on fewer resources then much less money is required, both in the present and the future. In a restructured economic environment smaller businesses, typically focusing on local communities, will have a chance to prosper, further helping to spread wealth out more evenly. The Wuppertal Institute of Bonn, Germany, has calculated that if the remaining resources on the planet were equally distributed, the average person will have the lifestyle of a West (not

East) German in the early 1970's, with somewhat fewer cars. Although, with the hyper-consumerism existing today this might seem painfully inadequate, it would represent near heaven to the East Germans of the time, and most of the world's current population enduring austerity daily. The world will never see complete equality of resource distribution, but the current situation of 1% (or even 10%) controlling much of the wealth and resources of the world is not endlessly sustainable.

By aiming for highly limited, or no overall economic growth, the wild fluctuations with double-digit returns in good years, and major corrections involving double-digit losses in bad years, will end. Consequently, the resulting economy will be more stable and predictable. As a psychiatrist one of my key aims is to stabilize patients reducing wild fluctuations in behavior, while fostering solid, consistent performance. The economic patient is in dire need of intensive therapy to achieve behavioral stability supported by reasonable expectations. To heal the patient and promote stability of the economy one further player must be treated, namely the consumer, because hyper-consumption enables the hyper-growth of industry.

Hyper-Consumerism:

Mass production presupposes mass consumption. Without a large number of consumers buying a large number of goods hyper-growth is impossible, and a full 70% of economic growth is derived from private consumption. Hence, if consumers decided not to shop, or only for what they actually need, then the scale of production would decline bringing a quick end to any illusion of endless growth. Unfortunately, hyper-consumerism aligns very well with our propensity to be greedy (see the Greed chapter), and this propensity also ensures that we are very receptive to messages encouraging us to endlessly consume, despite how self-destructive it is beyond the very short-term.

A trick used by industry is to get people to believe that wants are actually needs via advertising and marketing, and as has been said, "A luxury once tasted becomes a necessity." Virtually everyone is exposed to promotional material unless you live in an igloo and never come into town. There are billboards, magazine layouts, radio announcements, Internet ads, and of course

television commercials. The average US adult spends over two weeks a year watching television commercials, and the average child a full week! Since children usually do not have money to make their own purchases, one might question the impact of marketing targeted at them. Marketing research has shown that 20-40% of child-based purchases occur because the child nags the parent to buy the item. Advertisers exploit this “nag factor” by structuring ads to teach children how to effectively nag their parents. Marketing aimed at children has increased from \$1-2 billion in 1990, to over \$15 billion fifteen years later. Hyper-consumers confusing wants with needs are then created at a young age, supporting hyper-growth for years to come.

It is one thing to advertise, but does it actually translate into purchases? The amount of money spent on advertising by industry suggests it has an impact. More is better, bigger is better, and more plus bigger is even better. In 1950 there were about 500,000 different consumer goods available in the US, while currently 24 million are available on Amazon.com alone. 66% of US homes have three or more television sets, and the average home has more televisions than people. There is about 2.2 billion square feet of self-storage space available in the US for all those purchased good, equivalent to 7 square feet for ever single person. Hyper-consumption is not just a US phenomenon, given that \$30.5 trillion dollars were spent on goods and services throughout the world in 2006. A staggering 1.2 billion phones were purchased worldwide in 2008. 400 million toxic electronic products are discarded each year in the US alone. 100 million tons of plastic materials are consumed annually around the world, up from 5 million tones in 1950. 500 billion to a trillion plastic bags for all those consumer goods are made each year worldwide, and plastic based pollution kills about 100,000 marine creatures each year. There is an estimated 46,000 pieces of plastic floating in every square mile of ocean on Earth, including the so-called Great Pacific Garbage patch twice the side of Texas, where currents result in garbage accumulation. Marine creatures sampling the potential meals choke on plastic, and circular pieces can get caught around their necks or in gill slits.

Considering a different type of hyper-consumption, an estimated 1.4 billion people throughout the world are overweight or obese, a contributing factor being the countless ads for calorie

dense “junk food” and sweetened beverages. Massive quantities of these items are sold in the first world, and sales are rapidly increasing in the third world, as these developing markets are targeted. Mexico is now the most obese country in the world, with about 32% of adults suffering from this affliction. Hyper-consumption of food, contributing to the obesity epidemic, follows from hyper-consumption in general, and demonstrates how societal norms for excess consuming translate into a physical parameter-obesity. Despite the vast amounts of money spent on diet books, meal plans, and guided assistance weight is still on the rise. More and more adults and children are becoming overweight or obese, producing a generation that is less healthy than the previous one with fewer consumer goods. The hyper-weight problem is a very difficult one to manage (see the Obesity chapter), and is costing society massive amounts of money in health care costs, as with diabetes in children that will persist throughout their life. It is a classic example of self-destructive behavior.

Whether pertaining to “junk food” or other goods, the massive consumption (and resulting waste) has largely been a first world issue until recently. Third world resources have typically been hyper-exploited and hyper-consumed by the entitled first world. Approximately 60-80% of private consumption spending is accounted for by the 12-20% of the world’s population living in North America and Western Europe. People in the first world consume at a rate 32 times greater than that of the 5.5 billion in the third world. The average American consumes about 53 times more goods and services than do people in China. If consumption rates in China alone were to rise to US levels, world consumption rates would double. Then there is India with a billion people, and the remaining 3.5 billion people in the third world. Some of these people aspire to a first world lifestyle, and industry is increasingly targeting these developing markets.

As it stands now we are way beyond interest and digging into the natural principle of the planet, with about a third of its resources consumed over the last few decades alone. Imagine what will happen when third world consumption matches first world rates? A totally unsustainable situation will exist, but yet industry, supportive governments, and agencies worldwide, insist upon endless economic growth. Instead of advocating for a change to a

highly limited or no overall growth sustainable economic system worldwide, they are pushing for open markets with expansive free trade agreements, and the spread of hyper-growth and hyper-consumerism to the third world. Decades ago Mahatma Gandhi warned of the threat of hyper-growth and hyper-consumerism moving east saying, "If (India) took to similar economic exploitation (to the west), it would strip the world bare like locusts." Perhaps it is time to send that distress flare into outer space, but witnessing the self-destruction from afar, any truly intelligent race will stay well clear of us. Are we really that stupid for an intelligent species?

Intelligence aside, it is really perception or spin that counts. Marketing and advertising promoting hyper-consumerism, carefully crafts perception to ensure never-ending purchases and economic growth. But how is this achieved? One major way is by linking happiness to purchases. You will be a happier person if you own more and better stuff. Is this true? Fifty years of "happiness" research has found absolutely no correlation between personal satisfaction and material goods. No one dies thinking, "If only I purchased that item my life would have been more fulfilling," and there does not appear to be any hearses with luggage racks. "Happiness" in the US peaked in the 1950's when consumption levels were half of what they are now, and a substantial portion of the consumption back then consisted of actual needs, not wants spun as needs. Indeed with more consumer goods "happiness" has declined, likely due to increased debt, longer work hours, and reduced free time for social and other activities that bring satisfaction.

With enhanced productivity there are two options—More free time or more consumption. In the first world, and increasingly in the third world, people opt for the latter working longer hours to purchase additional products. However, purchasing only when we have enough money to afford an item does not truly support hyper-growth. Credit enables purchases to be made before the money is earned, and then we work harder to pay off the debt. Sky-high interest rates on credit cards, make it very difficult for the 50% of people who do not pay off the balance each month to get out from under their debt, especially when they continue making purchases using credit. The extra work means less free time for

activities that bring happiness and contentment. People feel unfulfilled, and believing that happiness comes from purchases, they buy more things ensuring that they have to work harder and have even less free time for truly fulfilling activities, thereby creating an endless self-sustaining hyper-consumption cycle. Debt levels in the first world are at record levels, with the average US household debt at about \$117,000. In 1968 consumers' total credit card debt was \$8.8 billion, and by 2008 it grew to a staggering \$942 billion. Total US consumer debt grew from \$898 billion in 1980 to \$2.6 trillion in 2008. Despite the hyper-consumption afforded by all this debt, there is no increase and if anything a decrease in contentment levels.

Marketing and advertising further ensure never-ending purchases and hyper-growth, by promoting so-called conspicuous or status consumption. The central concept being that your status in society is revealed by the material goods you have—The bigger the house, and larger and more expensive the car, the higher your status in society. For many people the reference group constitutes fictional characters on television shows. An interesting aspect of this crafted status message is that while the characters are supposed to be middle-class, their standard of living is to the higher end of the income scale. Consequently, the predominant middle or lower class viewer comes to believe that the level of consumption portrayed is what they should have. Hence, they go into more debt for it, work harder, and have less free time for activities that really bring contentment. This upward drift of consumption motivation also occurs via what Robert Frank calls, expenditure cascades, derived from high spending by top earners shifting the reference point upwards for all income levels—Those below the top earners see what the latter have and strive to achieve it, third tier spenders note what second tier ones have and increase their consumption level, and so on and so forth. Hence, there is a cascade throughout income levels, shifting the reference point higher. Consequently, all income earners spend too much, incurring more debt and stress, with less time for more truly fulfilling social and personal development activities.

A very interesting aspect of production supporting hyper-consumption is called, "planned obsolescence." Have you ever wondered why products keep breaking down after a certain

amount of usage or time? A key reason is that many are designed to only last a limited period to ensure that further purchases are made. “Value engineering” shortens the “replacement cycle” on many products. For example, rechargeable lithium batteries last only about 500 cycles before losing much of their capacity. Integrated circuits that are required to prevent fire or explosion during recharging also incorporate an algorithm that artificially limits the number of times the battery can be charged. An otherwise perfect battery that could safely last many more cycles, then ends up in the garbage, releasing toxic compounds into the environment, and forcing the consumer to make another purchase. Of course the product monograph never explains that the product has been engineered to fail and force you to purchase another one.

In many instances planned obsolescence is functional in nature, meaning that new technology is designed to make the older obsolete, as is seen all around us with computer-based devices. Astronomical amounts of plastics and metals go into these ever-changing units, and only a fraction is recycled when the recently purchased device quickly becomes obsolete. Status plays a role as well because people want to be seen with the newest and most elaborate products. The shame of it if you use one of those ancient three-year old pieces of junk—What a dinosaur! Of course, the latest programs might not run on them any longer, forcing the out-of-style user to both discard the device adding to environmental damage, and pony up more money for a new one.

As people keep purchasing more and more, and raise their debt level, financial inequality increases, despite the rhetoric that advanced consumerism raises the standard of living and floats all boats. It floats yachts and sinks smaller vessels. With the rich getting richer and the poor more in debt, gaps widen in many aspects of financial functioning, including the safety and resources of neighborhoods. A sharpening division of good and bad areas arises and progresses. People desiring good schools and safety aspire to the better areas, and increase their debt load and work time to achieve it, while reducing free time for family, friends, and activities. The rich, fearing that some might try to take what they have, live behind gated communities surrounded by other members of the financial elite. With all the hyper-consumerism, hyper-growth seems like something that might actually work, and to some extent it does, at

least for a brief period. However, as we have seen endless growth is impossible, and if and when hyper-growth supported by hyper-consumerism fully extends to the third world, the environment and all of us along with it are done like dinner.

Given that 70% of the economy is based on hyper-consumerism, shifting purchases to mostly true needs is essential. However, can you imagine trying to get advertising time on major media promoting the value of non-purchasing? You would probably have more luck getting advertising space for pro-terrorism products. With regulatory capture by major media corporations of agencies entrusted to regulate media (see the Irregular Regulation chapter), stations or written publications allowing alternative viewpoints to be promoted are few in number. The group Adbusters, creating ads like Joe Camel getting chemotherapy and a bottle of Absolute vodka drooping like a dysfunctional penis, faces lawsuits daily, that would scare most sensible people from opposing the hyper-consumerism advertising machine of the world. So given that the word is not likely to get out, or at best any airing of the message will be a pellet gun compared to the nuclear weapon of advertising for hyper-consumerism, are we facing an impossible scenario? I am not one to believe in losing scenarios, and prefer to search for options, but this is a difficult one. I suspect that the way forward lies in freedom of the Internet—If the message gets out in a medium that cannot be fully controlled by corporate interests, it might take hold. As it stands now there are many sites showing the way to a world not characterized by hyper-consumption and hyper-growth. Sites exist to assist people in sharing, recycling, reusing, and in general adopting a collaborative consumption lifestyle. For example there is swap trading and peer-to-peer car sharing. However, as it now stands these are dwarfed even on the Internet by ads for consumer products.

Once the message on ending hyper-consumerism to end hyper-growth gains traction, and people adopt a more purchase as needed approach, there are other steps that can be taken. One option that has been proposed is a progressive consumption tax to reduce the most destructive forms of consumerism. The idea is that there would be no income tax, just a steeply progressive tax on consumption. There are pluses and minuses of such an approach, a major minus being that with the shadow economy offshore world

in place, those with high financial intelligence (high FQ from the Greed chapter) will work out a way to shift all the money saved by not paying income tax into an offshore account. From this secretive source they will then make all the purchases desired, and not pay any consumption tax. To hide the purchases they will have to buy them in an offshore tax haven, meaning that even more revenue is removed from their home country. As long as the offshore shadow economy is allowed to persist, this problem will make a progressive consumption tax largely unworkable. Where it might have merit is to place a consumption tax only on products exerting undue environmental damage, when not required for employment. So for example, a heavy-duty pickup truck for a person who works in construction is fine, but a monster SUV for carrying groceries and elevating one's status might be heavily taxed, with the money going to environmental causes. A further instance could be house size beyond a determined square footage per person (actually living there), incurring a substantial consumption tax.

Most promising for reducing and ending hyper-consumerism, is the benefits realized when people give up their addiction to products. Debt will shift to savings, and excessive work transform into free time for activities that actually produce contentment. Higher quality products, that people can value and use over and over again, will replace lower quality highly disposable ones. Companies must be pressured by consumers to end planned obsolescence of both an engineered and functional form. Companies that persist with planned obsolescence will see profits fade, and companies delivering on quality that persists in synch with increases in scientific knowledge will thrive. Regarding the latter, as scientific knowledge increases so does technology leading to some necessary turnover, but current levels really only represent functional obsolescence.

To remedy the hyper-consumerism illness, I suggest that treatment clinics be established. Of course with virtually all governments and politicians supporting hyper-growth and hyper-consumerism, public funding might be hard to come by, likely necessitating not-for-profit community and private clinics, at least to start with. The value of these clinics follows from the addictive and obsessive-compulsive aspects of hyper-consumerism, evidenced by reinforcement effects. Reinforcement can be positive

or negative, with the former referring to the receipt of something desirable when the behavior is performed, and negative reinforcement the removal of something negative. When you buy your child a toy and get a nice hug, you are being positively reinforced for the purchase. When your child nags you endlessly for a toy, he or she has created an aversive state that you can eliminate by buying it—Negative reinforcement. Both types of reinforcement are powerful, but negative reinforcement is often more potent. When it comes to addictions positive and negative reinforcement occur. You gain the pleasing altered mental state from using, and also reduce or eliminate mental discomfort, at least in the moment, by consuming your chosen substance. Obsessive-compulsive behavior involves negative reinforcement, in that by acting as you feel compelled to tension and anxiety is reduced and managed.

Hyper-consumerism demonstrates both positive and negative reinforcement. By making a purchase and consuming you feel good, at least in the now, as you have been rewarded, and hence positively reinforced. This effect is particularly powerful for high calorie taste-enhanced food and sweetened beverages. For some people this reward is very potent, motivating them to seek the food product more often and in larger quantities, ultimately leading to obesity. Then as they withdraw from the glucose high they feel physically and mentally off, an aversive state motivating them to seek more of the substance, providing negative reinforcement. For non-food consumer goods, people have been programmed by advertising and marketing campaigns to feel inadequate, or lesser than, their reference group without the given item. This aversive state is then reduced or eliminated by purchasing the item. As the purchasing habit progresses it becomes a compulsive way of managing and containing anxiety, as in shopping therapy. Anxiety persists until a consumer purchase is made, and the reduction in anxiety negatively reinforces the compulsive behavior.

Many of the same treatment principles applicable to addiction and obsessive-compulsive therapy should form the basis of hyper-consumerism therapy. As with Alcoholic's Anonymous (AA) a group format can be applied to manage the addictive aspects, and support people in shifting from a maximizing to minimizing lifestyle, although I do not believe that a 12-Step

program is applicable. A useful aspect of the AA approach consists of “sponsors” having achieved significant “clean time” being available to assist others by phone, text messaging, direct contact, or other means when they are tempted to make an purchase that is not absolutely needed. Substitute behaviors designed to be rewarding and reduce discomfort, suitable for a given individual, should also be utilized. Often these will take the form of quality time with friends and family, or hobbies that do not entail excessive consumption.

A type of intervention for compulsive behavior, called exposure and response prevention, can be applied. When a person feels compelled to repeat a behavior such as hand washing, exposure to a stimulus such as dirt or even suspected dirt is allowed to occur. Then the person is instructed to prevent their normal response. Invariably the anxiety increases, but if they hold off for a while it decreases. The negative reinforcement effect is avoided and they no longer feel compelled to engage in the behavior. As applied to hyper-consumerism, a person might visit a store where they often purchase items from, or to a mall in general, and then refrain from purchasing until the desire passes. Exposure and response prevention frequently is done in a graded fashion to maximize success and confidence. So for example, a person might initially just imagine their hands being dirty or being near a store they like to shop in, and gradually progress to full exposure such as applying sticky dirt to their hands or entering the store. With these strategies the hyper-consumerism illness plaguing the first world, and rapidly spreading to the third world, might be treatable.

In my travels to third world countries I have been impressed by, first, how vastly fewer consumer products people typically have, second, the greater emphasis they place on relationships with family and friends, and third, how they are generally more contented and happier, despite the absence of consumer products and wealth. When I ask what is the one thing they would like to change, the answer is almost always better healthcare, and almost never more consumer products. Meanwhile, those in first world nations find themselves drowning in consumer goods fighting a war against stuff. People struggle to find ways to manage their stuff, even utilizing strategies such as hiring a new category of worker known as “organizers,” and renting storage

space. Many people experience significant anxiety and stress in their personal war against stuff, in part accounting for the lesser contentment and happiness. To end the war against stuff we have to stop engaging in hyper-consumerism. Hyper-growth can then be ground out, laying the seeds for much more responsible and sustainable use of the world's natural principle and interest. We must all keep in mind that our support of hyper-growth via hyper-consumerism, is damaging us despite its immediate reinforcement effects, while at the same time actually giving each of us real power in the now to bring about desperately needed changes to the economic system.

HOW URBAN AND RESOURCE DEVELOPMENT OVERLAP:

At first glance these two forms of development might seem unrelated, but they are actually very intertwined—Urban development creates much of the need for non-urban resources, and resources extracted from non-urban areas provides for urban development. The average size of a new home in the US hovered around 1,500 square feet from the 1960's to early 1980's. However, from 1983 to 2007 the average size increased to over 2,200 square feet. In the early 1980's approximately 25% of new homes were less than 1,200 square feet, and 15% were over 2,500 sq ft. In 2007 less than 3% of new homes were smaller than 1,200 sq ft, and over 40% were larger than 2,500 sq ft. What is even more striking about this change is that the average family size decreased during the same period, meaning a lot more space for everyone in these new homes. Of course more space means more products, such as wood and plastic furniture derived from forests and petrochemicals, respectively.

Sprawl development in particular plays a major role, because subdivisions allow for larger home size, not feasible in many urban cores. The high number of cars required by those living in sprawl development, means more mining for some types of minerals, and vastly more petrochemical products. Despite improved engine efficiency ever increasing amounts of these products are required for all the automobiles sprawl development relies on. More petrochemicals are also required for the excessive number of plastic goods in these larger homes. Although rarely discussed, our world is largely dependent on plastics such as for electronic products, and these are derived from petrochemical

resources. By increasing both the number of cars and plastic products, sprawl development greatly elevates the demand for petrochemicals. There is also more natural gas and oil required to heat these larger homes.

Urban cores are not off the hook, though, because the more well off members of society are obsessed with building monster homes. In Toronto, as in many other cities, smaller homes are demolished to build mansions. Walking along some streets not far from my office, I am shocked by the ongoing size increase. Every new owner has to build bigger in accordance with a status consumption motivation. Providing an interesting and humorous example, two monster home were built next to each other, with the owners of the second one constructed ensuring that their home is about 10 feet wider and taller, to elevate their status over their neighbor. Many of these homes can comfortably accommodate five to ten families. In addition, most of them also have a couple of high-end German made cars in the driveway. A few such homes in a highly limited area might be understandable, perhaps lottery winners or successful rock stars, but there are hundreds to thousands of them. What this is demonstrating is the power of conspicuous consumption, and the concentration of resources in the hands of the very few. The owners feel entitled to this inequity of resource distribution in favor of themselves, because if they felt otherwise a much smaller home would be built and the extra resources redistributed in some fashion.

TAKING ACCOUNT OF THE PROBLEM:

Unsustainable development, whether it be urban or resource, share an interesting feature that provides a method of managing the problem—They rely on an accounting error of all things! In business costs must be internalized in the accounting process. There are labor, supply, infrastructure, debt, and other costs. Failure to report these costs on financial statements is a crime. For example, Enron placed debts, losses, and unprofitable enterprises into offshore entities, making the company appear profitable when it was not at all. In accounting language, costs must be internalized. However, most costs to the environment and community are never internalized, a practice considered acceptable by regulators and government officials that we vote in to represent the public interest.

These costs are externalized meaning that someone other than the company responsible pays for them. Any guesses who does the paying and who profits by not internalizing these costs? Yes, it is indeed a rhetorical question.

When a coal mining company engages in mountaintop removal mining, numerous costs to the environment and local community arise. Streams that otherwise provide freshwater and support many life forms are filled with overburden. Coal slurry leaks into freshwater and causes damaging floods when it breaks through the containment barrier. Serious lung ailments are produced from inhaled dust arising from the mining process. The burning of coal without scrubbers adds further damaging pollution to the air, and atmospheric CO₂ levels are increasing largely due to it. The coal industry absorbs none of these so-called negative externalities, and hence is able to pocket huge profits. Despite being one of the most profitable companies ever, Shell has not internalized any of the costs to the environment or communities of the Niger Delta during their decades long oil extraction from the region. The only extra costs they internalized were bribes and security force payments to maintain full control. This scenario is repeated throughout the resource development world for oil extraction, mining, industrial agriculture, logging, and commercial fishing. It is also very much a reality with urban development, the costs of urban sprawl being absorbed by taxpayers and huge profits going to developers. Initial and ongoing costs of roads, water and sewage infrastructure to the project, plus loss of local high quality farmland in many instances, are externalized and paid for by the taxpayer.

Now what would happen if urban and resource developers corrected the accounting error, and internalized costs they conveniently externalize to you the taxpayer, or to the balance sheet of natural capital? Ah, maybe profits would diminish radically for corporations and shareholders insisting on double-digit returns, and development would proceed in a much more reasoned fashion. As an added benefit, we might preserve natural capital that we are now on the brink of wiping out as first world consumption levels expand to the third world. Based on a synthesis of various studies, Robert Costanza and colleagues have estimated the minimum value of goods and services supplied to us from the natural capital of the planet, to be in the range of \$16 to \$54 trillion

per year, with an average of \$33 trillion dollars per year! That is quite an amount to exclude from any accounting process, and it does not spell anything good for us when we exhaust it all. Given that it will prove very challenging to counter the advertising and marketing machine supporting hyper-consumerism, having a more direct way to shift unsustainable development to a sustainable footing is crucial. Ensuring that negative externalities such as damage to the environment and communities are absorbed by the urban and resource development industry provides such a way.

Efforts to correct this major accounting error have been underway since the 1960's, although we hear very little about them in mainstream media. Some countries such as Norway have employed environmental accounting strategies for a number of years. In some instances the accounting process incorporates many externalities, as with the expanding Norwegian system, while in other cases it is limited. For example, the Maldives calculated that each grey reef shark is worth \$3,300 in tourist revenue, compared to \$32 per catch. With this calculation it was a no-brainer to ban shark fishing as they have done. In Uganda it was calculated that a Kampala wetland provides \$2 million dollars in environmental services. This figure was arrived at by the proposed cost for a sewage treatment plant needed if the wetland was developed for commercial agriculture. By internalizing the cost of the sewage treatment plant, the commercial agricultural project was deemed unfavorable and the wetlands won out.

Considering that third world countries are capable of mounting solid environmental accounting processes, we might expect the US with its numerous educated financial people to both achieve and implement it. Early in President Bill Clinton's administration, the Bureau of Economic Analysis (BEA) made a foray into environmental accounting in the minerals sector. Political controversy and strong opposition from the mining industry halted it, and since then congressional appropriations to BEA have been accompanied by an explicit prohibition on environmental accounting work. Critics of environmental (and social) accounting frequently claim that it is too difficult to calculate what these services are worth. Often these are the same individuals who have brought the world complex financial products, such as derivatives. If we have the capacity to generate ultra complex

financial products, we definitely have the capacity to develop solid ways of internalizing environmental and social costs presently externalized by industry. These efforts can take advantage of the research that has already been conducted and implemented, and some promising work to date involves combining various approaches. With the application of financial resources and the devotion of skilled people to the task, a worldwide system of internalizing environmental and social costs could be fully in place within 10-20 years or less. This major step will help take the "devil" out of both urban and resource development.

As is often the case the problem is not the capacity, but the will to bring it about. The development industry is against the internalization of negative externalities. Politicians accepting campaign contributions from the development industry support those who have helped them. These politicians are also enticed by lucrative consulting contracts, and other employment opportunities, when their term ends. Regulators influenced by revolving door employment advantages, support industry instead of regulating it. In the third world direct cash bribes play a more prominent role. The 1% controlling virtually everything nowadays does so by hijacking the democratic process, and getting those who are supposed to look out for the needs of citizens to act on behalf of industry and the financial elite. This reality effectively makes a mockery of democratic principles, and we now have form of social/political organization best described as rule of the elite. Democracy has ceased to exist, although the pretense is there in that people get to vote for politicians who are advancing our self-destruction.

We have created a self-destructive system that ultimately works against the good of us all. Hence it is time for a major change! Simple tinkering with the system is equivalent to slightly slowing the spread of aggressive cancer. To bring about this change the words of anthropologist Margaret Mead strike a keynote, "Never depend upon institutions or government to solve any problem. All social movements are founded by, guided by, motivated and seen through by the passion of individuals." I might add that there is no need to look over your shoulder for that person, because the individual is you who must stand up and bring about the necessary changes.

TOO HOT TO HANDLE: GLOBAL WARMING

QUESTION:

The world is facing a major environmental challenge that is having a negative impact on your life now, and will have a much greater impact on future generations. What should we do?

- A. Be optimistic that it will all work out in the end, as these things usually do.
- B. Ignore the problem and let someone else take care of it.
- C. Do whatever we can to fix the problem regardless of the costs.
- D. Research until scientists are absolutely certain of what will work.
- E. Appreciate the realities and proceed strategically.

If you answered A you show the capacity to put a positive spin on negative circumstance that is very good for mental health. Unfortunately, problems typically do not just take care of themselves and environmental issues are no exception. If you answered B, then you are engaging in another defensive response consisting of detaching from the problem. As with positive spins, this approach can limit suffering in the present, but allows problems to escalate. Answer C is the one given by many who care about the environment, but it simply does not work because unless a threat is dire and immediate people greatly limit what they are prepared to sacrifice. Answer D sounds good but shows a limited understanding of the way that science works. Uncertainty can rarely be fully eliminated, and waiting for the impossible ensures we will never get it done. If you selected answer E you are in the distinct minority, and have taken the first step on the path to solving most environmental problems. This approach makes

optimal use of limited and valuable resources, thereby increasing the chances of success.

THE NATURE OF GLOBAL WARMING:

A Hot Topic:

Although there are many environmental problems, each with powerful consequences, the one that is on the mind of most people is global warming, or as it is often referred to, climate change. The latter name is a bit misleading, because it suggests that somehow the environment should remain stable, and that simply never occurs. Imagine if you woke up to the exact same weather every day of your life. The weather is always changing from day-to-day, or week-to-week, and even major fluctuations are the norm. Climate instability is a reality, and even the best weather forecast can go off. How many of us have set out on a day trip based on a forecast of sunny skies, only to encounter torrential rain? And that is for forecasts a day or so out. Try predicting the next month or two. Indeed, true climate stability would put weather forecasters and climate scientists out of a job. Another problem with the term climate change is that many natural fluctuations in weather are falsely attributed to this process. How many times have I heard something to the effect of, "This year we have had some bad storms, it must be climate change." Sounds good, but as we will see some of the problems attributed to "climate change" probably have other origins, and we are misleading ourselves by attributing everything to it.

So although climate change is a popular term it is not really helpful to the average person. Global warming captures the essence of what is happening to the world's climate, as it is slowly and steadily warming, with greater temperature increases at the north and south poles than the equator. One drawback of the term global warming is that it sounds good to many of us. I live in Toronto, Canada, where it is cold for about half the year. The term global warming conjures up images of not having to wear a jacket in winter, and perhaps only the odd day of having to shovel snow. I suspect that virtually everyone in a cold climate has had this fantasy, and even the leaders of some countries like Russia have expressed that it might not be such a bad thing for them. Let's face

it if you live in a cold country global warming might sound okay. It is no wonder then that people seem unwilling to sacrifice a lot to deal with the problem. It has even been suggested that the best term might be global WARNING, as it conveys the message that there is a danger and something has to be done about it. However, I will use the term global warming as it more accurately reflects what is occurring, and allows readers to substitute an “n” for the “m” if so desired.

Global Warming Is Real:

Some question the validity of global warming reading political motivations into it. Others insist we are nearing the end of humanity due to global warming. Is it a true occurrence? YES! The answer is really this simple. The Earth has warmed about .75 Celsius over the last 100 years. Although difficult to predict, it is believed by scientists that we could end up with maybe a 3 degree Celsius increase in global temperatures. Not something to recoil in horror over, but as this story unfolds you will appreciate the self-destructive aspect, and why it is definitely worth applying limited resources in a strategic manner to deal with the issue.

Gases & Global Warming:

It is often said that without the sun there would be no life, but more accurately without the sun there would be no warmth, and then no life. Energy from the sun reaches the Earth and is radiated back into space. Gases in the atmosphere prevent a portion of that energy from leaving, thus keeping us warm. On Mars the atmosphere is very thin so almost all of the energy escapes back into space, meaning that it is far too cold for life, at least on the surface. So-called greenhouse gases are good then, at least in moderation. In excess too much energy is trapped overheating the planet.

A variety of gases contribute to the greenhouse effect, not just carbon dioxide (CO₂) that there is so much talk about. Methane and nitrous oxide are two additional greenhouse gases. Compared to CO₂ methane has about 25 times the ability to trap heat in the atmosphere, making it a truly potent greenhouse gas. Human activity including livestock farming, landfills, wastewater treatment, and the burning of fossil fuels, produces much of the

methane released into the atmosphere. Increases in atmospheric nitrous oxide, another potent greenhouse gas, arise from fertilizer use, burning of forests and crop residues, and the combustion of fossil fuels. Several other gases produced exclusively by human activity such as PFC's and HFC's, also enter the atmosphere and trap in heat. Simple water vapor is another major contributor to the warming effect. So why is there so much emphasis on CO₂? First, CO₂ accounts for an incredible 80% of total greenhouse gas emissions, making it the most significant contributor. Second and very crucial to appreciate, CO₂ persists in the atmosphere, whereas the other gases clear rapidly. Methane actually undergoes a chemical change producing CO₂. Without removal from the atmosphere in some form, a process that might be thought of as scrubbing CO₂ from the air, it stays there.

Accumulation of CO₂ In The Atmosphere:

The amount of CO₂ in the atmosphere is presented as a concentration, or parts per million. Prior to industry the concentration of CO₂ was 280 parts per million; in 2011 it was 392, a very significant increase. Ice cores are taken from glaciers providing layers corresponding to years, as with the rings of a tree. Tiny bubbles of air trapped in the layers provide a sample from the past. Chemical analyses of these air bubbles show how much CO₂ there was in the atmosphere, and also the temperature at the time. The evidence is indisputable that first, CO₂ levels have been steadily increasing, and second, that temperatures are rising along with CO₂.

Al Gore in his book, *An Inconvenient Truth*, presents the relationship between CO₂ concentrations and temperature as a hockey stick with the long handle representing relatively flat CO₂ and temperature levels prior to industry, and then the blade sweeping upwards with industrial development. The atmospheric CO₂ concentration is now increasing at the rate of about 2 parts per million per year, meaning that in less than 100 years we will be near to or at 600 parts per million, greater than twice preindustrial levels, to produce a temperature increase of around 3 degrees Celsius. No one knows for certain what an acceptable level of CO₂ is, and as Roger Pielke Jr in his book *The Climate Fix* points out, focusing on a hypothetical limit can take away from more

successful strategies to deal with the rise. What is clear is that CO₂ concentrations in the atmosphere and temperature are both rising. One might say that these events are only correlated and not linked in any cause and effect sense. This argument does not stand up, though, because it is known that CO₂ and the other gases mentioned do block solar energy from escaping back into space, thereby increasing the temperature. We might wonder why so much CO₂ is in the atmosphere in the first place, and how could we possibly contribute to it?

Much of the CO₂ in the atmosphere is naturally occurring from sources such as gaseous volcanic eruptions, the decay of vegetation, and breathing. Every time that you breath out you are releasing CO₂, so those who say mankind is not contributing to atmospheric CO₂ are actually doing so in the process of speaking those words. With billions of people on the planet we cannot help but contribute. However, the CO₂ released by our combined breathing is not significant relative to the activities we engage in. Many believe that the industrial era marked the start of mankind's contribution to rising CO₂ levels, but this is not true. Humans have existed for approximately 200,000 years and our predecessors much longer. For 95% of this time we were hunter-gatherers collecting vegetable matter and hunting. If an area offered abundant food and was not overly dangerous we stayed, but moved where the food was. Then around 10,000 years ago a remarkable change occurred, namely that we began to stay in one place and grow crops based on annual plants. Up until that time 95% or so of vegetation consisted of perennials, meaning plants that live for two years or longer. We picked what food perennials offered.

With agriculture a massive shift occurred from perennials to annuals that only live for one growing season, devoting much of their energy to large seeds. Currently at least 80-90% of crops are annuals, representing a complete shift in percentage from pre-agricultural times. Our ancestors took the seeds of annuals and planted them each year. Seeds were selected from the most productive plants, stored, and used the next season introducing artificial selection. Natural selection increases the frequency of a gene in succeeding generations. For example, more acute close-up vision helped our very distant tree living ancestors see insects and small edible plant parts. Genes that fostered better close-up vision

increased the chances of surviving, and these genes became more represented in future generations. Hence, we can see very small things thanks in large part to how our ancestors liked to snack on high protein insects—A yummy thought. Artificial selection is when humans (or conceivably other species) select organisms with desired traits, and facilitate their reproduction. For example, we have many types of dogs because humans have allowed ones with desired traits to breed. Retrievers are selected for retrieving skills, and pit bulls for attack ability. By selecting seeds from the most productive plants and using these for the next season, our agricultural ancestors were engaging in artificial selection of annual plants. All of our main crops including wheat, corn, rice, and soybean are annuals.

Now you might well wonder what this could possibly have to do with our contribution to CO₂ in the atmosphere? The answer is much more than what most people would ever suspect. The soil is a massive reservoir of carbon, a key component of carbon dioxide. In fact the top meter of soil holds more than three times the amount of carbon stored in either vegetation or in the atmosphere! With perennial plants the roots stay put for several years leaving the soil undisturbed. With annual plants the soil is always being disturbed due to yearly planting of seeds, and also soil erosion arising from limited roots and no roots, for at least part of a year, when the crop is harvested. So with the advent of agriculture we began disturbing the soil and releasing carbon. In addition, the indigestible parts of annual plants decay and release CO₂. Given the small size of the human population and limited scale of agriculture, the impact of this CO₂ contribution was very small, but is important to appreciate as it shows how we have been contributing to atmospheric CO₂ for a very long time.

The really big change in terms of the human contribution to atmospheric CO₂ involves the burning of fossil fuels, an event that ushered in the industrial revolution a few hundred years ago. Carbon is the basis of both animal and plant life. When plants and animals of ancient times died they became buried under land or underneath the sea. Heat, pressure, and time turned these long deceased microorganisms into coal and petroleum. Coal arises from the fossilized remains of plants, while oil and natural gas are derived from a mixture of ancient plants and animals. Burning of

carbon based products produces energy, and energy is what powered the industrial revolution. We burn fossilized fuels as if there is no tomorrow, or perhaps more appropriately we burn it as if it's okay to push the consequences off to tomorrow.

Simply put, WE ALL LOVE ENERGY AND CANNOT GET ENOUGH OF IT!

Of the roughly seven billion people on the planet, virtually everyone relies on at least one industrial product. For example, the remote New Guinea villager who uses a machete to clear dense brush is tied into the industrial world. In modern societies we could not get by without a constant source of energy for heat, cooling, powering our computers and appliances, and making our cars run. Developing countries use less energy, but as the standard of living in these countries improves so will their energy consumption. In addition, approximately 1.5 billion people are off the power grid, and all of these people would like to be on it. It would be a very unfair scenario and a graphic violation of social justice to deprive these people of access, while those of us in the developing world use energy often with little or no restraint.

So who is to blame? All of us are or none of us are. The lesson to be learned is that we all love energy and will continue to use it. Trying to get the other person or group of people to use far less than what you do is not productive. Of course, those who seem determined to monopolize the world's supply might look at what is a fair intake, and revise their usage accordingly. But the key point is that we will continue to use energy and lots of it. With the rise in lifestyle of people in countries like China and India, the increase will be significant. If these countries had the 2006 emissions of France global CO₂ emissions would be 30% greater. Consider what will happen when the 1.5 billion without access to power are connected. Demonstrating how it is a problem that we all share blame in, hyper-consumerism practiced by so many people and hyper-growth promoted by industry, are depleting readily available fossil fuel supplies while adding to global warming. We are all to blame and have to take ownership of the problem.

SO WHAT'S THE BIG DEAL WITH RISING CO₂ LEVELS:

All sorts of problems have been attributed to global warming (do you hear warning), and fear induction based on this is a popular way environmentalists have of getting people motivated to do something about the problem. Furthermore, it is where science has fallen down trying to support claims that appear to lack substance. As pointed out by Roger Pielke Jr (*The Climate Fix*), this leads to a discrediting of science, and is not necessary because the majority of people believe in global warming and are willing to do at least something moderate about it. We are continually hearing how our climate is so destabilized with global warming that anything and everything can occur. That icicle that fell on my head from the roof this morning—"Oh, it must be global warming." But what can realistically be attributed to global warming? Here are some of the purported impacts with an evaluation of how likely it is that global warming is involved.

Ocean Acidification:

The oceans covering the majority of our planet absorb about a quarter of atmospheric CO₂, comprising a so-called carbon sink. That is good news for the rising CO₂ problem but bad news for the ocean environment. The problem relates to the acid-base balance of the oceans. Water becomes more acidic when hydrogen ions increase. Ions involve an imbalance of positive and negative charges, the negative provided by electrons and the positive by protons. Hydrogen ions occur when the sole electron is removed leaving only a positive charge (H⁺). CO₂ reacts with water releasing hydrogen ions, thereby acidifying the water (technically it makes the oceans less basic because they are not actually acidic). From preindustrial times to the present the oceans have become 30% more acidic, occurring at a rate about a hundred times faster than the most rapid events in the geological past. This all sounds impressive, but why is it so bad?

Many marine organisms require a solid support structure if they are to survive. For example hard corals need walls around their soft bodies. When you look at coral while snorkeling or scuba diving you are really looking at the solid non-living support structure. Think of an apartment building that is viewed from the

outside. The living organisms are inside and require that hard structure around them. If all the tenants of an apartment building were without the building and piled on top of each other, their survival from the pressure, elements, and predators (if we had any) would not be good. Likewise, the coral polyps with their soft bodies and tentacles for catching food particles are very vulnerable, and cannot survive without their solid apartment. Even soft corals that can be seen swaying with the current and surge require hard components within their structure to support the colony. Many other organisms beyond corals also need protection and support. The list is long and includes clams, snails, barnacles, sea urchins, sea stars, brittle stars, and tube worms.

You might now be wondering what makes up the hard part of these organisms? The answer is calcium carbonate. Calcium is a key component of hard structures found in living organisms, such as the bones in your body. Most of us can recall our parents saying, "Drink your milk, your bones need calcium," and we repeat it with our own kids. Calcium ions with a positive charge combine with carbonate ions having a negative charge (positive and negative attract), to produce the calcium carbonate that corals and other marine organisms require. Now think about all those H⁺ ions in the water due to excess CO₂ absorption. They in a sense soak up the negatively charged carbonate ions, leaving calcium without enough carbonate ions to bond with. Hence, there is too little calcium carbonate for all the organisms needing it.

Without calcium carbonate the organisms requiring it becoming weaker and many die. Coral reefs around the planet are suffering, and many are dying off due to this calcium carbonate deficiency. I am an avid scuba diver and underwater photographer. In the Caribbean I have seen firsthand how hard and soft corals have died and been replaced by algae. Reefs I dove in the 1990's that were quite healthy and vibrant are now essentially dead with algae covering them. If anyone suggested to me 20 years ago that those corals will soon be gone, I would have told them they were crazy, not a term to throw around idly when you're a psychiatrist. However, my diagnosis would have been wrong, and the pessimist would have been right. This problem is barely discussed partly because it is hidden even to many divers lacking marine biology knowledge. I have heard some say how colorful the reef looks,

when they are only seeing sponges that are much more resilient to ocean acidification.

In contrast to corals in the Caribbean that have largely been decimated, those in many other tropical areas have remained in fairly good health. How can this be if ocean acidification is a global event? All organisms that have survived over time have some degree of resilience, and corals are no exception. They can survive one punch as long as it is not too strong, much as we can usually survive one punch. However, when there are two, three, four, five, and even six blows, it is too much. This multiple blow scenario characterizes the Caribbean region. The first blow is ocean acidification due to global warming. The second punch is also likely due to global warming, namely rising ocean temperatures. Most corals survive best in a narrow temperature range, and their ability to survive falls off rapidly as the temperature either rises or falls. Ocean temperatures have been rising, and in 1998 the temperatures increased in some areas of the world's oceans such that corals suffered greatly. One of the worst hit regions was the Seychelles that I visited in 1999 to find the reefs decimated. The Caribbean was also hit hard by ocean warming.

A third blow is the removal of herbivores that eat algae and keep the reef clean. In many, or even most parts of the world, there is massive over-fishing, removing amongst other fish herbivores, such as surgeonfish and parrotfish. The Caribbean region has a large human population, many tourists, and a small area relative to some vast Pacific island nations. Not surprisingly, most of the medium-to-large size fish are harvested. In addition, fishing often occurs at spawning grounds ensuring too few juveniles to replace the harvested fish. The death of Caribbean spiny sea urchins, apparently due to a virus that might or might not be related to global warming (probably not), constitutes a fourth blow, because these urchins are major herbivores devouring huge amounts of algae. A fifth blow is nitrogen and phosphorous runoff from fertilizer use and untreated sewage, favoring the growth of algae and boring sponges that destroy corals. Excessive development, particularly along the shoreline, comprises a sixth hit because it results in too much silt in the water choking coral polyps. Very select regions in the Caribbean that have managed to avoid these problems have relatively intact reefs, one in particular being Cuba,

where the absence of industrial fertilizer favoring organic farming, negligible shoreline development, and limited fishing have protected the ecosystem. However, due to the multiple blow scenario described, with global warming playing a major role in terms of ocean acidification and likely rising ocean temperatures, coral reefs are fading worldwide, with some regions such as the Caribbean more damaged than other areas. Although hard to predict for sure, all coral reefs might be gone in 30-70 years, a time frame that undoubtedly will be advanced if the other blows that have devastated most Caribbean coral reefs, also exert themselves in more remote regions.

Showing how everything in nature is interconnected, coral reefs have a much greater role than simply providing a source of recreation. It has been estimated that a quarter of all marine species spend at least some of their life on the coral reef. For several the benefit is protection as there are places to hide. Food is also more abundant, and many species spawn by coral reefs, ensuring the continuation of their kind. Corals are the architectural basis of the whole ecosystem, and its collapse guarantees the demise of countless species. In addition, every marine organism that requires calcium carbonate will have trouble surviving due to ocean acidification, and creatures further up the food chain, such as sea lions feeding on shelled organisms, will suffer. Another very significant consideration is that the marine environment by far holds the greatest potential for new pharmaceutical products, given both the number of species and uniqueness of their chemicals. It is widely believed by scientists, pharmaceutical companies, and many government agencies, that most new drug discoveries are going to come from this realm. If we allow it to be destroyed we might well be giving up on drugs that could save many lives, maybe even your own.

I have presented the ocean acidification story in some detail because it illustrates several important processes. First, it provides a very clear example of how global warming has already damaged a major ecosystem. Second, it demonstrates how various influences linked to mankind can interact to produce severe consequences. Third, it reveals how all parts of an ecosystem are connected, such that if one major part suffers the whole system declines. These

points are very important to keep in mind as we look at the other impacts, clear and less clear, of global warming.

Melting of Ice Due To Global Warming:

We have all heard about how melting ice will raise sea levels causing flooding, but it is important to look at what might realistically occur. Sea ice will not raise ocean levels if it melts, because it is already in the water contributing to the current sea level. However, warmer water by being more expansive than cold water has raised sea levels 17 centimeters (just under 7 inches) since 1900. Due to global warming, sea ice in the Arctic and Antarctica is thinning and has been over several years. The Arctic is water covered by ice that is on average less than 10 ft. thick. The United States Navy has kept detailed records of the thickness of Arctic ice, as submarines can only surface from under the ice when it is thin enough. Since the 1970's the extent and thinness of ice in the northern hemisphere has declined markedly, and it is predicted that perhaps even by 2050, or earlier, the region might be ice free in summer, and maybe ice free period by 2100. While good for transportation with the opening of the Northwest Passage to shipping, it will be much less ideal for polar bears requiring sea ice to hunt.

Land-based ice raises sea levels if it melts, given that it adds to the oceans. Approximately 90% of land ice is found on Antarctica, 9% on Greenland, and only 1% on mountain ices sheets including glaciers. You can see why scientists are so concerned about what is happening to the ice sheets on Antarctica and Greenland. The ice sheets on Antarctica are up to 10,000 ft. thick. If all that land-based ice melts sea levels will rise by 65 meters! A reasonable prediction is that by 2100 sea levels will rise 1 meter. Although this does not sound too scary, consider that 200 million people and most of the world's largest cities live within that 1 meter. In areas with small populations rising sea levels have limited impact, but drastic and very expensive changes are unavoidable if the problem continues. Imagine closing down low lying sections of New York City and moving the population living there to higher ground, and fully shutting down cities like Miami that are now only slightly above sea level. Miami and other locations such as the Bahamas and Maldives, built on porous calcium carbonate (dead coral), cannot survive because water just percolates up through the foundation; imagine

building on a rigid sponge with water washing onto the sponge. Perhaps an opportunity for shallow water scuba diving and snorkeling to replace dead coral reefs, but most other people will not be too thrilled.

To fully understand the connection between global warming, land-based ice, and rising sea levels, it is important to look closer at the melting process. When we picture melting ice most of us think of icicles dripping, or ground ice turning into a puddle. As with so many things in nature though systems are more complicated and interconnected, as evidenced by melting glaciers. In Greenland a fascinating phenomena has been observed, whereby a lake will form on a portion of the ice sheet. Interesting in itself, but the really amazing part of this story is how the lake will simply vanish in a matter of hours—Here one moment and gone the next! Where did the glacier lake go? These lakes drain out to the bottom of the glacier forming a lubricant for the ice sheet to slide on. Consequently, more ice reaches the open water and enters it. As air temperatures warm, more of the ice melts, more water drains out providing a lubricated surface for ice to slide along, and more enters the open ocean. This same process is occurring on the Antarctic Peninsula. Ice sheets the size of Rhode Island and hundreds of feet thick have broken off due to this process. Increasing ocean temperatures from global warming melt the portion of ice exposed to the sea. In Antarctica the vast ice sheets extending out to sea are melting. Ice sheets are not the only victims, though, as the adorable and inspirational Emperor penguins featured in *March of the Penguins*, have declined 70% in numbers since the 1960's.

The already bad situation to the north and south of the planet might get a lot worse due to a few so-called feedback loops, the first arising from the tendency of ice and snow to reflect the sun's radiation back into space, while open water absorbs it—The Albedo Effect. Greater ice cover then means cooler temperature, whereas more open water heats the planet. As the temperature increases with global warming, more ice melts enhancing the absorption of energy from the sun, thereby producing further temperature increases, melting more ice, and so on and so forth. The second involves warmer water evaporation leading to more cloud cover trapping in heat, thereby raising the temperature, and melting more ice. The third feedback loop concerns the Arctic

permafrost, a deep layer of soil that remains permanently frozen so long as it stays cold enough. Billions of tons of carbon stored in this permafrost as methane might be released with thawing, thereby increasing greenhouse gases, that in turn will warm the planet further melting more permafrost and ice. What often at first glance appear to be simple and straightforward environmental changes have a way of being amplified in scope and complexity by these feedback loops, virtually ensuring that any predictions based on simplistic views will be underestimates.

Melting land-based ice has another profound effect on the environment, this one connected to the 1% found in mountains. Glaciers replenish fresh water supplies so vital to life. Snow and cold temperatures in mountain areas augment the ice in glaciers, and the melting of this ice at lower elevations during the spring and summer adds to rivers, streams, lakes, and underground water supplies. Unfortunately glaciers around the world are melting as if there's no tomorrow. One of the most picture perfect examples of global warming is to be found in photographs comparing glaciers now to a hundred years ago. In virtually all instances, the evidence is striking with the early 1900's one showing a healthy glacier, and the more recent picture the glacier vastly receded or even gone. For example, Mount Everest's East Rongbuk Glacier has lost about 350 vertical feet of ice during this 100-year period, now existing as a small remnant of its former self.

Asia relies on glaciers of the Tibetan Plateau, described as the roof of the world. The plateau and surrounding mountains contain the largest volume of ice outside of the polar-regions. Tens of thousands of glaciers give rise to and sustain Asia's largest and most important rivers, including the Yangtze, Yellow, Mekong, and Ganges. The Yangtze and its tributaries irrigate more than half of China's rice. Two billion people in more than a dozen countries, depend on these rivers that are in turn dependent on the glaciers of the Tibetan Plateau and surrounding mountains. Over 95% of the glaciers evaluated are losing ice, while at the same time water usage is increasing, the combination threatening the traditional balance between supply and demand. There has been some speculation about these glaciers melting entirely this century, but that appears unlikely. However, the imbalance between freshwater flow from these glaciers and increasing water usage will

undoubtedly contribute to water shortages, particularly if current water usage strategies for agriculture continue.

Forest Fires:

In some regions warming of the climate appears to intensify forest fires. Warmer temperatures in some locations mean drier weather, with heat plus dryness increasing the risk of forest fires. These burning forests release more CO₂, understandable given that all vegetation releases CO₂ when dead or being combusted. Fire does not necessarily kill all vegetation and some trees have evolved resistance. Furthermore, fires have advantages such as returning minerals to the soil, clearing dead vegetation so that new growth can occur, and in some species (pine and oak) fire is needed to crack open the seeds. Like with so many things in life it is a matter of degree. Too limited forest fires, as happens with intense fire suppression, can leave a lot of dead and dry vegetation just ripe for creating a massive uncontrollable fire when conditions are right. Too intense fires can virtually destroy a forest producing a massive release of CO₂. In many parts of the world slash and burn agriculture is the norm, whereby vegetation is slashed down and burned to clear the land for planting. This practice contributes to the CO₂ we are pouring into the atmosphere.

A very interesting example of how global warming contributes to forest fires involves the mountain pine beetle. This 5 millimeter long beetle is found in the forests of western North America from Mexico to British Columbia. Although small in size, it has produced the largest forest insect blight ever in North America. Over vast swaths pine trees have died, with the dry decaying wood releasing CO₂. Forest fires appear to have increased as a result releasing CO₂ even faster, although this is not proven. In normal circumstances the mountain pine beetle actually contributes to the health of the forest by attacking old and weakened trees, thereby speeding up forest regeneration. Cold winters and wet summers keep the number of these beetles in check so they can really only damage the weaker trees. With global warming summers in some regions of western North America are drier, and perhaps of even greater significance, winters are not cold enough to limit their growth. Consequently, the outbreak that is occurring now is ten times that of previous ones.

Pine beetles spend most of their life cycle under the bark of pine trees where eggs are laid. The invading beetle releases a blue stain fungus that blocks the trees defenses, and also the flow of water and nutrients. Females invade first releasing chemical messages to attract other pine beetles, and with sufficient numbers the tree is overwhelmed and dies, cut off from water and nutrients. Huge swaths of forest in British Columbia and parts of Alberta are infected, with over 40 million acres in British Columbia alone! The Canadian Forest Service estimates that by 2020 the pine beetle outbreak will release 270 megatonnes of carbon into the atmosphere from Canadian forests alone. American forests are also affected with significant damage occurring in Colorado and Wyoming. As with any global warming issue there is controversy, with some people arguing that pine beetle forest kill might actually reduce available fuel for fires. Even if this perspective is shown to be true, it does not change the reality that pine beetle killed trees shift from CO₂ absorbers to CO₂ emitters.

Large healthy and mature trees excel at taking CO₂ out of the atmosphere to support photosynthesis (CO₂ + water in the presence of sunlight produces sugars) necessary for survival. The larger and healthier the tree, the more photosynthesis and more CO₂ absorbed. Turning these CO₂ absorbers into dead CO₂ releasers is an obvious problem when it comes to managing greenhouse gases. The mountain pine beetle infestation adds to the transformation of mature trees from carbon removers to carbon contributors. This transformation is also occurring with slash and burn agriculture and industrial deforestation for timber and plantations (palm trees for palm oil and sugar cane for biofuel). These influences on the forests of the world are adding to atmospheric CO₂, with global warming producing the massive pine beetle infestation that in turn appears to be adding further to atmospheric CO₂ levels.

Hurricanes:

Also known as typhoons in most of the world, hurricanes can produce tremendous damage, making them the perfect poster child for environmentalists and environmentally concerned scientists and politicians trying to get a motivational rise, out of what sometimes seems to be a largely apathetic public. Unfortunately or fortunately, depending on your perspective, global warming does

not seem to have a clear role in hurricane risk, as covered very well in *The Climate Fix*. One of the fascinating things with natural phenomena is that no one really seems to notice or care unless people are in the way. Imagine these two potential headlines in the news: "Hurricane wipes out palm trees!" "Hurricane destroys large town!" Any guesses as to the story that will sell more copies? If you picked the former do not consider a media career. Scary news sells and hurricanes fit into this very nicely given the potential for great damage. Linking global warming to forest fires involves an intrinsic logic. The same logic does not readily apply to hurricanes, and severe ones have been documented in the western Atlantic, Pacific, and Southeast Asia over the course of many years. It might be feasible that warmer surface water provides more energy to the hurricane in select instances, but there are undoubtedly many other factors influencing whether or not a weather system starting off the coast of Africa has a major, minor, or negligible impact on North America.

So if hurricanes and typhoons are not worse due to global warming, why does it seem to resonate with so many people? As Roger Pielke Jr (*The Climate Fix*) argues, the real issue is development and people living in the path of hurricanes that even our recent ancestors avoided. For example, the coastline of Miami has become vastly more developed than it was a century ago. A hurricane back then might only have produced the, "Hurricane wipes out palm trees" headline, but now it produces "Hurricane kills people" type headline. The latter phrase catches the attention of the public, and also that of insurers having to pay out large settlements. Supporting the role of development in our perception of hurricane severity, the most hurricane damage occurred in the United States during 1991-1994, a period that was also the quietest for hurricanes! People are getting in the way of natural events, such as hurricanes, and this amplifies public perception of the intensity of these events. The same problem seems to apply to flood damage, not surprising considering that when safer prime land is exhausted developers turn to riskier areas. They are not required to absorb the cost, or any portion of it, for building in the path of severe weather events. The profits are for developers while costs are for taxpayers and insurance companies, although the latter ultimately transfer these costs on to individuals in terms of higher premiums.

IS THERE ANY WAY TO SEE WHAT A GLOBALLY WARMED ENVIRONMENT IS LIKE?

So far we have seen what greenhouse gases and global warming appear to contribute to, and what they likely do not. It would be nice if we had an example of a globally warmed world that we can look at and observe the changes. That example is the Paleocene-Eocene Thermal Maximum (PETM) occurring some 56 million years ago, long before we arrived on the scene. Over a period of 20,000 years or so greenhouse gases rose dramatically and the planet warmed. The reason for this warming obviously could not have been mankind, but seems to have involved the release of carbon stores that occurred when the supercontinent Pangaea broke up. Molten rock and intense heat rose up through a landmass encompassing what is now Europe and Greenland. Baked carbon rich sediments released CO₂ into the atmosphere.

Another source of greenhouse gases during the PETM consisted of methane, the simplest hydrocarbon consisting of a single carbon atom surrounded by four hydrogen atoms. Methane hydrate is an ice-like compound with water molecules surrounding a single molecule of methane. This compound is stable only within a narrow range of pressure and low temperatures. Deposits of methane hydrate are found in Arctic permafrost, under the sea floor, and on slopes linking the continental shelves to the deep abyssal plains. With the tearing apart of landmasses and formation of the North Atlantic Ocean, massive amounts of methane hydrate were likely released. With 25 times the warming power of CO₂, and conversion to CO₂ after a decade or two, this methane release was a major factor, something to keep in mind when we consider current global warming and its impact on Arctic permafrost. It also appears that man-made global warming is now heating up cold ocean water, and releasing methane from the slopes linking the continental shelves to the deep abyssal plains, as occurred during the PETM.

Let us now look at environmental change associated with the PETM. Beyond any doubt things were very warm with a temperature increase of about 8 degrees Celsius. The region of the world including China, India, southern Europe, and the United States, that now includes half of the current population, scorched at over a hundred degrees Fahrenheit day and night. Animal and

plant life migrated to the colder regions to the north and south. Ocean temperatures increased from top to bottom, such that the bottom was around 60 degrees Fahrenheit (F), up from the normal temperature of just above freezing. Arctic ocean temperatures in the summer rose to 74 degrees F. All that nice land ice keeping sea levels down was completely melted and sea levels increased by 220 ft! Recall I mentioned that a rise of about 1 meter (just above 3 ft.) is a reasonable estimate for what might occur by 2100 or so. Maybe that reasonable estimate is not so reasonable.

Acidification of the oceans evident with current global warming characterized the PETM, resulting in the virtual elimination of sea creatures relying on calcium carbonate. Goodbye corals and most shelled organisms. Oxygen levels on the sea floor were greatly reduced, leading to the death of additional marine organisms. Forests appear to have dried out in some areas likely contributing to increased forest fires, and insect populations grew. Consider how the mountain pine beetle might flourish in such a world. Clearly the PETM suggests that we might consider formally changing the term global warming to global warning. Some might question whether or not we can compare the PETM to the present. The evidence indicates that such a comparison is wise.

The burning of fossil fuels since the eighteenth century with the advent of industrialization, has released more than 300 billion tons of carbon into the atmosphere. Sounds like a lot but it only represents a tenth of that still in the ground transferred to the atmosphere during the PETM. Estimates suggest that if fossil fuel burning continues unabated we will be at the same place by 2400 as the PETM, making it an ideal model of what advanced global warming will look like. Interestingly, the situation might end up being worse than the PETM, because the time frame for change is a crucial factor in the ability of ecosystems to adapt. Prior to the PETM during the Cretaceous period, that ended 65 million years ago when an asteroid impact killed the dinosaurs, the world was a hothouse. Research indicates that species adapted better to this warming because it occurred over millions of years instead of the 20,000 of the PETM. Imagine if global warming and related changes were to occur over only 500 hundred or so years! Oh, but that is precisely what we are into now with global warming.

CAN WE DO ANYTHING ABOUT GLOBAL WARMING?

I sincerely hope that by this point no reader seriously doubts that we need to do something about global warming. If the problem continues unabated we are all in trouble. We are engaging in self-destruction, and certainly as pertains to our children and grandchildren. Anyone thinking that all is well should consider donating their brain to medical science, as it might go a long way in helping us understand how some people place massively positive spins on experience, even in the face of truly negative evidence. I know a person who was diagnosed with a form of blood cancer that few people survive. He never doubted he would live and sailed through chemotherapy remaining free of cancer ever after. Unfortunately, with global warming we are talking about a much more extensive system not likely to be profoundly, or even slightly, influenced by our best positive spins. I will assume that the majority of readers are with me that we should do something about global warming. Please note that I have not said what we should do or how much of it, just that we do something.

Surveys and just everyday conversation backs up the position that people are interested in doing something. The problem is that people are very confused about what to do and how much of it. Pessimism enters the picture with many hearing how it will all be too little too late. The failure of governments to address any of the global warming issues in a constructive fashion reinforces this pessimism. There is also opposition to any substantial change, such as opponents of wind farms arguing that our health suffers from wind turbines, and that too many birds and bats are killed. Then there is the hyper-growth focus of the economy with hyper-consumerism supporting it, requiring ever increasing fossil fuel consumption. Understandably the average person, and even those familiar with the issues, are doubtful we can do much, or that much will ever get done.

Fortunately, optimism is warranted based on a realistic option that will involve limited upfront expenditures and overall cost savings, plus many side benefits. As with any solution this one is going to take time, in the range of 20 to 50 years, so the sooner we start the better. First, however, let us consider the various things that we might try and do in response to global warming. Three general types of strategies have been proposed: Prepare so we can

adapt, reduce CO₂ emissions, and remove CO₂ from the atmosphere. These types of action are not mutually exclusive, and any sensible person will agree that working on all three is the best way to go. This latter statement is important to keep in mind because often when a viable solution is proposed for a problem, people forget all others that can play a major role in the final outcome.

Prepare:

Be prepared as the Boy Scouts like to say, and prepared is what many parts of the world will have to be. Already some nations vulnerable to rising sea levels are taking action. In the Netherlands floating homes are being built and people are already living in them. Images of houses floating around come to mind (do I see a comedy movie here?), perhaps with piloting capacity so you can drop the kids off at school and then float to the office. Of course the school might float as well, so it could come to your house. Humor aside, these solutions are highly innovative and might allow a low-lying nation such as the Netherlands to survive, as opposed to becoming a scuba attraction. Along the same line, the Maldives has embarked on a highly ambitious project to build floating islands! A Dutch company has been partnered with bringing their experience and ingenuity to the project. Diagrams of the islands are stunning with multilevel green spaces and accommodations underneath the terraces. The price tag for even one of these islands must be incredible, making it hard to imagine how this could be done for the whole country, but at least they are trying. Beyond this ambitious project the Maldives government is buying up land in nearby countries in anticipation of moving some of the population, and has gone carbon neutral to limit their own contribution to global warming.

On a somewhat more modest note, countries might try to restrict development to areas elevated enough to survive at least a one or two meter rise in sea levels. Of course development is difficult to control, and as we have seen more people are getting in the way of unpleasant natural events, with developers only focused on profits more than happy to accommodate these desires, and even create the market. However, to be developing in areas that will be underwater without heroic measures is certainly either very

shortsighted, plain crazy, or both. People must consider these issues when thinking of building in a given area, and politicians and regulating agencies need take this into account when approving projects. Pushing costs down the road is a popular strategy, but the costs might prove far too great favoring a more conservative approach, such as simply not developing regions that are projected to be submerged in several decades.

Forest fires are a consequence of global warming in some settings, and dead tree removal is a strategy to reduce this risk. In Colorado where trees tend to be densely clumped, removal in select areas where people frequent such as parks is ongoing. Governments in western Canada and the United States are trying to provide incentives for companies to harvest beetle-killed trees. The commercial timber life of these dead trees is about 8 to 10 years. Some effort is even being directed towards using these trees for biofuel or biopower. As with the flooding consequence of global warming, preparation strategies for forests are important. Unfortunately, a major problem with this approach is that it only works for some of the global warming impacts, and to a limited extent. Acidification of the oceans is an example of a global warming impact that we are really powerless to do anything about. Floating homes or islands are a very costly solution that might work to a limited extent for some wealthy individuals and nations, but are out of reach for most people of the world. Likewise, it will likely prove impossible to remove and market all the pine-beetle killed timber.

As is evident from the examples provided a lot of ingenuity is being applied to manage and prepare for global warming related events. Our ability to devise and modify technology suggests that further steps can and will be taken. Regrettably, these might prove to be grossly inadequate if we get to the point where sea levels rise above 200 feet, and most of the currently inhabited world is baking. In addition, it is a sad state of affairs given human ingenuity and technological ability to let it come down to preparing as best we can. Sure for earthquakes this does make sense, as we cannot predict when and where they will occur to any great degree of accuracy. Since buildings kill and not earthquakes, constructing earthquake resistant buildings has proven very successful. The 2010 Haiti earthquake was so devastating not because of the event

itself, but due to the interaction of the event with shoddy construction and the high-density population in the capital city. So while global warming preparation is important, hopefully we will not rely on this approach as our major one.

Reducing CO2 Emissions:

Most attention by far has been directed to this category of global warming response, and you would have to be living in the most remote part of the world, or perhaps moon, to not have heard of many of these options. Generally speaking ways of reducing CO2 emissions can be divided into improved efficiencies and switching to greener sources of power.

Improved Efficiencies: We all are aware of much more efficient light bulbs that can save a great deal of energy, and hence money, for both individuals and businesses. Appliances of old were energy consuming monsters compared to the greater efficiency of modern units. Efficiency certifications such as Energy Star indicate that a product is a winner in terms of the energy required to operate it. Many individuals and businesses have already made the switch to more energy efficient lighting and appliances. Even entire houses and building have been designed based on principles of energy efficiency, with the LEED (Leadership in Energy and Environmental Design) representing the highest of green standards. One component of LEED design is high efficiency windows that quadruple the thermal performance of double pane glass, and can be made from regular glass. Windows of the Empire State Building have been converted. Other innovative strategies applied to buildings and homes include white roofs reflecting heat thereby lowering cooling costs, and green roofs insulating against heat and cold while absorbing storm water.

Great improvements in energy efficiency have also been made in transportation. Efforts are focused both on improved mileage using regular fossil fuels, and use of greener strategies such as hybrid and purely battery-operated cars. Currently the gas-guzzling beasts of the recent past are being replaced with vehicles with a much reduced carbon footprint. So-called Smart City Technology can assist in the energy efficiency of transportation, such as by informing drivers of what roads, or even sections of a

parking lot, are crowded to prevent congestion and unnecessary burning of fossil fuel. All these efforts are to be applauded both for the designers of the technologies and users, because overall they are significantly reducing our carbon footprint.

Greener Sources of Power: Green energy provides lower carbon energy than burning fossil fuels. Wind turbines harness the power of the wind in a similar fashion, but at a much larger scale, than farmers of the past using energy from windmills. There is solar power taking sunlight and converting it to energy, either solar-thermal or solar-photovoltaic. Solar-thermal is more for large-scale applications with focused sunlight heating water or oil based fluids. The heated fluid is carried in pipes to a heat exchanger, where it is converted into steam to drive turbines. Solar-voltaic generates an electric current using two layers of semiconducting material. When sunlight is absorbed, excess electrons move from one layer to the other generating an electric current. This type of solar power is suitable for smaller-scale applications such as on rooftops.

A major issue with wind and solar energy is that they are not always available, and the energy generated has to be stored for when the supply diminishes. Even placing wind turbines in very windy areas and solar power devices in sunny locales, does not guarantee a constant supply of the natural ingredient. At night solar power is of course inactive, and cloudy days cannot be controlled. Storage of the energy is a major limitation, as there is currently no cost effective way to store the energy until when it is needed. With coal fire plants the burning of fossil fuels can just be increased or decreased to align with demand. An interesting option is to create a high voltage backbone akin to major highways for the power grid. The existing grid in North America cannot reliably handle huge bulk transfers, as with an inflow of green energy from wind turbines or solar power. A new high voltage system could handle this input shunting the power to where it is needed. No new technology is required, but the cost is about 2.6 million dollars per mile, and in the United States alone 19,000 miles of transmission are involved. Another impediment is the lack of commitment on the part of the relevant governments to integrating the electrical system on a continental scale.

Geothermal and ocean wave power are additional sources of green energy. Geothermal power relies on so-called hot rock within the earth that is fortunately present in many areas. In the best scenario heated water flows up by itself, but most areas with geothermal potential have “hot dry rock” requiring fresh water to be injected down and then recovered. The additional effort required with the latter type of rock reduces the efficiency of the system, as power is needed to inject the water, and valuable fresh water is consumed. With either wet or dry hot rock the heated water is typically converted to steam that drives turbines. An advantage of geothermal power over wind and solar is that it is always available, and the flow can be turned on and off to align with demand. Ocean wave power is more in its infancy than wind, solar, and geothermal, but has real potential in select areas. As the name implies, the immense power of waves is the basis of this green source of power. Strategies can vary, one being to build steel or concrete columns open below to the water and closed at the top. Wave action alternately pressurizes and depressurizes air at the top driving a turbine. Given that wave action in certain areas, such as the Pacific Northwest, is quite constant it could provide a steady source of energy.

Two green sources of energy that have been around now for quite some time are hydroelectric and nuclear. Hydroelectric involves harnessing the power of rivers and waterfalls to turn turbines that generate power. Frequently a dam is built to control the flow of water to turbines, such as at the impressive Hoover Dam. Unfortunately, this green source of energy appears to have reached its peak in almost all areas. In Canada, an amazing 61% of total electricity consumption (as of 2008) is provided by hydroelectric power, making it difficult to imagine increasing reliance on it further, although a new Niagara Falls project is providing power to about 160,000 homes. The United States meets only about 3% of its electricity needs with hydroelectric power, and there are few options for increasing this percentage short of buying Canadian generated hydroelectric power. Many argue that hydroelectric power is already overdone, being responsible for environmental damage related to altered and reduced water flow, and flooding of areas above dams. Major expansion of this green

source of energy is unlikely, and in some instances dams are being decommissioned.

We are all familiar with nuclear power and the potential risks. Nuclear power is really nuclear fission, whereby atoms are split releasing enormous amounts of energy. Nuclear fusion is a process occurring in the sun involving two or more atomic nuclei fusing to produce a single heavier element, such as hydrogen nuclei combining to make helium. The formed element is slightly lighter than the ones creating it, and the extra mass is transformed into energy. Nuclear fusion is the holy grail of clean energy, in essence giving us the power of the sun in a much more limited, and hopefully contained manner. However, by any reasoned estimate we are a long way from developing nuclear fusion as a viable and cost effective source of energy, perhaps even centuries, so it is not reasonable to consider it as a source of green energy we can expect to have any time soon.

The green sources of energy mentioned so far have been those contributing to the power grid, but what about switching from fossil fuels to greener fuel. Biofuels seem to be the most popular answer and ethanol from corn and sugar cane has entered gas tanks. It's all good, right? Let us take a closer look. To make biofuel plant material has to be fermented, much as with making the alcohol that we drink. Yeast or bacteria is mixed with the plant material in large tanks, and as the little organisms digest the plant material they release ethanol. The desired product must be distilled as with beverage alcohol, a process consisting of heating the mixture to boil off the ethanol and trap it in a separate container. You might ask where does the energy come from to boil off the ethanol? Good question, and as it turns out from fossil based fuels like coal or natural gas.

The energy that is derived from biofuel turns out to be only somewhat greater than the energy that goes into producing it! The input-output ratio is much better for sugar cane than for corn, however rainforests that absorb CO₂ from the atmosphere are being cut down in some instances to grow the sugar cane. Weighing into the equation the energy consumption involved in land clearing and the overall impact of deforestation, it turns out that the CO₂ release and consequent global warming resulting from sugar cane, and some other biofuels, actually appears to

exceed any reduction achieved by replacing good old gasoline. Furthermore, a gallon of ethanol only provides two-thirds the energy of a gallon of gasoline. Corn-based ethanol produces another problem, namely that corn for food is diminished, diverting it from the mouths of the billion or so people who are hungry each day. In the United States 40% of corn cropland has been diverted for biofuel driving up corn prices. This intensive industrial farming has also produced a massive dead zone in the Gulf of Mexico, caused by fertilizer runoff in the Mississippi River favoring the growth of algae. It has been suggested that what will destroy the planet is not global warming, but changes resulting from biofuel development. Sometimes it seems like we just cannot win.

A potential solution that seems great on the surface is so called grassoline—Instead of using crops like corn and sugar cane, fast growing grass and waste vegetation like the discarded remains of annual crops are used. The major problem here is that nature has evolved great strength in the cellulose walls of plant material, and chemically breaking down those walls to produce a fermentable solution is extremely expensive and energy intensive. Another option is using algae to produce fuel in the form of plant oil. Some strains of microscopic algae can harness 3% of sunlight to make plant material, as opposed to 1% for corn and sugar cane. Ponds of algae could conceivably produce plant oil for fuel. Although this is a potentially solid option requiring further work, there are numerous problems the first being how to preserve the algae against the elements and predators. To ensure that algae grow well nitrogen and phosphorous must be provided, adding cost and environmental impact issues. Furthermore, mature algae cell walls will not give up the oil easily and must be broken down using fossil fuel energy. As with corn and sugar cane, the overall cost-benefit ratio might not be that favorable.

While biofuels do seem to present an option for greener energy to put in our gas tanks, the promise might be a false one. The best-case scenario is that they will offer an alternative source of fuel with a poor input-output ratio, particularly when several undesirable byproduct effects on the environment are taken into account. Despite hopes, scientific and business knowledge, and massive government subsidies, no biofuel has come close to the

cost of fossil based gasoline. Without the financial subsidies the costs are so much higher that few will switch to biofuel. Using electricity to fuel cars is a promising option, but of course the power must come from the largely fossil fuel based power grid, and batteries capable of providing long-range capacity are difficult to produce.

What Might Green Sources of Energy Achieve? We have looked at green sources of energy and how there are significant limits on some, such as furthering the use of hydroelectric power and the poor input-output ratio of biofuels. However, the important question remains of what can green energy achieve in terms of reducing CO₂ emissions? I will focus on sources contributing to the power grid and not fuels, because as we have seen gasoline is not going to be replaced by biofuels any time soon, and the net benefit of biofuels to the environment and the level of atmospheric CO₂ is highly questionable. In addition, the preference of many people for large vehicles worsening global warming does not seem to be disappearing.

How much energy do we actually use? It is very crucial to understand our real energy usage if we are to arrive at a way of dealing with it. I will apply the analysis conducted by Roger Pielke Jr. in *The Climate Fix*, as it is both very comprehensive and revealing. As of 2006 the world consumed about 472 Quads of energy per year. To give a feel for how much power this is, a Quad is 11,000 megawatts and the average nuclear power station generates about 750 megawatts of power per year. Hence, it takes about 15 nuclear power plants to generate 1 Quad of power, or about 7,080 nuclear power plants to meet the worlds current energy needs. There are presently only 430 nuclear power plants with 474 planned. Clearly we love energy, and in nuclear power plant equivalents we are far short of what is needed.

Planning for energy usage cannot stop at what we currently use because demand is increasing. Gross Domestic Product (GDP) is the value of all goods and services produced within a nation in a year, and an indicator of economic growth. As the GDP increases so do carbon emissions according to an analysis by, Maddison and the US Energy Information Administration. Assuming a modest increase in energy consumption of 1.5% per year, based upon

ongoing economic growth, we have to add 206 Quads of energy used per year for the entire world by 2030. In nuclear power station equivalents that means adding about 3,090 more such power generation facilities. Oh, and we forgot about the 1.5 billion people who do not have access to electricity currently, but should have it. We will obviously need a lot more energy in the future.

To give another perspective on the need and what it will take in terms of green energy, if we were to reduce 2006 fossil fuel consumption levels by 10%, it will require 692 new nuclear power stations, 157,000 solar thermal plants, and 625,000 wind turbines to achieve it! That is for a 10% reduction, and we are not factoring in increasing energy consumption with economic growth, and those 1.5 billion people that have to be granted access to power. What about achieving the Copenhagen Consensus on Climate Change of 50% below 1990 levels by 2050? Between 1990 and 2012 the world's use of fossil fuels only decreased from 88% to 87%, and renewable sources now comprise just 3.35% of the total, according to energy researcher Yaclav Smil. Factoring in ongoing economic growth and those 1.5 billion people not on the system currently, it would take the equivalent of something like 12,000 nuclear power stations, requiring us to build one per day until 2050. It is difficult enough to get one built in most countries let alone 12,000 worldwide.

At this point some astute readers will suggest that the problem is economic growth, and that if we reduce it our power consumption needs go down. The IRON LAW as Roger Pielke Jr. refers to it kicks in at this point—Whenever, economic growth and global warming concerns counter each other economic growth always wins. Presently, no country is going to voluntarily give up on economic growth. But is endless economic growth inevitable? In an ideal world no, and such growth ultimately requires cheap and abundant resources that are rapidly dwindling. Biological organisms do not grow forever and endless growth is impossible as we learned in the Taking The “Devil” Out Of Development chapter. Many businesses like family owned small-scale operations make a profit, but one that remains relatively consistent over time. So there is no absolute reason why endless economic growth should be required. However, so long as it is insisted upon by corporations, shareholders, and politicians essentially working for corporations and the financial elite, we have no chance of

controlling global warming via green energy, or likely by any alternative or combination of options for very long. Furthermore, if the unsustainable drive for endless growth requires that all global warming moderation strategies fully align with economic considerations, there will be very few if any options available to us.

For the present we have to assume that economic growth will not be sacrificed voluntarily. Leaders of developing countries like India have been very public about this reality, and if you look at what has happened since global warming became a concern, it is obvious that economic growth never loses to global warming. Hence, global warming moderation strategies must align with economic growth if they are to succeed. For example, many companies have adopted green policies not because they are being altruistic and willing to sacrifice financial growth. No, they make the switch because the economics favor it. For example, recycling waste cuts way down on the costs of disposing garbage. Even if there is a small up front economic hit there are compensating benefits in other ways, such as attracting environmentally conscious consumers who will buy their products over those of less green competitors, or tax advantages. The second iron law of global warming might then be—Global warming moderation strategies must align with economic growth considerations if they are to succeed. Although it follows directly from the first iron law, it emphasizes what must be present in any global warming moderation proposal if it is to be a winner, at least within the current endless growth economic world.

Anyone concerned about the environment has to feel some degree of frustration about the agonizingly slow switch to green energy. We have been hearing about global warming and related climate change for many years now, but nothing really changes. If anything we seem to be building more coal fire plants and relying more on fossil fuels. Are we insane? Well perhaps we are but the iron laws of global warming show us why the shift to green energy is not taking place—Simply put, it costs too much and hence does not align with economic considerations. China burns more coal than the United States, Europe, and Japan combined, because its economy is growing with manufacturing requiring cheap energy. Manufacturing as a component of the economy is declining in North America and Europe, but we are still increasing our energy

consumption. We can blame China, but this is pointless because they are doing what we all are, putting economic growth before global warming considerations. Take yourself for example, while you might be willing to spend slightly more for green energy, if you are like the vast majority of people, slight will be the operative word, because even a modest increase in your energy costs will not be accepted. In 2009 a poll was conducted in the United States asking respondents about their willingness to support a proposed climate bill in Congress, at three different levels of annual cost per household. At \$80 a majority supported it, at \$175 support dropped by half, and at \$770 ten times more respondents opposed than supported it. Even \$770 per year per household could be seen as moderate but opposition was enormous, with support really only found for the low amount of \$80 per year. So how can we expect China or any country to accept much higher energy costs that counter economic growth? We simply cannot in the context of our current economic model.

Green energy costs far more than coal, much as unsubsidized biofuels do compared to gasoline. Of course if full environmental accounting was required, and producers and consumers of "dirty" energy paid for negative externalities, the cost of green energy sources would be closer to that of coal and gasoline. Something referred to as, the green paradox, adds another layer of complexity to the situation. The green paradox reflects how markets actually work focusing on what would happen if green energy all of a sudden dropped in cost. Some people assume that everyone would rush to buy green energy and that would be that. Market forces, however, dictate that suppliers, of let us call it dirty energy, would cut the cost of their product to outcompete green energy, ensuring that most customers will not switch over to the latter product. Can you imagine suppliers of dirty energy saying, "Well that's it then, let's just shut the doors for good." No, they will fight for their survival. Of course if the cost of green energy dropped greatly, such that the costs of dirty energy cannot compete, then green energy wins in regards to the iron laws. Unfortunately, we are a long way from this scenario. Vastly increasing the supply of green energy will reduce the cost due to improved efficiencies, but this will not be enough to successfully compete with dirty energy. Some argue that natural gas and

fracking to bring it to the surface are a key part of the solution, but there is a lot of debate regarding the safety and environmental impacts.

Fracking involves drilling into shale deposits and injecting millions of gallons of water, chemical lubricants, and sand at high pressure to fracture the shale and allow trapped natural gas (or oil) to travel up the well. The main component of natural gas is methane, and the possibility exists that disturbing deposits of natural gas will allow methane to escape into the atmosphere, mitigating any pluses in reducing global warming by burning natural gas (from fracking) over coal. There have been numerous reports of methane emerging from taps in homes located near to fracking areas, providing support for this assertion. In addition, groundwater is often contaminated due to the chemical lubricants used, adding a massive environmental cost. The rush is on to maximize this source of natural gas (and oil) without due diligence in testing for health and environmental impacts.

We Are All In A Very Big Bath Tub:

Let us assume for the moment that we live in an ideal world where the iron laws do not apply. Would everything be fine with us simply switching to green energy and driving atmospheric CO₂ levels right down? The answer appears to be no. First, there is the matter of how great the increase in green energy would have to be covered earlier, keeping in mind the provision of power to the 1.5 billion people lacking it now. Also, we might want to consider that the population of the world is growing, and these extra people will also want affordable power. Second, and more profound is what is known as the bathtub analogy. When water is run into a bathtub there are input-output forces to consider, although I suspect most of us look at a bathtub as a place to get clean or relax. Science is everywhere, including in your bathtub, but please resist the temptation to imagine a scientist peering up from the drain. If the water is running and the plug is in, the tub will overflow. When the plug is removed the water drains, but what if the plug was only partially removed or plugs with varying sized holes substituted. Also, we will adjust the flow rate. Whether the water volume in the tub increases, remains the same, or decreases, depends on the rate of inflow compared to outflow. In the same way atmospheric CO₂

levels depend on the relationship between emissions and CO₂ removal by so-called carbon sinks, or natural ways that the earth reabsorbs CO₂ from the atmosphere.

The concept that I am about to present is one that even graduate students at MIT have trouble understanding, according to John Sterman, an expert on this process, who cites it as a cognitive limitation blocking effective global warming solutions. So if you follow this you are ahead of many graduate students and on the path to solving the global warming problem. It is often assumed that if we substantially cut CO₂ emissions atmospheric levels will plummet, analogous to simply pulling the plug out of the large bathtub we are all in. Unfortunately, this large bathtub has a plug containing only a small hole limiting the overall capacity of the environment to remove CO₂ from the atmosphere in a given time frame. CO₂ levels will not plummet and might even continue to rise. The reason has to do with the capacity of carbon sinks.

Different natural carbon sinks exist, the major ones being plants and soil, oceans, and mixing with rocks and minerals. Plants and soil absorb CO₂ rapidly, but this carbon sink is currently limited due to deforestation and the agricultural system we have adopted, the latter a topic we will get to shortly. The ongoing deforestation of the world does not help at all, because large trees provide some of the best CO₂ absorption there is. Since deforestation fosters economic growth, stopping it to moderate global warming violates the iron laws, meaning that we cannot expect it to end with the current endless growth economic system. Oceans can absorb a massive amount of CO₂, but it is a slow process over decades and centuries. CO₂ laden ocean water sinks depositing the CO₂ deep down, but this sinking process only occurs at the poles limiting the speed, as with a bathtub plug possessing a couple of very small holes. Rocks and minerals that are broken up through weathering and other processes can absorb all the CO₂ we are putting out. Even calcium carbonate will be returned to the sea as atmospheric CO₂ binds with calcium leached from rocks by rain. The only problem is that CO₂ absorption by rocks and minerals occurs over centuries and millennia, so it will all be good in about 10,000 years. Think of a microscopic hole in our bathtub plug.

We are all in this large tub that is overflowing with CO₂, and even if we get around to radically reducing CO₂ emissions (very unlikely), the concentrations of this global warming gas will remain elevated, and maybe even increase for years to come. BOY, ARE WE IN TROUBLE! At this point most of you are likely feeling somewhat down, maybe even depressed, and not seeing much hope. Perhaps some of you have taken a break and gone on line to see if you can volunteer your children or grandchildren to be the first to colonize Mars. But are things hopeless? Should we be investing in massive arks to carry civilization as the seas rise? There is one more option available to us, that being to scrub or artificially remove CO₂ from the atmosphere.

Scrubbing CO₂:

Artificial removal of CO₂ from the atmosphere can be achieved by technology. For years CO₂ from human respiration has been scrubbed on submarines, spaceships, and by scuba rebreathers using filters. Building machines that can scrub CO₂ right out of the air is a brilliant idea. Although designs vary the basic principle is the same. Wind enters the machine through inlets and comes into contact with filters laced with an absorbing agent. CO₂ is acidic and a base such as sodium carbonate is used in the absorbing agent. Contact with the absorbing agent draws CO₂ out of the air, forming sodium bicarbonate or baking soda. Through chemical means the CO₂ is recovered and compressed to a liquid. Once in liquid form it can be stored deep underground where it will remain, at least theoretically, being absorbed by rocks and minerals.

Wow, does that sound great! It actually sounds more than great, and maybe too good to be true. As it turns out there are several problems with this option, the main one being the cost-benefit ratio. A detailed economic analysis by Jennifer Wilcox of Stanford University and colleagues, published in the Proceedings of the National Academy of Sciences in 2011, found that the cost-benefit ratio does not justify these approaches. Substantial energy and associated costs go into these machines, with manufacturing of the housing and materials, and powering of the unit so that CO₂ can be captured, separated, and compressed into a liquid. Then there is the cost of storing the liquid CO₂ with another analysis

showing that the amount of metal piping required to do so would be virtually astronomical. Where would all the energy come from to manufacture the scrubbing machines and piping to store the liquid CO₂ underground, and power the process? If it comes from fossil fuels the benefit is not there as CO₂ emissions from the required fossil fuels are far too great. If the energy comes from green sources, it is best to apply it right to the grid to reduce our reliance on coal and natural gas.

Even the economic cost itself is too great amounting to \$1,000 per ton of carbon, equivalent to a \$10 per gallon tax on gasoline to cover it. In contrast the cost to scrub CO₂ right from the smoke stacks of coal fired power plants is only \$50-\$100 per ton, and these are crucial point sources of CO₂ emissions. Ah, so why do we not add scrubbers to smokestacks of coal plants? The why is that it costs too much raising the price of previously cheap energy. China has indicated that it is too expensive to add these to the coal fired power plants it has, and is producing more of these plants every day. Once again we see that when global warming moderation efforts counter economic considerations, the latter wins every time. If the much lesser cost of point source CO₂ scrubbing will not wash, excuse the pun, then there is no way that the much more expensive CO₂ air scrubbers will ever fly.

We do seem to be running out of options and colonization of bleak Mars is looking brighter. Perhaps due to desperation, human creativity, or a bit of both, some more let us say oddball solutions have been proposed, and even tried. One such scheme arose from the realization that phytoplankton (plant marine organisms) blooms in the ocean are limited by not nitrogen and phosphorous, but by iron. Dust rich in iron blown from African deserts and falling in the Atlantic, has triggered phytoplankton blooms. The logic went, that if we add a large amount of iron to the ocean we might induce more phytoplankton growth that in turn absorbs CO₂ for photosynthesis. As the phytoplankton sinks down it takes the CO₂ with it, thus taking care of our atmospheric CO₂ problem. As you might imagine the project failed because of unforeseen consequences. As the plankton sank it also took with it nitrogen and phosphorous, reducing the amount available in other parts of the ocean, thereby limiting the growth of CO₂ absorbing marine plant life in more distant areas.

The spraying of aerosol particles into the atmosphere to reflect sunlight has been another solution of this type. Observations of ash sent into the high atmosphere from the 1991 Mount Pinatubo eruption, revealed that even though there was a sunshade cooling effect it was very brief, because the particles settled out of the atmosphere very quickly. So any aerosol strategy would require ongoing seeding at a staggering cost, and even then there could be unanticipated and dangerous consequences we cannot predict. Interestingly, over the last couple of years the pace of global warming has slowed slightly, largely due to the high number of volcanic eruptions and the reflecting of sunlight by the released ash. Unfortunately, as the ash settles out of the sky global warming will return to its normal pace, and maybe even make up for the delay.

In evaluating the potential of any so-called, geoengineering project, the criteria proposed by Dan Sarewitz and Dick Nelson, published in *Nature* (December 2008) are useful to consider. First, the strategy must have an established base of knowledge and experience, improving upon what already exists. Second, there must be a clear link between what the strategy is designed to do and what it actually does. Third, the results must be clearly measurable. Based on these criteria iron to grow phytoplankton and spraying aerosols into the atmosphere fail miserably. There is no solid knowledge or experience other than somewhat related observations of natural phenomena, what they actually achieve is not always what they are intended to, and it is difficult to assess impacts. In contrast, scrubbing CO₂ from the atmosphere with filters is based on existing technology, there is a clear link between what it is intended to do and does, and the results are fairly easy to measure. Unfortunately, the cost-benefit balance is not at all favorable.

So where does this leave us? Are we out of options? There is one more possibility that actually involves returning the earth to how it was prior to our changing it with annual plant agriculture. This strategy offers the possibility of massively ramping up the plant and soil carbon sink, and given the rapid absorption of CO₂ via this route atmospheric levels could actually plummet. It brings to mind *War of the Worlds* where all our sophisticated technology, nuclear included, could not stop the invading Martians, but simple

and natural common cold viruses could. Let us consider this hopeful scenario.

CONVERTING AGRICULTURE FROM ANNUALS TO PERENNIALS:

Annual plants add CO₂ to the atmosphere, whereas perennials remove it. It has been estimated that while annuals add about 410-1140 kg of CO₂ per hectare per year, perennials remove from 200-1050 kg of CO₂ per hectare per year. Common (or previously so) perennial grasses can even absorb and store a staggering 500-2,000 kilograms of carbon per hectare! To place the CO₂ scrubbing capacity of perennials in a more meaningful context, the United Kingdom's Biotechnology and Biological Services Council has calculated that if we replaced only 2% of annual crops with perennials, we could remove enough carbon from the atmosphere to halt the increase in atmospheric CO₂! If we were to replace all farmland with perennials we would sequester about 118 parts per million of CO₂, enough to return the world to preindustrial levels! In addition, plants and soil sequester atmospheric CO₂ very quickly compared to the other major carbon sinks. This is amazing, particularly considering the dismal scenario for managing global warming that we were looking at until this point. But how can this be?

The planet appears to require perennial vegetation to sequester carbon from the atmosphere. CO₂ is absorbed for photosynthesis and the carbon enters the soil via the roots. In forests virtually all vegetation consists of perennials, including trees and shrubs. Roots that commonly spread twice the height of the tree, and in many cases fairly deep in the ground, deliver carbon to the soil, the most significant carbon reservoir. On prairies, steppes, and the tundra, virtually all vegetation consists of perennial grasses and plants. Perennial plants have roots extending about 8-12 feet, as opposed to 1 ft for annuals. The capacity of perennials to transfer carbon to the soil is then much greater; perennial crops can transfer 320-440 kilograms of carbon per hectare per year, compared to from 0-300 kilograms by annuals. Douglas Kell, professor of chemistry at the University of Manchester and Chief Executive of the Biotechnology and Biological Sciences Research Council, estimates

that by increasing soil carbon just 15%, atmospheric carbon levels could be lowered by 30%.

Beyond their carbon transfer ability perennials survive for several years, leaving the soil undisturbed and the carbon trapped inside. With annual agriculture the soil is frequently disturbed for seed planting each year, and plowing the plant refuse underneath after the harvest releases carbon. Of course, decaying plant material itself returns carbon to the atmosphere. Hence, with annuals carbon is released, and with perennials carbon is stored in the soil. A massive benefit then ensues from the conversion of our major annual crops to perennials, in terms of cutting CO₂ emissions while at the same time vastly ramping up CO₂ absorption! Nature had it worked out, until we changed it. Readers knowledgeable about farming might argue that some annual farming does not disturb the soil and release carbon. With high quality farmland there is still a low-to-moderate risk of soil degradation, but only 12% of farmland worldwide is high quality. An incredible 33% of the world's farmland, supporting 50% of the population, is marginal in quality.

Another major problem related to the release of carbon from soil is the washing away of soil by rains. Perennial roots being so deep and extensive keep the soil intact, acting like rebar in concrete. With annuals the roots are shallow and limited, plus they die off each year. Rain can then wash the soil away, and wind can blow off the top layer if loose. On completely level fields the washing away of soil is limited, but a staggering 45% of the world's farmland is on an angle of 8% or greater, and 135 million hectares on an angle of 30% or greater (think ski hill). These inclined slopes are not compatible with annual plants, because the soil rapidly washes away with rainfall. Even targeting farmland on the steepest slopes for perennials would sequester 3.3 billion tons of carbon, a third of what we emit annually. A hundred years of comparing the relative capacity of annuals and perennials to retain topsoil, reported by Gantzer and colleagues in 1990, found that perennials were 50 times better at it.

The water part of the equation is important to consider. With sloping fields not only soil washes away but fresh water, an increasingly valuable commodity, and one that is only going to become more important with an expanding population. Currently we are rapidly depleting groundwater reserves worldwide to supply

annual crop agriculture. When these freshwater supplies run out these crops are finished. Even level high quality farmland loses water with annuals because the root system is so limited. The roots of perennials act like a sponge absorbing water during times of plenty, and releasing it when conditions are dry. Hence, perennials are crucial to fresh water conservation. Related to this function they play an important role in reducing floods that kill people in many parts of the world, via their ability to stabilize the soil.

A further advantage of perennials is nutrient retention. Nutrients such as nitrogen and phosphorous, are absorbed from the soil by fungus in the plant's root system, and transferred to the above ground portions of the plant. The extensive root system of perennials is incredibly well suited for nutrient retention and conservation. Annuals on the other hand are really poor performers in this regard, and soils become depleted of crucial nutrients very quickly. Even with flat high quality farmland where soil erosion can be limited, nutrients are still lost with water runoff. The same applies to fields where conservative tillage (leaving crop residue) and no tillage are applied to conserve topsoil. So how do annuals survive? They only do so with our intensive help in terms of, adding fertilizer to provide nutrients, pesticides to protect the crops, and water via irrigation techniques. These inputs in turn rely on the burning of fossil based fuels, further adding CO₂ to the atmosphere. Without our artificial help involving very costly CO₂ emitting fossil based fuels, annuals would never provide us with the food we need. Much of Africa is currently caught in a vicious cycle, whereby due to food scarcity high yield annual crops like corn and rice are planted, but lack of availability and the high cost of commercial fertilizer greatly limit its application. Consequently, the soil becomes progressively more depleted of nutrients, resulting in diminishing crop yields, more hunger, and further reliance of nutrient depleting high yield annual crops.

One of the more interesting aspects of this story is that without a chemical process invented by the German chemist Fritz Haber early in the 20th Century, 30-40% of the population would not be here given our reliance on annual crop agriculture. Although arguable the most important scientific discovery of modern times, few people are even remotely aware of the Haber-Bosch Process. Haber invented it and Bosch helped commercialize the process,

whereby atmospheric nitrogen is converted into ammonia for fertilizer. In the absence of this chemical process annuals could never supply the food needs of the world, given their poor nutrient retention capacity. Perennials with their excellent nutrient capacity do not require fertilizer, or in the worst-case scenario, only 3% of that required by annuals.

Given the poor nutrient retention of annuals it is not surprising that most of the added nutrients are lost with rainfall, only to accumulate further away. Global data for corn, rice, and wheat annual crops indicate that only 18-49% of nitrogen applied as fertilizer is taken up by crops while the rest is lost. Nitrogen losses from annual crops are 30-50 times higher than for perennial crops. Currently, there are hundreds of dead zones along coastal waterways. The largest of these covers 70,000 sq km, with perhaps the most well known one in the Gulf of Mexico being around 22,000 sq km, this one due to fertilizer runoff from the Mississippi River. They are called dead zones because oxygen is depleted, thereby killing animal species requiring oxygen. When fertilizer enters the sea the nitrogen and phosphorous contained within it promote the growth of small plant organisms (phytoplankton). Bacteria proliferate to eat dead phytoplankton that sinks to the bottom, and these bacteria use up all the oxygen. Consequently, fish and other marine animals die off. Fertilizer based phytoplankton growth also contributes to the die off of corals, such as in the Caribbean. In addition to water-based runoff of fertilizer nitrogen, much of it evaporates to nitrous oxide, a potent greenhouse gas adding further to atmospheric CO₂ levels.

Now you might say, okay I'm convinced that we must switch from annual to perennial agriculture, and wonder why we did not think of it earlier? When looking ahead the solution lying behind can often be missed. We are so used to annual crops that we do not consider alternatives, including what came before them. Our early ancestors saw annuals as the best option because the seeds are larger, and by planting the best seeds from each crop they could increase their yield with succeeding generations (artificial selection). Seeds of perennials are smaller producing a lower yield. Now at this point the skeptics will be thinking that perennials will not work due to the lower yield. Fortunately for us, the small seeds of perennials are not inevitable, but the result of natural selection in

stable and competitive environments favoring longevity. In most natural setting plants compete for resources, such as sunlight, water, and nutrients. Diverting the plants energy to the root system where water and nutrients are absorbed, and making sure that the roots grow stronger over years is the best way to compete. In a setting aided by man that reduces this competitive pressure, larger seeds are definitely possible. Of course, the large seeds of annuals are in large part due to the artificial selection provided by man.

What will it take to switch from annual to perennial agriculture? Presently virtually all of our major grain crops are annuals, the thirteen most common being wheat, corn, rice, soybean, sunflower, oat, barley, chickpea, common bean, peanut, pearl millet, rape, and sorghum. Perennial fruits include apple, apricot, avocado, banana, blackcurrant, grape, kiwi, pear, pineapple, plum, strawberry, and raspberries. Perennial vegetables include eggplant, broccoli, asparagus, leek, potato, rhubarb, spinach, taro, sweet potato, and watercress. Perennial herbs consist of alfalfa, basil, dill, garlic, ginger, horseradish, lavender, mint, onions, oregano, sage, and thyme. Clearly perennials are a type of plant we are familiar with, so the conversion of our most abundant grain crops from annuals to perennials is not radical.

While we are more familiar with perennials than most of us realize, it will take some effort to switch our main grain crops from annuals to perennials. What will be required is a combination of techniques, including artificial selection, hybridization, and genome derived knowledge. Researchers believe that applying artificial selection in a properly managed agricultural environment can produce a good seed yield in perennials. Four characteristics of perennials contribute to this potential, the first being the long growing season. In warmer climates perennials grow all year round providing ongoing food production. In colder climates parts of the root and exposed portion recede or die off during winter, but some of the root remains. Consequently, growth tends to occur earlier in the spring than it does with annuals. For example, in the Land Institutes research breeding nurseries in Kansas, shoots emerge from underground stems (rhizomes) of perennial sorghum a month earlier than shoots emerge from seeds of annual sorghum. Intermediate wheatgrass (a perennial) maintains a photosynthetically active leaf between July and September, when annual wheat plants are not growing at all.

The second characteristic of perennials giving them the potential to provide good seed yields with artificial selection is the very efficient use of nutrients. As reported by Cox and colleagues, in Kansas perennial hay has been grown adjacent to wheat and the nitrogen balance in each has been carefully measured. Both have been harvested for about 75 years, and yield similar amounts of nitrogen in the form of hay or grain. However, 70 kg of fertilizer nitrogen has to be added per hectare per year to the wheat fields, while none is added to the hay fields. Nitrogen levels are far greater in soil growing perennial hay than annual wheat, and the same result has been found for phosphorous and potassium. The third characteristic is that perennials yield a greater amount of overall above ground biomass than do annuals, and through artificial selection some of the carbon can be shifted to grain production. Fourth, perennials with their soil stabilization, and nutrient and water retention ability, are ideally suited to challenging growth environments where annuals do not do well, at least without intensive assistance. Even with human assistance, the soil in many of these regions is not sustainable due to ongoing erosion. Perennial species with high and consistent seed production and other traits suited to robust grain crop yields need to be identified. Then these species can be bred to further increase the frequency of genes for traits such as, large seeds that resist shattering, provision of a high seed yield per unit of land, and synchronous flowering and maturity.

In addition to artificial selection hybridization can be applied to convert our major annual grain crops to perennials. Hybridization is a very complex topic, but it basically involves crossing species, such as annuals and perennials, to increase genetic diversity. In some cases these crosses are infertile and not at all valuable, but in other instances they produce a more effective species. It is really taking advantage of genetic diversity that would be difficult, if not impossible, to achieve through artificial selection alone. Maize was one of the first crops to benefit from hybridization techniques. Fortunately for us, ten of our thirteen most common annual grain crops have perennial relatives, and have already been hybridized. This research is still relatively young and has a long way to go, but we have started the process. So far it has been discovered that hybrids tend to be perennial only when at

least 50% of their genome is derived from a perennial parent. By hybridizing an annual grain crop like wheat to a perennial relative, we might end up with a fully perennial form of wheat that yields large robust seeds. Artificial selection is then applied to a promising hybrid species to further its desired traits, in this case productive and enduring crop yields. So far cycles of hybridization, propagation, and selection in wheat, wheatgrass, sorghum, and sunflower, have produced perennials with characteristics intermediate between wild and cultivated species, yielding improved grain production. Genome mapping is either complete or underway for annual grain crops. This research will likely indicate the genes that are most linked to desired traits. We can then quickly assess the genetic constitution of hybrids to see if they have the most promising genes. This strategy will cut down on the length of time it takes to evaluate the effectiveness of a hybrid through strictly experimental crop yields.

So far everything seems great about converting all our annual crops to perennials, but is there a major downside? Based on the criteria proposed by Dan Sarewitz and Dick Nelson, it fairs extremely well. There is an extensive body of knowledge and expertise pertaining to crops, perennial vegetation, natural selection, hybridization, and genome mapping. A clear link exists between what perennials are proposed to do and what they actually do, in that they do absorb CO₂ from the atmosphere and deposit carbon in the soil. Finally, the results are measurable, and we already have values for their CO₂ absorbing capacity. Okay, that's great but artificially scrubbing CO₂ from the air with filters met these criteria and failed based on the cost-benefit balance. Maybe the same problem will occur with conversion of annual crops to perennials. If the costs are too excessive economic growth suffers and we violate our iron laws—Whenever, economic growth and global warming concerns counter each other economic growth always wins, and the related (but worth emphasizing), global warming moderation strategies must align with economic growth considerations if they are to succeed.

FINALLY, WE HAVE A TRUE WINNER, because the cost-benefit balance is vastly in favor of converting annual crops to perennials. The iron laws align extremely well given that economic prosperity is actually enhanced by this conversion. Farming

whether small or large scale is a business, and a very energy and resource intensive one. Annual crops require precisely timed new seed planting every year and plowing under of prior crop waste, both with significant labor and fossil fuel costs. If there is less machinery involved labor costs go up, and if there is less labor then fossil fuel and machinery costs go up. Then there is all that fertilizer, costly both in terms of the direct expense and the hidden costs of runoff, such as dead zones killing commercial and pleasure fishing. Readily accessible and hence cheap phosphorous, a key element in fertilizer, is being depleted worldwide and thus the costs of fertilizer will likely rise in the future.

Oh yes, and then there is the tremendous amount of fresh water that is wasted with annual crops, particularly on the vast amount of farmland that is sloped. Freshwater must often be delivered to fields, via expensive irrigation processes reliant on the burning of fossil fuels for pumping and manufacture of the irrigation equipment. Furthermore, water usage for irrigation often reduces the amount available for other purposes. Perennials make much better use of natural freshwater, acting like a sponge when it rains and releasing it when conditions are dry. Global warming will probably further reduce groundwater supplies that are currently nearing depletion in many areas, resulting in deficient amounts of this most valuable of resources. Due to their more natural evolution, and resulting genetic variation, perennials are much more resistant than annuals to challenges from harsh conditions, diseases, insects, and weeds. Perennials can survive in conditions that annihilate annuals, and resist diseases better. There will then be fewer costly crop failures with perennials. The lesser vulnerability to insects reduces the need for expensive pesticides that exert costs in terms of toxicity-related human and animal health effects, and rising CO₂ levels associated with their production and application. Given the much more extensive and permanent root system of perennials, they are superior at outcompeting weeds compared to annuals, greatly reducing the need for costly herbicides, thereby providing an additional cost savings.

From a cost perspective there is then a tremendous benefit to converting our major crops from annuals to perennials. This advantage is even greater if we take into account the cost of all the excess CO₂ in the atmosphere, and how perennials will scrub it out.

By switching from annual to perennial crops CO2 emissions are vastly reduced, based on both cutting the release that arises directly from annual crops, and that derived from the massive amount of fossil fuel required to support this form of agriculture. Combine the greatly reduced CO2 emissions with the vast and rapid CO2 absorption capacity of perennials, and it is easy to picture CO2 levels plummeting. In terms of the negative externalities associated with farming, perennials do very well and certainly relative to annuals, given the vastly reduced fertilizer, pesticide, herbicide, and irrigation needs, that all have negative impacts far removed from the farm. As it stands now efforts are underway to develop perennial grain crops, but 10,000 years of going the wrong way does not reverse in a minute. It will take both time and money. Scientists indicate that the time frame is in the region of 20-50 years, with full conversion feasible sometime in the latter part of this range. Ed Buckler, an Agriculture Department scientist at Cornell University in New York, believes that whereas with prior technology it would have taken 100-plus years, we can now do it in 20 years with a concerted effort. This might seem like a long time, but it is realistic and will take care of the carbon we have placed into the atmosphere, hopefully even to that point. In addition, there are really no other viable options that align with the iron laws.

The actual financial cost of converting our major annual crops to perennials is a very important consideration, beyond the time frame. Research is not cheap for anything of significance. The United States alone spends about \$30 billion annually on medical research, and \$80 billion annually on military research and development. In 2009-10 the United States Department of Agriculture provided \$1.5 million dollars in grants for perennial research, and asked Congress for \$1 million for 2012. Carefully note the difference between \$30-\$80 billion and \$1-\$1.5 million. Ed Buckler indicates that \$10-\$20 million a year and dozens of scientists are required to breed perennial corn that could be commercialized. It sounds like a lot and just for corn, but when we compare it to \$80 billion for weapons of destruction and defense it is an insignificant amount.

I encourage the required sums be provided by all governments to ensure the conversion of annual to perennial crops. To cover these costs, I further propose two small taxes at the individual

and commercial level. Given that sentiment is high for doing a little to assist with the global warming problem, a yearly income tax of \$100 per working person, with the option of voluntarily contributing more, be instituted in all countries with such taxes. A global system of taxation as proposed in the Greed: More Is Never Enough chapter can include this tax. At least 90% of this money is to be spent on research and implementation, and a maximum of 10% on related administration costs. In addition a \$5 per metric ton of carbon tax be collected at the end point, much of it diverted to this research, the remainder to green energy initiatives. Support for a green tax of this amount on carbon has come from the CEO of ExxonMobil. Many see this company as the evil villain, but remember no one or everyone is to blame, and we all are enjoying the ultimately self-destructive orgy of fossil fuel energy consumption. The latter tax would raise about \$150 billion per year, providing enough money to successfully convert all our major annual crops to perennials, and further the conversion to green energy.

Regarding the conversion to green energy, it is important that readers do not assume we can go on burning fossil fuels like there is no tomorrow, or there might not end up being a tomorrow that is livable. While perennials excel at scrubbing CO₂ from the atmosphere, there are limits and vastly increased atmospheric CO₂ might well overwhelm this capacity. In addition, readily accessible fossil fuel sources are limited and our society relies on them for needs way beyond cheap energy. The chair you are sitting on probably has plastic parts derived from fossil based sources of carbon, as does pretty much everything you rely on. If we use up reasonably available fossil fuels for energy, then we will all suffer. Gradually converting to greener energy will save fossil fuels for these other uses and reduce CO₂ emissions.

The global warming story that has unfolded is one that seemingly had no happy ending. The conversion of our major crops from annuals to perennials provides a very happy ending, if we rise to the challenge. In contrast to the other potential solutions, that either will not work or have a poor cost-benefit balance, this strategy is a winner. It is the only one that does not violate our iron laws, because based on the highly favorable cost-benefit balance economic prosperity is actually enhanced by it. The relatively low amount of financial investment over a 20-50 year period will be

more than offset by the advantages accruing, beyond the main benefit of scrubbing CO₂ from the atmosphere. Undoubtedly, there will be significant challenge and opposition from the current agriculture industry, including manufacturers of annual seeds, fertilizer, and pesticides, and biotech companies producing genetically modified annual crops. They will undoubtedly apply intense lobbying pressure to oppose research efforts that might undermine their fortunes, and drum up the marketing message that annual crops are the best way to go emphasizing any limitations to perennials. A key argument likely to be made by those who wish to see annual crop agriculture remain firmly in place is how it has fostered the Green Revolution.

With increasing populations after WWII severe food shortages appeared inevitable. To the rescue was industrial agriculture based on monocultures of annual seeds. Large fields utilizing one seed type produced tremendous amounts of food for the hungry mouths of the world. This Green Revolution has been described as a miracle even by highly scientific publications. However, taking a closer look at the situation reveals a somewhat different picture. Indeed large amounts of food are produced by strategies including intensive fertilizer and pesticide application, irrigation, and genetic modifications to produce high-yield seeds, but what about the ratio of input to output? Green Revolution monoculture is highly dependent on fertilizers to facilitate growth, and pesticides to control pathogens that these crops are vulnerable to. Manufacturing all the required fertilizer and pesticides consumes a tremendous amount of energy and resources. The machinery involved in this type of agriculture and the delivery of water for irrigation also consumes a lot of energy. As it turns out to produce a 100 units of food, 300 units of input is applied, as presented in *From Naked Ape To Superspecies* (David Suzuki and Holly Dressel), a losing scenario for the natural capital of the planet, but a winning scenario for industry given all the fertilizer, pesticides, equipment, and seeds that have to be produced.

Standing in stark contrast to industrial Green Revolution agriculture is so-called, biodiversity-intensive agriculture, a form of agroecology. There are many components to this form of agriculture, such as combining crops. By planting a diversity of crops vulnerability to a devastating pathogen targeting a particular

species is limited. Even this outcome is less likely given that natural protection against pathogens is present in the plants grown. For example marigolds, niger, amaranth, pepper, and even marijuana, have natural resistance to certain pathogens, that in isolation or combination can protect more vulnerable plants such as beans. In addition, the insects that accompany biodiversity-intensive farming often eat those that target plants, providing another layer of natural protection. The need for pesticides is then markedly lower or nil. Some of the crops applied such as legumes can stabilize the soil, translating into the retention of soil nutrients and greatly reduced fertilizer requirements. Soil stabilization also retains water reducing the need for intensive irrigation. In the final analysis biodiversity-intensive agriculture produces 100 units of food, using only 5 units of input! Wow, talk about a great input-output gain for the natural capital of the planet, and one that is far superior to the 300 units of input for 100 units of output characterizing Green Revolution annual seed agriculture.

Traditional agriculture techniques developed over thousands of years, and well before industrial fertilizers and pesticides were available, have been largely biodiversity-intensive. Tax records from pre-colonial India suggest that real agricultural yields (considering the input-output ratio) were 7-8 times higher than during the Green Revolution. Research by the World Bank and the International Food and Agriculture Organization, reveal that maximum productivity occurs on small fields up to 3 acres in size applying traditional agriculture. Third world colonization by first world nations transformed this highly productive and sustainable form of agriculture, and modern day industrial monoculture annual seed agriculture has virtually eliminated these advantageous agroecology practices. Imagine if we combined biodiversity-intensive agriculture practices with fully perennial crops. The input-output ratio would be amazing. All too often the crucial matter of the input-output ratio is ignored by industrial agriculture, because the results do not favor the strategies they are promoting. When the negative externality of rising atmospheric CO₂ levels from these practices are accounted for, along with the highly beneficial CO₂ absorption by perennials, the true input-output ratio is tremendously in favor of converting our annual crops to perennials, and utilizing agroecology techniques wherever and whenever feasible.

By considering the input-output ratio, the miracle of the Green Revolution fades to a more mundane story of unsustainable hyper-production based on intensive resource usage. The natural capital of the planet is diminished, while the artificial capital of agriculture-related corporations is enhanced. Consequently, if the agricultural industry waves the Green Revolution flag to support the value of monoculture annual seed crops, they can only do so by excluding any discussion of the dismal input-output ratio. In line with the optimism that perennials give for our future, it is feasible that the annual seed industry will step up to the plate and share its vast expertise and experience. A portion of the research funding for conversion of annual to perennial crops could even go to such firms if they come on board, compensating them for losses associated with the conversion, and bringing us closer to the goal of full perennial agriculture. Each of us as individual citizens will need to make politicians aware of this perennial option for managing global warming, and support related actions. Advocates of perennial agriculture will have to be vigilant for the inevitable opposition and counter it. Considering that we are all in the same big bathtub together with ongoing global warming representing a form of self-destruction, a concerted effort to convert our major grain crops to perennials does make sense. In addition, there is something very conceptually appealing to returning the world to its natural state in the process of managing global warming.

A CONFLICTED WORLD: RESEARCH BIAS

QUESTION:

What statement best applies to medical research?

- A. It is a very pure endeavor often succeeding it producing valid results.
- B. Researchers tend to focus on basic science research.
- C. The public is very trusting of those engaged in medical research.
- D. Biotechnology and pharmaceutical products are tested in an unbiased fashion.
- E. Medical research is extremely biased largely due to industry financing, putting the public at risk.

Many people view science as always getting to the truth, but as we will see Answer A is far off base, at least in the current era. Answer B is incorrect because most medical and biotech research has shifted to product generation and marketing, and those attempting to engage in basic science research often end up without funding. One of the themes about nowadays is how scientists and science is no longer respected and trusted, an occurrence in part due to the shift from seekers of truth to seekers of profit. In the 1950's and 60's medical research was more focused on basic science and discovery of underlying mechanisms. Researchers tended to be well respected and trusted, but with the shift to more of a profit motivation that trust has eroded. Therefore, Answer C is wrong for the most part. Answer D is extremely incorrect, as the testing of biotechnology and pharmaceutical products is highly biased both by design and unconscious influences. Placing a positive spin on their efforts, many or arguably most researchers are unaware how biased their efforts are, and of what forms that bias takes. Industry funding and presently control of biotechnology and pharmaceutical research

costs both in terms of health and financial outcomes, as we will see, hence Answer E is correct.

Biotechnology research largely focused on genetic engineering and medical research oriented to drug treatments impact on all of us, even those in remote areas of the world. The promise is great and the potential for benefit is enormous, but as so often happens high ideals decay to problems. Three key factors play a dominant role in this decay. First, ascertaining the truth is a very resource intensive exercise requiring solid funding and rigorous unbiased implementation. Second, as wealth has become increasingly concentrated in the hands of corporations and the financial elite (see the Greed: More Is Never Enough chapter), there is relatively little public funding for research. What suffers the most is so-called pure or exploratory research aimed at uncovering basic mechanisms. Biotechnology and pharmaceutical companies can provide money, but they are mostly interested in product generation and marketing. Wise readers might be wondering, "How can we continue to generate successful products without discovering the underlying mechanisms?" A very good question, the answer being that it is a very shortsighted scenario, based largely on the need to generate ongoing profits and growth in the now.

The third reason for the decay of high research ideals is that the tendency of people to cognitively distort occurrences in a positive direction (see Defending the Indefensible chapter), ensures a slew of biasing factors both conscious and unconscious eroding the quality of even well conceived research. Much of this bias is fostered and supported by a system captured by industry that is oriented to product generation, approval, and marketing. Vast sums of money are wasted, biotech products potentially dangerous to our health, and medications not achieving the intended outcome, but often having serious side effects, result from the current system of research. It is a self-destructive scenario, because the health consequences adversely affect each of us, even those who profit financially. By understanding how it has gone wrong, we can take steps to ensure much more idealized research, in the form of greatly enhanced basic science exploratory endeavors, and unbiased testing of biotechnology and pharmaceutical products. The current chapter will examine biotechnology and medical

research separately, although there is definite overlap with several corporations engaging in both forms.

BIOTECHNOLOGY RESEARCH:

Research of this type is focused largely on genetic engineering, frequently applied to altering annual crops. Massive investment in biotechnology by transnational corporations began in the early 1980's, based on a pivotal US Supreme Court decision-Diamond v. Chakrabarty-allowing microorganisms to be patented. Companies such as Monsanto and Novartis (now Syngenta) strategically shifted their research and development efforts towards genetic engineering, and acquired the appropriate companies through the 1990's. Their patents on life represent so-called intellectual property rights, allowing the company to charge anyone using their product, even if inadvertently spread from a field planted with genetically modified crops. The rise of agricultural biotech is not to be downplayed as it represents one of the key events of our era. Agricultural biotech relies on monocultures of annual plants, and is extremely input intensive in terms of fossil fuels, pesticides, fertilizers, and water for irrigation (see the Too Hot To Handle: Global Warming chapter). In 1991 only 107 agricultural genetic engineering field trial permits were issued, but more than 1,000 per year have been issued since 1998, and 12,000 in 2005 alone. The alternative to agricultural biotech is agroecology, focusing on a wide variety of more natural techniques including, biological control using insects, habitat management systems, crop rotation, and mixed plantings. Funding for agroecology research has declined with the rise of agricultural biotech, an occurrence linked to the impossibility of patenting agroecology practices and marketing them for profit. The profit motive has won hands down moving agricultural biotech far ahead of agroecology.

Despite how significant the rise of agricultural biotech has been over the last 30 years, people commonly assume that genetically engineered products have not entered the food system to any real extent. However, the reality is that at least 70% of our modern processed foods contain parts of modified organisms. Corporations based largely in the United States, Canada, and Australia, are leaders in the field, and are aggressively pushing genetically engineered organisms on the world. By eating corn,

canola oil, breakfast cereals, ice cream, baby food, or non-organic soy, you have ingested genetically modified organisms. These crops are grown on about 114 million hectares in 23 countries. Via their influence on regulating bodies and politicians (see the Irregular Regulation chapter), no labels are present to warn you that the product contains genetically modified organisms. The situation is somewhat better in Europe, where due to intense resistance by the public genetically engineered products must be labeled. The same applies to China, the government apparently seeing the value of labeling and hence informed consent of a sort. But what is this genetic engineering thing about anyway, and could it be dangerous to our health?

Virtually everyone has heard of genetic engineering, although few are really clear about what it entails. Genes representing the building blocks of life give rise to proteins and natural chemicals we need to survive. The process of genetic engineering transfers genes horizontally from one species to another. Scientists snip a desired bit of DNA (the substance making up genes) and place it in another organism. There are at least three potential problems with this approach that can have major health implications. The first problem being that the process is far from precise and messier than what it sounds like. The term “genetic engineering” implies precision, conjuring up an image of scientists extracting the desired gene, and surgically implanting it in the new organism in just the right place. In contrast to this perfectionist image the process more involves throwing multiple copies of the desired gene into the genetic material of the organism it is being transferred to, and hoping it takes and in the right place. The plan is that the desired benefit will be achieved with no ill effects, but it is something of a crapshoot. Issues of context play a role in that genes produce effects in one organism by virtue of their being in a certain location in the sequence of genes, but can produce other effects in different organisms, even if in the same region. In short, achieving the desired result without collateral effects is not so easily achieved. A key concern is that the adverse effects of the placement of new genes can take time to manifest, and since research is focused on immediate results, problems can appear after short-term testing is complete.

The possibility of genetic parasites accompanying the genetic modification is the second major problem. Taking away further from the precision connotation of genetic engineering is the reality that elements of DNA, including viruses and other transposable entities such as proteins, can hitch a ride on the transferred gene. Species barriers naturally exist to prevent horizontal transfer of such entities, but genetic engineering removes these barriers. Viruses that remain within a species tend to be limited in their impact, because the immune system learns to manage them. For example, common cold viruses for all the aggravation they inflict do not really harm us. However, it is a vastly different story when a virus crosses from one species to another. Back in December of 1997, and again in January of 2004, a chicken virus was horizontally transferred to humans. Several people died and many more likely would have if not for the slaughter of millions of chickens. The flu pandemic of 1918 killing more than 22 million people, also involved horizontal virus transfer. Mad cow disease arose from the transfer of what is known as a prion, from sheep largely unaffected by it to cows, due to the latter being fed ground up meat products to enhance the success of industrial agriculture. Cows lost control over neurological functioning, as did humans who ate the infected cows. Many diseases such as AIDS, Ebola, hepatitis C, Lyme disease, SARS, and hantavirus, have been attributed to horizontal gene transfer. Artificial gene transfer is implicated in the spread of new pathogens, and at the very least appears to represent a disaster waiting to happen. Genetic engineering scientists might point to the “crippling” of strains, but there is evidence that some can survive and even lay dormant to reactivate at a later date.

The third major problem associated with genetic engineering consists of unanticipated effects on the surrounding ecosystem, based on the interconnectedness of nature. If gene transfer occurred in isolation the impact would be more favorable and safer. Most examples of genetic engineering applied to agriculture consist of either transferring a gene producing a toxin against insects, or modifying the capacity of the plant to resist certain types of insecticides. If the effect of the change was restricted to that desired it might all be good, but due to how everything in nature is interconnected, and often in complex ways

that we do not understand, the results simply cannot be predicted. The only thing that can be said with certainty is that collateral effects will occur, but we do not know if they will be good, benign, bad, or highly toxic. One very complex type of interaction, capable of producing major problems, is “insertional mutagenesis,” whereby an inserted gene can dampen the activity of nearby genes, raising the possibility of a host of downstream effects. Some of the impacts of inserted genes can actually skip generations appearing much later. It is even feasible that some of the health problems we are facing, such as Type 2 diabetes, certain cancers, Alzheimer’s disease, and autism, might be arise in part from the impact of genetically modified organisms. Although this scenario currently appears unlikely, we just do not know. Extensive unbiased testing seems like it might be warranted.

Take the example of the natural insect toxin produced by *Bacillus thuringiensis* (Bt). Cotton plants were genetically modified to produce a protein from Bt that acts as a natural insecticide. The hope was that the modified cotton plants could resist the boll weevil. Farmers discovered that they still had to use commercial pesticides, and the cotton plants developed deformities such as twisting, few leaves, and impossible heights. These monster plants understandably produced less cotton. Industry tends to blame this “yield drag,” common to genetically engineered plants, on things like climate and soil type—A very positive marketing spin for industry. Another collateral effect is the decline of monarch butterflies and other “desirable” insects attributed, at least partly, to plants with genetically engineered Bt toxin. Meanwhile, damaging insects appear to have developed resistance, and are even thriving on the genetically engineered insecticide. For example, researchers in Venezuela found that the diamondback moth grows 56% faster on treated than untreated plants.

The best example of a genetic modification permitting the plant to resist certain herbicides, is that of Monsanto’s Roundup Ready, whereby the modified plant can stand season long application of the herbicide Roundup. By producing a soil imbalance (see the Irregular Regulation chapter for more complete coverage) a toxic fungus occurs. In addition, the genetic modification transfers naturally to other crops. This transfer has contaminated valuable strains of corn in Mexico and canola in

Canada for example. Instead of being held responsible for the costs of this negative externality (see Taking The “Devil” Out Of Development chapter for coverage of negative externalities), Monsanto has accused farmers of illegally procuring their product, and has sued for compensation! The legal team that the average farmer can hire pales in comparison to the corporate law force of Monsanto, and years of financial and psychological strain have been placed on farmers by this unfair process.

Frequently the testing ground for genetic modifications is the real world, and the results are very distressing. In India many people get much of their nutrition from what industrial agriculture refers to as weeds. Approximately 200 species of these “weeds” have traditionally grown alongside staple crops and are used to provide nutrition. With intense spraying of Roundup and other herbicides, these crucial plants are destroyed and nutrition suffers greatly. Tens of thousands of children in India went blind due to the lack of Vitamin A normally supplied by these plants. There are also grave concerns that glyphosate, the herbicide in Roundup, acts as a metabolic inhibitor and carcinogen. As such no use is ideal, and spraying it relentlessly throughout the growing season seems sheer madness. Again as a psychiatrist I do not take terms like madness and insanity lightly.

A more general example of the pitfalls of genetic engineering can be found with the modification of rice in Bali during the 1960’s. With excessive optimism, instead of prudent caution, the World Bank funded International Rice Research Institute (IRRI) introduced a modified variety of rice, IR-8. It was designed to mature in less time and produce enormous yields. The Balinese government marketed it to farmers, and offered credits so they could pay for the expensive fertilizer and pesticide inputs. Unfortunately, IR-8 was susceptible to the brown planthopper, and 2 million tones of rice were destroyed in 1977 alone, when 70% of south-central terraces were planted with IR-8. IRRI scientists then came up with IR-36 (you can only imagine what IR-9 to IR-35 were like). The Balinese government legally mandated this form of rice ensuring widespread planting. As of 1979 IR-36 proved highly susceptible to the viral disease tungro. PB-50 was then introduced, but that was vulnerable to rice blast. By the mid-80’s farmers were caught in a losing battle to stay ahead of rice pests using the

newest, and typically more expensive, variety of genetically engineered rice on the market. Regarding the negative externalities of this fiasco, farmers incurred massive debt, natural rice strains developed over centuries or longer were lost forever, and the pesticides themselves produced dire consequences—Testicular cancer linked to pesticides rose in rice paddy workers, and animals such as ducks, eels, and fish, that were commonly raised in rice paddies were killed off. If not so sad, it would make a good science-fiction comedy story.

Due to the three major problems associated with genetic engineering, it is only reasonable to expect full and nonbiased testing of all genetically engineered products, including for long-term effects. However, what we have now is a system where governments and regulating agencies leave it up to the biotech industry to do their own testing. The US Environmental Protection Agency (EPA) and Canadian Food Inspection Agency, have biotech companies conduct and submit studies regarding the potential of their products to do harm. Furthermore, there are no real follow-up procedures or independent monitoring of outcomes. Researchers developing and testing biotech products are either employed directly by companies like Monsanto, or are funded by them, influencing these researchers to generate product quickly with pro-product research results. This market agenda leaves little or no room for objective testing. Should we be surprised by the outcome of most testing, particularly considering that corporations are not required to internalize negative externalities arising from their products? The only route open for redress is lawsuits that can be extremely costly and very drawn out. In addition, many biotechnology and pharmaceutical corporations appear to view the odd payout, after many years of profitable sales, as an acceptable cost of doing business, with the profits far outweighing this deferred cost.

A major conflict of interest occurs when the company inventing and marketing the product also does the testing. What happens if the product is found to be deficient and potentially dangerous? Is production halted and massive amounts of money lost, or does the company downplay the results of the study and rely on other research not finding the same negative outcome? The latter option is typically taken, unless the results are so clearly

negative that moving ahead is simply not feasible. Researchers working for the biotech company or funded by them are highly motivated to produce encouraging results, and are aware that continued funding is dependent upon it. Under such conditions it is easy to downplay a negative outcome and write it off to an error in procedure or conditions. Earlier in the 1940's and 50's chemical companies reassured the public that products such as DDT and PCB's were safe based on their testing, and we later learned how unsafe they actually are.

Perhaps we cannot rely of the companies making the products, but we should be able to trust politicians elected in a democracy, and also our regulating bodies. We should but this is not the case at all regarding biotech. Government agencies usually only conduct tests if a concern has already risen and there is pressure to investigate. In the Irregular Regulation chapter we learned how lobbying influences on politicians often via campaign contributions and lucrative consulting contracts, and revolving door employment for regulators, have enabled industry to capture politicians and regulators. Regulatory capture applies well to the biotech industry. Backing the biotech industry fully the United States, Canada, and Australia launched a formal complaint in June of 2003 to the World Trade Organization (WTO), regarding Europe's strict controls on biotech agriculture. The European Union held firm and also required labeling of genetically modified products. Although it would be nice to think that politicians and regulators in Europe were so deeply concerned about their constituents that they initiated opposition to the biotech industry, it was actually the people of Europe who spoke loudly and clearly forcing governments to adopt these approaches. Many politicians and regulators were on board with the biotech industry, as they are subject to the same industry influences as in North America and Australia, but the voting public was actually heard and responded to.

An interesting and very sad case of the whistleblower, Dr. Arpad Pusztai, highlights how the system is geared in favor of biotech firms. Dr Pusztai worked as a research scientist for the tax-supported Rowett Institute in the United Kingdom. His research revealed that rats fed genetically altered potatoes suffered adverse effects. Growth was impaired, tumors developed, and shrinkage of the brain occurred after only ten days of being fed the potatoes. A

protein or virus used in the gene-splicing technique was implicated. Dr Pusztai announced his work publicly in 1998, believing that as a taxpayer funded researcher the public had a right to know. Even if he ignored protocol, the public deserved to be made aware that all is not well in the land of genetically engineered potatoes. Right away Dr. Pusztai was forced to “retire,” and although public pressure led the Rowett Institute to rehire him, he was soon encouraged to leave. His research was attacked, with the potato studied reportedly being designed to be toxic for research purposes. Four years later his home was vandalized with all the research data removed. His old lab at the Rowett Institute was also broken into a few months later. According to Dr. Pusztai and two of his colleagues, “Monsanto called President Bill Clinton, Clinton rang Prime Minister Tony Blair, and Blair rang Philip James (Dr. Pusztai’s boss).” Now if that isn’t reach and clout! Blair’s government continued to try and push genetically engineered crops into the British diet, but the public distressed about Mad Cow disease, and sympathetic to the plight of Dr. Pusztai, rejected the push of genetically modified food.

A more recent research example, and one that definitely cannot be accused of involving genetic modifications designed to be toxic, is that by Dr. Gilles-Eric Seralini and his team at Caen University in France, published in 2012 (The long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize, published in *Food and Chemical Toxicology*). Over a 2-year period Dr Seralini’s team fed rats Monsanto’s Roundup Ready genetically engineered corn treated with Roundup (.1 parts per billion glyphosate). Compared to control rats those tested had higher levels of cancer and died earlier. Female rat’s mortality was 2-3 times greater mostly due to large mammary tumors and disabling of the pituitary gland, consistent with the notion that endocrine disruption is occurring. Males experienced liver congestion and cell death, kidney impairments, and 4 times more large tumors. Photographs of the tumors alone should be enough to scare anyone away from products that glyphosate has been applied to.

Attacks on the study have come fast and furious, largely from industry-supported researchers, institutions, and publications. For example, Martina Newell-McGloughlin, director of the Biotechnology Program at the University of California/Davis,

funded by Monsanto, Syngenta, and Bayer indicated, "This study appears to be without scientific merit." The US National Corn Growers Association concluded that the research is deeply flawed and questionable at best, and does not offer credible evidence that biotechnology in agriculture negatively impacts animal health. An article by Forbes suggested that, "Seralini has made a specialty of methodologically flawed, irrelevant, uninterpretable-but over-interpreted-experiments intended to demonstrate harm from genetically engineered plants and the herbicide glyphosate in various highly contrived scenarios." These are very damning criticism writing the results off as garbage. The managing editor of Food and Chemical Toxicology, who is a toxicologist as well, has responded that the study "raised no red flags during peer review."

A major, or more appropriately mega-death, problem in the biotech research world is the aggressive nature of the attacks against opponents of genetically modified organisms. Respected research scientists, such as David Schubert who heads the Cellular Neurobiology Laboratory at the Salk Institute for Biological Studies, and David Williams a cellular biologist at the University of California, Los Angeles, along with a handful of other scientists, charge that speaking up against genetically modified products invariably leads to ostracism within the scientific community, and by the media. After publishing comments in respected journals raising concerns about genetic modifications, Schubert and Williams say that they experienced coordinated attacks on their reputation. Schubert believes that many scientists producing research results raising safety concerns about genetically modified organisms, deliberately withhold their findings due to fear of repercussions, such as attacks designed to damage their reputation and reduced funding. The attacks that quickly arise from diverse quarters having the common ingredient of funding by biotech firms involved in genetic engineering, confirms that this is a real occurrence and not paranoia. Science has degenerated a few levels below research bias to research bullying! No wonder science and scientists are losing respect in the wider community. When we are at the level of research bullying it is time for a time out, and shift to objective unbiased testing for both short-range and long-range problems. Although "anything that is not impossible is possible,"

such an occurrence is virtually impossible given the current status quo of industry funding of biotech research.

Getting back to Dr. Seralini's study, criticisms have largely focused on the use of a strain of rats (Sprague-Dawley), that are prone to tumors and only tend to live about 2-years, the time frame when many of the tumors developed. However, the rats treated with glyphosate were compared to untreated control rats making this criticism largely irrelevant. If the control rats were only 1-year old and the glyphosate treated rats 2-years old, the criticism would have merit, but this was not the case. Monsanto's own research into its NK603 genetically engineered corn used the same strain of rats, but only tested them for 90-days, a period of time much less likely to show tumors or other diseases. They concluded that there was no risk based on their research. Tumor and endocrine-disruption related diseases take time to manifest, a consideration that the designers of Monsanto's studies could not have been oblivious to. David Schubert believes that Dr. Seralini's study was unfairly dismissed. Being a research scientist himself and very familiar with protocols for high quality animal toxicology studies, he has commented that the study made the grade. In his opinion there is no problem with the breed of rat used and the methodology; the study outcome is valid.

Concerned scientists have pointed out what would seem to be obvious—Dr. Seralini's study raises serious concerns about genetically modified crops and we have to withhold the use of them, at least until further research (not supported by industry) is conducted. Meanwhile, most governments and regulators captured by industry dismiss anti-biotech research such as Dr. Seralini's and Dr. Pustazi's, ensuring that the population at large be the ultimate experimental guinea pigs or rats. They also lock people into the experiment by blocking labeling of foods indicating that genetically engineered organisms are being consumed. People have no choice but to be part of the experiment. Interestingly, since there is no control group free of genetically modified organisms, any increase in cancer or other diseases can be easily dismissed as being due to factors unrelated to the genetic modification. Are we going to swallow this? It is somewhat of a rhetorical question, because we already have.

Proponents of genetically modified organisms commonly argue that humans have been modifying organisms for a long time, such as with artificial selection and even more so with hybridization. Indeed, those who wish to see industrial agriculture based on annual plants remain firmly in place, will critique the option of converting our major crops from annuals to perennials (see the Global Warming chapter), by arguing that the problems I raise here with genetically modified organisms can also apply to hybridized crops. With hybridization of annual and natural perennial relatives some potential risks might exist, and I suggest both short and longer term testing to ensure safety. However, the risks increase substantially when genes from completely unrelated organisms are combined. Genetically modified foods often involve fish or mammal genes being added to plant organisms, such as fish genes in tomatoes. The gap between species is enormous, and as such no natural resistance to viruses and other transferred parasites exists. The mixing of genes from annual and perennial relatives is much less likely to incur this problem and result in toxicity, although once again testing for safety must be a priority.

One of the most interesting and telling signs of how poor (and definitely not pure) research into genetically modified crops and biotech is in general, is that insurance companies will usually not insure biotech products. The litmus test for safety is insurance. If an insurance company will not insure where you want to build your house, then plan on building in a different location. Brian Goodwin, a theoretical biologist at Schumacher College in England, indicates that insurance companies typically will not sell insurance to biotech companies because the results of genetically engineered organisms cannot be predicted. The risk assessment process does not yield a satisfactory result for them to proceed with insuring. What this means practically is that biotech products represent an unreliable technology, according to Brian Goodwin. All the more reason for intensive independent unbiased testing of genetically modified organisms, carefully evaluating both the short and long-term outcomes. We are not even close to this paradigm, and the biotech industry is rushing to produce and release products with only very limited short-range testing, fully controlled or funded by industry itself.

Public funding for research has declined throughout the years, leaving academic institutions susceptible to biotech industry influence and even control. In first world nations private funding for agricultural research is three times that of public funding, and private research is focused on products that can be patented and marketed. So-called public-private partnerships (PPPs), linking academic centers to industry are very common. Funding serves as a conflict of interest because people naturally feel obligated to reciprocate when given something of value, such as research funding. A solid 95% of our ancestral past consisted of life within hunting-gathering groups. A crucial aspect of the hunting-gathering form of social organization is reciprocity, and our social cognitive capacities are highly oriented to keeping track of what we are owed and what we are obligated to pay back. By not paying back what is owed, a person within a hunting-gathering context risked ostracism that consisted of being excluded from receiving important resources in a mild form, and expulsion from the social group in extreme instances. Failure to call in debts owed resulted in loss, and undoubtedly disrespect and diminished status in the group. So strong is our social cognitive capacity oriented to reciprocation that even a small gift produces a solid motivation to reciprocate.

Reciprocation to funders can manifest in various ways, some quite subtle. For example, administrators and university scientists who participate in partnerships with biotech firms tend to define the public good as research that leads to the creation of commercialized products, thereby narrowing the definition of public good to that of what is good for industry. This finding emerged from an external review of the collaborative research agreement between the University of California and Novartis, in 2004 by Busch and colleagues. Much less subtle is the increasing presence of representatives from industry on committees establishing research priorities, constituting a form of research program capture by industry. Equally intense is the efforts of biotech firms to influence the research agendas of other key organizations, such as the European Commission, and secure intellectual property rights with the WTO. Even just the massive amount of funding to universities and individual researchers biases academia away from pure exploratory research to commercially

oriented research objectives. This is a very unhealthy state of affairs for the public, although a very profitable scenario for industry and those funded by it.

A major discussion topic in science-oriented publications over the last few years has been the demise of public trust and belief in scientists. Undoubtedly, one of the major factors in this shift is the movement of scientists away from more pure exploratory research examining the mechanisms underlying disease and other problems, to the generation of product. Scientists and increasing physicians engaged in health research are being seen as profit seekers, and not as noble individuals dedicated to advancing knowledge and the human condition. For scientists and researchers to regain the respect they once had, there must be a shift back to exploratory research not oriented to product. As it currently stands, though, we are progressing ever faster in the opposite direction. Academic scientists engaged in genetic engineering and other forms of biotech research, rush to produce marketable products, frequently even establishing their own biotech companies in the hope that a major biotech firm will want their product and buy them out. There just does not seem to be any end to the greed, an understandable scenario considering how prone we all are to greed, despite how self-destructive it is beyond the short-term.

MEDICAL RESEARCH:

Considering that products are a crucial feature of modern medicine and how the profit motive can corrupt, there definitely exists great potential for bias in medical research. To appreciate the forms that this bias takes it is important to have an overview of how medical research operates. While there are many variations along the way from basic research to product, the typical starting point is for researchers to uncover mechanisms of action that might eventually lead to a marketable product. This initial research usually involves animal or cellular models, being far removed from work on people. Researchers, most commonly employed in academic centers, hope to uncover a promising mechanism of action, and have a pharmaceutical or biotech company pick up on their discovery. Promising discoveries are published in peer-reviewed journals, a process consisting of one to four researchers in the same field

reviewing the study, identifying problems with it, and either rejecting it for publication in the given journal, or recommending it be accepted typically with some revisions. Biotech and pharmaceutical companies often become aware of promising research from its publication in peer-reviewed academic journals. Products are then developed or advanced beyond the initial phase by industry scientists or those funded by them. Testing of these products for both approval by regulatory agencies and marketing purpose represents the final step, with the majority of researchers funded by industry in some form.

A very important shift occurred in 1980 greatly influencing the structure of modern day medical research. Up until that time the US federal government retained the rights to research and discoveries of investigators it funded. Consequently, researchers could not benefit financially from their discoveries and companies experienced difficulty obtaining licenses to develop, manufacture, and market the resulting products. The Bayh-Dole Act of 1980 legislated two changes designed to enhance medical research. First, it permitted recipients of federal funds to obtain title on the inventions they develop under their federally funded projects, and to transfer the technology to the private sector. Second, it requires federally funded researchers to obtain a patent for products developed, to seek commercial opportunities, and to report to the National Institutes of Health (NIH) on the use of their discoveries. The Bayh-Dole Act essentially transformed basic medical science research from not-for-profit to profit based. Researchers, that prior to 1980 had little or no incentive to produce a marketable product, suddenly were being encouraged and even required in a sense to fulfill this function. On the one hand, this legislative change increases the likelihood of medical discoveries leading to useful products, but on the other hand, it opens the door to pro-product bias that can and does manifest at all stages of the process. To appreciate how bias in medical research occurs a basic understanding of research design is crucial.

Medical Research Design:

Outcomes of any research can be either true or not true. A product can work or not work. In contrast to most products we purchase, it is difficult to ascertain whether or not medical products really work.

When you purchase a car you can tell that it works when it starts and runs as designed to. If you turn the ignition switch and nothing happens, then it does not function properly. When you take a drug for an illness and the condition improves, the drug might be working, but there are other possibilities. One option is that time itself has taken care of the illness, and the drug only seems to be working. A classic example of this is with upper respiratory track viral infections producing the common cold. You take an antibiotic designed for bacteria but ineffective against viruses. The cold improves when you take the antibiotic, and you conclude that the antibiotic cured the cold. However, if you did not take the medication the same outcome would have occurred in the same time frame, assuming that a secondary bacterial infection did not arise. Next time you have a cold you go to your family doctor and demand an antibiotic, insisting that it worked before. Practicing family medicine for a short period early in my career I can testify to the strength of these beliefs. Discussions as to how antibiotics are ineffective against viruses, and how we are just encouraging antibiotic resistance, often fall on deaf ears, highlighting the power of the cognitive distortion, and how short-term outcomes are far more important to people than longer-term ones.

Another major possibility accounting for the perception that a medical product works when it really does not, is the placebo effect. Anticipation of a benefit seems sufficient in many or all people to produce the intended improvement, likely via the recruitment of natural healing processes, or the diminution of symptoms. If you believe that an antidepressant will work it just might based on belief alone. Conversely if you believe that a medication will have all sorts of unpleasant side effects, it just might when it would not have in the absence of this belief. The mind is a powerful tool that is linked to health outcomes. So how can we possibly know if a medical product actually works? The basic approach to this problem is to compare a prospective treatment to an agent lacking the therapeutic ingredient. So for example, a given antidepressant is compared to a placebo substance such as a sugar pill. Half of the subjects with depression take the antidepressant and half take the placebo, and the outcome is compared. If equal numbers improve on the placebo then the antidepressant is not effective.

Readers with a knack for research will be wondering, but what if the depressed subjects know they are taking a placebo or active pill? Then the results are largely meaningless, because those aware that they are taking the real drug might activate the placebo effect unconsciously, while those aware that they are only taking an inactive substance will block any such benefit. To add to the complexity of the situation, the researchers awareness of what the subjects are taking is also crucial. If the experimenter is aware that a subject is taking the medication, verbal and non-verbal cues might give it away and communicate that an improvement is expected (or not if the researcher does not believe in the medication). Likewise, if the experimenter is aware that only a placebo is being given, cues might make the subject aware of this.

Hopefully, you see how difficult it can be to determine whether or not a medical product works, and also how much room there is for bias. To reduce the possibility of bias a common strategy applied is known as the, Randomized Control Trial (RCT), that ideally takes the form of a randomized double-blind placebo control trial. Randomization consists of subjects being assigned to treatment (active agent) and placebo groups on a random basis, to ensure that there is no bias such as higher functioning patients, who are more likely to improve, being directed into the treatment condition. The double-blind part involves both the subjects and researchers being “blind” regarding who is taking the placebo, and who is taking the active agent. Understandably, these steps reduce bias that can potentially influence the results. Perfect you say and that is all there is to it, so we can fully trust the outcome of medical research and sleep easier at night. Well perhaps in some ideal world, but this world is anything but ideal. There are countless sources of bias all well documented that can still leave us very unclear about whether or not a medical product truly works. Most of these sources of bias also apply to research focused on biotech products.

Sources of Research Bias:

Statistics: To determine whether or not an active ingredient truly works better than placebo, statistical analysis of the data is essential. As a starting point there is what is known as the null hypothesis, basically stating that there is no relationship between

two phenomena. So for example, a proposed medication for depression does not improve depression. The results of an experiment either reject or do not reject the null hypothesis. If the null hypothesis is rejected the outcome is said to be positive, indicating that a relationship exists between the medical product and disease outcome. If the null hypothesis is not rejected then no relationship exists, and the outcome is said to be negative. I believe that the use of positive and negative, in this fashion at least, is a major mistake contributing to bias, because most people are naturally positive based on our defense mechanism functioning (see *Defending the Indefensible* chapter), and hence researchers will unconsciously bias research in whatever direction is "positive." An improvement would have been to apply the term positive to not rejecting the null hypothesis, as this is the most likely outcome in the majority or vast majority of cases. Negative applied to rejecting the null hypothesis would have provided a much more cautious orientation to research. Although technically speaking failure to reject the null hypothesis is not absolute support, it might have been more ideal to label outcomes as supporting or not supporting the null hypothesis. Given that supporting is more positive there would have been an unconscious motivation to be cautious in rejecting it.

The question arises as to how we know whether or not an outcome is "positive" rejecting the null hypothesis? At one level this might seem straightforward, based upon the active treatment producing more of a benefit than the placebo treatment. Assuming that we have a solid randomized double-blind placebo control trial, it should all work out. However, it is possible that the active agent performed better than the placebo simply due to chance. One way to reduce the likelihood of a chance result is to run numerous tests, but issues of subject availability and suitability for the study, costs, and manpower can make this impossible. Instead statistical tests of significance are applied to determine the probability that a given outcome is due to chance. Significance in statistics does not equate with the common meaning of significant as important, given that a result might be significant but not important. Toasting bread at a higher setting produces crispier toast, a result that would be statistically significant if tested, but relatively unimportant in terms of its impact. Statistical significance is set in levels of confidence

that the observed outcome is not due to chance. Frequently a .05 significance level is applied, meaning that the result could only have occurred by chance 5% of the time, allowing us to be quite confident that the effect is not due to chance. Obviously a significance level of .01, allowing for a chance outcome only 1% of the time, is even better.

Once we arrive at our statistically significant result with only a 5% or less probability that it is due to chance, it would seem that everything is fine. However, there is the all important and too often neglected issue of, how we interpret a significant result. Many complex issues are involved in the interpretation of significant results and we will only focus on what appear to be the most important—Number of tests run, effect size compared to how well the results can be generalized, and the critical importance of how likely it is that the results are actually true prior to initiating the study. A trick that is often consciously employed to increase the likelihood of positive results rejecting the null hypothesis is known as “data mining.” What it consists of is running as many statistical analyses as possible, and often planning the study in such a way to facilitate this possibility, knowing full well that the more tests you run the greater the likelihood of something being significant. This problem, or opportunity depending on your perspective, arises because significant results can be due to chance—If you run say a hundred analyses, maybe 5% will be positive due to chance alone. The researchers can then point to these positive results claiming a find. It has been stated, “If you torture the data long enough it will confess.” Commercial data mining packages are available that will do most of the mining for the researcher. Data mining is extremely widespread in medical research, representing a major source of bias in and of itself. For medical researchers in academic settings it is publish or perish, and positive results are far more likely to be published than negative results for reasons we will get to shortly. The “publish or perish” scenario might then be viewed as distort or despair.

Regarding the effect size and generalization of the results, there is a trade-off between the power of the outcome and how well it applies in the real world. If a researcher uses what are often referred to as “pure” subjects possessing only the condition of interest, then the chance of obtaining a statistically significant result

separating from placebo is enhanced. Research evaluating antidepressants has been strongly criticized for using subjects suffering only from depression, thereby increasing the likelihood of obtaining results supporting antidepressants. Even in these studies a reasonable description is that a third of patients experience an improvement in depressive symptoms on placebo, and a third more from the given antidepressant. This outcome largely occurs due to the strong effect size resulting from the use of "pure" subjects. As an outpatient psychiatrist having treated numerous patients with depression and other conditions, I can confidently say that "pure" patients are fairly rare. Depression frequently occurs alongside anxiety problems, mixed in with varying degrees of trauma, personality disorder, addiction to alcohol or other substances, shaken and stirred. Hence, positive outcomes for antidepressants tested on pure depressive patients are not likely to generalize well to the typical patient. Given all the linkages between various psychiatric conditions the benefit of antidepressants is often limited. For most patients the combination of antidepressants and psychotherapy work best, and often we have to combine a couple of antidepressants to get any appreciable effect. A quick case example will demonstrate this reality.

A young female patient referred by her family doctor had "treatment resistant depression." The family doctor had tried a few different antidepressants, but the patient remained very depressed and off work on disability. Interviewing her it became apparent that a so-called transference issue had arisen based on abuse during childhood. Her father was very physically and mentally abusive towards her, and they no longer had any relationship. She had quite effectively walled off (dissociated) the trauma and experiences with her father. At work a new male boss came on the scene that was like her father in terms of mannerisms and a critical harsh nature. All of a sudden the barriers she had erected fell, and she began to react to this new boss as if he was her father (transference). Memories and emotional pain associated with her early life abuse surfaced and she became very depressed. Therapy involved insight oriented psychotherapy for the effects of abuse, plus the combination of two antidepressants. Even with this intensive intervention progress took months. Although the specifics vary between patients, the story remains much the same

with antidepressants only playing a limited but still valuable role. Fortunately, some newer studies are testing antidepressants on more typical patients, an occurrence that as you might appreciate is not as ideal for antidepressant results. All drugs should in my opinion be tested on real life patients, given that artificially enhanced effect sizes based on “pure” subjects really only serve to optimize product marketing, while outcomes that can be generalized to real life patients actually help those who are suffering.

The third major issue we will cover in regards to the interpretation of statistical outcomes is so critical it packs a massive WOW factor, and by understanding it you are actually ahead of the curve relative to most medical researchers. Initially we learned that a research outcome is true or not true. The probability that a research outcome is true turns out to be heavily reliant on the probability that it is true prior to the study being performed. Hence, interpretation of the outcome of any research requires a careful evaluation of the likelihood that the result is actually true before the study has been conducted, or “a priori.” When an outcome is very likely to be true to begin with, a statistically significant experimental outcome confirming it provides reassurance that it is indeed true. However, what happens when the a priori probability of an outcome being true is low? Now this is where part one of the WOW factor comes into play—If the probability of the outcome being true is low prior to the experiment, a statistically significant outcome is simply a measure of the bias present in achieving this outcome! This critical point is very well presented by Professor John Ioannidis in his paper—Why most published research findings are false (Plos Med, 2005).

Statistically significant results are just measuring bias when the a priori probability of the outcome being true is low. So for example, I devise a treatment for depression that consists of rolling marbles in your hands. I have one group of subjects perform this act and a control group simply holding paper. Amazingly, my study shows a statistically significant result in favor of my marble hand-rolling treatment, and I am now on my way to a revolutionary and cost effective intervention for depression. The only problem being that with a very low a priori probability that this treatment is truly effective for depression (we can only assume), my statistically significant result just measures the bias

that went into the study to get this result. Perhaps I talked to the marble rolling subjects providing psychotherapy, while remaining mute with the paper holding controls.

In considering many of the statistically significant outcomes in medical research, Professor Ioannidis believes that given the low a priori probability of many of these results actually being true, most medical research is false only serving as a measure of bias. This represents part two of the WOW factor associated with the a priori probability of a result being true. One example of this is found in psychiatry, whereby pharmaceutical companies frequently attempt to show that their antidepressant is superior in terms of speed of action and effectiveness. The a priori probability that drugs targeting neurotransmitters (chemical messengers between brain cells) linked to depression will have some effect on the illness, is reasonable. However, the probability that one will work better than other drugs acting on the given neurotransmitter system is very low. Throughout medical research this problem repeats with pharmaceutical companies attempting to show that their version of a product works better than that of the competition, when each has the same mechanism of action. Consequently, studies reporting benefits over the competitor's product are most often just providing a measure of research bias favoring their product. This aligns with a problem known as transitivity—If drug A is better than drug B, and drug B is better than drug C, how can drug C be better than drug A? This scenario occurs frequently with studies comparing drugs of a given class, but it does not stop pharmaceutical companies from using these studies to market their product. It seems that there are enough statistical sources of bias to conclude that the research world is indeed a very biased one, but additional equally potent sources of bias are present.

Reporting & Publication Bias: Reporting bias refers to what researchers decide to report, pertaining either to the data itself or the whole study. Data mining can yield positive results for a small segment of the data, and those results might be the only ones reported. For example, three measures are employed to see if a drug works better than placebo, with only one of the measures separating the active drug from placebo. If the researchers only report the positive measure, and fail to identify that the active drug

produced a negative result on the other two measures, then reporting bias is present. Likewise, if the researcher reports the negative results but downplays them reporting bias is also present, although to a lesser degree. This often takes the form of excluding negative results from the abstract. An abstract is a brief summary of the study that is read by vastly more people than the article itself. In many instances a researcher will not advance a study to the publication phase, an occurrence far more common with negative results than positive ones. Another form of reporting bias occurs with scientific papers sponsored by industry being ghost written by professional scientific writers, who optimize the organization, reporting, and language in favor of the product. Since the researchers names are on the paper it appears that they have written the article. In other instances a study is actually conducted by industry paid researchers, and a recognized researcher is paid to place their name on the research study and present it for peer review. The problem of ghost written papers can be difficult to identify, but what is clear is that it is quite a common problem.

Publication bias can result directly from reporting bias or arise from the nature of academic publishing itself. By withholding studies producing negative results researchers automatically bias publication in favor of positive results. To take an extreme example, an experimental result while not true is positive statistically due to chance alone in 5% of studies. The other 95% of studies produce negative results accurately revealing it to be not true. Researchers of the 95% negative studies hold back their results from publication, while the 5% with positive results advance them to publication. Assuming these studies make it through the peer review processes, doctors, scientists, and members of the public conclude that it is a true result. Medical interventions become based on a false outcome, appearing as a true one due to publishing bias.

The Federal Drug Agency (FDA) in the US typically only requires 2 positive results for a drug to be approved, so many more negative results could occur and the drug still be approved. Due to this problem legislation has been enacted requiring the registration of all drug trials so that there is a record. However, this has not really resolved the problem, because the researcher or drug company funding the study can make it very challenging to access the data required to determine if the study really produced a negative result.

Drug companies frequently retain control over data from studies they fund. Furthermore, people including physicians, researchers, and those in industry, tend to be more influenced by what makes it through the peer review process into academic journals. In some instances negative results will be published but reported in a biased way, such as making the results somewhat ambiguous, or clumping several negative trials to make them appear as only one. Meta-analyses, consisting of studies assessing several papers focused on the same topic, that are based on biased reporting and publication will be distorted, unless all the unpublished negative results are accessed and appropriately weighted to produce an accurate picture. Most meta-analytic studies only focus on published research findings, and consequently can be seen as being biased in favor of positive results.

Academic publishers are not free of bias and they contribute greatly to publishing bias. When a researcher sends a study to an academic publisher the editor/s quickly reviews the study and decides whether or not to advance it to peer review. At this stage negative results are often rejected and positive ones more likely to advance. If the editor/s decides to move the study forward to peer review bias can still occur, in that the study can be sent to a reviewer or reviewers known to be more lenient or tougher, depending on whether or not there is a desire to see the study progress to publication. If the peer review process yields an ambiguous result the editor/s has to decide what to do with the study, and if favorable is more likely to give it the benefit of the doubt and publish with revisions. If unfavorable to the study it will be rejected. Editors are like the rest of us being very vulnerable to biasing influences, and any editor denying that this process occurs is being deceptive or is not self-aware. In most instances the bias is fairly subtle and largely unconscious, but in many instances it is overt and fully conscious. But why should an editor of an academic journal care about whether results are positive or negative?

Beyond the natural bias people have in favor of views and results supporting their own, academic publishing is vulnerable to bias based on status issues. Typically in academic publishing editors make very little or no money, the benefit being derived from academic standing and reputation. With academic journals there is a measure of success known as the impact factor, based on

the average number of citations in peer reviewed papers, pertaining to recent articles published in the given journal. The calculation covers citations for the prior two calendar years. For example, if a journal has an impact factor of 3 in 2011, papers published in 2009 and 2010 received 3 citations each on average. The calculation consists of dividing the number of times articles published in 2009 and 2010 are cited, by the number of “citable items” during that period (for the given journal). A bigger impact factor equates with higher status. Given that positive results historically tend to draw more attention than negative findings, or so it is assumed, editors see the publication of positive results as improving the impact factor of the journal more than negative results will. A higher impact factor elevates the status of the journal, and by extension the editor. Fortunately, the trend favoring positive results has shifted slightly over the last few years, but positive results are still far more likely to be published than negative results.

In contrast to the editors of academic journals the actual publishing company is interested in profit. There are thousands of academic journals out there published by only a handful of academic publishing corporations. Although the publisher largely leaves the editorial process up to staff of the particular journal, the latter are very much aware of what sells for the publisher. Journals with larger impact factors tend to be more profitable as articles in them are preferentially sought out. Interestingly, what the publishing company finds most profitable are reprints of articles. Unlike in the entertainment business academic writers receive nothing financially beyond whatever funding they acquire to do the research, so all the profit goes to the publishing company. But who buys reprints of articles? As it turns out the single largest category of purchaser consists of pharmaceutical companies, and they buy articles showing a positive result for their product over placebo or a competitor’s product. It might be suggested that pharmaceutical companies would be interested in purchasing negative results for competitor products, but in advertising as in real life it is all about the positive spin. The message, “Buy our products because the competitor’s is no good” does not work. If a study shows your drug to be superior to a competitor’s comparable product then it sells. Armed with reprints of favorable research

articles, pharmaceutical company representatives approach physicians at their workplace or at medical events, distributing the reprints as a form of promotion. Another source of financial influence over journals occurs in the form of advertising, with up to 99% of advertising from pharmaceutical companies. Due to all this industry influence on the whole academic publishing process, the UK HC Science and Technology Committee in 2011, indicated that medical journals are to a large extent the marketing arm of the pharmaceutical industry.

Some might find it hard to believe that sales of reprints could influence academic publishing, but reprint sales figures suggest that it is a very important biasing factor. A study by Adam Handel and colleagues published in the *British Medical Journal* (BMJ) in 2012 (*High reprint orders in medical journals and pharmaceutical industry funding: Case-control study*), demonstrates the importance of reprint sales. The researchers contacted the editors-in-chief of leading medical journals—The *Journal of the American Medical Association* (JAMA), *New England Journal of Medicine*, *Annals of Internal Medicine*, *BMJ*, the *Lancet*, *Lancet Neurology*, *Gut*, *Heart*, and *Journal of Neurology, Neuroscience & Psychiatry*. JAMA, The *New England Journal of Medicine*, and *Annals of Internal Medicine* refused to participate. Focusing on the remaining journals, the researchers compared high reprint articles to control articles. The latter were articles of the same type from the same section of the same issue, or at least of the prior issue. For all the journals other than *Gut*, high reprint articles were significantly more likely to be funded by the pharmaceutical industry than the lower reprint articles. The cost of a single research article from an academic publisher can be more than some books, although discounts occur with volume orders. The *Lancet* had a median order of 126,350 articles for its high reprint group, *BMJ* 13,248, and *Lancet Oncology* 10,500. The other journals had a still very respectable and profitable 5,200 or less. 62.3% of reprint orders in *Lancet* were in excess of 100,000 copies. The success of these academic journals is largely based on reprint orders, and pharmaceutical companies are by far the major purchasers. In our modern computer era where people typically get a single copy of an article online and pass it on to others, reprint sales to pharmaceutical companies are likely to further increase in

importance. Naturally the articles that pharmaceutical companies order in high volume are those supporting their product, with the research typically funded by them. Editors of academic journals are definitely aware of this reality influencing them to favor research showing positive results of interest to pharmaceutical companies.

Let us now take a look at specific examples of reporting and publication bias, and see what effect it might have on medical care. One area of medicine where substantial bias has been documented is in my own area of psychiatry. In a landmark study in 2008 (Selective publication of antidepressant trials and its influence on apparent efficacy, *New England Journal of Medicine*), Erick Turner and colleagues examined 12 antidepressants approved by the FDA between 1987 and 2004, with the studies involving 12,564 adult patients. Of the 74 FDA registered studies, 23 (31%) were not published. Out of the 74 studies, 38 (51%) were deemed by the FDA to be positive, and all but one was published. The 36 (49%) of studies not found to be positive by the FDA, were either negative (24) or questionable (12). Of these 36 studies, 11 appeared to be published as positive in contrast to the FDA's conclusions, 22 were not published, and only 3 were published as not positive. Studies that the FDA judged to be positive were about twelve times more likely to be published in a way that agreed with the FDA's conclusions, than were studies the FDA viewed as not positive. Revealing further bias, the effect size of the medications derived from journal articles exceeded that derived from FDA reviews, ranging from 11-69%, average 32%. In other words, medication efficacy was greatly exaggerated.

The bias uncovered by Turner and colleagues is extremely important because it suggests that the true evidence favoring antidepressants is at best marginal. We must keep in mind that most of these studies were conducted on so-called pure subjects with depression and no complicating conditions, thereby magnifying the effect size compared to real life patients with a mixture of conditions. The published literature makes it appear overwhelmingly that antidepressants are beneficial, given that almost all of these studies report positive results. Meanwhile, only 51% of the antidepressant studies were truly positive. Meta-analysis based on this publication bias can only conclude that antidepressants are highly beneficial. However, a much different

picture emerges if negative result studies are taken into account. The issue with meta-analytic research cannot be emphasized enough, because nowadays any seasoned medical practitioner is aware of the biases that can and do go into the reporting and publication of randomized controlled trials. The results of meta-analytic studies are trusted to provide the most accurate picture, but if they are based on biased reporting and publication then they are mostly meaningless.

Turner and colleagues' results did not permit them to say at what stages of the reporting and publication process bias entered, but it likely appeared at all stages. Results that were deemed negative by the FDA were reported as positive by the researchers in some instances. Both the researchers and drug companies clearly pushed the publication of positive results, given that only a single study of this nature remained unpublished. Considering that most negative result studies were either not published or reported in a biased fashion, it seems clear that researchers and/or the drug companies sponsoring their research, either blocked publication of the results or interpreted the data in a more favorable fashion prior to publication. Academic publishers with a bias in favor of positive results also likely played a role by filtering out some negative result studies. Regardless of the actual reality, at the end of the day the medical community and patients are left believing that antidepressants are much more effective than they actually are. Insurance companies in the US and other non-socialized health care systems, favor antidepressants over psychotherapy based on the biased reporting and publication, often depriving patients of valuable psychotherapy.

Another study examining antidepressant efficacy by Kirsch and colleagues (Initial severity and antidepressant benefits: A meta-analysis of data submitted to the food and drug administration, published in PLOS Med in 2008) complements Turner's results. They reviewed 47 industry-sponsored studies on the antidepressants, Prozac, Paxil, Zoloft, Effexor, Serzone, and Celexa. About 40% of the clinical trials were not published, a rate twice that of clinical trials on average. The unpublished studies were those that failed to show a significant benefit from taking the drug. By comparing the baseline to endpoint effect of placebos and antidepressants, Kirsch and colleagues calculated that 82% of the

reported antidepressant benefit was actually due to placebo! Not exactly a ringing endorsement of these antidepressants to say the least.

Reporting and publication bias has also been found for bipolar disorder, occurring when a person has depression and manic episodes, the latter consisting of greatly increased energy, speeded up speech, reduced or absent sleep, irritable or euphoric mood, dysfunctional behavior, and psychosis. A medication heavily promoted for bipolar disorder is lamotrigine (Lamictal). Ghaemi and colleagues (Publication bias and the pharmaceutical industry: The case of lamotrigine in bipolar disorder, published in *The Medscape Journal of Medicine* in 2008) looked at how effective it truly is. Of 9 studies, 2 show positive results, and these two secured FDA approval for the use of the medication in bipolar disorder. Of the remaining 7 studies, 5 are negative and reported as one study with the negative results combined. The other two produced negative results on the main outcome measures used, but positive results on secondary measures. These studies were reported and published as positive results, although they were actually negative or at very best mixed. Hence, 7 studies were actually negative and two positive. Influenced by the great press I tried lamotrigine on some bipolar patients with abysmal results.

Turning to antipsychotic medications, Turner and colleagues (Publication bias in antipsychotic trials: An analysis of efficacy comparing the published literature to the US food and drug administration database, published in *PLoS Clinical Trials*, 2012) attempted to see if the bias characterizing antidepressant trials applies to antipsychotics. They found that two-thirds of antipsychotic trials were positive, as compared to the one-half for antidepressants. As a consequence fewer antipsychotic trials were needed to obtain the two required by the FDA for approval: Three trials for antipsychotics compared to about six for antidepressants. Is anyone thinking that the best two-out-of-three registered trials be all that is allowed? It amazes me that pharmaceutical companies can just keep going until they come up with two positive trials! The situation seems so ideal for pharmaceutical companies that it strongly hints at regulatory capture based on revolving door employment between the FDA and industry (see the *Irregular Regulation* chapter), and also lobbying influence on politicians

having some power over how the drug licensing system is structured.

A very important point to note about the Turner study regarding antipsychotics is that the focus was on the use of these medications for psychosis. It has been very well established that all antipsychotics work by blocking dopamine (a neurotransmitter), and so the science backs up their efficacy in this regard. However, so-called second-generation antipsychotics are being heavily researched, marketed, and prescribed for depression and anxiety disorders, where the science for psychosis does not apply. For example, between the periods 1996-1999 and 2004-2007, psychiatrists in the US increased antipsychotic prescriptions for anxiety disorders from 10.6% to 21.3%, and I would not be surprised to learn that this rate is low compared to what is currently occurring. These medications have toxic effects on cholesterol (lipid) profiles and promote weight gain and diabetes in most instances, health problems collectively referred to as the metabolic syndrome. Considering that their main mechanism of action pertains to dopamine, and this neurotransmitter appears less significant in depression and anxiety disorders, it is wrong in my opinion that these toxic medications be pushed so intensely for non-psychotic disorders. Unfortunately for the drug companies, there are not enough patients with schizophrenia and mania (psychosis) to maximize the market potential of the drugs, and by extending their use to these other indications it is a virtual bonanza. The timing is ideal given that patent protection for most antidepressants has expired. With the pipeline for new antidepressants slowing to a trickle, academic researchers jump on the funding bandwagon for testing second-generation antipsychotic medications in non-psychotic disorders. In my own practice I currently see numerous patients placed on them by their family doctors and psychiatrists for anxiety, depression, and even as a sleep aid.

Attendance at any psychiatry conference, review of advertisements in psychiatric publications, or viewing of direct to consumer marketing, will convince you that the application of these second-generation antipsychotics for non-psychotic conditions is as heroic as penicillin was in the past for infections. How can you not love them and want your patient to be on them for depression and anxiety; in fact you are almost made to feel guilty for not giving your

patient the cure. I suspect that when Turner or other researchers carefully evaluate the true standing of second-generation antipsychotic medication for non-psychotic disorders, the results will not support their use in this context, other than perhaps for patients who do not respond to antidepressants alone. Meanwhile the obesity, diabetes, and cardiovascular disease problems plaguing the psychiatric population (see the Weighing Down The World: Obesity chapter) will only get much worse. However, the profits of pharmaceutical companies will do very well, given that they are not held to account for the negative health externalities arising from the use of their product (see the Taking The “Devil” Out Of Development chapter for coverage of negative externalities). It is up to patients launching expensive class-action lawsuits to redress the negative externalities, and even then the deferred cost of a legal settlement is nothing compared to the profits these companies make over several years. If an outcome was completely unanticipated and nobody saw it coming that is one thing, but when it is well known that these medications promote the metabolic syndrome, pharmaceutical companies should have to pay for the negative externalities in regards to poor health outcomes.

The issue of incorporating negative externalities regarding health into the costs of doing pharmaceutical business might go a long way in helping protect the public. The topic of antidepressants and cancer risk is informative in this regard. Antidepressants, and in particular Selective Serotonin Reuptake Inhibitors (SSRI's), have been suspected of being linked to cancer. This suspicion might simply reflect a spurious correlation, in that people are often taking these medications for a period of years and develop cancer, making it seem that the two are linked, while it might well be increasing age advancing the risk of cancer. However, the notion that breast and ovarian cancer are linked to antidepressants has persisted as a concern. Personally, in my years of prescribing antidepressants I have only had a couple of patients develop either form of cancer, almost suggesting a protective effect, but some might comment that patients could develop cancer years after stopping the medication.

To look at possible bias that might play a role, Lisa Cosgrove and colleagues (Antidepressants and breast and ovarian cancer risk: A review of the literature and researcher's financial associations with industry, published in PLoS One, 2011) examined

relevant studies. Of 61 published studies, 20 reported a positive linkage between cancer (breast and ovarian) and antidepressants. Of these none had industry funding or association. Industry association occurred in 15 of the 41 studies finding no link between cancer and antidepressant use in women. Clearly there is some bias in that none of the studies finding a link had industry funding, and a substantial proportion of those finding no linkage had industry funding. If the costs of cancer-related negative externalities had to be absorbed by pharmaceutical companies, they might be more interested in discovering a linkage early on to reduce long-term costs. It is of course feasible that studies finding a link with cancer are biased against antidepressants.

An interesting study reveals how the pluses of psychiatric medications are promoted and minuses downplayed in regards to marketing. A couple of researchers-Srijan Sen and Maya Prabhu-who were training in psychiatry at the time, examined medication trial studies presented at the American Psychiatric Association (APA) conferences in 2009 and 2010. The APA conference is the largest yearly psychiatric conference in the world attracting thousands of psychiatrists and allied professionals. The researchers identified 278-medication trial abstracts, with 195 supported by industry and 83 not so. Of the industry supported trials 97.4% reported results that were positive toward the medication in question, 2.6% reported mixed results, and none reported negative results. In contrast, 24.1% of the trials not supported by industry reported mixed results and 7.2% negative results. This study demonstrates how there is incredible bias pertaining to medication trial outcomes reported by industry-sponsored researchers at the APA conference (and presumably other such conferences). It also shows how there is still a trend to favor the presentation of positive medication results, as if all the negative ones are somehow less important. In fact they are actually more important, given that they cast doubt on the true efficacy of products that many people are consuming and experiencing side effect from.

Based on what has been presented so far I doubt that many of you will be singing, or even whispering, the praises of psychiatric medications. Quite possible the results are even worse than presented based on a problem with the method employed in most research. Recall how it is necessary to compare an active drug

to a placebo if we are to say that the drug actually works. As part of this methodology, both the subject and experimenters cannot know who is taking the active ingredient and who is taking the placebo (double-blind). What happens if both the subjects and experimenters are not actually blind? Answer, the results are largely meaningless, because subjects who know they are on the active medication will unconsciously recruit their natural healing powers, while subjects aware that they are on a placebo will expect no benefit and not recruit their natural healing powers. In other words, the placebo effect will be enhanced in those taking the actual drug, and diminished or inactivated in those taking the placebo. Experimenters who know the subject is on the activate drug will influence the results, by for example sounding more optimistic when interacting with these patients, or communicating the expectation of improvement.

But how can subjects and experimenters ever be aware of medication status if double-blind conditions prevail? This possibility resides in a fundamental difference between active agents and placebos—Active drugs have side effects and placebos typically do not. Any patient at all experienced with psychiatric medications, will suspect either unconsciously or consciously that they are on the active agent if they have side effects, and believe that they are on a placebo if no side effects occur. Any even slightly experienced experimenter will also have a good idea of what subjects are on if any information regarding side effects is known to them, even a spontaneous report by a subject. This issue needs to be front and center in psychiatric research, but as it stands now is barely mentioned by anyone. One option is to use a so-called active placebo (one that has the same side effects but lacks therapeutic action). For older Tricyclic antidepressants a reasonable one existed in the form of anticholinergic medication, producing dry mouth, blurred vision, and sedation, common side effects for these antidepressants. SSRI's have a different side effect profile and one that is not shared with any active placebo that I am aware of.

In addition to side effects, active psychiatric medications also show withdrawal effects and tolerance. The pharmaceutical industry and researchers funded by them prefer using the much nicer sounding term, "discontinuation syndrome," instead of withdrawal. It has a sophisticated and lofty sound to it. Some withdrawal-sorry,

discontinuation effects-are not at all pleasant including agitation and sensory-perceptual changes, such as lightheadedness and even electric shock sensations. Tapering is usually required to prevent withdrawal effects (let's call them what they are). Tolerance is also extremely common, whereby the effects wear off at a given dose and the dose has to be raised to achieve the same effect. I start out at the lowest dose that works, to both minimize side effects and not hit the maximum dose too fast in anticipation of tolerance. Now what also produces side effects, tolerance, and withdrawal? Addictive substances of course! So antidepressants have a lot in common with addictive substances, although they usually do not produce an altered state of consciousness. Some critics of antidepressants might, and even successfully so, challenge this last statement. When is the last time you heard the pharmaceutical industry referring to the addictive aspects of antidepressants? Yes, another one of those rhetorical questions. As pertains to the double-blind status of subjects and experimenters in research, there are some study designs whereby subjects are switched from active agent to placebo, or vice-versa, to evaluate the effect. The presence or absence of withdrawal effects will provide further information for both subjects and experimenters regarding whether the former are on an active agent or placebo.

Supporters of the pharmaceutical industry, or at least that segment devoted to psychiatric medications, might raise the objection that subjects being largely inexperienced will not be aware of side effect and withdrawal issues. Consider the 12,564 depressed subjects reported in the 2008 study by Turner and colleagues. These for the most part quite rare pure depressive patients could not have been all that easy to find. A little known fact, even amongst many non-research psychiatrists, is that subject recruitment can pay well. Due to the competition for psychiatric subjects, especially those with purer states of illness, a researcher can receive between \$10,000 and \$30,000 per patient enrolled (at least for subjects with schizophrenia). They might even receive a bonus on top of that from the pharmaceutical company if a certain number of patients are enlisted. Recall that the larger the sample size the more likely that a positive result will emerge from the data, and too low sample sizes can actually lead to the conclusion that a

result is negative when it is positive. The hunt is on for those special subjects.

As reported by Gabriella Rosen in an insightful article in *Scientific American Mind* in 2012—Studying drugs in all the wrong people—many subjects willing to participate go from study to study, and have substantial medication experience both in regards to treatment and research exposure. These subjects are quite likely aware of whether or not they are taking an active drug or placebo, based on their experience with medications and research studies. Interestingly, the recruitment of subjects who enroll for monetary compensation or treatment if uninsured can artificially influence the response to placebo—If a subject boosts their symptoms to get into the study, that artificial elevation will disappear even without placebo treatment. For example, a potential study subject presents with symptoms rating a severity of say 8/10 to ensure entrance into the study, and once admitted the presentation is dropped shifting the symptom rating to 6/10. The placebo appears to be more effective than what it is, thereby reducing the likelihood that the active agent will separate from placebo. However, if due to the same experience with psychiatric studies a subject is aware of whether they are on a placebo or active agent, the bias likely favors the medication. Either way, there is a lot of complicated bias that needs to be sorted out.

The research reviewed shows how reporting and publication bias operates using the example of psychiatric research. While the bias in psychiatry might be one of the most graphic examples, bias in reporting and publishing occurs in every area of medical research. Supporting this conjecture is a study by Kristin Rising and colleagues (Reporting bias in drug trials submitted to the food and drug administration: Review of publication and presentation, *PLoS Medicine*, 2008). These researchers identified all clinical trials registered in the New Drug Applications (NDA) for drugs approved by the FDA in 2001 and 2002. They then searched for publication of the results five years later, a safe time frame to include all that are ever going to be published. Only three-quarters of the trials were published and positive results were nearly five times more likely to be published, resulting in a massive distortion in the published literature.

It is human nature to bias things in a positive direction, at least when a person has good mental health (see Defending the Indefensible chapter), but research bias goes way beyond what can be expected from defensive motivation. Ultimately, it is largely about money. Pharmaceutical (and biotech companies) have product to sell and invest a lot in the development of those products. It takes a great deal of money to bring a new drug to market, but the profits can be staggering for best sellers. For example, in 2010 antipsychotics and antidepressants placed in the top five best sellers, generating \$16.9 billion and \$16.1 billion, respectively, that year alone! These numbers pay for a lot of influence to get the drug to market, and ensure it is profitable until the patent runs out. Researchers have careers to protect and advance, and in this publish or perish world it often becomes a matter of distort or despair, if ongoing funds are to be secured from pharmaceutical companies. Inevitably, this influence represents a funding bias and conflict of interest.

Funding Bias & Conflict Of Interest: Research that is funded by industry tends to overwhelmingly support the product in question, whereas research funded by other sources is far less likely to be supportive. Funding sets up a reciprocal obligation as discussed under biotechnology research, and the strength of this motivation within virtually all of us is not to be underestimated. Unlike most consumer products that either work or not, the effectiveness of pharmaceuticals is complicated by the placebo effect. Research is required to determine the true value of the product, but biasing influences can and commonly do make the results meaningless, or at best very difficult to interpret. Both consumers as patients and physicians are then left in a difficult position of trying to evaluate what is worth taking and for what condition.

Funding bias sets up a conflict of interest because there is a motivation to reciprocate by finding supportive results, while the role of a researcher is to distinguish true from non-true effects, and assess the degree of effectiveness. When negative results arise there is conflict between the reciprocity motivation and the role of researcher, producing an unpleasant psychological state known as cognitive dissonance. Unconscious forces work to resolve the conflict and restore a more peaceful mental state. In some instances

researchers funded by industry do so by redefining the research role as that of product generator. In other instances, positive cognitive distortions are applied to the empirical data. For example, emphasizing secondary measures yielding positive results, and downplaying negative results on primary measures. By resolving the conflict cognitive dissonance is eliminated, a form of negative reinforcement that is often more powerful than the receipt of something rewarding (positive reinforcement). Beyond these more subtle forces, there is out and out greed that we are all vulnerable to, researchers included. Examples of funding bias and conflict of interest will help illustrate how the process works.

Bisphenol A (BPA) found in plastic bottles is now recognized as being a health risk, and has been removed from baby bottles and many other products. Researchers working for or funded by the chemical industry concluded that the chemical is safe. Basing its decision on these studies, the FDA determined in 2008 that BPA is safe when leached into food. Meanwhile, research not funded by the chemical industry reached different conclusions, with over 90% finding adverse health effects from even low doses of BPA. Baker and colleagues reviewed 176 studies examining the safety of BPA. A full 100% (13/13) of industry funded studies indicated no harm, while 86% (152/163) of studies not funded by industry reported harm. In a similar vein, scientists with tobacco industry funding are much more likely to find that nicotine or smoking improves cognitive performance, than studies funded by other sources. In the past the tobacco industry actively recruited medical researchers willing to refute the link between smoking and cancer, without declaring their funding source. Researchers funded by cell phone companies are least likely to find a link between cell phone use and brain cancer, or other health risks.

Then there is the uniquely Canadian asbestos research example, so well documented and elevated to public attention, at least briefly, by the Canadian Broadcasting Corporation (CBC). Asbestos mined in Quebec is a known carcinogen banned by more than 50 countries presently. Asbestos particles enter the lungs inciting inflammation leading to a form of cancer known as mesothelioma, and/or asbestosis impairing the ability to breath. Outcomes are fatal, but typically occur years after exposure opening the door to all sorts of bias in linking asbestos to the

disease state. Dr. John Corbett McDonald of McGill University's School of Occupational Health and his team received lucrative funding from the asbestos industry to study the health effects of this product. The CBC National show revealed that he received \$1 million between 1966 and 1972 alone. While virtually every other researcher in the world found dire health consequences in terms of mesothelioma, Dr. McDonald's team found that chrysotile asbestos, that just happens to be the type mined in Quebec, is far safer than other forms. This has been compared to jumping from the 18th floor rather than the 20th floor. Bias is alleged to have occurred in Dr. McDonald's research, such as excluding females exposed to asbestos; females are much more vulnerable and develop problems faster and under lesser degrees of exposure. McGill University has so far refused consent to a full independent evaluation of Dr. McDonald's research. As an interesting and revealing side note, Dr. McDonald also received \$10,000 from Imperial Tobacco to simply review a study on the health effects of tobacco, based on a 1988 letter from Dr. McDonald to Imperial Tobacco stating, "As agreed, our fee for this work is \$10,000."

Looking at more mainstream pharmaceutical research, a study by Henry Stelfox and colleagues—Conflict of interest in the debate over calcium-channel antagonists (published in the *New England Journal of Medicine* in 1998)—surveyed researchers who investigated the effectiveness of these medications for cardiovascular disease. They looked at five sources of funding by industry consisting of, support to attend a symposium (funds for travel expenses), an honorarium to speak at a symposium, support to organize an educational program, research funding, and employment or consultation. They also assessed whether the researcher was supportive, neutral, or critical of calcium-channel antagonists. Only 69% of those supportive completed the survey, compared to 83% of the neutral and 91% of the critical authors. Examining the question of whether supporters of these medications were more likely to have financial ties to calcium-channel manufacturers, they found strong support for this hypothesis—96% of the supportive researchers had these financial ties, compared to 60% of the neutral authors, and 37% of the critical authors. It might be suggested that critics of calcium-channel antagonists favor competing products and are funded by those sources. Stelfox and

colleagues did not find any evidence for this option, because supportive and neutral authors (towards calcium-channel antagonists) were more likely—88% and 53%, respectively—to have financial ties to competing products, than were critical researchers (37%). This result suggests that those supportive of calcium-channel antagonists might be funded by the wider pharmaceutical industry, indicating a more extensive bias. As it turns out 100% of supportive authors, as compared to 67% of neutral authors and 43% of critical authors, had financial ties with industry. The results of Stelfox and colleagues provide clear evidence for the perspective that financial ties with the pharmaceutical industry are associated with support for products manufactured by these companies.

A meta-analysis of studies investigating the relationship between funding source and outcome included both individual research trials and relevant meta-analyses (Joel Lexchin and colleagues—Pharmaceutical industry sponsorship and research outcome and quality: Systematic review, published in *BMJ* in 2003). The studies examined covered a diverse range of diseases—Osteoarthritis, multiple myeloma, psychiatric illnesses, Alzheimer’s disease, venous thromboembolism, and numerous drugs. The majority of 16 studies (13) found that clinical trials and meta-analyses sponsored by drug companies favored the product manufactured by the funder. The authors point to various sources of bias in industry funded studies including: Poor study quality capable of exaggerating treatment benefits by an average of 34%; industry preferentially funding studies when they believed that the product stood a better chance of yielding positive results; inappropriate doses of comparison drugs with higher doses of the drug produced by the funding company, and too low doses of the comparison drug manufactured by a competitor, biasing the results in favor of the former; publication bias with industry-funded studies less likely to be published, because the funder blocked the publication of negative results. They also found that so-called pharmacoeconomic investigations (assessing the financial cost/benefit ratio of drugs) were more likely to report results favoring the product when funded by the manufacturer, than studies financed by other sources, an outcome found in all five studies investigating this issue. Backing up the pharmacoeconomic result is an earlier study by Sacristan and colleagues, finding a 92%

rate of positive findings for this type of research in the journal *Pharmacoeconomics*, when during the study period of 1988-1994 drug companies sponsored 83% of research in the journal. By contrast, positive findings occurred with only 49% of the studies published in general medical journals, where 74% of the funding came from government agencies.

So far the discussion has largely focused on individual researchers, pharmaceutical companies, and academic journals, but what about academic institutions? Are they exempt from medical bias? Most readers by this point will not be at all surprised to learn that academic institutions also play a major role. Funds from industry often go to departments in academic institutions that conduct research supportive of their product/s. These institutions have a financial stake in products as evidenced by the research of Justin Bekelman and colleagues (Scope and impact of financial conflicts of interest in biomedical research, published in *JAMA*, 2003). They did a meta-analysis of all studies between 1980 and 2002 examining the impact of financial conflicts of interest in medical research. One of their more interesting results revealed that two-thirds of academic institutions hold equity in start-ups that sponsor research at the same institutions. If anything this conflict of interest has progressed in scope and depth from that time. Bekelman and colleagues also found that industry sponsorship was associated with pro-industry conclusions, and restrictions on publications and data sharing.

Researchers working in academic institutions are strongly influenced by the hierarchy of the particular institution. Promotions to higher levels are contingent upon performance evaluated by those in the most senior positions. Those who align with the agenda of the department and institution are much more likely to be promoted, everything else being equal. Unfortunately, the playing field is not equal because promotion is often based on number of publications, impact factor of the journal, and citation rate of articles published by the researcher. Funding from pharmaceutical companies assists a researcher in producing potentially publishable results, positive pharmaceutical results are substantially more likely to be published and particularly in high impact factor journals, and the citation rates for positive result pharmaceutical studies tends to be high. How can medical

academic institutions not gravitate to promoting researchers who deliver in this fashion, particularly when the institution is receiving money from the pharmaceutical industry, and can expect to receive more with publications favorable to industry? Ultimately, it has become a business. No researcher in academic medical institutions is immune from this bias.

A very personal example influencing my career direction will illustrate how the process can and often does work. In 1990 I entered the postgraduate program in psychiatry at the University of Toronto. This program is one of the largest in North America, and at the time was aiming to be the "Harvard of the North." A new Chair of the psychiatry program, Dr. Paul Garfinkel, was very keen on research, encouraging residents to partake in it. A special program was set up providing qualified residents a half day per week of protected time to conduct research. Being very interested, optimistic, and naïve regarding politics, I seized the opportunity designing a unique research study supported by my supervisor, Dr. Gerry Shugar.

The study was designed to see if a major psychological variable, self-esteem, influences or is linked to the content of psychotic experiences. An ambitious project that passed through the ethics and scientific boards at the university very quickly. The study involved interviewing actively psychotic patients regarding their delusions and hallucinations (not the easiest task at the best of times) using a standardized assessment tool, administering self-esteem measures to them, and having raters blind to the self-esteem scores and identity of the subjects reporting the psychotic experiences, evaluate the delusions and hallucinations for self-enhancing or diminishing content. Correlation studies providing a measure of the relationship between two entities cannot determine causality or direction, but one reason behind my selecting self-esteem was that it only changes gradually over years in response to major life events, whereas the content of psychosis can change very rapidly. Hence, self-esteem is more likely to influence the content of delusions than the reverse, at least in the shorter-term. The study yielded a very strong correlation between global self-esteem and the content of delusions, and represented the first to objectively demonstrate a relationship between the content of psychosis and a major psychological variable, despite decades of discussion

regarding this linkage. The research was eventually published in the Canadian Journal of Psychiatry in 1998.

Getting back to my first year of residency, it would all seem good with a young and aspiring researcher investigating a novel problem in a creative fashion. One day Dr. Garfinkel expressed to me that he was pleased by my interest in research, but did not agree with the type of research I was doing. He stated, "What is important is the thin of the thick, not the thick of the thin," interpreted as mainstream drug company type research is important and chewing off a thin piece of it is good, whereas exploratory research tackling big questions is irrelevant. Backing this interpretation up, a short while later during what were known as professorial rounds, I presented a small paper where I applied a robust psychological variable and one of the key theories of motivation, cognitive dissonance, to various psychiatric issues such as psychodynamic conflicts. The presentation was vastly more creative than others focused on medications and specific disease entities. His comment to the group was, "Who feels that this is important?" If my presentation had of been, "The Pluses of Prozac" I have no doubt that his response would have been vastly different. What was glaringly clear to me was that I had a choice between relinquishing my exploratory research ambitions and embracing pharmaceutical type research, or not seeking an academic career at the university. The former felt very much like selling out on what I believe in, and not being one to sell out, I decided to work solo conducting theoretical and exploratory research (see theorypsychiatry.com). Even though the University of Toronto appeared to be the worst culprit in Canada from what I observed, the entire academic psychiatry system was shifting towards pro-industry research, limiting my potential to freely conduct exploratory research, no matter where I went. Essentially psychiatry was being captured by the pharmaceutical industry.

Dr. Paul Garfinkel went on to international infamy amongst the larger scientific community with the so-called "Toronto Affair." Dr. David Healy, an Irish psychiatrist, was actively recruited for a position in the University of Toronto, Department of Psychiatry (Centre For Addiction and Mental Health-CAMH) in 1999. Following a three-day visit senior staff, consisting of Dr. Paul Garfinkel (Chair) and Dr. Sidney Kennedy (Head of the Mood & Anxiety Division), wrote congratulatory letters to him. Dr. David

Goldbloom (Physician-in-Chief) and Georgina Veldhorst (Vice-President Mental Health Programs), later formally offered him a position as Clinical Director, Mood and Anxiety Disorders Program. On November 30, 2000, prior to starting his new position, Dr. Healy attended a meeting at the University of Toronto entitled, Looking Back. Looking Ahead—Psychiatry In The 21st Century: Mental Illness and Addiction. Dr. Healy presented a talk—Psychopharmacology And The Government Of Self. The topic was critical of several aspects of the pharmaceutical industry including: The inadequacy of clinical trials in terms of how efficacy in studies does not translate into true effectiveness in patients (recall pure patient selection issues); ghost written papers; negative clinical trails being suppressed, and positive ones over-promoted. Dr. Healy also indicated that Prozac and SSRI's in general lead to suicidal behavior in some patients. He criticized the industry for not taking these reports seriously and conducting the necessary research to safeguard patient safety.

Based on my experience with the University of Toronto Department of Psychiatry hierarchy, I would not have predicted a favorable outcome for Dr. Healy, despite his raising perfectly valid concerns that needed to be addressed as psychiatry moved into the 21st century. On December 7, 2000 right after his talk, Dr. Goldbloom sent him a letter retracting the job offer. The letter stated, "Essentially, we believe that it is not a good fit between you and the role as leader of an academic program in mood and anxiety disorders at the Centre and in relation to the university. This view was solidified by your recent appearance at the Centre in the context of an academic lecture. While you are held in high regard as a scholar of the history of modern psychiatry, we do not feel your approach is compatible with the goals for development of the academic and clinical resource that we have." The repeated reference to "we" suggests that Dr Garfinkel was involved in this decision, and as Chair was ultimately responsible.

Dr Healy understandably felt that the job offer retraction was due to his stance against pharmaceutical companies, and in particular Eli Lilly, manufacturer of Prozac. Eli Lilly had been a major contributor to the University of Toronto psychiatry program, providing 52% of total funding for the Mood and Anxiety Disorders Program that Dr Healy was to head, and \$1.5 million

dollars to CAMH to help its fundraising campaign. A precedent existed for Eli Lilly withdrawing funding to programs seen as being anti-Prozac, based on \$25,000 funding being pulled from the Hasting Center when they published an article by Dr. Healy indicating that Prozac induced suicide. The Hasting Center stood by its decision, showing moral backbone. Response to the withdrawal of Dr. Healy's employment offer was swift and intense. The Canadian Association of University Teachers (CAUT) fully supported Dr. Healy, and lobbied the University of Toronto on his behalf. In a letter to Robert Birgeneau, then President of the University of Toronto, they stated, "Retraction of a job offer suggests a fundamental attack on academic freedom...what happened to Dr. Healy appears to be an affront to academic freedom in Canada." Condemnation of the decision arrived from all corners of the globe, as it represented one of the most flagrant violations of academic freedom. Dr. Healy launched a lawsuit for \$9.4 million in damages against CAMH and the University of Toronto that was settled for an undisclosed amount. Dr Healy's experience aligns very well with what I encountered.

Although some justify industry support of academic programs and argue that it does not produce bias, the example by CAMH and the University of Toronto provides very strong evidence that academic freedom is extremely impacted by it. Industry funding of academic departments has steadily increased over the years, and anti-industry sentiment can and does jeopardize that funding. Researchers supporting industry objectives frequently advance, while those with opposing viewpoints and/or research data languish. Basic science exploratory research that is not as financially viable in terms of product generation, support, and marketing suffers. As would seem obvious, this is a very shortsighted objective, because without new insights and findings product development must ultimately be diminished. In addition, it should not be all about product generation in science, and vastly more value has to be placed on seeking the truth, regardless of whether or not the process and outcome yields a financially viable product.

A further problem with industry funding and how it relates to new insights is the subspecialty focus it requires. Based on my years of conducting exploratory and theoretical research, I can

confidently state that the truth does not respect artificial man-made boundaries. If you want to discover the truth about something a cross-discipline approach is almost always required. I seek information from diverse sources such as neuroscience, psychoanalysis, anthropology, evolutionary biology, psychology, sociology, psychiatry, and even physics. In contrast to this very cross-discipline approach, medical academic centers are typically sub-sub-specialized. A researcher might be a psychiatrist (specialized), working in the area of mood disorders (sub-specialized), and exclusively focused on bipolar disorder (sub-sub-specialized), and maybe even sub-sub-sub-specialized such as restricting research to bipolar mania. Unless the truth can be distilled from a highly concentrated approach (rarely the case) a lot is going to be missed, and data is often devoid of a larger context. One of the main reasons why academic researchers are so intensely specialized is to attract money from funding sources, such as pharmaceutical or biotech firms. By being sub-sub (or sub-sub-sub) specialized, you can put yourself forward as a true expert in that small area and draw in funding. As you publish papers and present at the relevant conferences, your reputation grows assisting you in drawing in more funding. In the University of Toronto system staff psychiatrists were asked to sub-specialize or move on.

Funding bias and conflict of interest infects every area of medical research, leaving physicians and consumers not really knowing what to trust. Patients frequently end up taking medications producing little or no benefit, while incurring both short and long-term side effects. This is not to say that medications are useless, and indeed many can be very helpful. We are just left in a state where no one really knows what is useful, for precisely what indication, and too what extent. Trusting meta-analytic studies and treatment guidelines published by experts are not viable either. As we have seen, meta-analyses based on distorted data are largely meaningless. Likewise, treatment guidelines produced by "experts," who almost universally receive substantial industry funding, can be very difficult to interpret due to conflict of interest. For example, in psychiatry first line treatment guidelines for depression and anxiety disorders are often medication and not psychotherapy. If those making the recommendations were not receiving what are in many cases very large amounts of money

from industry, would psychotherapy be moved to first place? Quite possibly, or at the very least it would advance in the rankings. The experts point to studies demonstrating the benefits of psychiatric medications, but these sources cannot be trusted due to all the sources of bias covered. Many of these same experts establish criteria for specific disorders, as laid out in the Diagnostic And Statistical Manual (DSM), and these criteria can be set up to be overly inclusive, thereby helping to sell more pharmaceutical products. Lisa Cosgrove and colleagues (Financial ties between DSM-IV panel members and the pharmaceutical industry) published in *Psychotherapy and Psychosomatics* in 2006 uncovered some relevant findings—They found that 100% of the “mood disorders” and “schizophrenia and other psychotic disorders” panel members had one or more financial associations with the pharmaceutical industry.

At this point you might say, “Fine, maybe we just have to rely on our major regulatory institutions, such as the FDA and National Institutes of Health (NIH) in the US.” Unfortunately, this appears to be a bust as well. We have already seen how the FDA typically approves drugs based on only two positive result studies, even if many more are negative. Regarding the NIH, Charles Seife, a professor of journalism at New York University, examined conflict of interest and funding bias issues within this organization (Is drug research trustworthy? published in *Scientific American*, December 2012). The details uncovered are fascinating, and so is the fact that in several instances he had to evoke the Freedom of Information Act (FOIA) and legal action to view relevant material. Using a database including all NIH grants from 2009-2010, combined with ProPublica data of drug company payments to researchers, he discovered that \$1.8 million in payments from drug companies to NIH grant recipients were made in New York State alone. These included payments for speaker bureau appearances (where the researcher presents an industry written presentation), consulting jobs, and other services. What this means is that while it appears that researchers receiving NIH grants might be unaffected by funding bias (at least from industry), they are anything but. Even more amazing is Seife’s findings pertaining to the NIH itself. NIH committee members who decide what researcher gets what grant and how much (advisory and review committees), are often

funded by industry! He found nearly 70 advisory committee members taking a total of more than \$1 million for speaker's bureau appearances, consulting, and other services. Some of these payments clearly violate federal ethics rules, prohibiting advisory committee members from participating in decisions that might affect an organization they are receiving substantial remuneration from. Even worse, the NIH does not address conflict of interest issues.

A few years back, the Department of Health and Human Service's Office of Inspector General obtained documents showing that NIH management discourages investigations into conflict of interest of NIH-sponsored researchers. To investigate how the NIH hierarchy deals with internal conflict of interest issues, Siefe made a request for information to the NIH. When this failed he filed a Freedom of Information Act request, and when this failed he sued. He indicates that what NIH officials were mostly covering up is "waivers" exempting government employees from ethics laws. Dozens of these waivers were issued for NIH advisory committee members receiving thousands of dollars from industry. Beyond the obvious ethical problems, the application of these waivers violates federal law—These Waivers are only to be applied rarely in extenuating circumstances, with a great deal of oversight by the Office of Government Ethics (OGE). In the instances reviewed by Siefe, the waivers contained no specific information of funds the advisory board member received from industry, and in only three instances (none involving advisory board members) was the OGE ever consulted. Essentially, the NIH hands out waivers granting advisory board members immunity from the law!

Basically where all this leaves us is that research conducted by many medical (and biotech) researchers cannot be relied upon due to extensive biasing factors and conflicts of interest, meta-analyses and guidelines based on this biased research are very dubious, and regulating bodies have dropped the ball. The US Congress is fed up with conflict of interest and funding bias issues in medical research, viewing taxpayer money spent as being largely wasted. Researchers, academic institutions, and regulatory bodies are failing miserably doing nothing that actually rectifies the problem. Starting in 2008 congressional hearings looked at this matter identifying some major abuses. Currently, the process of

reform is only starting and faces a mountain of resistance built on the influence of money.

Wanting to place a positive spin on what they are doing, many of those involved in the bias and conflict of interest fiasco characterizing medical (and biotech) research, argue that despite any problems we can rely on research findings. It is natural to defend what one is doing, but despite the predominant funding of research by industry, massive amounts of taxpayer revenue are still being wasted on highly biased, and hence very questionable research, that unquestionably benefits industry. Of even greater concern, patients and frontline physicians are left not really knowing what truly works, such that benefits exceed side effects. A key issue associated with research is how often results actually turn out to be valid. If valid in the vast majority of instances, despite the numerous biasing and conflict of interest influences, then maybe we should not be as concerned. Let us now take a look at how valid medical and biotech research is.

HOW OFTEN DOES RESEARCH YIELD TRUE RESULTS?

This question can be very difficult to answer accurately. We have already learned that there are a large percentage of negative result trials for pharmaceutical products that are either never published, or altered to appear positive. However, what about earlier stage research leading up to products? The best place to look for an answer to this important question is of all places industry, because they have so much invested in solid and profitable outcomes. A very interesting article appeared online in 2011 (*Academic bias & biotech failures*, at Life Sci VC), written by Bruce Booth, a partner at Atlas Venture who describes himself as, "A recovering scientist turned early stage venture capitalist." He indicates that most academic research results are not reproducible! He explains that, "The unspoken rule is that at least 50% of the studies published in even top tier academic journals-Science, Nature, Cell, PNAS, etc-can't be reproduced." His assertion is backed up by dozens of experienced research and development professionals who have participated in the retesting of academic findings. An example is given of a researcher who set up a company based on a new approach to drugging hot receptor targets. Booth's company did not sign on, but another venture capital firm did. \$5 million dollars

was spent trying to validate a platform that did not actually exist. A re-examination of the lab notebooks revealed that the founder's lab had, at the very least, massaged the data, and shaped it to fit their hypothesis. Essentially, they ignored every piece of negative data.

Booth believes that the cause of the problem resides largely in how academic researchers are faced with publish or perish, that as I have mentioned becomes distort or despair. Grants are competitive, and there is a strong bias to write conclusions supporting the hypothesis in the grant or in prior publications. He states that, "To think there is only objectivity in academic research, and pervasive bias in industry research, is complete nonsense." Searching the topic of academic bias in research, he uncovered zero articles on PubMed (an online site providing a comprehensive list of all medical publications), compared to 63 peer-reviewed articles dealing with Pharma conflict of interest. Booth indicates that academic bias most likely manifests via three routes. First, senior academic investigators directly or indirectly pressure personnel in their lab to publish best of all experimental results, rather than the average or typical study. Second, the "special sauce" of the author's lab, such as what serum was used, leads to optimal activity in the paper that cannot be replicated elsewhere or is not broadly applicable. Third, contradictory data is systematically ignored in order to support the lab's hypothesis, the result being the discounting of conflicting findings. I have encountered many PhD students who were told repeatedly by their supervisor, when negative results emerged, to revisit the data and run more experiments. If a result has not been reproduced in an independent lab it is probably "bleeding," rather than "cutting edge," according to Booth. He concludes that we have to confront and reduce academic bias, and improve the external validation of published findings.

The content of Booth's article is backed up by responses from people in the know. One commentator, Art Krieg, went from medical researcher to industry as Chief Scientific Officer for Pfizer. Commenting on the notion that academic research is somehow "cleaner" than industry research he expressed, "In my own experience, just the opposite is true. In fact, I think that your (Booth's) estimate that 50% of high profile academic research is irreproducible is optimistic—I think the truth is even worse,

especially in hot areas, where the pressure for an academic scientist to publish before being scooped is especially intense, and where the rewards for being seen as a leader in the field may be more immediate than the cost of publishing something that turns out to be wrong." He further indicates that having worked on both sides he sees that industry researchers are under less pressure to publish, and apply a significantly higher level of rigor. Krieg mentions cases where he questioned the principal investigators of flawed non-reproducible research if there was any difficulty in generating the data. A typical response was that the junior researchers had to be pressured hard to get the "right" data. Furthermore, the vast majority of these false results are never retracted from the literature.

Big Pharma has actually studied the matter of academic bias. Three of Bayer's (total revenue of 36.5 billion Euros in 2011) Health-Care's drug discovery researchers (Florian Prinz, Thomas Schlange, and Khusru Asadullah) looked at their own experiences, and came up with some quantitative data they published in *Nature Reviews Drug Discovery* in 2011 (Believe it or not: How much can we rely on published data on potential drug targets?). They found that, "With reasonable efforts (sometimes the equivalent of 3-4 full-time employees over 6-12 months), we have frequently been unable to reconfirm published data." To measure the extent of the problem they conducted an analysis of research and development on early stage in-house projects (target identification and target validation), for Bayer's three main strategic research fields of oncology, women's health, and cardiovascular disease. Amazingly, they found that only 21% (14/67) of projects were characterized by published data being in line with in-house findings. Of the 14 projects only 1 perfectly reproduced the data, while 12 could be adapted, and one was not applicable. For two-thirds of the projects (43/67), inconsistencies between published results and in-house data were so great that the projects were scrapped. That these results occurred for published data, deemed by experienced industry researchers and staff to be promising enough to warrant in-house study, is almost unbelievable. Think of all the published results seen as too weak to warrant consideration. Reasons for the lack of validity in published data cited by the researchers included: First, bad statistics involving incorrect or inappropriate analysis of results or insufficient sample sizes, translating into a high number

of irreproducible or even false results. Second, publication pressure experienced leading to negligence regarding the control or reporting of experimental conditions. Third, publication bias favoring positive results ensuring that fewer negative results make it into print. Fourth, the presence of inadequacies in the peer-review process allowing flawed studies to be published.

These striking revelations from Bayer prompted Glenn Begley, head of Hematology and Oncology Research at Amgen (total revenue for 2011 exceeding \$15 billion), to conduct an investigation. The study-Raise standards for preclinical cancer research-was published in Nature in 2012. Begley and his colleague, Lee Ellis, identified 53 “landmark” publications (papers in top journals from reputable labs) over the prior decade that their team checked on. These studies, according to Begley, were ones that the pharmaceutical industry relies on to identify new targets for cancer drug development. Of the 53, only 6 (11%) could be confirmed. A full 47/53 or 89% failed! Begley expressed, “Even knowing the limitations of preclinical research, this was a shocking result!” Equally shocking, confidentiality agreements between the authors and Amgen bar any disclosure of the 47 studies that failed, meaning that “the world will never know” that these often highly cited papers are false. Comparing good and bad (true and false result) papers, Begley and Ellis found that the good ones were characterized by authors paying close attention to controls, reagents, investigator bias, and described the complete data set. The bad ones lacked these qualities, with investigators often not being truly “blind” to the experimental versus control group. In confronting authors of false studies the most common response Begley received was, “you didn’t do it right,” suggesting that most of these authors were consciously unaware of the positive distortions they applied to the results. Begley describes one less defensible instance, where he explained to the researcher in question that they had run the test 50 times without a positive result. The investigator said that they had done it 6 times and got this result once, putting it in the paper because it made the best story. Another one of those Wow moments, and this is to do with leading edge cancer therapy.

The same problem applies to all areas of medical research, as for example genetic studies trying to uncover links between genes and disease. We are continually hearing in mainstream media how a

certain gene is now linked to a disease, and we can expect a breakthrough cure resulting from this discovery. However, we never hear any more about the gene, and never see a breakthrough cure. This occurrence is particularly striking for psychiatric illnesses. To investigate the true success of these genetic studies, Laramie Duncan and Matthew Keller (A critical review of the first 10 years of candidate gene-by-environment interaction research in psychiatry, published in the American Journal of Psychiatry in 2011) investigated 103 such studies over the first decade of research. They discovered that while 96% reported positive results, only 27% of these held out with any replication attempt. Not a very positive scenario, but one perfectly in line with the research bias we have seen.

Glenn Begley (Amgen) believes that a key aspect of the problem of untrue studies being propagated is that academic success is measured not by the metric of science quality, but by the number of published papers and the impact factor of the journal. Hence, a totally untrue paper in a high impact factor journal scores, whereas a scientifically tight paper revealing negative results, that either does not get published or in a lesser journal, represents a career limiting failure for the researcher. Begley indicates that the academic system and peer-review process tolerates, and even inadvertently encourages, this state of affairs. Researchers seeking funding, a job, promotion or tenure, need a strong publication record often involving first-authored papers in high-impact journals. Journal editors, reviewers, and grant-review committees, often look for a scientific finding that is simple, clear, and complete, such that it makes a perfect story. Billions of dollars and Euros are wasted every year through this process, because a biased result is a useless one. For us to remain in a state of distrust without acting, or go on applying a massive positive cognitive distortion, and believe that medical researchers and the system supporting them is trustworthy, are no longer viable options. So what can we do about the problem?

BRINGING TRUTH TO MEDICAL & BIOTECH RESEARCH:

Changing a system almost designed to produce biased results will be a very uphill battle going against a lot of vested interests. However, enough is known about the problem, and there is certainly ample discontent to fuel the necessary changes. To set the research process on the right track, the starting point must be to

place TRUE RESULTS as priority number one. Currently, it seems to be priority 10 at best, and even 100 to some highly focused on personal profit, while product marketing is number 1. By putting the truth as the key objective we must always be asking does this or that option facilitate our primary objective. If definitely no, then that option is cast aside; if yes, then we work with it. The enormous amount of taxpayer money wasted, eroding confidence in medical research and scientists, uncertainties arising from biased research, and compromised health outcomes hurting us all, necessitate change. To achieve this pivotal shift of medical research from falsity and greed to truth and decency, several major changes are required.

Progress So Far:

Some steps have been taken to deal with research bias, the first consisting of investigations into the problem, with several examples covered in this chapter. Unfortunately, much more attention needs to be paid to the bias of academic researchers and academic institutions, as this topic is almost non-existent in the medical research literature, perhaps not surprising given that researchers, editors, and reviewers of medical journals are, for the most part, academics working in academic institutions. There seems to be a pervasive self-enhancing positive cognitive distortion that academic researchers and institutions are somehow pure. A key step forward, with only slight progress to date, is to shatter this positive distortion and shine the light of truth on academic bias.

A key advance has been the Clinical Trial Registry, providing official cataloging of all clinical trials conducted. ClinicalTrials.gov, run by the US National Library of Medicine (NLM), was the first online registry for these trials, and is the largest. Some countries require clinical trials to be registered as in the US, whereas others only encourage it. The International Committee of Medical Journal Editors (ICMJE) decided that from July 1, 2005, only registered trials are considered for publication. Pharmaceutical and biotech companies register all trials they set up before data is known, to prevent only positive outcome trials from being recorded. Trials registered without transparent data are not particularly useful, because all that someone can really say is that the study did not make it to publication. We might assume that the

result was negative but other options exist, such as problems with subject recruitment. An obstacle in some or many instances has been access to the trial data to see exactly what the outcome is. Incorporating all registered studies into relevant meta-analyses provides a better picture of how truly effective a medication or biotech invention is, but meta-analytic studies often just rely on published results.

A further step in the right direction has been declaration of conflicts of interest by medical researchers. Whenever they publish an article or present a paper, they are to declare funding sources that might produce a conflict of interest. My impression is that many researchers see this requirement as a silly formality to dispense with, often demonstrating this attitude in their nonverbal, and even verbal, demeanor whenever a presentation is given. This attitude aligns with the cognitive distortion that accepting money from someone does not actually bias their work, when the reality is that even a small gift sets up an unconscious motivation to reciprocate that can produce significant bias. In many or most instances funds received from industry are far more than small gifts. On the publishing side, editors of medical journals and reviewers have been encouraged to publish more negative result studies, but this so far has had limited success.

The report card pertaining to progress so far is not good at all, rating an E or on a good day a D-. Numerous sources of bias from statistical, reporting and publication, funding and conflict of interest, march on only slightly grazed by the limited opposition. The monetary influence from industry, and the current structure of biotech and medical research supporting this influence, is formidable. Although well intentioned, the opposition's artillery to date can best be characterized as bringing a pellet gun to a tank battle. As noble as the attackers are they stand no chance at all. The words of the Borg in Star Trek come to mind—"Resistance is futile." With greed constituting the new world religion, and medical researchers (yes including "pure" academic researchers) adhering to this religion, the problem seems to be getting worse over time. If we want to establish a system where true results are priority Number One, radical changes will be required.

Changes Required To Reform Medical & Biotech Research:

As it stands now there is virtually a complete absence of objectivity in medical and biotech research, as warped as that sounds. Subjectivity and bias reign supreme, despite “evidence-based medicine” touted as the only way to go. It is biased evidence-based medicine, essentially meaning invalid evidence-based medicine. I find it amazing that staunch proponents of evidence-based medicine are often completely unaware of the depth and breadth of research bias. This occurrence represents a positive cognitive distortion, because by assuming that the research they engage in or support is for the most part accurate, it is easier to believe that there is real evidence-based medicine that we can rely on. As the insightful statistician John Ioannidis mentions, no one wants to believe they are working in a null field, meaning in an invalid domain. Unfortunately, all the wasted taxpayer money going to biased research just ends up worsening health outcomes for the many, while enhancing returns for pharmaceutical and biotech corporations, and elite researchers, many of whom are themselves registered as corporations. To objectify the system for the betterment of consumers and scientific integrity, the following changes are essential:

Establishment Of Independent and Objective Testing and Approval Centers: As it currently stands academic and industry researchers test new biotech and pharmaceutical products. These two groups are largely synonymous, because academic researchers doing this testing essentially work for industry, via funding for research, consulting contracts, speaker bureaus, and the like. Furthermore, many medical researchers set up corporations that become tied into larger biotech and pharmaceutical companies if all goes well. There is very little objectivity, and we must always keep in mind that even a small gift sets up a powerful unconscious or conscious motivation to reciprocate. Academic researchers are indeed very influenced by funding bias and conflict of interest, even though the vast majority will aggressively denounce this possibility. In the “publish or perish” academic world, this reality translates into distort or despair. The evidence reviewed pertaining to the various sources of research bias, backed up by industry experience and investigations, totally support the perspective that there is little

objectivity in current day academic research, and that is even for top-tier research. The question then becomes how can we achieve this objectivity?

Of primary importance, academic and industry researchers must be removed from the testing and approval process for biotech and pharmaceutical products. Fully independent, both in regards to staffing and physical plant, medical and biotech product testing and approval centers need to be created, that must adhere to internationally established research and ethics criteria. Medical and biotech product testing for licensing is to be done in these centers, funded for the most part by industry, given that approval means profit for these companies. In instances where a profitable product is not involved, such as for very rare diseases, public funds can be used. This revised testing and approval process must apply to all genetically engineered food products, and chemicals associated with biotech engineering, such as glyphosate. It should also be extended to other chemicals produced by industry, such as obesogens (see the Obesity chapter), again funded by the company producing the substance.

Researchers working in these medical and biotech product testing and approval centers, cannot have any academic or industry linkages, or receive any appointments or revenue from these sources. They must be paid a solid salary, with promotion opportunities based on merit determined by scientific rigor and their ability to produce true research results. This overriding merit criteria contrasts sharply with the current status quo, whereby researchers are largely rewarded for positive outcome research furthering marketing objectives. An interesting side benefit of this system consists of employment opportunities for medical researchers finding it difficult to achieve placement within academia. Far too many PhD's are being trained for the very limited tenure track academic positions available, further increasing the motivation to tow the line and do what they have to, even if distasteful. Employment within these independent and objective product testing and approval centers will provide a solid and highly ethical career route for scientists.

Researchers within these testing and approval centers must receive and pass rigorous training in statistics, sources of research bias and the management of them, and ethics. Their performance

must demonstrate this knowledge, and also a commitment to ethics and truth seeking in an ongoing fashion. Revolving door employment opportunities between these centers and both academia and industry must be blocked, or have very strict rules applied to prevent regulatory capture (see the Irregular Regulation chapter) by the pharmaceutical and biotech industries. Any violation of the rules pertaining to research ethics, conflict of interest, and revolving door employment, require substantial punitive measures attached to them, such as lifetime bans from working in these centers. The highest level of public trust in research and science are to be placed in these centers, and violations of that trust are completely unacceptable.

Product approval by the FDA, and similar agencies in other countries, is currently highly biased in favor of the pharmaceutical and biotech industries. Research funded or conducted by these industries forms the basis of the approval process, and incredibly only 2 positive studies are typically required by the FDA for approval, no matter how many others have failed. Regulatory capture derived from lobbying and associated campaign contributions to influential politicians, plus revolving door employment for regulators, has helped structure the system in favor of the pharmaceutical and biotech industries. This biasing influence must end, with a key ingredient being approval, based on two out of three studies, conducted by the independent and objective medical and biotech testing and approval centers. If the product fails two out of three tests it does not receive approval, period! Given that the studies are to be conducted to the highest standards of research excellence and unbiased statistical analysis, 2/3 is more than fair. A key ingredient of research design will be to use real life patients, and not the pure condition patients so common in academic and industry research. This shift will reduce effect sizes to more realistic levels, and greatly expand the generalization of outcomes. Patients, (when studies focus on human subjects) are then best drawn from family practice and community hospitals having large numbers of real life patients, as opposed to the often pure condition patients that end up at sub-sub (or sub-sub-sub) specialized academic clinics.

Some might argue that the FDA and current regulating bodies are in the best position to comprise the independent and

objective medical and biotech testing and approval centers. However, their current mandate is not actual testing, and the facilities associated with them are not in any way designed for this purpose. In addition, biasing factors favoring industry derived from regulatory capture influence these agencies. Contract-research organizations (CRO's) and site-management organizations (SMO's), that provide a degree of independence from industry currently exist, but these organizations are for profit and receive funds from industry to conduct testing. The potential bias this sets up in the absence of solid international standards, and a not-for-profit structure, largely eliminates these organizations from fulfilling the role of unbiased product testing and approval centers. We could never be sure if through funding, consulting contracts to senior personnel, or other revolving door employment, whether pro-industry bias is present in these organizations. Designing the proposed product testing and approval centers from the ground up, based on internationally established research and ethics criteria, is more likely to achieve our goal, than attempting to redesign and reconfigure existing institutions and organizations. It might be suggested that the testing and approval components be separated, but if approval is based on the best two out of three results conducted in the independent and objective testing and approval centers, there is no need for an additional layer of bureaucracy. Furthermore, if the approval agency ends up being captured by industry, then research results from the testing centers could be questioned and overridden whenever they fail to support product approval.

Academic & Industry Researchers: The system advocated will clearly take product testing away from academic researchers, and hence much of their funding will dry up. So what will they do? The answer is return to basic science exploratory research, so crucial to the ongoing pipeline for novel inventions and advances. This shift will necessitate public funding derived from fair taxation of corporations, including pharmaceutical and biotech, at the rate applied to individuals for the portion of their business registered in the first world, and eliminating the offshore no tax world enjoyed by so many or all of these corporations for part of their assets (see the Greed chapter). With adequate public funding academic

researchers can concentrate on pure science exploratory research, and not worry so much about achieving pro-product positive results to publish successfully, instead of perish. Truth and trust will replace distort or despair arising from publish or perish pressures. Although some researchers will resist this shift because it will reduce their financial position, for the vast majority there will be much less pressure on them, because they will not have to worry so much about whether or not their research is product compatible. Academic researchers too imbedded in the profit motive can continue doing this type of research, but with product testing for licensing out of their hands research will be less profitable, unless they come up with something truly effective.

Being blinded by the radiance of money, and engaging in self-enhancing positive cognitive distortions, most academic researchers are largely oblivious to the extent and potency of biasing factors in medical research. Consequently, every academic researcher need go through a rigorous program of training in research biasing factors and ethics to receive funds for research. Instruction in how we tend to deceive ourselves, and only see what is self-supporting, should be a crucial component of this training. In addition, the key issue of a priori probability of a result being true, greatly influencing the extent that research results measure true outcomes versus biasing factors, desperately needs to be addressed. If so then much of the ludicrous product comparison research so popular now for marketing purposes, that for the most part only measures bias, might be seen for what it truly is. Despite this training, there must be 100% transparency regarding all funds received, regardless of value considering that even small gifts can set up powerful reciprocal obligations. Some current reporting guidelines, seemingly drafted by industry (although most likely only influenced by them), set the limit at an absurd \$5,000-\$10,000. Anything below this value does not have to be reported. Can you image a police officer not having to report a \$5,000 bribe to withhold evidence? They have to report even a \$10 one or face severe consequences.

As an additional safeguard, regulatory agencies independent of academic institutions need track trials and publications by researchers to monitor for bias, and respond to conflicts of interest. Academic institutions cannot be trusted to do

this monitoring given the bias present within them derived from industry funding, although a shift to public funding and basic science exploratory research might well weaken the pro-industry bias. Regulatory agencies must have sharp teeth to deal with biased academic researchers, as academic centers have a history of protecting their own, such as with McGill University defending the extremely dubious asbestos safety research of Professor McDonald. The same guidelines and oversight need be applied to researchers directly employed by industry. These researchers must also be fully excluded from any product testing and approval research, and receive the same training in research and ethics as do academic researchers.

Medical Journals: These journals must be encouraged to report more negative result studies, but so far pressure and influence has not really worked for the vast majority. This occurrence raises the option of a special journal not funded by the publishing industry, reporting all research trials conducted by the independent medical and biotech testing and approval centers. Hence, for every product that approval is sought, the three research studies determining this outcome are published back-to-back, regardless of whether there is a positive or negative result. This journal might actually be published by the testing and approval centers, or by an affiliated non-biased, non-profit agency adhering to the same medical research standards and ethics. Considering that firstly, medical journals have largely dropped the ball (or negative result studies), and secondly, that they are very profit oriented in most instances, with those profits highly influenced by article reprints ordered by industry, a non-biased journal reporting outcomes for testing and approval trials does make sense. Furthermore, in line with the not-for-profit nature of this reporting, all results should be available free of charge to anyone interested, as with current open access journals. For their part, academic medical journals and editors must be required to report in a prominent position in the journal and associated website, data including the number of positive and negative result articles received, and how many of each are published. An index, based on a ratio of negative to positive published results, should be established and reported.

Regulation: The sums of money from Big Pharma and Biotech firms exert an intense biasing influence, via the support of elected politicians derived from lobbying and related campaign contributions, revolving door employment opportunities for regulators, funding of researchers, and influence on the profitability of medical journals. Without independent and ethical oversight the system will likely march on in its highly biased fashion, or any changes will rapidly be corrupted. All players, including the independent medical and biotech product testing and approval centers, researchers within these centers, academic and industry researchers, academic centers, and industry need to be monitored carefully. All funding sources, conflicts of interest, systematic bias, and revolving door employment scenarios, need to be fully transparent, with effective remedial action taken when there is a significant violation. Enforcement powers for these regulatory agencies are crucial, because if they lack sharp teeth then any benefit derived from regulation will not be realized. Consistent with this tight regulation, the higher level person and computer-based regulating bodies advocated for in the Irregular Regulation chapter, are essential for overseeing on the ground medical and biotech regulating agencies.

Rise of the Robo Scientist: Humans are inherently biased whereas robotic and computerized systems are not, unless of course humans program bias into them. Hence, a feasible way to reduce or even eliminate research bias is to apply robotic and computerized systems. There is no issue of funding bias and conflict of interest, because they are immune from the influence of money, very unlike humans. Statistical analysis of data can be error free, with full reporting of results whether favorable or not. You might say it sounds good but there is no such thing as a robotic-computerized researcher. Well, maybe there is. Ross King and colleagues in a paper-The automation of science-published in the journal Science in 2009, demonstrated how a robot scientist "Adam" is able to conduct all phases of gene research focused on yeast. Adam can generate hypotheses based on prior research data, design experiments to test these ideas, and conduct the actual research. This unique researcher discovered three genes encoding a specific yeast enzyme that human scientists failed to uncover.

Adam seeks genes linked to orphan enzymes. For example, one enzyme called 2-aminoadipate transaminase, facilitates a reaction making it a potential target for anti-fungal drugs. Adam formulated hypotheses regarding possible genes that might be linked to this enzyme, by reviewing the database pertaining to genes in other organisms that encode for it. The brown rat gene Aadat encodes for the same enzyme. Adam then took the protein sequence of the enzyme encoded by the Aadat gene, and searched yeast to see if any similar protein sequences are encoded in the genome. "He" knows that if the protein sequences are similar enough they are probably homologous, meaning sharing a common ancestor, and that the function of the common ancestor is probably preserved. Adam discovered three yeast genes producing protein sequences similar to that generated by the Aadat gene. The next step was for Adam to test these genes through many physical experiments. The robotic part of Adam enabled him to remove different yeast strains from a complete freezer collection, and grow them in the proper medium. Amazing so far, but the really impressive part is that Adam is able to do something that humans struggle with—Design the best, meaning cheapest and most efficient, approach to test as many hypothesis with the least number of experiments. Humans tend to just keep testing one hypothesis at a time. Adam uses superior computational abilities and an approximation strategy. The result of Adam's testing was that the three genes identified coded for the 2-aminoadipate transaminase enzyme. Manual testing by humans confirmed the results.

The example provided by Adam shows that robotic-computerized systems can do much of the medical research that humans currently do, and in some regards are superior. Of greatest significance, Adam is not biased and cannot be corrupted by money. He is not concerned about sending his kids to the best college or purchasing a home he aspires to, or worrying because his reputation and career advancement will falter without positive findings. As long as we keep emotions out of these systems they will be bias free. To date Adam is more of a starting phase for robotic-computerized systems, and one demonstrating great initial progress and promise. Although King and colleagues designed the

system more with a focus on improving efficiency and reducing costs, minimizing bias might be the best feature.

Robotic-computerized systems could even be adapted for psychiatric research involving patient interviews. For example, all interviews might be conducted by such a system applying the exact same tone and words to each subject, and scoring responses according to set criteria allowing no room for distortion. If the computer became aware of placebo or active agent status based on side effect reporting, no bias would be expressed to contaminate results. Statistical analyses of the data would run efficiently, and there would be no mining of the data for the right results (unless programmed to). Robotic-computerized systems should be designed to complement the activities of research scientists, and compensate wherever and whenever human biasing factors might contaminate results. This unique blend of human and robotic-computerized testing will greatly advance the objective of achieving true results.

WRAPPING UP RESEARCH BIAS:

Presently biotech and pharmaceutical product research is massively distorted by biasing influences in favor of pro-industry results. Even early stage research utilized by these industries is deeply flawed, with very few truly valid results. If research bias tended to be anti-industry then consumers would be more protected, although promising innovations would occasionally be missed. The massively pro-product research bias wastes taxpayer funds, leaves consumers and front line physicians uncertain about what works, exposes everyone to toxic products and medications where side effects exceed benefits, and has greatly eroded confidence in science. It is indeed a biased and conflicted scenario that will require extensive changes to the way that research is conducted and products approved.

The changes outlined will be challenging for the biotech and pharmaceutical industries, but interestingly enough might actually assist them by greatly improving the efficiency and accuracy of the whole process. Everyone will advance in terms of health outcomes by consuming food products proven to be safe, incurring much less exposure to toxic agents, and receiving medical products that truly work where the benefits exceed the costs. They will also have less

financial strain, because as it currently stands a large percentage of taxpayer dollars devoted to medical research is wasted due to bias—Biased results are essentially useless ones. The money saved can be invested into programs that actually improve health outcomes. Once again people must speak, and louder than the money fueling the biased linkage of industry, researchers, academic institutions, and academic journals. This well lubricated system will not change voluntarily despite how it is hurting us all in one way or another. The recommendations advocated here will establish a non-biased system where science is based on true results instead of greed.

WEIGHING DOWN THE WORLD: OBESITY

QUESTION:

A few forms of treatment exist for a medical illness, each possessing a seemingly solid rationale and apparent success rate. Providers of the different approaches say that their treatment is the best, but the reality is that each strategy only works for a short time. What do you suggest be done?

- A. Recommend that they keep battling it out, because the one who perseveres the longest will convince the world that their approach is best.
- B. Suggest that they seek solid empirical data to support their claims.
- C. Give up because they are wasting their time.
- D. Advise that they reconsider the success of all these treatment approaches, since they do not work beyond the short run.
- E. Indicate that a search be conducted to see what might truly work.

If you answered A your suggestion is very much in line with what is happening now in the weight loss world. There are many diet strategies that tend to focus on carbohydrates, fat, and protein. All of them seem to work in the short run, and none of them in the long run. However, this does not stop the proponents of each from claiming that their approach is the best. Those who answered B are scientifically minded (a good thing), but unfortunately the countless and often contradictory results in the literature can be cherry picked to support claims. Giving up (answer C) might be the way to go, although it abandons the many who are suffering from obesity and its consequences. If you chose D you are definitely on the right track, but it is difficult to convince someone to change

when income is dependent on maintaining the status quo. Answer E is also solid, but as it turns out we actually do have evidence for what might work in the long run; we just have to pay attention to the evidence, an occurrence that is unlikely in the context of the multi billion-dollar weight loss industry. While no answer is ideal, D and E are best, with B being good if medical research was less biased (See the A Conflicted World: Research Bias chapter).

A WEIGHTY PROBLEM:

Most of you have noticed that we are getting fatter, and fatter, and fatter. The World Health Organization estimates that as of 2008 more than 1.4 billion adults, of the roughly 7 billion in the world, are overweight, and at least 500 million are obese. Considering that many people in the world do not have enough food, those that do must really be stockpiling it, literally. Obesity is present in about 1 in 3 Americans and 1 in 4 Canadians, and about half the population in these countries is overweight. Nor is the problem restricted to adults, with 1 in 10 Canadian children suffering from obesity, and at least this many in America. Obesity is defined as a Body Mass Index (BMI) of 30 and over. BMI is weight in kilograms, divided by the square of height in meters; in essence it evaluates weight relative to height. BMI does not directly measure the percent of body fat, but a larger BMI means more weight for the given height. Unless a person is extremely muscular higher values indicate a weight and fat problem. A BMI of 25-29.9 means that a person is overweight, and many more people tend to be overweight than obese, with upwards of half the population in the first world being somewhat overweight. We are hyper-consuming food resources as if there is no tomorrow. Of course as we learned in the Taking The "Devil" Out Of Development chapter, there might not be a tomorrow if we continue to consume resources endlessly, given that we are severely depleting the natural capital of the planet.

But what is the problem with being overweight? If it is just a matter of preference, with some cultures viewing excess weight as attractive, than maybe we should change our attitudes. Unfortunately excess weight both kills and costs. Like with many things in nature extremes are not ideal. Those suffering from anorexia, where body weight is often very low, incur several health problems, such as cardiac disease (low blood pressure, irregular

heart rhythms, slowing of the heart, and sudden death), diseases related to a deficiency of calcium and other minerals (osteoporosis, brittle nails and hair, dry skin), constipation, and mental health issues. On the excess weight side, there are numerous health risks as well linked to what is known as the metabolic syndrome, consisting of various abnormalities of metabolism, such as raised bad cholesterol, reduced good cholesterol, elevated glucose (sugar) levels in the blood, insulin resistance (an inability to store the raised blood sugar), and increased blood pressure. The metabolic syndrome greatly increases the risk of several related diseases, including diabetes, heart attacks, hypertension, and stroke. In addition, gallbladder disease, osteoarthritis, sleep apnea, and perhaps some forms of cancer (uterine, breast, colorectal, kidney, and gallbladder) occur more frequently with obesity.

It has been estimated that there are 160,000 deaths in the United States alone per year due to these obesity related health issues, and each obese person costs the system at least \$7,000 a year in lost productivity and medical costs. With an ever fattening, as well as aging population, future health care costs are likely to be overwhelming. People of all income levels are less healthy due to the epidemic of excess weight, and maintaining health into middle age, let alone old age, is becoming more and more elusive for most people. Essentially, we are killing ourselves with food, and so preferences aside, there are very good reasons why we cannot just let it be regarding excess weight and obesity.

As a psychiatrist I find myself in a very unique position regarding the weight problem for two reasons. First, while the population as a whole is overweight, the psychiatric population is much more so. The reasons for this occurrence are complex, involving both factors associated with psychiatric illness and medication side effects. Regarding the former, a key consideration is the degree of behavioral activation and behavioral inhibition. Two very primitive behavioral templates, present even in reptiles, are to engage in action for reward (behavioral activation), and to inhibit behavior when there is punishment or the anticipation of it (behavioral inhibition). As it turns out, many psychiatric conditions including depression, anxiety, and schizophrenia, are characterized by high behavioral inhibition. With reduced behavior there is naturally less energy expenditure, fewer calories burned, and more

weight retained. In the case of depression, there is also low behavioral activation, adding a further contribution to reduced activity and impaired energy expenditure. Hypomania, as a milder and adaptive version of mania, appears to defensively compensate for depression, in part by increasing behavioral activation and reducing behavioral inhibition.

Beyond the impact on behavioral activation and inhibition, mental illness often involves impaired regulation of behavior. Those with schizophrenia, for example, demonstrate poor control over eating, and excess weight is very common. Some individuals with depression and anxiety also show deficient regulation of eating behavior, as evidenced by comfort eating. Certain hormones and neurotransmitters (chemical messengers between brain cells) likely provide a further reason for the link between mental illness and obesity, but this is a complex topic without clear findings. What is clear, though, is that many medication treatments for psychiatric problems can contribute to weight gain. Some antidepressants seem to promote weight gain in certain people, but this occurrence is often overstated in my experience. An antidepressant called mirtazapine (Remeron), that is helpful for sleep and anxiety, does produce weight gain in many people, and it is one that I never prescribe to a person prone to excess weight. Lithium, a medication used to treat bipolar disorder (also known as manic-depressive illness), typically increases weight. This medication is less frequently prescribed now, despite it being the "gold standard" for bipolar treatment, since the advent of second-generation antipsychotic medications.

Second-generation antipsychotic medications, designed to treat psychosis present in schizophrenia and manic episodes (mania frequently involves psychosis), tend to increase weight and alter lipid profiles, raising so-called bad cholesterol-low density lipoproteins (LDL) and triglycerides-and reducing good cholesterol, consisting of high density lipoproteins (HDL). One of the most unfortunate occurrences that I have seen in psychiatry is how drug companies and many academic psychiatrists funded by them, are promoting these newer antipsychotics for depression, anxiety problems, and even sleep. The reality for pharmaceutical companies is that there are not enough psychotic patients to make these drugs hugely successful, necessitating their strategic targeting

of depression and anxiety problems. The reality for academic psychiatrists is that the pipeline for antidepressants and anti-anxiety agents has basically dried up, so research funding is achieved by promoting the value of newer antipsychotics for non-psychotic illness, despite the adverse metabolic effects. While the occasional patient with extreme and difficult to control anxiety or depression, might benefit by adding a second-generation antipsychotic to the antidepressant medication prescribed (an augmenting strategy), the widespread application of these medications for depression, anxiety, and sleep, is largely inappropriate and one that is worsening the already high rate of obesity in psychiatric patients.

The second reason why I am in a unique position regarding weight issues, is my unbiased role based upon not making any money from a particular approach—My main source of income is not from treating obesity, and my research is completely non-funded, preventing any funding biases with it. This might not sound like much, but it actually is everything given that once you receive money you are prone to be biased in favor of that source, as covered in the *A Conflicted World: Research Bias* chapter. Mostly this bias occurs unconsciously with people spinning the positive side of the entity to enhance its value. The vast majority of people working in the weight loss industry make their income from a particular approach, whether by writing diet books, selling exercise and weight loss strategies, or drug company funding. I treat mental illness in the Canadian system that allows me to apply what works best, without any external controls or biasing influences. From this non-biased position, I have seen and learned a lot about weight problems and how to approach the matter.

JUST LOSE IT?

Given how common weight issues are amongst those with psychiatric problems, no psychiatrist should ignore the issue, although some unfortunately do mentally wall it off as a “physical problem” and request that the patient see their family doctor about losing weight. In my years of doing psychiatry I have seen every conceivable approach, as well as permutation and combination of these approaches applied to weight loss. The list is virtually endless but here are the more common:

- Reduce carbohydrates to varying degrees.
- Reduce fat to varying degrees.
- Raise protein intake.
- Increase protein reducing fat and/or carbohydrates.
- Rely on vitamin supplementation while reducing overall food intake.
- Attend social support type programs, such as Weight Watchers and Overeaters Anonymous.
- Exercise more without altering diet.
- Exercise more and reduce calories generally, or alter specific components.
- Try weight loss medications.
- Focus on the input and output of calories, in some instances actually tracking calories in and calories out, with some of these approaches also reducing fat, carbohydrates, or both.
- Monitor food intake in a log, given that a standard behavioral therapy approach to controlling undesirable behavior is to monitor and log its frequency of occurrence.
- Drink excessive amounts of water, a strategy that is frequently recommended by those in the weight loss business, and also commonly used by anorexic individuals, to reduce hunger sensations by artificially inducing a fullness sensation.
- Consume large amounts of fiber to provide a sensation of fullness.

The list goes on and on and on. Each of these approaches seems to have merit, and early on I was optimistic that if the person adhered to the given weight lose approach it would work. What I witnessed virtually every time was that no matter what the person did they lost weight initially, assuming they were motivated and believed in the approach. However, within a matter of months, or at the very outside years, the weight came back and they often ended with more body mass than prior to the dieting attempt. Providers of diets and other weight loss strategies became richer, while patients spent hard earned money and failed to lose weight beyond the short-term. Okay, so maybe they were not as motivated as is required, right? Wrong. I tried motivational interviewing designed to increase motivation, in this scenario by showing them the inconsistency between their desires for weight loss and current eating behavior. In addition, I ensured that any medication they were on would not promote weight gain, and might if possible

reduce it. For example, a medication used for depression, smoking cessation, and anxiety in some instances, called bupropion (Wellbutrin), that does not increase weight, and in some people lowers it, was substituted if feasible. The grand result ended up being no different from lose it in the short run and gain it back in the long run, observed up until this point. I did notice that those who engaged in a program with a social support component seemed to do slightly better, but when the weight started returning they would typically drop out. Several patients tried many approaches and the pattern repeated, the now well-known “Yo-Yo effect.” A major negative impact of the Yo-Yo effect, particularly with rapid drops in weight, appears to be increased risk of very painful gallbladder stones. Surgical intervention is often required for this ailment.

Skilled clinicians are really problem solvers, applying what is in their toolbox in unique combinations to achieve the desired outcome for their patient. In line with this I shifted most of my patients with weight problems to an approach that was gaining in popularity, namely lifestyle modification. The idea here is to aim for about 1-2 pounds of weight loss per week by focusing on improvements in lifestyle, including more exercise and healthy food substitutions. On the surface this approach sounds great, but it was always a hard sell because it lacks the glamour of packaged approaches. Although I did succeed in getting many patients to try it, the approach failed in virtually every instance. Patients complained of not losing enough weight, or losing too much one week and then regaining most of it the next week. They would question whether or not they could get off plateaus they seemed stuck on, and then become more radical cutting way down on carbohydrates or fats for example. It was often unclear whether failure to lose the pound or two per week, or even regaining it, was due to excess water intake and retention. Eventually, most patients gave up on this lifestyle approach.

Looking into the historical record, it is clear that over time clinicians have struggled to help their patients manage obesity and lose weight, often trying numerous approaches. In fact many of our modern day packaged strategies, such as reducing carbohydrates and increasing protein via meat, were advocated in the 19th century. As occurs today nothing really worked for long, and very

dubious treatments were proposed. One particularly creative approach that fortunately did not catch on, excuse the pun, was the application of leeches to the anus. You can just picture the ad campaign, Leech Away Your Weight! Given the number of overweight people in the world, widespread application of this approach could enhance leech population numbers, but I question how much it would help for weight loss. In the spirit of anal matters inspired by the leech approach, medications for weight loss have been tried, most ending up in the crapper. Currently the only one approved for obesity treatment in Canada is Orlistat that works by binding fat in the intestine and preventing absorption. Although perhaps up to 6% of body fat can be lost, the side effects are typically unacceptable to most. They include oily anal spotting, flatus (a nice medical term for farting), fecal urgency, more frequent defecation, and fecal incontinence. One of the funniest stories I have heard in the weight loss world is how an overweight advocate for this drug tried it himself, and while giving a presentation about the drug involuntarily defecated in his pants. Now that really stinks (sorry, I couldn't resist). On a less humorous note, Orlistat appears to produce liver damage. Other medications for weight loss have demonstrated much more serious side effects, including cardiac conduction problems, leading them to be pulled from the market. Sibutramine, the only other weight loss medication, other than Orlistat, available in the United States, has been removed from the market in Europe due to concerns over heart attack and stroke.

Another type of medical treatment for obesity is called bariatric surgery, whereby the stomach is reduced in size by various surgical techniques. This extreme intervention carries a number of medical risks, some life threatening, and hence should only be sought by those who are very obese, or simply obese with diabetes. The latter scenario is based on the ability of this procedure to reverse Type II diabetes in some people. Type I diabetes occurs when cells in the pancreas that produce insulin fail. Insulin promotes the storage of sugars, and without insulin blood sugar levels rise to lethal levels. Type II diabetes involves resistance within tissues to the effect of insulin, meaning that glucose cannot be removed from the bloodstream despite the presence of insulin, and hence too high blood glucose levels occur. Although many

people view this as a permanent form of weight loss, like with so many other approaches weight is frequently regained, unless the person adopts a radically different approach to food consumption and health related behavior. I have a patient who after having the surgery indulged in ice cream as it can be processed by the smaller stomach. Over a few years she regained all the weight she had lost from the procedure. Regaining of weight following bariatric surgery is more common than many proponents of the surgery often like to acknowledge, and occurs in about a third of patients.

One might say at this point, “You have in your non-biased role found that weight loss approaches fail other than in the short-term, and agree that drugs and surgery approaches are not ideal for the vast majority of people, but maybe your experience is not representative of the overall weight loss community.” Well, let us look at what weight loss research has found. It turns out that fewer than 20% of those attempting to lose weight are able to achieve and maintain a 10% reduction over a year, according to Kraschnewski and colleagues (Long-term weight loss maintenance in the United States, published in the *International Journal of Obesity*, 2010). So if you weigh 250 pounds, less than 20% achieve and maintain 25 pounds off over one year. Most weight lost is over a 3 to 6 month period, with at least a third returning over the first year. The majority of weight lost is regained over 3 to 5 years, with some suggestion that only 5% of people at most retain the weight loss throughout this period. These amazing results come from studies by Anderson and colleagues (Long-term weight-loss maintenance: A meta-analysis of US studies, published in the *American Journal of Clinical Nutrition*, 2001) and Weiss and colleagues (Weight regain in US adults who experience substantial weight loss, 1999-2002, published in the *American Journal of Preventative Medicine*, 2007). The best-case scenario for the average person, based on the review of 29 weight loss studies by Anderson and colleagues, is to be just over 3 kilograms (about 7 pounds) lighter at 5 years. Even less impressive for dieting approaches is the possibility of regaining more weight than was lost—A 2007 review by the American Psychological Association of 31 diet studies, found that as many as 2/3 of dieters end up weighing more after 2 years than they did at the start of the diet. Even applying cognitive behavioral

therapy (a proven form of treatment for many psychological problems), most obese individuals regain the weight in 3 years.

The research evidence then aligns very well with what I have observed in my non-biased role as a psychiatrist, and when clinical experience perfectly matches empirical research, you can almost always be certain that you are onto a solid finding. No doubt those who believe in specific approaches can pull out studies supporting their chosen intervention strategy, but once again, when money is made from a given approach bias is present and evidence can be distorted, as we learned in the Research Bias chapter. Now some might think that individuals who engage in this bias are charlatans that need to be punished. While some fit this bill the majority actually believe in what they are doing and spin the evidence in favor of their position. The vast amounts of money to be made from weight loss approaches, helps those providing this service unconsciously spin the outcome in a positive way. In addition, the nature of weight loss with substantial initial reductions over 3 to 6 months further helps foster this overly positive spin, since it at first appears that the given approach is working. If a person is only trying to lose weight in the short-term, as for example an actor preparing for a movie role, this is fine, but it is not at all acceptable for the vast majority who are interested in long-term results.

Fortunately, from my non-biased treatment background and research into the whole weight lose problem, a viable approach emerges, and one that will be difficult to make any money from. The answer is simpler than what most people assume, although without the glamour and sparkle of most packaged weight loss approaches. It can help people overcome the health consequences of obesity and excessive weight, and prosper in terms of better health. However, before presenting this simple approach it is necessary to gain a greater understanding of the weight issue. Ultimately, there must be reasons why so many people are gaining weight and so few losing it. If we can identify the factors involved, then hopefully we will be further ahead in determining ways to intervene effectively, and also more open to alternative and reasoned approaches that follow from this research.

WHY ARE WE GAINING WEIGHT?

Many variables are associated with weight gain and obesity, an overview of these will now be provided:

Calories In:

What we take in naturally influences our health and weight; it could not be otherwise. As a graphic example of this statement, no one gets fat in a prisoner of war camp where there is very little to eat. The food we ingest is used for both fuel to power the cells of our body, and also for maintaining structure. Fat and carbohydrates serve as the fuel, while protein provides structure via amino acids serving as the building blocks of life. Much of the controversy in the diet world focuses on the relative value of each of these ingredients. For instance, if fat is seen as being the bad guy, then a diet must have reduced fat, whereas if carbohydrates wear the black hat, then we must limit carbohydrates. Given that this is the current focus in the weight loss world, we will look at each of these main ingredients to gain some understanding of their role. It is very important to realize that food metabolism is extremely complex, as any overview of the topic on a medical search engine will reveal. All too often proponents of a given diet simplify metabolism to support a particular approach. Considering factors such as the conversion of one food type to another, hormonal influences, and the role of brain chemistry, it quickly becomes apparent that the topic is extremely complex, and is currently only partially understood.

Carbohydrates: This category of food is really sugars, namely glucose, either in the form of plant material, such as vegetables, or in a more processed form, as with white bread and candy. The difference between non-processed and processed sugars is largely the degree of fiber content influencing how fast and easily the sugar is absorbed, a quality known as the glycemic index. Sugars in the form of vegetables and whole grains are absorbed slowly and less fully, given the fiber content of vegetation. Our bodies have to work to get the sugars out. Even fat and protein slow the absorption of sugars. Of course when mixed with fiber, fat, or protein, sugars are also less concentrated. The sugar in processed

carbohydrates is easily and rapidly absorbed, and also highly concentrated. Perhaps the most rapid absorption of sugar occurs with sweetened beverages containing a type of sugar known as fructose. If you suffer sugar depletion, the fastest way to restore levels is by ingesting a sweetened drink. Glycemic load provides a measure of both the amount of sugar a food contains and the speed of absorption, with processed carbohydrates providing a high glycemic load.

Fast absorption of highly processed and concentrated sugar seems to produce a reward sensation, plus withdrawal symptoms in some people, addicting them to sugary substances. The vastly successful packaged food industry, producing and aggressively marketing an almost infinite variety of food and beverage items containing highly processed sugars, both initiates and maintains this addiction. This industry contributes to the plethora of health problems arising from obesity, such as that occurring with diabetes and cardiovascular disease, making enormous profits yet paying for none of the associated health care costs. If they were required to pay for the negative externalities (see the Taking The “Devil” Out of Development chapter for coverage of negative externalities) associated with obesity, there would be more motivation to produce and market healthier food alternatives.

Once inside the body sugars serve as fuel. Some of this fuel is consumed immediately, and certain parts of the body, such as the brain and red blood cells, seem to prefer it. A crucial issue in metabolism (and life in general) is regulation, with receptors in various tissues influencing hormone and neurochemical (nervous system chemicals) levels that in turn communicate to the brain the status of energy supplies. The brain then responds by regulating sugar use and storage. Excess sugar is stored as glycogen in tissues, such as the liver and muscle, where it serves as a fuel depot, similar to the gas tank in a car. An interesting fact of sugar storage is that glycogen contains a lot of water, 3 pounds for every pound of glucose. Hence, when you lose weight from a low carbohydrate diet, much of it is due to water loss. The tremendous amount of water that must be stored, along with the sugar component, reduces the value of storing this form of fuel, and enhances its benefit as an immediate use fuel. Imagine if gas tanks had to be

large enough to store three parts water for every part gas. Might there be a better source of fuel for storage purposes? Yes, fat.

Fat: Meat is the primary source of fat and those who eat large amounts of meat, such as traditional Inuit, have a high fat diet. Fat consists of fatty acids that are burned for fuel, much as sugars are. Some of the fatty acids from a meal are used for fuel, but any excess is stored as triglycerides with three fatty acids bound to a molecule of glycerol. Fat stores occur throughout the body, such as below the skin (subcutaneous), within the abdomen (intra-abdominal), and in the liver. When fuel is required triglyceride molecules too large to flow in and out of cells are broken down to fatty acids, and these are released into the circulation. Fat stores in the body are known as adipose tissue, and tissues that burn fuel such as muscle are lean tissue. When the water content of glycogen is factored in, fat fuel stores are much more calorie intensive, making them a superior source of fuel storage. As with sugars there is a complex interaction of receptors, hormones, neurochemicals, and brain regions monitoring fat storage and fuel requirements. Although a complex topic, it is worth taking a brief look at this regulation before considering proteins.

Regulation of Fuel Storage & Utilization: Proponents of various weight loss approaches frequently turn to metabolism to support their claims. Unfortunately, the complexity of the various players and interactions prevents any simplistic rationale. Based on a review of the medical literature, I suspect that it will be at least 50 years before we really understand all the metabolic interactions well enough to intervene effectively. Most descriptions of metabolism begin and end with the role of two key hormone-like substances, insulin and leptin. Insulin can be thought of as a hormone that promotes fuel storage, while leptin acts to mobilize fuel stores. One of the key problems occurring with the metabolic syndrome is that the body develops resistance to both hormones blocking the storage and healthy utilization of sugars and fat. Hence, sugar levels become very high producing diabetes. With Type II diabetes, the normal role of insulin in blocking glucose production in the liver is also impaired, contributing further to

excess sugar in the bloodstream. As it stands now the cause of insulin and leptin resistance is not well understood.

Given the key role of insulin in fuel storage, it seems logical that we just have to reduce insulin levels to manage weight as some advocate. Unfortunately, life is rarely this straightforward, and certainly not in the case of metabolism. It is known that beyond insulin and leptin there are numerous substances within the body and brain that play a role even in how the two star players operate, and various brain regions respond to these diverse substances regulating what transpires. The list of players seems endless including, alpha-MSH, CART peptide, corticotropin-releasing hormone, urocortin III, cholecystokinin, glucagon-like peptides, neuropeptide Y, agouti-related peptide, orexins, melanin concentrating hormone, galanin, ghrelin, enkephalin, and thyroid hormones. Feedback loops occur between many of these substances and nutrients, serving to either increase or decrease weight. In addition various genes play a role in weight-related metabolism, and many substances influence the activity of these genes, such as responsive element-binding protein (ChREBP), activated in response to high glucose levels. A high fat diet inhibits ChREBP slowing down glucose utilization.

Nutrients themselves such as fatty acids influence the expression of certain genes, and the products of this gene expression in turn affects levels of fatty acids and sugars. Various parts of the brain, such as the hypothalamus, assimilate information about the nutrients ingested, as well as their utilization and storage in various tissues. It is an extremely complex time ordered process, as different tissues are in diverse states of energy balance at varying intervals following food intake, and the system is always in motion. Hopefully, you get the idea that simplistic explanations, based on static descriptions of one or two of the many components of this highly complex and interconnected system, do not cut the fat.

Protein: Protein is found in both animal and some vegetation-based foods such as peanut butter and tofu. The amino acids comprising protein contribute to the health of lean tissue including muscle that we all need to function well. Given the apparent benefits of supporting lean tissue and the problems associated with excess

fuel, it is understandable that some people advocate higher protein diets, and blame carbohydrates and/or fat for all our weight problems. Based on what has been presented so far, it is clear that we need both structural support and fuel to function. A car that is well designed and assembled might look great, but without fuel and a tank to store it in the vehicle is pretty much useless. Furthermore, given the differences between fat and sugar as sources of fuel, it is also apparent that we need both types.

Beyond the balance issue, protein intake in excess of approximately 35% of total calories is potentially damaging and can cause several problems, consisting of hyperaminoacidemia (excess amino acids in the blood), hyperammonemia (excessive ammonia from the metabolism of the excess amino acids), kidney disease (due to excess amino acids and ammonia), hyperinsulinemia (excess insulin as insulin helps deposit amino acids in muscle tissue), diarrhea, and even death. Although protein does help with lean tissue and appears to reduce feelings of hunger, it clearly can only comprise a minority of what we take in. The majority must be in the form of carbohydrates and fat. But, do we limit carbohydrates and/or fat while leaving protein low or maximizing it?

The Winner Is: If one of the dieting approaches was superior to others in the long run, we might be seeing a real reduction in the number of overweight and obese people. Looking around it does not appear that this is the case, but what does research show? A review of high protein, low carbohydrate studies by Cunningham and Hyson (The skinny on high-protein, low-carbohydrate diets published in *Preventive Cardiology*, 2006), found that while weight loss and improvements in lipid profiles occurred in a time frame of less than six months, there was no continued benefit beyond this period. Neither were there any benefits over other weight loss strategies. In addition, high protein, low carbohydrate diets might provide an additional risk factor in those with cardiovascular disease, due to the high fat and cholesterol content (remember if carbohydrates are low dietary fat is increased), and reduced intake of high fiber foods such as whole grains, fruits, and vegetables. Furthermore, some or much of the initial weight loss with this type

of diet is due to water loss, given the high water content associated with glycogen stores.

The alternative of low fat and high carbohydrate, at least with low glycemic index carbohydrates, constitutes a popular diet strategy. For example, the Okinawa diet, named after the area of Japan where it originated, consists of very high carbohydrate intake in the form of vegetables and fruit, and very low fat. Although a seemingly logical approach to weight loss, research suggests a further complication to the weight loss story, in that a given approach might have variable effects based on ethnicity, sex, and even individual differences. For example, a study conducted in Hawaii by Maskarinec and colleagues (Trends and dietary determinants of overweight and obesity in a multiethnic population, published in *Obesity*, 2006) found that carbohydrates have a stronger association with excess weight among native Hawaiians and Japanese men than among Caucasian males. Based on this finding, a low carbohydrate diet might have more benefit for native Hawaiian and Japanese men. Of course the Okinawa diet high in carbohydrates might contradict the benefit of a low carbohydrate diet in Japanese men, but if the carbohydrates ingested are low in fiber, plus highly processed and concentrated, then reducing them could produce a real health advantage. In support of this idea the Hawaii based study found that high dietary fiber is linked to low BMI.

How do low fat and low carbohydrate diets compare with each other and more balanced diets? An interesting 2005 study by Dansinger and colleagues (Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and cardiac risk reduction) published in *The Journal of the American Medical Association (JAMA)*, addressed this very question. Overweight or obese individuals were randomly assigned to one of four weight loss programs: Atkins (carbohydrate restricted), Zone (macronutrient balanced), Weight Watchers (calorie restricted), or Ornish (fat restricted). The amount of weight lost at one year was not significantly different between the groups. Success at one year was predicted by how much the individual adhered to the given diet. Approximately 5 to 7 pounds were lost with each diet, and of course given the nature of long-term weight loss it is reasonable to suspect that most of the weight would eventually be regained in each group.

Additional research backs up the finding that at least beyond six months low fat and low carbohydrate diets produce equivalent weight loss. For example, a meta-analysis by Nordmann and colleagues-Effects of low-carbohydrate vs low-fat diets on weight loss and cardiovascular risk factors: A meta-analysis of randomized controlled trials-published in Archives of Internal Medicine, 2006, examining several studies found that while weight loss was greater at six months on the low carbohydrate diet, there was no difference between this diet approach and low fat at twelve months. The initial water loss with low carbohydrate diets might account for the greater success of this type of diet at six months.

Various diet strategies then appear to be equivalent in terms of weight off at one year. There is no winner, and in the long run no real weight losers, as virtually everyone seems to regain the weight. Beyond the very few people who are only interested in short-term weight loss, there is no real success from weight loss approaches based on adjusting the percent of carbohydrates, fat, and protein. However, this does not seem to stop the ongoing proliferation of new and reborn dieting strategies relying on low fat, low carbohydrate, high protein, and various combinations of these strategies. The money to be made from these approaches, combined with our tendency to spin things in a positive fashion (See Defending The Indefensible chapter), ensures that dieting strategies will persist, despite their inability to impact positively on long-term weight loss. Given the dismal situation it is no wonder that alternative approaches have been sought, such as calories in-calories out.

Calories In-Calories Out:

Intuitively it makes sense that what really counts might be the total calories that we take in, relative to how many we burn off. Based on the equivalent performance of the various approaches involving carbohydrates, fat, and protein, it certainly does appear that total calories are more important than the source they come from. High fructose intake has been linked to the metabolic syndrome, but high fat and high carbohydrate diets cause the same effects, according to a review by Tappy and colleagues-Fructose and metabolic diseases: New findings, new questions-published in the journal Nutrition, 2010. These authors conclude that it is the total

calorie intake that is the main contributor to the metabolic syndrome. The concept of energy dense, as opposed to nutrient rich foods, is relevant here. Energy dense foods are those high in fat and sugar, while nutrient rich are those high in vitamins and minerals. The consumption of more nutrient rich and less calorie dense food reduces the total calories consumed. But what about calories expended?

The balance between calorie intake and output would seem to be important. Many practitioners disillusioned by the long-term failure of diets based on modifying carbohydrate, fat, and protein levels, shifted to a focus on this balance. In treating excess weight and obesity in psychiatric patients, I frequently emphasized this as part of a lifestyle change approach. If you cut back somewhat on the calories you take in, and increase the calories burned weight will eventually come down. Right? Well, not really. For many patients there was an initial very gradual drop, with a return to prior weight levels over time. But how can this be when the balance between calorie intake and output must play a role? If you burn more than you take in weight has to go down! Contributing to the failure of the calorie in-calories out approach are several issues. One important aspect being that it is so much easier to take in calories given the calorie dense packaged food all around us. In a very compact form we can rapidly ingest 200-400 calories or more. On the other hand, the human body is a highly efficient biological machine that is capable of minimizing calorie burn for any given level of activity. To match those 200-400 calories a solid high-speed jog for about one-half hour is required. Then as your muscles get more used to jogging, the calorie burn diminishes requiring faster speeds and/or longer times. Athletes in training must always be vigilant for muscle adaption, and constantly change their training based on heart rate to ensure a sufficient calorie burn.

The phenomenon of exercise adaptation highlights another key problem with the calorie in-calorie out approach, namely that these components are not isolated. If we could simply output more calories than we take with no adaptation or compensation, then this approach would work and be a winner. Unfortunately, calories in are not isolated from calories out. Our system monitors all fuel stores and adjusts them to match activity levels. Critical to this occurrence is the issue of set point or homeostatic balance. Body

temperature provides an example—As warm-blooded creatures we naturally and unconsciously maintain body temperature at a very specific level. Cold-blooded creatures regulate their internal temperature based on the external temperature, and automatically adjust their activity level accordingly. When it is hot they sun themselves to warm up, allowing more activity. When the external temperature drops they reduce activity. When really cold weather occurs, species such as some frogs and turtles, burrow into a safe resting place and enter into a dormant state. Natural antifreeze in their system keeps tissues from freezing.

The human body maintains a set point for weight ensuring that calories in and calories out are very intertwined. The manifestations of this homeostatic set point for weight are striking. For example, if you burn calories a hunger sensation often arises right after to ensure that you ingest those lost calories, something easily achieved with all the calorie dense food around us. Alternatively, or in addition, you might unconsciously restrict activity the rest of the day to reduce further energy loss. When weight is lost there is often diminished lean body mass, reducing the resting energy expenditure and hence ongoing calorie burn. Lower body mass also reduces the energy cost of any given activity level, diminishing the calories expended in doing the activity. These influences contribute to the plateau frequently encountered in weight loss, whereby a person cannot seem to drop below a certain level. The powerful but yet subtle role of homeostatic processes is demonstrated in an interesting study by Macias (*Experimental demonstration of human weight homeostasis: Implications for understanding obesity*, published in the *British Journal of Nutrition*, 2004), where the calorie intake and energy expenditure of two healthy males was tightly controlled. When no weight was lost a sustaining calorie intake maintained weight, but when weight was lost this calorie intake led to weight gain. Furthermore, the same calorie intake led to weight reduction when weight had been gained due to inactivity. Evidently, homeostatic mechanisms enabled one level of calorie input to sustain, increase, or reduce weight, depending on whether the individual maintained, lost, or gained weight, respectively.

Highly involved in this sophisticated energy homeostatic process is the brain, with the hypothalamus particularly implicated

as a so-called adipostat. This crucial structure registers energy related information in response to both circulating levels of hormones, such as insulin and leptin, and nervous system inputs as from the liver via the vagus nerve. Responses designed to conserve or expend energy seem to originate from the hypothalamus. When energy is expended and fuel supplies reduced, this homeostatic control center responds by attempting to restore the lost calories. The hypothalamus, and central nervous system more generally, can be likened to a thermostat in a house (adipostat), registering and responding to changes to maintain a set point. Along more dynamic lines, the system might be seen as a conductor orchestrating the activity of many tissues to maintain a constant state of weight.

The weight regain, that invariably seems to occur in the long-term, appears to be the result of these energy homeostatic set point mechanisms ensuring that lost calories are made up for. When a person actually maintains a lower weight for a long period, it might well be the case that they succeed by resisting homeostatic processes, capitalizing on a relatively rare ability to resist the influence of these mechanisms over time. Given the complexity and multiple pathways these homeostatic mechanisms have to influence weight, it is understandable that most people cannot resist for long. Those of you who are really paying attention might wonder why these homeostatic mechanisms do not ensure that we remain thin, assuming we were thin in our teens and younger years. If weight loss is compensated for, then why not weight gain as in the Macias study? The answer to this question appears to reside in evolutionary influences.

Evolution & Genetics:

A safe assumption pertaining to our evolution in hunting-gathering groups is that food shortages were common, at least in regards to calorie dense food items. Meat was the primary source of food providing concentrated calories, and a scarcity of prey species would have occurred for a variety of reasons. Even when prey animals were abundant, they did not just offer themselves up for the kill to assist in the proliferation of this new and unique two-legged animal. No, they tried to maintain a safe distance, ran, and hid whenever possible. Killing with spears, or even more recent

bows and arrows, is low probability event, with many potential victims getting away. Furthermore, the calories expended in the hunt, kill, and transportation of food back to the group, would have been significant. Compare this to getting in you car, driving to the local supermarket and purchasing calorie dense food. The supply is reliable and energy expended to get it is very limited. Vegetable food would likely have been more readily available during our evolution, although not always so in the colder European climate. In addition, energy was required to collect and prepare this food, and available carbohydrates had to be extracted from the fiber.

Now you might be wondering what this could possibly have to do with energy homeostasis favoring weight retention over weight loss? If periods of calorie scarcity were common, and the consequences of it severe as with not surviving, then it is only natural that homeostatic mechanisms would evolve to defend against weight loss more strongly than against weight gain. By storing calories in terms of fuel (fat and glycogen), and also protein, periods of food resource scarcity could be tolerated. Failure to retain these stored calories for use when there was scarcity would likely have impacted on what is known as evolutionary fitness, or in other words success in surviving and reproducing to pass on your genes. A short-term failure to lose excess weight would likely have had minimal impact, because both recurrent food shortages and nearly constant movement to find food ensured the eventual utilization of these stored calories. Instances of ongoing weight excess might then have been quite rare. In addition, throughout much of our evolution life appears to have been short and brutal, with people usually not surviving beyond 40. It is only during the last 30,000-40,000 years of our 200,000 or so year time frame, that there is evidence of people living longer, and even then not radically so. Hence, diseases like Type II diabetes and heart disease were not a concern as few lived long enough to incur them.

Given the advantages of storing weight the capacity to do so appears to have evolved, with homeostatic mechanisms defending against weight loss to a greater extent than weight gain. With most genetic traits, and certainly any that pertain to behavior, there is a range. For example, with personality there are genetically based dimensions such as degree of reactivity to the environment

(typically described as emotional stability). This dimension of behavior had implications for our evolutionary fitness and so became genetically based. However, the value of a particular point on the continuum varies with environmental circumstances. For example, in a setting where crocodiles frequently inhabit watering holes a high degree of reactivity is highly adaptive, as even a slight ripple will trigger such an individual to jump back. The low reactive person might ignore the ripple and be eaten. In a safer environment overreacting to benign stimuli wastes energy resources, and could produce hostile reactions from other members of the group. The capacity to react to environmental stimuli is then within all of us, but the precise degree that is genetically endowed varies, and the level that is most adaptive fluctuates with environmental circumstances.

Likewise, having the capacity to store calories has adaptive significance, but the value of any given degree of propensity in this regard depends on circumstances. In an environment characterized by frequent and prolonged food shortages, the capacity to readily pack on extra weight is highly adaptive. If the environment has rare and only brief food shortages, and requires a high degree of physical fitness to hunt animals and evade dangerous predators, extra weight is a hindrance to survival. Hence, there is a range of inherited energy storage capacity. Some people seem to simply look at a donut and gain weight, whereas others can consume quite a lot of calorie dense food and not gain much weight. A further contribution to the genetic influence on weight retention is what is known as, epigenetics.

Debate raged in the past as to whether or not behavior and traits are due to genetics or the environment, with some combination of influences being the synthesis of these two views. As it turns out genes and environment are much more tightly interconnected than anyone suspected, once again demonstrating how everything in the universe, or at least nature, is highly interconnected. Genes are not static entities that just act to produce proteins. Much of our genetic material consists of what are known as regulatory regions turning genes on and off. As it turns out, the environment can influence these regulatory genes, determining whether or not and to what extent a given gene is turned on or off! This process is known as epigenetics. If pathogens are invading

your body genes producing and mobilizing immune defenses are turned on. If the threat is taken care of these genes are turned off.

I suspect that epigenetic environmental influences play a crucial role in weight, although future research will have to prove this conjecture. In an environment where we are forced to be active searching for good sources of nutrition while evading predators, epigenetic processes likely turn on genes for energy utilization, and dampen the activity of genes for energy storage. Proving this might be difficult though, as a research study subjecting humans to food scarcity and dangerous predators is unlikely to pass the ethics review process. In an environment where food is readily available but only at certain times, shortages frequent and prolonged, and predators few, genes for energy storage are likely to be turned on, while genes promoting activity are dampened. In our modern day environment high calorie food is readily available, and there are no predators to speak of, so genes for energy storage might be on and those for energy utilization off. Although food is abundant and easily obtained for many individuals currently, this is a very recent evolutionary occurrence, and for numerous people in the world food shortages are ever present. Perhaps over several generations if high calorie food remains abundant and evolutionary fitness is reduced by ongoing excess weight, then epigenetic mechanisms might evolve to more rapidly activate genes for energy utilization over energy storage. However, as it stands now once weight is gained homeostatic mechanisms protect it, even if the weight is excessive for the given person.

A further aspect of our evolution relevant to the issue of food and weight is the type of diet we relied on. Generally speaking there are three types of animals when we consider food intake: Carnivores, herbivores, and omnivores. At the top of the food chain are carnivores relying strictly on a meat diet, such as members of the cat family and sharks in the underwater world. Salads do not cut it for these animals. Herbivores rely on vegetable matter and include many species, such as ungulates on land and spiny urchins underwater. Omnivores are more versatile eating a wide range of food. No one will be surprised to learn that we are omnivores eating many different types of food, as a stroll through any supermarket will quickly confirm. Our omnivore status is significant because it sheds light on why diets relying on low fat,

low carbohydrates, high protein with low fat or low carbohydrates etc, etc, are not likely to work well. We evolved to eat carbohydrates, fat, and protein, and almost certainly in varying proportions depending on what the environment offered.

Given the frequent scarcity of calorie dense food during our evolution, we tend to prefer such sources, a reality that acts to our detriment now with how readily available these foods are and in such a compact form. Trying to limit them, as by for example cutting back on highly processed carbohydrates is sensible, but it is not easy given their availability and our preference for them. Once we gain weight trying to lose it by restricting these foods does not work in the long run, due to homeostatic mechanisms protecting calorie stores. Although a hunting-gathering way of life might be helpful for losing weight, we can no longer return to it. Perhaps the best that we can reasonably do in terms of food intake is to eat a variety of foods consistent with our omnivore nature, and try to limit calorie dense foods containing highly processed carbohydrates, ensuring adequate nutrition while limiting further weight gain. However, weight loss over the long-term should not be expected from this approach. As if there were not enough influences on weight and weight loss to deal with, an additional major category consists of chemicals within our environment.

Obesogens:

As the name suggests obesogens are substances contributing to obesity. In 2002 Paula Baillie-Hamilton of Scotland published a paper (Chemical toxins: A hypothesis to explain the global obesity epidemic) in *The Journal of Alternative & Complementary Medicine*, describing a link between the rise of chemicals like plasticizers and increasing obesity rates. Given that other factors could account for the rise of obesity she needed evidence that chemicals could produce obesity. That evidence came in the form of studies of toxins going back a number of years. The prevailing concept among researchers was that toxins led to weight loss, and some writers were almost apologetic in papers when an increase in weight, instead of the anticipated loss, occurred in their experimental animals. She documented how various toxins increase weight. On the other side of the Atlantic, Bruce Blumberg, a scientist at the University of California, found that certain

chemicals seemed to be inducing the proliferation of fat cells in developing fetuses among his lab animals. For example, pregnant mice fed a common disinfectant and fungicide, called tributyltin, gave birth to offspring with a 5 to 20 percent higher chance of being obese. He termed the chemicals producing this bizarre effect, obesogens.

The work of Bruce Blumberg addresses the interesting finding that the incidence of obesity amongst those less than six months of age, has increased about 70 percent since 1980. While dietary factors might account for some of the increase, other factors must be involved. One effect of obesogens is to raise the actual number of fat cells in a fetus, and hence the capacity of the animal to store fat. Fat cells once created persist, providing a life long vulnerability to obesity. In environments where food shortages are common and prolonged, individuals with excess fat storage capacity are likely to survive better, but in the environment of well-fed lab animals and humans, it ensures ongoing obesity in at least some individuals.

But how can chemicals have such an impact? Currently this topic is being intensely researched and different pathways have been identified. One mechanism involves chemicals acting as epigenetic agents. Genes understandably play a major role in the metabolism of fat, and also the growth of adipocytes (fat cells). Obesogenic chemicals appear to target regulatory genes involved in these processes, promoting increased growth of fat cells. For example, progenitor cells capable of developing into many cell types are induced to become preadipocytes, and these cells are then stimulated to become adipocytes. Obesogens also stimulate increased fat accumulation in these adipocytes. A very interesting additional epigenetic influence is on sex steroid balance. Androgens (male sex hormones) mobilize fat stores, thereby countering obesity. By acting on regulatory genes obesogens reduce androgen levels, at least relative to female hormones (estrogens), leading to increased fat retention. Exposure of female mice fetuses to excess female hormone levels results in obesity, despite lower birth weight, clearly highlighting how fat metabolism is shifted to storage over utilization. Indeed, by increasing female hormone activity obesogens reliably tip the fat storage-utilization

balance in favor of the former. Due to their impact on hormones obesogens are also known as, endocrine (hormone) disrupters.

Obesogens also influence brain regions and receptors involved in fat metabolism. Acting on the hypothalamus, some of these chemicals seem capable of altering the homeostatic set point so as to ensure that more weight is retained. This effect might occur by the action of these chemicals on brain receptors sensitive to circulating levels of insulin, leptin, and other substances involved in the balance between fuel storage and utilization. Regulatory genes appear to be involved in this process, with stimulated receptors increasing activity of genes responsible for shifting the homeostatic set point to a higher level of fat storage over utilization. Due to the evolutionary based tendency to protect fuel stores, many animals seem primed in this direction, making it easier for environmental chemicals to amplifying the tendency to increase fat stores.

So now that we know chemicals in our environment contribute to the weight problem, all we have to do is eliminate them! Well, that's not so easy. When these chemicals act during fetal development to increase the number of fat cells, the impact is life long. Of course we might ensure that human fetuses are not influenced by obesogens, but here lies the problem—These chemicals are everywhere. It is almost like Invasion of the Body Snatchers where you suddenly realize that the spores are in everyone. Do I hear silent screams? Virtually everyone exposed to modern day packaged goods has levels of obesogens in their system. Many chemicals are implicated, such as those in tin (organotins) present in countless food and beverage products packaged in cans. Tributyltin and triphenyltin are examples of common organotins acting as obesogens. The most well known obesogen, bisphenol A (BPA), is a common chemical in plastics including baby bottles. In some parts of the world it is now banned from baby bottles, but is still in most plastics. As covered in the Research Bias chapter, industry sponsored research examining the safety of this chemical has been extremely biased in favor of it. Bisphenol A and many other chemicals we consume daily are usually only tested for safety by industry researchers, or those financed by them, producing the inevitable conclusion that the chemicals are safe. Based on these studies regulating agencies okay

these chemicals for human consumption, and this is for the relatively few chemicals that are actually tested for safety. Negative externalities in terms of obesity related health problems do not have to be absorbed by the chemical industry manufacturing obesogens, and other industries adding them to products, with the health and financial costs absorbed by people.

Given the ubiquitous nature of these modern day chemicals the old promotional line, "Better living through chemistry," might be changed to, "Fatter living through chemistry." Short of only ingesting locally produced crops grown without pesticides and fungicides, and meat with no hormonal or chemical additives, there is virtually no way to prevent these chemicals from being part of you. The only bright bit of news is that unlike the spores in *Invasion of the Body Snatchers*, where everyone infected becomes an alien, only some people seem to be affected by obesogens. This fact is obvious given that some people remain slim despite being exposed to obesogens during fetal development and throughout life. The reasons for this intriguing occurrence are not well understood. The answer will quite likely end up involving the spectrum of fuel storage capacity, in that those with a much greater capacity to store than utilize fuel might be much more susceptible to the influence of obesogens, given that their system is highly primed for weight gain.

Although the concept of obesogens initially focused on chemicals in the environment, it has been extended to medications and substances that we actively seek. Medications used to treat diabetes (thiazolidinediones, rosiglitazone, and pioglitazone), ironically can contribute to persistent weight gain through their effect on certain receptors. Medications commonly used in psychiatry are implicated as well, such as second-generation antipsychotics. Hopefully, you appreciate why I recommend that these medications only be used for psychosis and not depression and anxiety, unless as an augmenting strategy, since the goal should not be increased fat in terms of financial gain for pharmaceutical companies and researchers accepting money from them, but less fat in the psychiatric population already experiencing more than it's fair share of it. Regarding obesogens that we actively seek, fructose in sweetened drinks tops the list as our bodies readily convert it into fat. Some see fructose as a

powerful obesogen contributing hugely to fat storage over utilization.

At this point many readers will be wondering, why should I or anyone else try to lose weight? The obesogens inside us, availability of calorie dense food, and our evolved tendency to protect fuel stores make weight loss beyond the short-term virtually impossible, particularly for those on the higher end of the spectrum of fat storage proneness. Furthermore, if those who succeed are only the rare individuals somehow equipped to fight our homeostatic set point mechanisms, how can weight loss ever work for the majority of people? The answer is that you are right: There is no point in focusing on weight loss, because IT DOES NOT WORK! I emphasize this point because the focus is always on losing weight. Unfortunately, weight loss is a losing proposition, and the focus on it has to end, at least until such time as the complex biology is sufficiently well understood that we can safely intervene with medications or other affordable procedures. As so often occurs, people are too fixated on one approach missing or negating the most reasoned strategy. What I recommend is a simple approach rarely considered given the obsessive focus on weight loss, but one that has tremendous health and appearance benefits.

LOSE THE FOCUS ON WEIGHT:

What is the goal of weight loss for most or even all people? The answer is to improve health, look better, or both. Even if someone else, such as a doctor or spouse, is encouraging you to lose weight it comes back to these motivations. To improve health and appearance when overweight or obese, a focus on losing weight is a losing proposition, as we have seen. A much more effective focus is to increase activity. Carefully note that I did not say exercise. To many people who are overweight and sedentary, exercise is perceived in the same category as jumping off a cliff without a parachute. Since we would not expect anyone to do the latter we cannot reasonably expect formal exercise, at least not at first. The focus is simply on becoming more active.

Physical activity is one of the most undervalued occurrences that there is, and inactivity is a major risk factor for a range of cardiovascular diseases. Those with psychiatric illness are

much more likely than the average person to be overweight or obese. One reason is that they commonly experience high behavioral inhibition (BIS), contributing to a reduction in activity, and hence increased weight. Depression adds another dimension to the weight problem by also directly reducing behavioral activation (BAS). If not for depression causing some people to lose weight by diminishing the urge to eat, this condition might qualify as the number one contributor to obesity. Not infrequently when people are substantially overweight they incur ridicule and have fewer friends, thereby increasing the likelihood of depression, resulting in further inactivity and weight gain.

A very simple and useful therapeutic strategy is to get patients to increase their activity level. This might be via formal exercise shown to have benefits for depression and anxiety comparable to antidepressants (likely related to how it reduces behavioral inhibition and increases behavioral activation), taking up hobbies with some activity component, or simply walking more. I frequently encourage my patients to walk and not think of actual exercise, unless they are familiar with it. The value of walking as a way of increasing physical activity is justified given that it is the easiest and preferred way for most people. For example, a study by Dunn and colleagues (Six-month physical activity and fitness changes in project active, a randomized trial, published in *Medicine and Science in Sports and Exercise*, 1998) found that when people are asked to voluntarily increase the amount of physical activity by 30 minutes per day, 20 minutes of this consists of walking for most individuals. A crucial value of walking is that it does not require special skill, equipment, or even motivation, and virtually everyone can do it. In addition, it can be done almost anywhere, alone or with other people as a social activity. It is also cheap. The fact that there is little or no money to be made from this approach helps explain why there has been so little focus on it. Diet books sell and then some, walking books less so. But could something as simple as walking help with the weight problem?

To assess the benefits of walking Marie Murphy and colleagues carefully examined walking research studies in, *The effect of walking on fitness, fatness, and resting blood pressure: A meta-analysis of randomised, controlled trials*, published in *Preventative Medicine* in 2007. Murphy selected walking studies meeting the

following criteria: Randomization of subjects to walking and non-walking conditions to reduce bias, walking as the only intervention so that the impact is clear, a minimum 4 week intervention, pre and post-intervention assessment of cardiovascular risk factors, and the use of sedentary subjects 18 years and older. The search period was from 1971 to 2004 producing 24 studies that met their criteria. The results strongly support the benefits of walking for fitness and cardiovascular risk factors. Maximum oxygen uptake, the gold standard for assessing cardiovascular fitness, improved in all the studies assessing it with an overall gain of 9%. There was a slight reduction in BMI, while percent body fat decreased from .2-2.5%. These changes suggest that percent muscle mass increased at the expense of fat mass. Supporting this proposition, the authors indicate that fat mass was reduced and not lean body mass, with loss of the latter more characteristic of calorie-restricted diets. Weight among walking subjects dropped .2-2.0 kg, while weight in the non-walking control groups increased .1-4.0 kg. Diastolic blood pressure was 3.4% less than in non-walkers.

The results of the Murphy meta-analysis clearly demonstrate that simple walking has a very significant impact on fitness and cardiovascular risk factors. Some might wonder if the amount of walking made a difference, the so-called threshold effect that is often applied to exercise, whereby above a certain value there is benefit and below no gain. Over the years I have heard this perspective repeated and could never understand why there would be some absolute threshold. The results of the Murphy study confirm my perspective, in that there was no difference in any of the measured variables between those who walked less than 150 minutes per week, and those who walked for more than 150 minutes. Skeptical readers might question the overall value of the relatively small changes in the Murphy study, such as for example a maximum 2.5% reduction in body fat found. The studies examined mostly ranged in duration from 10 to 26 weeks, with only one study reaching 52 weeks. Hence, even in a short-term time frame there was substantial improvement in fitness and cardiovascular risk factors, despite no change in diet. It is very conceivable that if participants continued walking the benefits would progress, and given the low demand nature of walking many people can stick with it. Furthermore, subtle changes such as a modest reduction in body fat and increase in

muscle mass can be very important for not only reducing cardiovascular risk factors, but improving overall fitness and appearance. Very impressive is the 9% increase in maximum oxygen uptake substantially enhancing cardiovascular fitness.

Historically walking has been an essential human activity. The Italian physicist, Cesare Marchetti, in a departure from his usual research focus on nuclear power, examined commuting behavior across the millennia from hunter-gatherers to modern day city dwellers. His research reveals that people tend to commute about an hour per day, a value that in urban planning circles has become known as, Marchetti's Constant. Throughout human history this hour of commuting has typically involved walking. Marchetti believes that the constant represents a basic instinct, and that urban design has reflected this natural proclivity. For example, the mean area of an ancient Greek village was 20 square kilometers, representing a circle with a diameter of five kilometers, the distance that most people walk in one hour. Marchetti argues that many older cities have been structured on the basis of an hour walking commute.

Modern day urban design, based largely on sprawl development, has regrettably lost this focus. People can only walk on inhospitable busy roads often lacking sidewalks, or in convoluted suburban housing developments leading to nowhere. Given that the design is incompatible with our propensity to walk about an hour per day, people just get in their cars and drive. In line with this occurrence those living in city cores, such as Manhattan, tend to walk a lot more than those in the suburbs, and are healthier for it. Hence, inner city living or more sensible suburban planning geared more to travel by foot, will help people return to what comes natural to us—Walking. Think of what an hour of walking per day can do for your health. A patient of mine who was overweight and sedentary, shifted to at least one hour of walking per day without any focus on weight loss per se, and presently I have to remind him not to get too thin. Having kids walk an hour per day is a great way to prevent and combat childhood obesity, while providing a solid and inexpensive activity-based family bonding experience. Given that a threshold effect does not seem to apply, an hour of walking per day is not necessary, but the more the better, at least below the level that causes damage to joints and other body structures. For

those with medical problems incompatible with walking, a viable alternative is activity within a water environment, such as so-called Aqua-fit.

While Western society does tend to emphasize thinness, what most people find really attractive are toned bodies. Fat and muscle mass actually weigh the same, it is just that muscle looks much better and is healthier. When the population is largely sedentary, the only way to ensure no flabby tissue is to be thin. However, a person can also achieve this look by being large and muscular. Take for example a 250-pound middle-aged male for whom activity mainly consists of getting off the couch for more beer and potato chips, and compare to a 250-pound world's strongest man contender. Few would hesitate to point at the latter when asked to identify the most appealing body. Likewise, women who have a curvaceous muscular build are often desired models for swimsuit photos, being considered more appealing than stick figure models. Toned and larger is actually more appealing to most people than thin and flabby, it is just that thinness makes it much easier not to be flabby, in a sense compensating for a lack of lean muscle. Most of us can recall thin and very inactive people who end up having heart attacks at an early age, because they are not healthy despite the thinness. The key message is that thinness should not be equated with good health, although the two are almost considered synonymous.

Walking produces healthier and more appealing bodies at any size. It is also enjoyable, or at least not aversive, and many walkers become hikers enjoying the beauty of nature, an experience that is also beneficial for mental health. Furthermore, many of those who stick with walking often progress to dare I say it—Exercise! This might take the form of jogging, resistance training, or even strenuous uphill hikes. While the capacity of exercise to reduce weight is debatable given our homeostatic compensatory mechanisms, benefits for cardiovascular risk factors is clear. Formal exercise, whether aerobic (increased heart rate) or resistance based, improves the ability to burn fatty acids for fuel, decreases resting heart rate, increases the resting and exercise stroke volume of the heart, elevates maximal cardiac output, improves exercise tolerance, reduces percent body fat, increases fat free (muscle) body mass, and diminishes bad cholesterol while raising good

cholesterol. Exercise also works well for obese children and adolescents, even assisting with asthma that along with obesity is reaching epidemic proportions among young people. Following heart attacks exercise training improves cardiovascular parameters in older individuals.

Some very intriguing mechanisms seem to play a role in the benefits of activity and formal exercise. One of these is an increase in the number and size of mitochondria in muscle tissue. Mitochondria are structures within cells dedicated to burning energy, much like a furnace. Increasing them uses up body fuel supplies, thereby reducing percent body fat. Every pound of muscle burns about 50 calories per day, due to the activity of these mitochondria. Hence, the more muscle mass, the more calories burned and less fat mass. Even more intriguing is how epigenetic influences play a role, with exercise increasing brain chemicals that stimulate mitochondrial growth and development in cells throughout the body. Elevated mitochondrial genetic material, indicating increased local mitochondrial growth, has been found in mice brains following exercise. This amazing result might help explain why exercise improves cognitive abilities, and also why those who exercise are less likely to develop dementia, in that increased activity of mitochondria within the brain improves cognitive ability and resilience.

Epigenetic factors also play a direct role in exercise induced utilization of dietary fat for energy, in that exercise enhances the expression of genes that reduce fat uptake, and increase its mobilization and burning for energy. These benefits also likely transpire with walking. Another interesting effect of exercise is on the distribution of fat in the body. Abdominal fat, specifically linked to elevated cardiovascular disease risk, can be improved by exercise—Higher cortisol (a stress chemical) increases fat storage in this region of the body, and exercise can reduce cortisol levels. Activity in general also seems to stimulate the sympathetic (activity) portion of the nervous system, increasing the breakdown and utilization of fat stores in the abdomen and elsewhere, while blocking the storage of fat.

Research evidence clearly reveals that exercise, and even simply walking, improves the capacity of muscle and brain tissue to burn energy, while impairing the storage of fat. Weight

reduction typically accompanies fat reduction, and so it is not surprising that walking and exercise can induce modest reductions in weight. Various mechanisms play a role in this occurrence, such as the increase in mitochondria in skeletal muscle and the brain, and shift of the system from fuel storage to utilization. Exercise can also diminish feelings of hunger and improve appetite control in some people, although intense activity often leads to hunger sensations triggered by homeostatic control mechanisms, ensuring that lost fuel is regained.

By not trying to lose weight and just focusing on activity, more weight might ironically be lost in the long run. This occurrence arises from a unique aspect of homeostatic control processes—Marked deviations from a homeostatic set point trigger strong compensatory responses, while negligible deviations often do not activate these processes. For example, if your body temperature drops by a few degrees homeostatic control processes engage to generate heat, by for example prompting you to shiver. Deviations of a fraction of a degree are tolerated and do not activate these homeostatic mechanisms. Likewise, with weight if you lose a small fraction of a pound per week homeostatic processes might not be activated to restore fuel supplies. However, if you drop even one or two pounds in a week by trying to lose weight, with or without exercise, these processes engage and restore the lost weight.

It is even possible that the homeostatic set point might drift downwards over time adjusting to a lower level of weight, although the feasibility of such an occurrence is difficult to prove at this point. By focusing on walking to increase activity, perhaps a quarter-to-half pound of weight might be lost per month, in line with the results of the Murphy study showing a .2-2.0 kg (.44-4.4 pounds) weight lost over 10-26 weeks. While this certainly will not sell many weight loss books, it could produce a sustainable 15-30 pound loss over 5 years, in addition to the primary benefits of improving health and appearance. This weight loss result would blow away the competition so to speak, given that all strategies focusing on weight loss fail over the long haul.

Hence, we get to our destination by not following the path right in front of us. The most obvious route to managing excess weight is seemingly focusing on weight loss via dietary

modifications, or ensuring that calorie output exceeds input. Unfortunately, our evolution and genetics conspire to thwart us, by engaging homeostatic processes much better at restoring lost weight than dropping excess pounds. Increased activity, on the other hand, works with evolutionary and genetic adaptations to enhance energy utilization and diminish fat storage. If done in a modest fashion, without any focus or effort directed to weight loss, we might ironically lose more weight over the long haul by not activating homeostatic compensatory processes. Even if no weight is lost, the cardiovascular and fitness benefits are pronounced, and certainly so when compared to the dismal long-range situation derived from a weight loss focus. Increased behavioral activation can also play a major, and largely untapped role, in the treatment of depression and other psychiatric problems. Through simple walking and activity all of us can be healthier, compensating for how we are self-destructing with excess high calorie food and inactivity.

DEFENDING THE INDEFENSIBLE

QUESTION:

It is most adaptive to perceive things:

- A. Realistically as possible.
- B. See the negative side of things to be extra careful.
- C. It does not really matter because crap happens no matter how we view things.
- D. With a positive spin.
- E. As you are naturally inclined to.

Answer A is popular with many people believing that we should always be perceiving things in a fully realistic way, and that any other perspective is a sign of weakness or mental illness. One potential problem with this option is determining exactly what reality is, something scientists struggle day in and day out to define. Routinely seeing the negative side of things (answer B) is associated with depression, anxiety, and other mental health problems, and an excessive focus on the negative side of life can actually wear a person down reducing coping ability. Answer C is a very passive orientation suggesting that perception does not influence how we act and react to the environment. Perceptions, though, greatly influence behavior and so it really does matter how we view things. Answer D and E are the most accurate, because there is a natural tendency to place a positive spin on life, and this perception is associated with good mental health. As a psychiatrist I do not encounter many people who are positive in their perspective, and most people who see a professional such as myself have a negative outlook.

PERCEPTIONS OF THE SELF & WORLD:

Absolute reality is unclear making it very challenging to perceive things in a completely accurate fashion all the time, or even most of the time. For concrete events it might be relatively straightforward to see the occurrence accurately, but when it comes to interactions, personal motives, accomplishments/failures, and social events what is the reality? Would you and your partner agree on the absolute reality why you had an argument this morning? If so then you are probably so well in synch with each other that fighting is unlikely. Even if you both agree the actual reason might be different than the attribution arrived at. Perhaps both of you are worried about whether or not you will become parents, but sexual frustration seems like a more salient reason. Why are you employed in your area and not in another occupation? Not so straightforward considering all the possible factors that play a role, and the relative contribution of these ingredients. For social events involving multiple players and interactions absolute reality is even less clear.

While it is difficult to perceive reality in a fully accurate fashion we are usually reality congruent, at least if we wish to function in an adaptive manner. We cannot say for sure what the intentions and motives of strangers or even close acquaintances are, but we keep the options in certain boundaries, at least while conscious and awake. When asleep we can generate spectacular scenarios like how those around you might be agents of Satan plotting your demise. Waking up you return to reality and realize that it was just a nightmare. However, if you walk around believing that strangers you pass are truly agents of Satan and hear them plotting your demise, then there is a tremendous misperception of reality that is not at all adaptive. In reaction to the words spoken by these agents of Satan, you start screaming at them leading to injury or incarceration. Schizophrenia frequently involves such an occurrence.

The key point being that while it is highly adaptive and normal to be reality congruent, it is extremely difficult and virtually impossible to perceive most occurrences completely accurately. This scenario opens the door for positive and negative spins pertaining to the self, others, world in general, past, and future. In a 2004 paper, Psychological Defense Mechanisms: A New

Perspective published in the American Journal Of Psychoanalysis, I proposed that one of our major psychological defense templates consists of positive cognitive distortions (the other major defense template I proposed is dissociation). This perspective is backed up by the work of Aaron Beck, the originator of cognitive therapy. He believes that a healthy mental state is characterized by a positive bias. With the onset of depression the positive bias (spin) is neutralized, and then transformed into a negative spin with full depression. The same process applies to anxiety disorders. Mentally healthy people recall the past in a selectively positive way, preferentially retrieving positive memories. They also overestimate the probability of positive potentialities coming true in the future, downplaying the probability of negative ones. Indeed about 80% of the population demonstrates an optimism bias particularly pertaining to the self, close friends, and relatives.

If given the choice between a negative outlook associated with depression and anxiety, or a positive outlook making you feel better which would you choose? The choice seems obvious even though as it turns out it is not so much a choice but an evolutionary occurrence, and human intelligence plays a lead role. A critical aspect of our evolution is intelligence. As with most evolutionary adaptations there are pluses and minuses. Intelligence has many positive aspects including, facilitating more adaptive responses in the moment, conscious and even unconscious action planning, more skill as a predator, and superior ability to navigate complex social interactions. On the negative side it drains a lot of energy, approximately 1/5 of our energy even at rest. Not surprisingly intelligence has only evolved in a limited but diverse range of species, where the pluses outweighed the minuses. For example, our close evolutionary cousins the great apes including chimpanzees, bonobos, orangutans, and gorillas, were able to benefit from the social abilities, and perhaps tool making capacity, that intelligence provided. In a totally different physical but strikingly similar social context, dolphins, whales, and orcas evolved intelligence seemingly to facilitate more complex social interactions within pods, and devise advanced hunting strategies in the case of dolphins and orcas. The complex social interactions of elephants in a grazing context likewise benefited from the evolution of intelligence. Some birds, such as magpies, crows, and

raptors, also evolved significant intelligence, and undoubtedly certain dinosaurs would have done so as well facilitating superior social interactions and predation.

So even though we like to think of ourselves as the only intelligent creature (a positive self-enhancing cognitive distortion), we are only one of several species to have evolved intelligence. At least then we are not alone feeling we have to search the heavens for other intelligent life. We typically never try and understand what intelligence means in the context of other creatures like dolphins. Perhaps if we did and compared this to the typical reality television show the difference might seem negligible, or dare I say, in favor of a dolphin? However, at the risk of engaging in a species centric positive cognitive distortion, it does appear that humans have evolved a level of intelligence greatly exceeding that of other species, as demonstrated by our conceptual and abstract thinking ability.

Okay, so we are more intelligent than other creatures, but what does this have to do with perceptions and cognitive distortions? The answer involves both thoughts and emotions, and the linkage between them. For every emotion there is a thought, or what is known as a cognitive activating appraisal, giving rise to it. The cognitive activating appraisals can be conscious or unconscious in origin, so we are only sometimes able to clearly identify them. Certain emotions tend to be primary meaning present in all people—Fear, sadness, anger, disgust, shame, happiness, interest, and surprise, although some researchers debate shame and interest. The universality of these emotions was established by examining societies having no or very little contact with outsiders. Focusing on an isolated New Guinea society Ekman & Friesen in 1971 gave adults and children three photographs at once, each containing facial expressions of either happiness, sadness, anger, disgust, surprise, and fear, and told them a story that involved one emotion. Subjects were able to match stories to facial expressions for the six emotions beyond that predicted by chance. The researchers went one step further having nine New Guineans show how their face would appear if they were the person in the story. The unedited videotapes were shown to college students in the United States. Except for the poses of fear and surprise, that the New Guineans had difficulty making faces of, the students accurately recognized

the displayed emotion. Supporting the work of Ekman and Friesen, Boucher and Carlson studied Malaysian aboriginals and found that the same six emotions were recognized in facial expressions with an above average frequency.

A very interesting and important aspect of this thought-emotion linkage is that there is a so-called deep structure to the circumstances giving rise to each emotion. These deep structures are universal, as evidenced by research conducted by Boucher and Carlson in 1980, demonstrating that members of one culture can accurately identify primary emotions from antecedent conditions provided by members of a completely different culture. The deep structures to our primary emotions consist of:

Fear: Threat or danger.

Sadness: Loss.

Happiness: Gain.

Anger: Violation or damage.

Disgust: Contamination of a physical or moral nature.

Shame: The commission of a social transgression.

Interest: The presence of something offering the potential for reward.

Surprise: The sudden appearance of the unexpected, with either positive or negative implications.

Even a quick review of the circumstances linked to your own experience of these emotions will confirm the validity of the process. For example, when threatened fear is common, as is sadness when a loss is incurred. Emotions can be experienced together, such as fear, sadness, and anger, because some circumstances contribute to all three. For example, bullying typically involves perceptions of threat and danger, loss of personal safety, and violation of self. Interest and happiness can occur together, because what offers the potential for reward commonly also indicates that a gain is to be had. Based on the deep structure of emotions the co-occurrence of some feelings such as happiness and sadness is unlikely, given that circumstances contributing to loss are not likely to also produce gain. The only way that this might occur is if you imagine different aspects of a given scenario, such as losing your partner resulting in sadness and then starting a new romance producing a feeling of happiness.

These primary emotions are also present in many other species including several significantly lower in intelligence. Take man's best friend for example. Dogs show interest when a bone is presented, and appear happy to see us when we come home. If there is a threat fear arises, and if attacked anger (expressed as aggression) occurs. When a dog loses its owner sadness seems to ensue. In conducting theoretical work it is important to ask the right question, as unique questions give rise to novel solutions. As also presented in *Irregular Regulation*, a crucial question I asked myself is what would happen when a much greater level of intelligence is superimposed on primary emotions already present? If many mammals display primary emotions, and certainly higher primates, it is a given that they were present in our own direct ancestors. *Homo sapiens* (humans) have been around for about 200,000 years, with the same basic level of intelligence.

The answer I came up with is that our emotions became amplified, based on intelligence making the underlying cognitive activating appraisals more intensive, extensive, and adding a temporal dimension. So for example, you lose your partner and feel sadness based on the loss. Thoughts about all the specific losses like missing dinners, walks, and other events you shared intensify the loss. Thinking about circumstances beyond the actual loss extends its impact, as by for instance the thought, "If she left me I might not be worthy of another relationship and will lose that one too." Also highly significant is how intelligence enables us to replay events over time reactivating the relevant emotions. For instance, going over the loss of your partner and associated occurrences, keeps reactivating feeling of sadness. People often go over losses, violations, and threats for days, weeks, months, and even years. Many mammals probably just experience the event in the moment and do not replay it in their mind, limiting the impact to the present. More intelligent creatures such as higher primates, dolphins, and elephants seem to experience emotions over time, suggesting that this temporal dimension also somewhat applies to them.

The term I coined for the process of intelligence amplifying emotions by making the cognitive activating appraisals more intensive, extensive, and adding a temporal dimension is the Amplification Effect. It has been said that we are the most emotional of all creatures, and I believe that the amplification effect

accounts for this occurrence. We experience great interest and happiness on the positive side, and profound fear, sadness, anger, and shame on the negative side. Considering positive and negative emotions what type do you think will naturally dominate? When we look at the number of primary emotions, it readily becomes apparent that there are more negative (fear, sadness, anger, disgust, and shame) than positive variants (happiness and interest). Surprise can be either negative or positive. As some of you might have noted we experience many more emotions than the primary ones listed, including amongst others, joy, satisfaction, contempt, and guilt. These so-called secondary emotions, arise either as variants of primary emotions (joy and satisfaction as a variant of happiness, and guilt as a form of shame, for example), or as combinations of primary emotions (contempt based on anger and disgust for instance). Secondary emotions, based on variants or combinations of the five negative primary emotions, are likely to be more common than secondary ones derived from the two positive emotions. If for no other reason than the greater number of negative than positive primary and secondary emotions we can expect more negative feelings.

An additional factor contributing to the greater burden of negative than positive primary and secondary emotions, is the evolutionary based tendency to focus on negative consequences over positive. During our evolution it was most adaptive to preferentially attend to threats and related negative states. For example, the approach of a predator impacts on survival and reproduction (evolutionary fitness) much more than missing one good source of nutritious food. If you miss the food item you can find another later, but if a predator attacks you or your offspring there is no undoing it. Hence, evolution seems to have endowed us with a tendency to focus on the negative, as evidenced by popular media where bad news is known to sell best, and slogans like, "Report every story as if its World War III!" are common.

The excessive burden of negative emotions derived from the amplification effect of human intelligence on emotional information processing, the greater number of primary and secondary negative emotions, and our evolutionary derived tendency to preferentially attend to negative states, actually predisposes us to depression and anxiety disorders. In a sense the

stage is set based on excessive perceptions of loss and threat, producing amplified feelings of sadness and fear. Depression, or at least the emotional aspect, represents amplified sadness, while amplified fear constitutes anxiety. Although some evolutionary researchers see a potential value to depression and anxiety, I as a highly experienced clinician see only suffering, and a great deal of it. In contrast to depression and anxiety disorders, the root emotions of sadness and fear can be adaptive when briefly experienced. Sadness is an asset when it alerts us to loss and motivates behavior that can minimize, reverse, or offset the loss in the moment. Fear by alerting us to threat and danger can motivate adaptive avoidance, flight, fight, or freezing responses, depending on the circumstances. However, when these emotions are greatly amplified and experienced as a persistent state, as occurs in depression and anxiety disorders, there is typically only suffering.

An important rule is that evolution is hell on maladaptive traits, particularly if they repeat over circumstances and time. You might get away with not scrutinizing a watering hole for signs of a crocodile once, but do not try it a hundred times, or even ten. The greatly diminished adaptive capacity occurring with depression and anxiety disorders would undoubtedly have reduced evolutionary fitness, particularly because these mental health conditions extend over time. Symptoms of depression and anxiety including, poor concentration, impaired memory, diminished motivation and activity, reduced sexual drive and energy level, impaired sleep, and compromised social functioning, would have left a person very vulnerable to predation, injury, resource depletion, and also ostracism from the social group. Within our hunting-gathering evolutionary context reciprocity was crucial (see the Greed: More Is Never Enough chapter). If your hunt went well and you share, then the other parties might share with you when things are not going so well. Keeping track of debts and entitlements, and acting on this knowledge, was crucial to successful social functioning. If you forget or are not motivated to repay someone there is a risk of being ostracized, and if you do not call in an entitlement you lose out. In addition to reciprocity based obligations and entitlements, life in a hunting-gathering society involved status issues, alliances, and good old "small p" politics. In a depressed or overly anxious state a person would find it difficult to navigate the political landscape, and

build solid alliances. To offset the evolutionary fitness reducing impact of amplified negative emotions, I believe that psychological defense mechanisms evolved.

Frequently, an evolved trait while adaptive overall, will have negative consequences that can reduce evolutionary fitness if not compensated for. As an example, due to shrinkage of jungles our distant ancestors ventured down from the trees and began walking on the open savannah. Unfortunately, the physical form of monkey-like animals is not suited for long range walking, leading to the evolution of two-legged motion (bipedalism). Now what happens to a fur covered creature when it walks in the open sun? It overheats reducing evolutionary fitness. To compensate we evolved into a naked ape. However, what happens to white skin under intense and prolonged sun? Right, it develops skin cancer reducing evolutionary fitness again. So what defensively evolved was dark pigmentation to reduce the effects of the sun.

In a similar fashion, intelligence evolved to help us adapt to both the physical environment and the complex reciprocal exchange and political context of hunting-gathering groups. Lacking the natural body weaponry and speed of many other animals we relied on social groupings, meaning that our evolutionary success was tied to them. As a byproduct of the evolution of intelligence, amplified emotions occurred contributing to depression and anxiety disorders. To compensate for excessive negative emotions and attenuate the fitness reducing impact of depression and anxiety disorders, psychological defense mechanisms evolved. I proposed two main templates-positive cognitive distortions and dissociation-subsuming many individual defenses, because much like the immune system with its defense templates (antibody and cellular), an evolved psychological defense mechanism system must logically be based on core platforms allowing for the development of specific defenses. With this background in mind we can now take a closer look at positive cognitive distortions and dissociation, and see how these defenses tend to perpetuate the status quo, ironically ensuring that we continue to engage in self-destructive behavior.

POSITIVE COGNITIVE DISTORTIONS:

Positive cognitive distortions take several forms and vary in intensity. Mild versions include placing self-enhancing spins on

experience, seeing things through the proverbial rose-colored glasses, placing a sugar coating on events, and a humorous outlook. For example, people often see their own abilities in a somewhat more favorable light than others might. As pertains to past events people typically recall them in a way that enhances the positive aspects. For instance, on a trip you strain a back muscle while lifting luggage. As long as the pain is not chronic memory of the discomfort fades, and all that is remembered are the pleasant experiences. Regarding future scenarios people tend to be excessively optimistic about their chances for growth and success, compared to what more objective evaluations by others predict. Students frequently do this downplaying limited grades believing that their marks will not impact adversely on future scholastic performance.

Another form of mild positive cognitive distortion consists of attribution biases. A person with good mental health tends to see positive outcomes as being due to their own stable characteristics, and adverse outcomes arising from unstable external causes. So for example, I did well on the exam because I am a good student and quite intelligent. I did poorly on the test because that disorganized professor added material to the exam that should not have been included. The exact opposite attribution profile occurs in depression. A depressed student will see the bad grade as being due to poor performance and ability, and a good grade due to an easy test. When depression and anxiety occur the defensive self-enhancing spins on experience characterizing good mental health, are transformed into negative self-defacing spins. I conceptualize this as the disease capturing the defense, much as occurs with what are referred to as autoimmune diseases, whereby the immune system normally defending against pathogens attacks a person's own tissue. This process plays a key role in rheumatoid arthritis for example. In a similar fashion, the positive cognitive distortion defense turns against the psychological self with depression and anxiety disorders. To become more attuned to cognitive distortions listen to how people explain things, make attributions for various experiences, recall the past and anticipate the future. You will be amazed at how common milder self-enhancing cognitive distortions are. When you encounter someone who typically engages in negative self-defacing cognitive distortions, appreciate

that the person is most likely experiencing depression and/or an anxiety disorder, or at least has the mindset that underlies these illnesses.

Mild positive cognitive distortions effectively attenuate the unpleasant. They enable people to slightly alter their perceptions of various experiences by placing a positive, self-enhancing spin on them so that they are less negative and threatening. These milder positive cognitive distortions go a long way in improving a person's emotional wellbeing and contentment in life, at least in the present. For example, people with good mental health are more likely to interpret neutral facial expressions as revealing happiness than fear or anger, making them feel more liked. Believing that your health is better than what it truly is, by for instance downplaying the accumulation of fat in the wrong places, is common because it makes you feel more comfortable in the present. Much or all of advertising and business is crafting positive cognitive distortions or spins on products and services, something that many people seem quite prepared to accept without much due diligence, likely based upon our natural propensity for positive cognitive distortions.

An interesting example of a milder positive cognitive process is provided by what has been described as, the carnivore's dilemma. When we consider eating an animal that we believe thinks and feels, we face a conflict of sorts. Consistent with positive cognitive distortions, research by Brock Bastian and colleagues (*Don't mind meat? The denial of mind to animals used for human consumption*, published in *Personality And Social Psychology Bulletin*, 2012) has found that after hearing about the full life cycle of an animal, including butchering, those who have to eat the given meat rate the animal as less able to think and feel. This cognitive distortion makes it psychologically easier to consume the meal. In a similar fashion those who kill wildlife, such as dolphins and sharks, commonly ascribe inhuman and even evil qualities to the animal. For example, Japanese fishermen who slaughter dolphins, as portrayed in the documentary, *The Cove*, see the dolphins as fish killers damaging their survival.

Moderate cognitive distortions involve a greater transformation or modification of events, and include excessive fantasy involvement, magical thinking, over-valued ideas, and

paranormal beliefs. Examples of magical thinking consist of superstitious thoughts, a belief in fortune telling and horoscopes, and acceptance of mystical modes of healing. Even the belief that you can win a lottery constitutes a moderate cognitive distortion, because if the probability of winning most lotteries is considered, the odds are essentially zero. A purely logical and rational approach would be to take the money that is to be spent on the lottery ticket/s each week and add it to a jar. After several years this money could be used to buy something nice. Instead, people engage in fantasy about what winning will mean to their life (always the positive aspects), and greatly distort the odds. Magical thinking is pronounced with many believing that a number they pick has a better chance of winning, when in reality the numbers that come up are purely random. Some individuals go further with magical thinking, noting and responding to possible signs, such as, "I saw the number 5 several times today, so I have to put a lot of 5's in my pick." If pushed to select numbers how many of us will chose our lucky numbers?

Many of us engage in superstitious thinking as a part of everyday life. Examples include, not wanting to walk under ladders, cross a black cat, or think about negative occurrences because they might then come true. How many of us have a favorite jersey or cap we wear to a game to increase the chances of our team winning, or reduce the likelihood that something will go wrong? Countless people believe in unproven and mystical modes of healing, such as concoctions of herbal agents with no scientific validation. Paranormal experiences are also very common with about 15-25% of people believing in mental telepathy. Many of you might now be trying to defend against the notion that you do indeed engage, and frequently, in these moderate level positive cognitive distortions. Rest assured that there is nothing wrong with these thoughts, and generally your mental health is better if you believe in them.

Regarding belief, a common or perhaps universal mild-to-moderate level positive cognitive distortion is spirituality and religion. All religions that manage to persist provide a positive cognitive distortion to the otherwise bleak nothingness alternative. A more appealing option is offered whether, First Nations happy hunting grounds, continuation as nature spirits, reincarnation, or a

peaceful afterlife in heaven. All offering are upbeat compared to, THE END. Individual spiritual beliefs, an increasingly popular alternative to formal religion, also offer an assortment of positive options suited to the individual designer. Religious and spiritual beliefs represent cognitive distortions because we simply do not know what happens, although if scientists are to be believed nothing happens, and anything else is then a very positive distortion of the truth. Believers commonly denigrate science and scientists, and distort scientific concepts to support a creationist view. This is not to say that there is nothing beyond our limited existence, it is simply that we do not know and cannot, hence any belief has to represent a cognitive distortion.

Given the popularity of religious and spiritual beliefs, we might expect to find some solid evidence that these positive cognitive distortions make us feel better. In this regard there has been quite a bit of research, and the evidence supports an improvement in happiness, wellbeing, and mental health arising from these beliefs. Religious people tend to be less anxious, worried, depressed and suicidal than non-believers. In one interesting study by Lisa Miller and colleagues-Religiosity and major depression in adults at high risk: A ten-year prospective study, published in the American Journal of Psychiatry, 2012-people who rated religion and spirituality as being highly important to them, were 25% as likely as those not providing these rating, to experience a depressive episode over the next 10 years. When those vulnerable to depression based on a family history of the illness were considered as a subgroup, the risk fell to 10%. These results applied most strongly to depression recurrence. Even when religious people experience depression they tend to fair better, and the capacity to cope with major setbacks in life such as, illness, divorce, and bereavement is enhanced.

Research has also shown that those who are most vulnerable, such as the elderly, tend to gain maximally from religious and spiritual beliefs. Likewise those contending with addictions benefit from a so-called higher power to help them overcome the addiction, providing a solid rationale for belief being incorporated into Alcoholic Anonymous and other 12-Step programs. It has been said that there are no atheists on the front lines. In the comfort of a good life people can detach (dissociate)

from thoughts of death, enabling them to live reasonably comfortably not believing in anything beyond this world. Atheists often have a change of heart as the end approaches, and some actually make their non-beliefs into beliefs such as the power of science and evolution. In a sense a strong non-belief can be viewed as belief, although not as positive a distortion as believing in a nice afterlife and perhaps purpose to this life.

At times religious and spiritual beliefs can be very intense and clearly distorted beyond what most religious or spiritual people would accept. This occurrence highlights how cognitive distortions can range from mild to extreme. For example, a mild cognitive distortion applied to religion and spirituality is that since science cannot disprove an afterlife it could be feasible, so why not believe in a good ending. A moderate level distortion consists of the assumption that there is a specific type of afterlife, such as a world of nature spirits including all our ancestors, and we can commune with them. Interestingly, prior to our rational industrial world people probably lived very much in this magical and mystical type of mental domain. The global economy, necessitating that we focus on real entities like text messages and emails at all times, and complete work assignments yesterday, does not align well at all with this magical thinking and mystical type of mental domain. Could this possibly be why so many people are discontented despite the enormous growth in material comfort? I suspect it plays a very large role and encourage people to take the time to engage in positive fantasies, and absorb themselves in activities that can generate positive cognitive distortions.

Extending our religious and spiritual cognitive distortions to an extreme level might provide the belief that you are the agent of God destined to convert the masses. Those at all familiar with mental illness will recognize this type of belief as a delusion, meaning that it has lost contact with reality. Those suffering from schizophrenia commonly have such thoughts, being unable to distinguish reality from unreality. While it is not beneficial to have delusions during the conscious and awake state, thoughts such as these are common during sleep. For example, in your dreams you might emerge as the chosen leader of religion. Upon waking though you return to your more limited role in life. Psychoanalysts have for years noted the similarity between delusions (and

psychosis more generally) and dreams. In 2011 in a paper entitled, *A Cognitive Regulatory Control Model of Schizophrenia*, published in *Brain Research Bulletin*, I proposed that psychosis occurs because of a breakdown or relaxation of cognitive regulatory processes normally blocking extreme cognitive distortions, thought form variants, and sensory-perceptual experiences (hallucinations) from entering the conscious and awake state.

Due to the evolution of human intelligence and our advanced cognitive abilities, a naturally occurring range of cognitive distortions, thought form (the tightness and structure of thought), and sensory-perceptual experiences occurs. To facilitate reality congruency, necessary for adaptive functioning in the real world, regulatory regions of the brain must prevent extreme variants of these cognitive parameters from being expressed in the conscious and awake state. During dreams when reality congruency is not important, given that we are not engaging in any actions, these cognitive regulatory controls are deactivated. Likewise, when we have sufficient psychological defensive needs they can also be deactivated, as is seen with hallucinations during grieving. When a person loses someone close to them hearing the lost person's voice, seeing them, or feeling their presence is quite common amongst otherwise normal people. Although some will ascribe this to the presence of the person's spirit (a moderate level positive cognitive distortion), I believe that the brain is defensively trying to restore the lost sensory and emotional stimulation, and to do so deactivates the cognitive regulatory control processes, such that a hallucination of the lost person is experienced in the conscious and awake state. Supporting this perspective, it appears that psychedelic drugs produce their effects by diminishing activity in brain centers that regulate extreme cognitions. In the case of schizophrenia, I proposed that a disease process damages the cognitive regulatory control mechanisms, accounting for why psychosis tends to manifest after signs of more general cognitive impairment emerge.

Other than for limited specialized scenarios, such as the loss of a close person where having the capacity to experience their presence for a period of time is positive, extreme cognitive distortions and sensory perceptions are not adaptive, largely because they are not reality congruent. Mild and even moderate

ones are adaptive because they make us feel better, while allowing for reality congruent functioning. Although less extreme positive cognitive distortions undoubtedly protect emotional functioning in the now, in certain instances they can produce undesirable consequences beyond the present, because problems are not seen for what they are, attended to, and remedied. The ways that we are damaging ourselves presented in this book, actually persist in part because of positive cognitive distortions. This effect is so pronounced that it is worth being consciously aware of the positive cognitive distortion process, and proactively correcting distortions that prevent us from seeing self-destructive behavior for what it is. We will now explore cognitive distortions that are blocking efforts to remedy our self-destructive ways, and see what a more realistic non-distorted perspective reveals.

CORRECTING DAMAGING POSITIVE COGNITIVE DISTORTIONS:

There are many instances of positive cognitive distortions producing undesirable consequences beyond the present. What makes us feel more comfortable, secure, and happy in the now does not always work out so well further down the road. As an obvious example, people who engage in high-risk sexual behavior often distort the risk to see it as less than what it actually is. If this distortion was corrected in the present moment the person would be more likely to take precautions and reduce the risk of disease. The same applies to other high risk behaviors, such as problem gambling, where positive cognitive distortions can result in financial devastation and punishment if the person owes money to loan sharks. The treatment of problem gambling involves identifying, addressing, and countering the positive cognitive distortions. Common cognitive distortions include, "I can beat the house," "My system will pay off if I persevere," and "Even though I'm losing now I know I can win it back."

In treating problem gambling I make sure that the person understands the nature of positive cognitive distortions, identifies pro-gambling ones, and acquires the ability to counter them. Treatment for problem gambling is never successful if the person continues to engage in positive cognitive distortions. Once they see that the house always wins they are more likely to resist urges to

gamble. Positive cognitive distortions also serve to maintain other forms of addictions, such as to alcohol, cocaine, and sex. The negative consequences are diminished and the benefits emphasized. Every clinician used to treating addictions is aware that positive spins rationalizing the behavior, and minimizing problematic aspects, are inevitable. For example, people will often makes statements such as, "I need to drink in order to wind down," "All my friends use cocaine and they're okay." Positive cognitive distortions maintaining an addiction must be countered if the person is to overcome it.

Positive cognitive distortions also underlie the propensity of people to take up residence in areas at high risk for severe weather and natural event disasters. Over the last hundred or so years more and more people are living in areas frequently hit by hurricanes, tornados, mudslides, and flooding. Developers in their never-ending quest to make money are more than happy to oblige and develop properties. When the developer does have a social consciousness, positive cognitive distortions are engaged in to support their project, such as, "I'm helping people live where they want to be." Playing a major role in the development process are municipal politicians and urban planners, who generate positive cognitive distortions downplaying the risks while emphasizing the benefits, as with the thought, "Nothing bad has ever happened here, and our area needs the tax revenue." Of course, the money spent mopping up after the disaster ends up costing far more than tax revenues bring in. Meanwhile, developers are free and clear with their money. Perhaps if they are required by law to contribute substantially to a disaster preparedness fund out of their profits, whenever they build in areas deemed by fully independent evaluators to be at risk, they might think more about those risks or at least be forced to pay for this potentiality when it becomes a reality. People who purchase these risky properties almost invariably minimize the probability of disaster striking them, with positive cognitive distortions such as, "God will look out for us." All these positive cognitive distortions contribute to a "culture of unpreparedness." If those involved countered the positive cognitive distortions supporting development in areas at significant risk for natural disasters, less of this type of development would

occur, and there would be greater preparedness when disaster does transpire.

Positive cognitive distortions also facilitate out of control urban development, upping the pluses and diminishing the minuses. Urban developers push for all they can get away with to maximize their wealth, few considering the negative impact on communities and people. These developers, along with municipal politicians elected from developer campaign contributions, spin the benefits of poorly planned urban development. For example, "People need affordable housing," "We don't really need that farmland because we can bring in food from elsewhere," "The community needs the tax revenue." These positive cognitive distortions are easily countered: More environmentally conscious forms of affordable housing are feasible, and with their control of municipal politicians it is developers who are creating the need and recruiting the local political system to realize it. What happens if a major disaster blocks just on time delivery, such that the typical three days of food supplies in most urban areas run out? The very real possibility of this occurrence is downplayed in line with the tendency to distort things in a positive way. With the true cost of roads and other infrastructure, urban sprawl development typically costs more than it returns in tax revenues. Urban developers with a social consciousness might appreciate how distorted the process is both cognitively and practically, and be more open to development that is environmentally and socially responsible, even if this entails less profit. To manage the more antisocial breed (seemingly very well represented, based on the callous disregard for the needs and wishes of the local community that is frequently demonstrated), it really is a matter of citizens ensuring that their elected representatives remain developer-free in terms of campaign funding and other influences. Citizens rarely see the reality that their elected municipal councilors are largely working for urban developers with salaries paid by taxpayers, instead spinning it to themselves that these elected officials are looking out for the needs of their constituents.

Non-urban resource developers frequently justify what they do on the basis that, shareholders demand a substantial return on their investment that would not ensue if environmental and social impacts were fully internalized. This type of rationalizing spin only

serves to support profits and reduce any guilt that might be experienced. If all resource development companies were forced to internalize negative externalities, then environmental and social justice would be greatly advanced. In many instances of resource development positive cognitive distortions put people and the environment at risk. Man-made disasters frequently arise because those in positions of responsibility engage in positive cognitive distortions, downplaying the risks and overestimating the safety margins. A "culture of denial" is created, whereby within the circle of those responsible this positive bias is shared and reinforced, hence the term "culture," such that negative scenarios are denied. Not surprisingly, mounting risks are ignored and nothing changes until disaster strikes. The BP Deepwater Horizon tragedy in the Gulf of Mexico is a classic example of this process, resulting in loss of life and great environmental damage. Backup systems and emergency procedures were seen as being fine, when there was evidence that they were very limited, thereby putting the oil rig at risk.

In a similar fashion, key figures in the financial investment sector ignored or severely downplayed the mounting risks of subprime mortgages and selling bundled packages of these risks, while over-emphasizing the benefits to homeowners, investors, and the economy. This positive spin kept people feeling good about what was transpiring, and blocked actions that could have averted the catastrophic financial collapse of 2008. The positive cognitive distortions of citizens played a role in this wild west financial scenario, with people spinning it that everything would be fine, even when there was little money down on their part and questionable income to support even a modest rise in interest rates. Senior financial people contributed further to this scenario by using their influence on government to remove regulatory controls established after the financial collapse of 1929. As with extreme cognitive distortions, extremes of financial risk have to be regulated for the system to function in a healthy, adaptive, and hence reality congruent fashion. Those in the financial sector counter this notion with the very cognitively distorting spin, "The market knows best," ascribing a non-human entity with reason and intelligence. Likewise, believers in the financial status quo espouse beliefs such as, "Complex financial products generate wealth for many," and "Free trade advances the good life for most people." Removing

these positive cognitive distortions exposes the reality that complex financial products and free trade, largely end up enhancing prosperity for the elite few. If you are a supporter of the financial status quo, your mind is now automatically trying to spin how this is wrong, and why the status quo is good, in line with the power of positive cognitive distortions.

Overly positive spins play a major role throughout the entire business and financial world. Daniel Kahneman, in studying self-deception argues in his book, *Thinking, Fast and Slow*, that people are overly optimistic about their relative standing on any activity that they do reasonably well at. For example, while the chances of a small business surviving in the United States is only 35%, an amazing 81% of entrepreneurs assess their odds of success at 70%, and 33% of them put their chances at 100%! Having a positive attitude might well help with motivation and sales, but such a high degree of over-optimism can be dangerous when it leads a small business owner to take on too much risk. As pertains to the actual marketplace, a study of almost 12,000 chief financial officers (CFO's) matched their forecasts to market outcomes and found a correlation of zero, meaning that they could not predict what the market would really do. Those who had the most optimistic predictions about the market were also most optimistic about their firm, resulting in those companies engaging in strategies that were too financially risky.

Beating the market consistently is almost impossible given the complexity of elements, financial, political, and psychological, contributing to its performance. Financial professionals who truly believe that they can do so over time are for the most part engaging in positive cognitive distortions that could prove costly to their clients. Those who deceive clients often develop creative rationalizations to minimize guilt. Individuals allowing these professionals to invest their money frequently engage in a positive cognitive distortion believing that a given investor can reliably beat the market. This positive cognitive distortion makes them feel better in the moment, by facilitating the belief that their money will both grow and be safe. People often persist in these beliefs even when returns are unnaturally high and consistent, as was the case with many of those who invested with the ultimate Ponzi schemer, Bernard Madoff. Risk and return are directly related—The greater

the risk, the higher the potential for substantial return but also for major loss. Engaging in a positive cognitive distortion, many investors turn up the volume on the high return part, and reduce the volume regarding the loss part. Naturally, the powerful human desire to accumulate resources plays a role influencing the volume adjustments for gain and risk information, thereby facilitating the positive cognitive distortion.

Positive cognitive distortions regarding the relative accumulation of wealth allow many to justify vast inequities, and not feel too guilty if they end up on the winning side. Furthermore, we distort the brilliance, ethics, and abilities of those at the top, including oneself if in such a position, as part of the power of the hierarchy. These positive distortions often block the perception that those like Bernard Madoff are quite capable of deceit and treachery. Aside from incompetence and potential (or actual) conflict of interest issues, members of the Securities and Exchange Commission (SEC) appeared to have been seduced by the power of the hierarchy, engaging in the positive cognitive distortion that someone as powerful as Madoff could not be a common criminal. Almost a decade of suspicions regarding Madoff presented to the SEC only motivated lame inquiries allowing his scheme to continue. If it was not for the market collapse of 2008, Madoff might have died before it all came out.

Even religion and spirituality, arguably the most common type of positive cognitive distortion, can produce undesirable consequences. We are all familiar with how harm to others in the form of genocide, war, and persecution, has and still does flow from religious and spiritual beliefs. Those committing crimes of this nature frequently rationalize their behavior on the basis of their convictions. Logic and decency frequently suffers, such as with the belief, "God never intended for gays." The positive cognitive distortions inherent in some religious and spiritual beliefs also serve as an impediment to safer behavior. For example, believing that God will heal so that medical care is to be rejected in favor of prayer. A logical analysis of the situation suggests that if there is a God and medicine has been developed, God would support it, but this possibility is not seen. Many people have suffered and died unnecessarily due to these distorted beliefs.

Some believe in the power of healing touch, based on a greater power being conveyed by the contact. An interesting ad I read referring to the, "Night of Power" stated, "If only I may touch His clothes I shall be made well. Come and touch the Holy Mantle." The list of conditions that can potentially benefit from this, "Night of Power," is impressive, consisting of, pain, headache, incurable diseases, insomnia, depression, addiction, marriage problems, unemployment, debts, loneliness, traumas, bereavement, bad luck, family problems, and fears! That pretty much covers it all, and if accurate it would make medical practitioners, counselors, and financial advisers obsolete. People who believe in these mystical forms of intervention often fail to take solid and realistic steps to address their problems. If the situation is truly beyond real assistance, such as incurable disease, then buying some hope might be worth it. However, as is often the case those who are desperate end up being taken for more than a small amount of money. In regards to the, "Night of Power," I have no idea of what their actual agenda was and is; I am commenting in general. Given that medical practitioners, counselors, and financial advisors are still working, I suspect that the power of the "Night of Power" is more of a marketing spin than a reality.

Another very interesting religious/spiritual positive cognitive distortion, demonstrating how extreme circumstances often produce more intense cognitive distortions to defensively compensate, has risen from the drug wars of Mexico. The situation in that country is horrific, with tens of thousands of mostly younger men being killed. To protect themselves many of those involved or at risk in some way, believe in La Santa Muerte, the female saint of Holy Death, to protect them from death! Now if this isn't a positive cognitive distortion, I do not know what is. How many of you think that embracing a goddess of death will save you from death? Anyone presenting to a psychiatrist with such a belief would be assessed for delusional thinking. Believers of La Santa Muerte are not delusional, however, they are just engaging in more extensive positive cognitive distortions to manage fear of a violent death. Believers tattoo themselves with images of this powerful saint, and carry icons of her.

Throughout time people in many different cultures have used tattoos, body piercings, and icons, to harness the power of the

spiritual world, and gain an advantage. Believing that spiritual forces are on your side makes people feel better, but often blocks steps that could save lives, as with believers of La Santa Meurta, who would be wise to get as far away from the drug trade as possible. Religious and spiritual positive cognitive distortions can also be used to support cruelty against other species. Currently tens of thousands of elephants are being slaughtered per year, largely to provide ivory for religious and spiritual icons in places like the Philippines, Thailand, and China. Of the few who show any concern for the elephants, the spin is generated that these elephants were already dead (not true), and/or that their spirit continues in the icon. Brutal cruelty to an intelligent creature is cognitively distorted into an okay, and even good occurrence, in the name of religion!

Positive cognitive distortions have the potential to impact very negatively on the wellbeing of those generating them, although in the short range they do ease and even eliminate emotional discomfort. One very clear example is with global warming skepticism. Despite the abundant evidence, a substantial percentage of the population still believes that global warming is a farce. Statements reflecting this sentiment include, "The world has seen many cycles of warming and cooling, and we are just in a slightly warmer one now," and, "I remember when I was a kid and some winters were so warm there was hardly any snow." Discrediting of global warming scientists and science helps to support and maintain these cognitive distortions. If we believe that there is no problem and our kids and grandkids are going to be fine, then we can sleep better at night and not have to worry. It is much more distressing to accept a problem that to many seems to have no viable solution, although as we have learned converting our major annual crops to perennials goes a very long way in addressing the problem. One of the most difficult issues environmentalists encounter, is that when a person stops engaging in self-protective cognitive distortions, they switch rapidly to despair. This switch reflects both how well cognitive distortions protect us from adverse emotional states, and how cognitive distortions can flip in a sense turning against the self. One of the major benefits of converting agriculture from annual to perennial

crops is that it offers an inexpensive and relatively simple way to address the problem, thus providing hope instead of despair.

Health issues are a concern to all of us, and without good health there can be little in the way of hope. Positive cognitive distortions can ease anxiety and sadness arising from medical problems, but often block steps to improve our physical and mental wellbeing. Many people see themselves as more fit than what they are, thereby limiting efforts to improve health, such as by engaging in more physical activity. We trust in medications and procedures to maintain health, all the more important if you do not engage in health improving behavior. Medical research bias of various forms such as the under-reporting of negative results, making ineffective treatments appear effective, puts all of us at risk for taking medications not producing any real benefit, while generating health impairing side effects. Most researchers are not even consciously aware that the receipt of money, even a small amount, sets up a powerful obligation to reciprocate translating into pro-industry bias. Demonstrating a positive cognitive distortion, they commonly deny to themselves and others that receiving money from pharmaceutical or biotech companies can bias the outcome of their research, when the evidence overwhelming disagrees with this perspective. The blind trust that many people place in medical and biotech research represents another positive cognitive distortion jeopardizing the health and welfare of everyone. It also contributes to the staggering profits realized by the pharmaceutical and biotech industries.

Greed has seemingly become the new world religion. The shadow economy with offshore tax havens as a central feature, combined with the "capture" of politicians and regulators, ensures that the system works for corporations and the financial elite. Justifying the vast inequality of wealth that is hurting most of us are cognitive distortions, such as, "Corporations are required for economic stability." Meanwhile jobs are being eliminated as quickly as possible by mergers and downsizing, and the relatively few retained are being relocated to special economic zones, where pay is very low and there are no rights for workers. The pro-corporate spin is so successful that the public accepts ongoing tax cuts for the portion of corporate interests registered in the first

world. For the portion of their operations registered in the offshore world, typically zero tax is paid.

Spinning things in a positive comforting fashion, people commonly believe that politicians and regulators act predominantly for the public good. Meanwhile, lobbying efforts involving campaign contributions and consulting contract offers, ensure that many politicians actually work to advance the wellbeing of corporations and the financial elite. In addition, lucrative revolving door employment opportunities have largely guaranteed that regulators regulate in the service of these special interests. Although defenders of the status quo might spin it that this is a negative cognitive distortion, the evidence indicates that it is a very real occurrence, effectively making a mockery of democracy. Interestingly, many citizens still believe that democracy is fully intact—A positive cognitive distortion. Supporting the imbalance of wealth is hyper-growth spun by many as the only viable economic scenario, despite how it advances global warming and is depleting the planet of valuable resources. Those adhering to an endless growth economic model seem to distort the reality that it is both mathematically and practically impossible, and is not endlessly sustainable. Profits in the now win out over the appreciation of this reality.

Hyper-consumerism, encouraged by the potent spin machine of advertising, supports hyper-growth. It is all about spin as advertisers are well aware of, and to rectify our current situation we will have to counter the well-oiled hyper-consumerism spin machine. People commonly justify excessive material acquisitions, transforming wants into needs, as for example, “I need a bigger car to feel safe.” Hyper-consumerism and hyper-growth are rapidly depleting the natural capital of the planet. One thing that we can be certain of, all spins aside, is that when we exhaust the natural principle and interest of the planet, we are in big trouble, and that day will come unless we check the cognitive spins contributing to resource depletion.

The results from happiness/wellbeing research, revealing no increase in contentment beyond a income level necessary to free people from adversity, might help counter our greed facilitating cognitive distortions. The richest Americans comprising the Forbes 400 are only slightly happier than the average person. This privileged segment of the “1%” monopolizing so much wealth,

might want to consider that for all the inequity and risk of global and local revolution they are contributing to, they are not really any happier for it. If a revolution does come, they will certainly be much less happy as the targeted 1%. For the other 99%, it cannot be good for mental health always trying to make it into the 1% by acquiring consumer items to demonstrate a wealthy status, in line with conspicuous consumption. Increasing debt means greater stress and lesser emotional wellbeing. Engaging in more reasoned positive cognitive distortions such as, "If I only purchase what I truly need and save extra money in a safe non-greedy fashion, then I will be fine," might generate a sense of wellbeing by providing solid hope for the future.

Self-spun positive cognitive distortions, such as the ones covered here, make people feel better in the moment, but serve to maintain our self-destructive ways. If we can only pull away from these distortions and see what is occurring, then change can happen. Of course people deceive themselves about their capacity for self-deception, believing that it does not occur. Once these positive self-enhancing distortions are checked, negative emotions are frequently experienced. However, it is important for people to realize that we can benefit from them. Perceiving what is actually occurring often induces, sadness, fear, and anger, from the loss, threat, and violation, respectively. By responding in a constructive fashion to these emotions the status quo can be altered. Anger is a particularly useful emotion in this regard, because it can sustain longer-term endeavors. However, for us to capitalize on the motivational potential of these emotions, we first have to contend with the other major class of defense mechanisms—Dissociation.

DISSOCIATION:

Another major defensive strategy that we automatically use to diminish the impact of disturbing emotions is to dissociate or detach from these emotions, and/or the circumstances contributing to them. The most common form of dissociation engaged in by everyone is absorption. Types of absorption include, missing part of a conversation, remembering past events so vividly one seems to be reliving them, not sure if a remembered event happened or was a dream, absorption in some activity such as a computer game or

television program, so involved in a fantasy that it seemed real, ignoring pain, staring into space, talking out loud to oneself when alone, not sure whether one has done something or only thought about it, and finding evidence of having done things one can't remember doing. How many of us have mentally drifted off when bored or stressed? As a dull speaker rambles on your thoughts turn to an upcoming trip. Imagination is often activated producing a nice fantasy.

Absorptive experiences represent a milder form of dissociation, and like mild positive cognitive distortions, they are familiar to each of us. Ross who has done extensive research on dissociation, evaluated the percentage of people experiencing different types of absorption, both on some occasions and 30% or more of the time. The figures he arrived at, with the first number listing the percentage experiencing the given type of absorption on some occasions, and the second those experiencing it 30% of the time or more, consist of: Missing part of a conversation-83, 29; remembering past events so vividly one seems to be reliving it-60, 19; not sure if a remembered event happened or was a dream-55, 13; absorption in a television program or a movie-64, 24; so involved in a fantasy that it seemed real-45, 11; able to ignore pain-75, 33; staring into space-63, 26; talking out loud to oneself when alone-56, 18; not sure whether one has done something or only thought about it-73, 25; finding evidence of having done things one can't remember doing-59, 14. It is clear that the various forms of absorption are extremely common, with the majority of people familiar with them at least at some point. Furthermore, there is nothing inherently pathological about these experiences, even when displayed at high levels, and people displaying them are well adjusted. Hence, if you are part of the 56% who talk to yourself when alone on some occasions, or the 18% who do so 30% or more of the time do not worry about being crazy. You are simply engaging in a milder form of dissociation involving self-absorption to protect your mental health. These experiences enable you to gain some psychological distance from disturbing emotional states, such as by hearing the sound of a person you trust—Yourself.

In the world of psychiatry dissociation is often restricted to severe events, such as personality fragmentation, as in Dissociative

Identity Disorder (formerly Multiple Personality Disorder). This perception is understandable because clinicians are trained to see problems, and milder dissociative experiences pass beneath their radar. Dissociation is easier to understand when it is viewed as a spectrum from mild to extensive, with absorption and emotional numbing on the mild end, amnesia and personality fragmentation on the extreme end, and depersonalization/derealization occupying the middle ground. With depersonalization and derealization, a person's relationship with the external world shifts or disconnects; in the case of depersonalization you change, and with derealization the world around you seems to change. Depersonalization and derealization experiences are actually fairly common, particularly when tired, stressed, or intoxicated. For example, you have a sleepless night and perceive that the world around you is somewhat different and odd. Amnesia for specific events is also not uncommon, and can be induced by alcohol in the form of blackouts. Amnesia can be adaptive when the memory of a disturbing or traumatic experience is blocked.

Similar in intensity to absorption is emotional numbing, whereby a painful emotional experience is dulled. People who deal with emergencies, such as paramedics, emergency room workers, police, and firemen, often unconsciously numb their feelings. This defense enables them to focus on the task, and not allow distressing feelings to overwhelm their coping capacity and impair their functioning. When circumstances do not have to be attended to, absorption in a neutral or pleasing focus is often engaged in. Various types of meditation likely work via absorption, and hence represent a form of dissociation. There is typically active instruction in how to redirect attention away from distressing cognitions, emotions, and memories, facilitating absorption in the more positive or neutral focus, consistent with the particular form of meditation. In the process negative thoughts and emotional reactions are detached from. Meditation comes in various forms, but might be separable into concentrative and mindful types. Concentrative meditation involves an object of meditation, whereas mindfulness meditation emphasizes the peaceful aspects of the present moment. Both rely on the absorption form of dissociation, with or without imaginative involvement, in that a person becomes

absorbed in the focus of meditation in the concentrative form, and in the safe, positive, or neutral present in the mindfulness variety.

Absorption and emotional numbing help us diminish the impact of negative emotions in the moment. While this can be extremely helpful for those prone to excess negative emotions, it can also foster avoidance allowing problems to persist. For example, as a manager you ignore an employee's limited performance, thereby blocking any chance of improving it, particularly if the employee is also peacefully detached from the problem. Although facing it is more stressful in the short-term for both the manager and employee, solutions can be arrived at to improve performance. Likewise, with many of the ways that we are damaging ourselves, if people address them and take steps to help solve the given problem, we might find that solutions are achievable. More emotional distress in the short-term has to be accepted when it comes to facing concerns, such as global warming, the inequity of wealth, corruption of regulating bodies, out of control urban and resource development, depletion of natural resources, the realities of weight gain, and bias in medical research. It is easier to tune out these disturbing issues, such as by turning the channel when a news story regarding one of them is presented. Facing the problems of the world and supporting solutions with actions and financial support when appropriate and feasible, can make a huge difference when it comes to correcting our self-destructive tendencies.

An interesting and significant contribution to the problems we are experiencing, is the antisocial personality (also referred to as psychopaths or sociopaths). Movies often portray these individuals as violent thugs, a perception that is in part supported by research focusing on incarcerated psychopaths. While this type of psychopath is commonly found in jails, it has been noted that the jail population over emphasizes violence and lesser intelligence, perhaps even brain damage. It can be argued that more intelligent psychopaths are for the most part able to avoid jail. In contrast to the common misperception of psychopaths being violent thugs, most individuals who are antisocial are actually very charming and socially gifted. They can smile at you in a reassuring fashion while lifting the wallet out of your pocket.

This is why so many people are taken in by the likes of Bernard Madoff and other con artists—People like them and find them appealing. Men with this personality type often demonstrate, “spectacular promiscuity,” being able to seduce many women. Their smooth and appealing persona is like a magnet to countless women, but when the psychopath has acquired what he wants, the polarity of the magnet rapidly switches, and he is gone. How many single mothers out there are raising the child of a psychopathic man? The answer is many.

What about psychopathic women? Although there are indeed violent ones, most typically engage in more subtle antisocial behavior. Not uncommonly, they seduce a good provider man to be with them, while becoming impregnated by a tough and rugged male, not infrequently also psychopathic in nature, who is never going to stay around. The provider male is often unaware that the child is from someone else. If this is discovered, such an individual often gives in to the mother’s faked remorse. In the event of a divorce the provider male is taken to the cleaners. Yes, the judge will often sympathize with the plight of this unfortunate woman based on her court performance. Psychopathic women also commonly engage in other non-violent forms of manipulation and deceit, such as financial fraud. Hopefully, you get the idea that beyond the limited intellectual capacity type of psychopath, who often ends up in jail due to violence, most of these individuals are very interpersonally skilled and highly sociable. Essentially what they are really great at is deceit and manipulation.

Given the value of resources to survival and evolutionary fitness, there is a place for the evolution of advanced deceit and manipulation. As we learned in the Greed: More Is Never Enough chapter, we are all equipped for deceit, but it appears that some of us, namely psychopaths, are much better at it than others. Acquiring resources without reciprocating produces a very solid gain. However, it is a dangerous strategy if not done carefully and with skill, because those impacted will ostracize or even kill the person. Throughout our evolution we did not have a justice system with courts, and payback by the individual, and/or that person’s family, was the norm. For advanced deceit and manipulation to be successful, two components of emotional experience must be in place. The first being attention to facial expressions, and other signs

of how people are reacting emotionally to you. For example, if you are not aware that a potential victim is becoming tense and suspicious, how can you succeed in the manipulation?

The second component is your own emotional reactions. If you experience emotions, such as sadness, fear, guilt, and remorse, as you take advantage of the victim, the other person might perceive these feelings and pull back. Hence, a successful deceit and manipulation strategy necessitates that a psychopath be very attuned to the emotional reactions of the victim, while being emotionally detached from the experience. Did I say detached? Yes, dissociation plays a major role in the antisocial process, and I have proposed that antisocial personality disorder represents a more intense and specialized form of dissociation, evolved from the dissociation defense template. Studies of psychopaths reveal two main clusters of behaviors—Emotional detachment and antisocial behavior. Emotional detachment is dissociation. Research has also shown that psychopaths are indeed highly attuned to the emotional reactions of others, and not as some suggest emotionally impaired. Their ability to pick up on very subtle emotional reactions is actually superior to that of the average person. At the same time they are able to detach from their own emotional reactions to succeed in the deception. Of course a certain level of intelligence is necessary for deceptions to work well, and those lacking it might be viewed as failed psychopaths, with failure often putting them in jail.

When we look at white-collar crime, it is useful to appreciate this interesting juxtaposition of very sophisticated emotional information processing, pertaining to the potential victim's reactions, and the perpetrator's detachment from their own emotional responses. It is this unique combination of abilities characterizing a psychopathic nature that enables financial charlatans to sucker victims into their schemes. Many senior level bank employees and financial advisors do not even believe in the value of complex financial instruments, beyond enhancement of their own commissions, but still sell them to numerous customers. Psychopathic traits such as superficial charm, egocentricity, persuasiveness, and lack of empathy, are actually more common in business managers than psychiatric inpatients and hospitalized criminals, as revealed in a study by, Belinda Board and Katarin Fritzon, who did psychological

profiling on these three groups. Have no doubt that psychopaths are very well represented in the corporate and financial world. While psychopaths are particularly skilled at deceit, we have all evolved the capacity for it, and not uncommonly attempt to acquire more than we give back, a strategy that exerts a substantial cumulative cost on all of us.

Even if a person does not have a true antisocial capacity, detaching from the plight of others can make a person feel more comfortable. Interestingly, emotional detachment is an ability that can be learned, and refined through practice and rationalizations, bringing a person close to the capacity of a psychopath. To justify their privileged and entitled position, the financial elite and senior personnel of corporations often engage in self-enhancing cognitive distortions that effectively detach them from the suffering experienced by others. For example, "The poor are lazy while I work hard for what I have," and "There will always be winners and losers." Comfortable detachment derived either from a true psychopathic nature, or practice at dissociating, helps perpetuate the status quo of greed. If the 1% monopolizing so much of the world's wealth emotionally connected to the circumstances of the other 99%, particularly those in the lower segment, they might be more accepting of changes that will improve society.

To defend against disturbing emotions, we often unconsciously combine both dissociation and positive cognitive distortions. Dissociation from adversity makes it easier to place a positive spin on experience, and positive cognitive distortions further distance a person from negative circumstances. Cognitive distortions, such as denial that minimizes a problem, are particularly good at facilitating detachment from unpleasant issues. Ultimately, both positive cognitive distortions and dissociation increase the likelihood that problems will be avoided, instead of faced and dealt with in the here and now. Avoidance is a common and sensible dissociative defense when what you are facing is objectively dangerous. Guns are dangerous, and even more so when in the possession of certain people, and hence it makes sense to avoid them. Too often people avoid circumstances that are not objectively dangerous, that if faced and dealt with could spare much anguish and prevent complications in the future. By facing

the ways that we are damaging ourselves, both individually and collectively, we can make some real headway in the here and now, and even save us from self-destruction.

ENLISTING ENTROPY: ORDERING DISORDER

QUESTION:

What is entropy? More than one answer may be correct.

- A. A heavy metal rock band.
- B. A law of thermodynamics.
- C. A physics concept totally irrelevant to everyday life.
- D. An explanation for why things never seem to work ideally.
- E. Something with an important link to resources.

Answer A is wrong, but it is the one provided by 70% of first year physics students. It is the second law of thermodynamics, so Answer B is correct. As a difficult to understand physics concept it might seem unrelated to everyday life, but entropy is something we all know intimately, hence answer C is wrong. Answer D is correct, given that entropy underlies why things naturally fall apart or diminish, rather than improve. Answer E is right, and the linkage of entropy to resources helps explain why D is accurate. It also provides a crucial way of conceptualizing and working with the concept of limited resources to make the world a better place, rather than an entropy sinkhole.

Entropy is a measure of the disorder in a system. The more disorder the higher the entropy, while low entropy characterizes highly ordered structures. Probability plays a major role in that there are more ways for something to be disordered than ordered. For example, if a car is to work ideally it has to be assembled and maintained in a specific way, representing a highly ordered low entropy state. Disorder can take many alternative forms, from a breakdown of a part, to normal wear and tear reducing the functioning of most parts, to all the possible wreckage configurations after a collision. Hence, the probability of a car being

in a disordered state of some form is much higher statistically, than of it being in an ideal form.

Beyond this statistical aspect, there is a definite trend for all things to progress from order to disorder. You buy a new car that looks and runs ideally. Over time it declines in terms of looks and performance, at least without solid maintenance. Imagine if you bought a 10-year old used car, and each year it got better such that in 10 more years it was brand new! Perhaps in some weird alternative universe, but not this one (nor I suspect in any alternative universe). Upon birth, or arguably fetal development, the cells and organs of your body are in ideal shape with no sign of wear or genetic damage. Over time no matter how careful you are your body ages showing deterioration, both externally and internally. No one has or likely ever will find a way to age backwards to greater health, although many charlatans throughout the ages claim that they have found the secret. Indeed, the only criterion for a spontaneous change in the universe is the progression from order to disorder, or in other words from low to high entropy. In the absence of any restorative input, decline in a structure occurs naturally. Think of all your possessions and take note of how they decline over time without care. In some instances the changes are subtle and barely noticeable, such as the color of a fabric gradually fading over time, but such change is always occurring.

The only way that things can remain in a highly ordered form is by applying an ordered intervention. Your house will experience deterioration requiring repairs and replacements, such as with paint, roofing shingles, furnace parts, and the like. Expert mechanical care must be applied to your car to ensure that the engine and other parts continue to work well. Mechanical devices require more than repair to work; they require energy. A car needs gas to run and appliances need electricity. The second law of thermodynamics was largely derived from work with machinery during the industrial revolution. Ideally all the highly ordered energy put into a machine will come out as work. However, it was noted that only part of the energy is available for work, and a significant portion emerges as disordered heat. The highly ordered energy progresses to disordered heat. Ah, but maybe a machine can be constructed that is super efficient, and all that energy can be

transformed to work, as with a perpetual motion machine. Unfortunately, nothing in this or any other universe will prevent the progression from order to disorder, meaning that there can never be a perpetual motion machine. This law of the universe is so tight that patents are closed to perpetual motion machines. The concept of entropy arose from these machine observations. Highly ordered low entropy energy is converted to disordered high entropy heat, and only a portion of the energy can be used for work.

Now you might be thinking, this is interesting (or not depending on how scientifically minded you are) but what has it got to do with making the world a better place? The answer in short is everything. If things naturally progressed from disorder to order, the problems covered in each chapter would not be a consideration. Overweight bodies would improve spontaneously over time achieving ideal muscle mass and form with limited fat, regulatory agencies would regulate in a fair and objective manner preventing many of the financial and environmental problems we experience, complex financial instruments would work ideally, endless economic growth could occur as resources spontaneously renew themselves, political systems would work as intended representing the interests of the electorate, energy would be unlimited and provide 100% efficiency resulting in zero waste output such as CO₂. Clearly this is not the world we know and live in. Our world is entropy driven, where things go from whatever order they might initially have had to disorder. The only way to prevent this change is to apply ordered low entropy input to counter the progression to disorder. It might seem like a losing battle as in reversing the flow of a river, given that order naturally flows to disorder. The key is to appreciate this reality and learn to apply limited low entropy sources to optimally offset the natural decline. Let us look at how this might work for the various problems presented in the book.

GREED:

It's all about money, but what is money all about? Money is in essence currency for the acquisition of ordered low entropy. The more money you have the more low entropy you can purchase, and use to oppose the inevitable slide from order to disorder. The rich have massive homes and can afford to maintain them in pristine

condition with high quality building materials, appliances, and workers. Without the ongoing input of costly ordered low entropy the house will gradually fall into disrepair and decay. Aging is not kind, and although money cannot stop it, the purchase of specialized products and services, like plastic surgery, can at the very least make it appear that our bodies are not progressing from order to disorder. Hence, it is really all about low entropy sources, and money facilitates the acquisition and even monopolization of them. But is it all really worthwhile?

Happiness research clearly shows that money does not buy happiness, beyond a certain basic amount necessary to free a person from adversity. How can this be if money enables us to purchase ordered low entropy items to counter the shift to disorder? Could it be that the process is rigged against us all by entropy, and we are fighting a losing battle of sorts? No matter how much money you have it continually has to be applied to stem the flow of order to disorder. Even if you hoard it for a rainy day disorder will eventually take you. How many rich older people would give everything they own to have the body of an eighteen year old? Thankfully for eighteen year olds, entropy will not be cheated, and all that money can only buy a comforting illusion. It comes closer to a reality when the poor and imprisoned in third world countries have a kidney removed to provide one for a wealthy person, but these instances seem limited so far. If instead we applied money strategically for the purchase of adversity ending low entropy, the world would overall be a much more ordered and reasonable place. Suffering and higher entropy for the many might then shift to relative prosperity and lower entropy, maximizing our overall battle to counter the slide from order to disorder. Understanding that the fight to maintain perfect order for the few is doomed to failure, and does not bring true happiness, opens the door to a world less characterized by greed. Unfortunately, greed does not seem to be on the decline, and all indicators are that it has become the new world religion, as shown in the Greed: More Is Never Enough chapter.

One of the key facilitators of greed is the offshore shadow economy. This highly ordered entity helps ensure prosperity for the financial elite and corporations, and suffering for many of those excluded. With money comes highly structured low entropy

influence over politicians and regulators, in terms of campaign contributions, lucrative consulting contracts, revolving door employment, and bribes. This influence was instrumental in setting up the offshore shadow economy in the first place, and ensures that it remains safely in the shadows. Without the financial input provided to politicians and regulators, the system would collapse very quickly, in accordance with the natural conversion of ordered low entropy structures to high entropy disorder. Despite talk by politicians and international agencies, the offshore economy is remaining firmly in place. Meanwhile, the average person absorbs increasing disorder in terms of a declining lifestyle.

REGULATION:

Highly ordered entities need regulation to function effectively. Regulation itself requires a high degree of order and falters when structures and processes decay. These realities apply to physiological, psychological, and societal processes. In regards to physiological systems, cells within us are interconnected in complex ways enabling us to live for many years. When regulation fails disease arises, such as diabetes characterized by uncontrolled sugar levels, and cancer occurring when cells escape regulation and reproduce out of control. Psychological functioning demonstrates how highly ordered structures and regulation work hand-in-hand. Human specific cognitive activity represents one of the most highly ordered entities in the universe. Included are executive functions, social cognition, and motivational states. Executive functions consist of working memory, attention, flexible shifting, planning, response inhibition, and multitasking. Social cognition involves the ability to understand your role in relationships, that of others, and the nature of interactions. Motivational states apply to speech, activity, social engagement, and the ability to enjoy.

These human specific cognitive capacities are vulnerable, due to their highly ordered low entropy organization, and the natural progression of ordered structures to disorder and higher entropy. Their relatively recent evolutionary origin makes them even more susceptible to the influence of entropy, because the template is not solidly established compared to other processes, such as smell that has evolved over millions of years. Failure of these human specific cognitive capacities during development

seems to produce the negative symptom prodrome of schizophrenia, consisting of deficits in executive functions, social cognition, and motivational states. The neural damage underlying these negative symptoms also appears to damage or impair cognitive regulatory control processes, that normally block psychotic thoughts and sensory perceptual experiences from intruding into the conscious and awake state (see the Irregular Regulation and Defending The Indefensible chapters). Consequently, psychosis arises completing the picture of schizophrenic symptoms. These cognitive regulatory control processes constitute a very highly ordered low entropy process that is vulnerable to disruption.

When we consider the role that regulation plays in various health conditions, both proven and hypothesized, it is clear that highly ordered functioning relies on it, and that a high degree of order is required for effective regulation. Financial markets and other societal processes also rely on highly ordered regulation that is vulnerable to disruption and decay. After the stock market crash of 1929, very solid regulatory controls were put in place in the US, helping drive the growth and stability of the economy for years. Financial system regulatory controls were systematically eroded, starting in the 1980's, leading to the real estate boom and bust of that decade, and the financial meltdown of 2008—Order to disorder. Spinning things to serve their own interests, many proponents of the financial status quo claim that regulations are not the answer, and push for even less regulation. Greed underscores this agenda, because by ensuring a deregulated market tremendous profits are feasible for an elite few.

With all their low entropy facilitating money, the financial elite and corporations have even “captured” regulating agencies entrusted to protect the public good. As covered in the Irregular Regulation chapter, these agencies then do the bidding for those they are supposed to be regulating, ensuring a highly ordered world for this privileged segment of the population. Meanwhile, suffering increases for the many due to regulatory capture. The progression from order to disorder is evident in how the highly ordered nature of regulation, can so easily be eroded. A lesson to be learned is that if regulatory bodies are to truly regulate for the people they are supposed to protect, substantial low entropy

resources must go into them to ensure effective functioning and block regulatory capture.

DEVELOPMENT:

Development industries, both urban and resource, provide an ideal example of how industry almost always gets its way. In the third world the carrot of bribes is relied on, often accompanied by the stick of threats of physical violence, and/or diminishing the reputation of an uncooperative official. In the first world bribes also play a role in the form of cash payments, and special considerations such as highly reduced interest rates on money loaned to cooperative officials and politicians. In Quebec Canada, investigations into the development and construction industry have revealed how officials at various levels up to mayor, appear to get a set percentage of the profits, proving that bribes are indeed alive and well in the first world.

However, being more “civilized” in the first world, corruption at higher levels tends to take the form of, campaign contributions, lucrative consulting contracts, and revolving door employment. Urban developers get the go ahead for their projects in almost every instance, based on money buying highly ordered input in terms of politicians, planners, lawyers, architects, and the like. The campaign money provided to municipal politicians wins the day, with these elected politicians reciprocating by voting in favor of development projects, helping to maintain the low entropy ordered state (at least for developers) of urban development. On the high entropy waste output side of the equation, the environment both locally and globally frequently loses. Locally, fertile farmlands and forests vanish, and people are forced to drive long distances on congested roadways to get anywhere. CO2 levels rise worsening global warming, due to the excess number of cars, and also trucks required for long range just on time delivery of food and other goods.

Resource developers, along with other industries exert tremendous influence on politicians and regulators. In the US the door has opened to unlimited campaign contributions by corporations and the financial elite. The 2002 Bipartisan Campaign Reform Act, better known as the McCain-Feingold Act, prohibited corporations (including non-profits) and unions, from engaging in

“electioneering communication” intended to influence the outcome of an election. In 2010 the US Supreme Court, in *Citizens United versus Federal Election Commission*, struck down the McCain-Feingold Act, and an earlier 1990 decision restricting corporate and union campaign contributions. Unlimited sums can now be raised to influence the outcome of elections.

Money and its influence on politicians and regulators, enables the development industry to maintain its highly ordered low entropy state, while in essence passing the high entropy disorder of negative externalities on to the masses. The only way that this can be altered is for people to ensure that politicians, government officials, and regulating bodies, act in the interests of the public and environment. Currently, with rule of the elite we only have the illusion of democracy. Perhaps it is time to put things to the test and see if any real semblance of democracy remains, by taking control away from those who seek unlimited wealth for the few. The proposals advocated in *Taking The “Devil” Out Of Development, Greed, and Irregular Regulation* chapters, can assist in this regard. Essentially, it will entail using limited low entropy, compared to that controlled by the financial elite and corporations, to create highly ordered political institutions and regulating bodies, that work for the good of the average person. If rule of the elite is too strong and democracy is indeed a total farce, then at least we can call a spade a spade and grieve the loss. This would provide an ideal example of how the highly ordered low entropy system of democracy, has decayed into a much more disordered (for the many) high entropy scenario.

As pertains to environmental justice, the pace and extend of resource extraction is such that we are severely depleting the natural capital of the planet. Marine resources, forests, and fresh water supplies are all diminishing despite how they are capable of renewal, if given a reasonable chance. The natural progression of order to disorder combined with the level of extraction and consumption, ensures that we are nearing a crisis point with these natural resources. Endless economic growth relies on an endless supply of cheap resources, but entropy ensures that such a scenario is not endlessly possible. Hyper-growth, and certainly at the double-digit levels typically expected by shareholders and senior personnel of corporation, represents a very highly ordered low

entropy event. Given the natural propensity of everything to shift from order to disorder (low to high entropy), endless economic growth is not feasible, accounting for why the whole enterprise is impossible, and as such misguided. Financial markets naturally correct in line with entropy. To even achieve the illusion of endless economic growth for a short period of time, massive amounts of low entropy input are required, the costs extracted from society and the environment, with the benefits primarily realized by corporations and the financial elite.

GLOBAL WARMING:

Energy represents a highly ordered low entropy source, providing the capacity for work and productivity. To maintain work output, energy must continually be applied, but only a percentage is converted to actual work, the rest is waste output in the form of heat. In a sense we can view global warming as the heat output of all the energy we are burning. CO₂ represents the medium of this heat transfer to the environment. The more energy we consume, the more CO₂ is emitted, and the warmer our world gets. Appreciating that perpetual motion machines are not feasible, based on the second law of thermodynamics, readers will hopefully resist the temptation to suggest designing machines that do not warm the planet. Even if we propose wind energy, the construction, installation, and maintenance of these machines requires substantial energy input, accompanied by the inevitable heat waste output. The same applies to solar, geothermal, and wave derived sources of energy, although the waste heat from green sources is far more favorable than from coal. No matter what energy source we select, there will always be some waste heat, and if we connect everyone to the power grid there will be a lot more of it.

If we invariably heat the world by applying ordered low entropy energy to power our machines, then what can we do? In the *Too Hot To Handle: Global Warming* chapter, we learned how nature had essentially solved the problem for us in the form of perennial vegetation. With the advent of agriculture, approximately 10,000 years ago, we began shifting plant life to annuals. Whereas perennials sequester CO₂ countering global warming, annuals add CO₂ to the atmosphere. By converting all of our major annual crops to perennials, atmospheric CO₂ will return

to preindustrial levels. Nature had it worked out, until we came along and changed the game. It seems that the planet requires perennial vegetation as the predominant form of plant life, to absorb and contain carbon, and even more so given our love of highly ordered low entropy energy. All that waste heat conveyed to the atmosphere via CO₂ is jeopardizing our future, and impacting negatively on our present. It is time that we invest the relatively small amount of money required, to ensure that our major annual crops are converted to perennials. The technology must be for all, and not monopolized by corporations interested primarily in profit. For that to occur the research must be publicly funded, and derived largely, but not exclusively, from modest taxation of CO₂ emitting industries (see the Global Warming chapter). Nature could not override entropy, but solved the problem for us with perennial vegetation, and we can at least be smart enough to follow nature's lead.

RESEARCH BIAS:

Unbiased research is an expensive, highly ordered low entropy enterprise. In an era where corporations and the financial elite rule and control most of the wealth, there is relatively little money available for publicly funded research. Not surprisingly over the last few decades research funding has shifted to the corporate sphere. Money applied to research funding is the medium supporting the low entropy highly ordered entity of scientific research, and the provider of that low entropy source is increasingly corporate in nature. What better way to ensure the sale of a given widget than to have the corporation making it, or others directly funded by them, conduct research designed to test the products safety and effectiveness. Nor are we talking about benign widgets; the products involved are often genetically modified living organisms, potentially toxic chemicals, and pharmaceutical products ingested by many of us. When harmful effects exceed benefits, high entropy physiological and psychological disorder increases.

Scientists needing research funding to survive in some cases, and advance their careers (in all cases), realize unconsciously or even consciously, that positive results favoring the corporation's product will ensure ongoing funding, whereas negative results for their

provider will reduce the likelihood of future funding. This perceived state of affairs contributes to bias in research outcomes and published data favoring industry. Regulatory agencies, largely captured by industry, shift research responsibility to the corporation making the given product, regardless of whether it involves a genetically modified organism, potentially toxic chemical, drug, or the environmental impact of resource development. Politicians at different levels of government elected largely due to the campaign contributions from industries, including “Big Pharma,” biotech, and resource developers, endorse this shift of research responsibility to industry.

Have no doubt about it, your safety is not a given with the current control of research agendas by industry. At one level the bias of industry is understandable, because a corporation puts a great deal of money into designing a product, and naturally attempts to do everything to make it successful. However, in a universe ruled by entropy a product that truly works, and in a fashion where the benefits clearly exceed the negative impacts, is by no means a given. Frequently the negative aspects end up exceeding the benefits, warranting that the product not be pursued. With the large sums of money invested and desire for great profits, the corporation making the product and scientists funded by them cannot be fully trusted. Idealized research producing truly valid results requires a great deal of ordered input in the form of financial resources, skilled researchers, exacting standards, procedures, and regulation. With the current system of industry controlled research agendas, highly biased research favoring industry, and regulatory bodies captured or influenced by industry, we are far from that highly ordered idealized state, and the validity of much research, and what is released for public consumption, is dubious to say the least.

Considering the tremendous importance of truly objective research, bias must be removed from the process to the maximum extent possible. This shift will require pharmaceutical, biotech, and other industries producing substances potentially toxic to humans and the environment, to largely fund truly independent product testing and approval centers as covered in the, *A Conflicted World: Research Bias* chapter. No direct funds or other incentives can be provided to researchers in these centers by industry, in the form of

research grants, or fees for advisory board work, consulting contracts, speeches, and the like. The additional components of non-biased computerized-robotic testing of products to minimize human bias, and unbiased regulation of these research organizations, will ensure a highly ordered low entropy research world benefiting the average person. Products will truly help preserve physiological and psychological order, and not advance the decay into disorder. This unbiased research world will have the additional benefit of restoring confidence in science.

OBESITY:

An ideal highly ordered low entropy body form is one characterized by high muscle development and limited body fat, although enough to provide sufficient energy reserves. When muscle mass throughout the body is high, sagging is limited, providing a lean and mean frame. How well does that apply to the average person? Not even close you say and are right. As discussed in the Weighing Down The World: Obesity chapter, we are getting bigger and bigger and bigger. The obesity epidemic has spread to children, and is rapidly becoming a third world problem as well. Once again we might remind ourselves of entropy and appreciate how body form progresses from order to disorder. The very lucrative weight loss and fitness industries would be out of business (or never started), if poor physical form naturally progressed to lean and mean.

The problem is not simply the natural progression of body form from order to disorder, but the excessive ingestion of high energy, and hence highly ordered, low entropy sources. We cannot seem to get enough of those compact sources of low entropy for the body, particularly the variety that requires very little effort to digest. Highly processed sugars and sweetened drinks are impossible to resist for many people. But highly ordered low entropy sources are supposed to be good for maintaining things in a state of high order, correct? Yes, however the conversion process requires effort that most people are unwilling to make. So when you ingest a source of high-energy low entropy, what is necessary is activity to process it into muscle mass, and given the energy dense nature of highly processed foods a lot of activity is required. Unfortunately, this activity rarely occurs and falls far short of the

energy input. What we then end up with is the incompatible scenario of a great amount of energy taken in without being processed into a highly ordered body form. Instead our bodies store it largely as fat ready for the day when it is to be converted into output, but that day never comes. We become rounder, rather than leaner and meaner. Hard bodies are becoming an endangered species that we might shortly have to legislate special protection for, and devise plans on how to save them from extinction.

A contributing factor to the imbalance of energy in and activity to convert it into a more ideal body form, is our reliance on machinery. Machines consuming low entropy fuel do the work for us, while discharging waste heat into the atmosphere via CO2 emissions. Try using a manual saw or axe to cut branches or trees for even an hour. People used to do this eight to ten hours every day, often six days a week! No wonder those old pictures of loggers show lean and tough looking men. I have a patient who has struggled with weight his entire life, and was picked on as a child for being obese. In his thirties he took a job as a general laborer working long hours, sometimes six days a week. He rapidly lost all the excess weight becoming lean and very muscular, without even going to a gym. The attention he receives from women helps motivate him to keep going, despite the physical demands of the job. While we cannot expect people to give up machines, increasing activity by just walking an hour or so a day can have a major impact, and set you on the right course. The energy dense low entropy food ingested, then starts being converted to a highly ordered body form, as opposed to sagging body fat. Through this simple activity we can help maintain or return our bodies to a lower entropy state.

MAKING THE MOST OF OUR ENTROPY DOMINATED UNIVERSE:

To save us from self-destruction entropy is an essential consideration. Suffering equates with disorder and high entropy, while success aligns with order and low entropy. Money is the medium of low entropy in our global economy. By monopolizing virtually all the wealth, corporations and the financial elite maintain an ordered system supporting their entitled position. The offshore shadow economy enabling them to contribute no or very

little in the way of taxes, and pay workers next to nothing in affiliated special economic zones, is a key entity in this ordered world. Other entities relied on consist of campaign contributions to control elected officials, lobbying efforts often with a campaign contribution aspect, lucrative consulting contracts and bribes for cooperative officials, and capture of regulating bodies facilitated by revolving door employment offers of various types. Meanwhile, the average person gets the disordered end of the entropy stick. When crap hits the fan, governments acting on behalf of corporations and the financial elite, turn to the average person asking and often demanding more austerity! For example, in Ontario Canada every person earning income from the provincial government was forced to except greater austerity as millions of dollars were cut from the 2012-2013 budget. Meanwhile, \$60 million was set aside to reimburse logging and other resource extraction companies for the cost of roads into pristine wilderness.

But what can be done and how can we make entropy work for the common good? To start we have to appreciate how important and difficult it is to achieve and maintain the right order. For the average person that right order consists of true democracy, whereby elected officials represent the interests of the public, and regulating bodies actually regulate for the public good. By monopolizing money and strategically applying this medium of low entropy, the financial elite and corporations have succeeded in establishing a highly ordered system of their own design. This makes a mockery of democracy, and has created rule of the elite. Citizens on the disordered end of the entropy equation must check the positive self-comforting spin that our elected leaders and regulatory agencies are working for the good of us all, and see what is really happening. The truth can be depressing, but anger over the violation can be channeled into action. In a democracy (assuming that any vestige of it still exists), people can act to ensure that those elected will serve the public good, even if this means the emergence and growth of new political parties.

Given their key role in maintaining a highly ordered state of affairs, regulating agencies must be set up in such a fashion (see the Irregular Regulation chapter) to actually regulate those they are entrusted to regulate, and resist capture by industry. To provide the money necessary for ordered regulation, corporations must be

taxed at individual rates in the first world. In addition, the offshore shadow economy allowing for “legitimate” tax evasion must be ended. Given that any highly ordered system will naturally drift to disorder, the system advocated here will require ongoing ordered input, including public vigilance, if it is to persist. By turning around the entropy table, the financial elite will end up with their fair share of disorder, and the average person greater order, ensuring that overall the world will be much more ordered and stable. We will then have made the most of our entropy dominated universe, or our small segment of it.

SAVING US FROM SELF-DESTRUCTION

Currently we are facing severe problems that threaten the very stability of society, our health, and the environment that our health and wellbeing are so dependent upon. These problems result from self-destructive behavior in the form of rampant greed, irregular regulation, unsustainable urban and resource development, out of control global warming, highly biased medical and biotech research, and very weighty levels of obesity and related ailments. While it is evident that we demonstrate self-destructive tendencies, you might at this point be wondering why? There are at least four reasons for this occurrence, the first being the strength of our psychological defenses enabling us to see things in an overwhelmingly positive way, and discount any negative reality. For example, monopolization of wealth is often rationalized, blocking any consideration on the part of the entitled few that their actions are creating a very fertile ground for revolution, that could easily remove all the wealth accumulated. The second explanation is that short-term benefits trump long-term consequences, as with packing on the calories now and not worrying about the long-range health costs. This short-term over long-term valuation arises from our evolution when we had to focus on the now, due to how survival was a major challenge and there often was not a tomorrow to worry about. With much greater overall security, assuming we do not push ourselves into widespread revolution, tomorrow is an important consideration but our psychological processes have not caught up.

The third reason, and a very ironic one, is that we are inherently selfish given the importance of passing on our own genes. We somewhat consider close kin, as they share a portion of our genes enabling kin selection to occur, but unrelated individuals are a different story. If it was not for the social force of reciprocity we would likely be a lot more self-focused, as difficult as that is to imagine. All this self-focus means that our own needs typically trump any other consideration, fostering behavior that is harmful to entities that we rely heavily upon—Society and the environment. For example, many people still drive gas-guzzling monster vehicles not at all required for employment, without considering the global

warming impact that ultimately harms even those insisting on such a vehicle.

The fourth reason is a novel one proposed for the first time here—We might align with one of the strongest forces in the universe, entropy. All of us are intuitively aware that things naturally proceed from order to disorder, despite most people never having heard of entropy. Things break and never spontaneously reassemble. At a deep, mostly unconscious level, I suspect that we sometimes resonate with this powerful force and go along for the ride. Sigmund Freud spoke of a death instinct. There are numerous interpretations of what he meant by this, but he did seem to be referring to how we engage in self-destructive patterns of behavior. Perhaps it is not a death instinct, but an “instinct” for the overwhelming strength of entropy, and by aligning with it we vicariously feel the power of the universe!

Speaking of powerful forces, we are all prone to greed and the lure of wealth. If resources were unlimited allowing for endless economic growth and wealth accumulation, then all might be well. Unfortunately, valuable resources with money as the medium of exchange are limited. It is all about money and as we discovered in the Enlisting Entropy: Ordering Disorder chapter, money is all about sources of low entropy providing the capacity to maintain and advance order. The only criteria for a spontaneous change in the universe is a shift from order to disorder, and sources of low entropy are the only way to offset and slow this decay. Money provides for sources of low entropy such as fuel to run our machines and heat homes. High calorie (low entropy) sources of nutrition and health products are also popular acquisitions to maintain order in our physical state. Greed motivates us to seek sources of low entropy necessary to stave off the decay to disorder.

During our evolution in hunting-gathering societies a robust motivation to acquire important resources rarely led to monopolization, and by sharing a person was able to advance their own standing, and virtually ensure reciprocation when things did not go so well. Hunting-gathering societies relied on reciprocal exchanges, and our social cognitive processes are still very much attuned to reciprocity. Outside of a hunting-gathering form of social organization it became feasible, and highly beneficial, to monopolize resources, an occurrence reaching its zenith in modern

industrial society. Greed has become the new world religion with no shortage of the faithful transcending physical, political, and historic religious boundaries. Generators of wealth such as banks, financial institutions, and corporations are the new religious icons. Yes, God appears to be dead for most people and Greed is very much alive!

Although we are all greedy, a small segment of the population seems to possess a unique ability to acquire and monopolize valuable resources. The proof is in the pudding so to speak, given that something in the order of 1% of the population is said to control 99% of the wealth in first world nations, with the situation much worse in third world nations. In the Greed: More Is Never Enough chapter, I refer to this ability as high FQ, or financial quotient, suggesting a distinct form of intelligence much like general and emotional intelligence. Those with high FQ excel financially hoarding money for the purchase of a vast array of low entropy resources. The financial elite and corporations advance in prosperity while the vast majority of people are finding it more and more difficult to get by. For example, holding on to a middle class standing is becoming a real challenge, despite long hours of work, and is typically only achieved by raising the level of debt. In some European countries, such as Greece and Spain, far-reaching austerity measures have been implemented jeopardizing the health and welfare of many people. Even in third world countries where countless first world jobs have shifted, wages are very low compared to the first world affording at best limited prosperity. Who has really prospered is the financial elite consisting of senior people in corporations, wealthy shareholders, and others managing to monopolize wealth. In the future hardship for the majority of people will only get much worse, given the aging population in first world nations requiring costly medical and supportive care, and no or little money available to pay for it. It will indeed be an end of life nightmare for many people.

Those with high financial intelligence have succeeded in altering the playing field to monopolize wealth via several routes, a major one being the corporation. In earlier times corporations were established for a limited time frame with tight controls to realize specific goals, such as building a railway. Over the years this has been corrupted such that corporations have achieved the status of

individuals, although with far more rights. One of these rights is for corporate entities registered in first world nations to now pay taxes at approximately half the rate of individuals. In addition, corporations can sit on huge amounts of money and not invest it in the economy. Another right granted to corporations and one playing a pivotal role in the problems we are facing is the vast offshore shadow economy.

The offshore shadow economy ensures that the average person cannot win and corporations and the financial elite rule. The essential ingredient of this world is that businesses registered in it pay no (or virtually no) taxes. Double taxation treaties, best viewed as double no taxation treaties, prevent an entity incorporated in an offshore tax haven from being double taxed, typically meaning that no taxes are paid. Almost every major corporation and quite a number of minor ones, have some of their interests registered in offshore tax havens. Anyone who conducts a business with international money transfer can incorporate in the shadow economy for a low fee and legally avoid taxation. The many other services of the shadow economy, covered in the Greed chapter, tilt the playing field so far in favor of the financial elite that everyone else can at best hope to grip on to the game board to prevent sliding off. With corporations and the financial elite paying very little in the way of taxes, guess who is asked and required to pay too much? Yes, you the average person of course, adding further to the financial strain that most people are experiencing.

With no or very little tax paid for the portion of the corporation registered offshore, and half the taxation rate of regular people in first world nations, one would think that in a fair world corporations should give back and then some. Unfortunately, the world is not a fair place, a reality that is difficult for many people to process given our social cognitive orientation to reciprocity. One of the major reasons why corporations submit to being taxed at half the rate of individuals in first world nations is because they get something valuable from the deal—Protection. Canada for example protects mining companies making a lawsuit against one almost certain to end poorly for the individual or organization suing. Consequently, many mining companies have a corporate presence in Canada, in addition to a very substantial offshore presence.

The shadow economy itself represents another form of protection for corporations and the financial elite, derived from first world nations despite the loss of tax revenue. This murky financial world would never have been created without the assistance of first world politicians, and requires their ongoing support, providing another major return for the tax dollars corporations endure in first world nations. Lobbying efforts by corporations and the financial elite, often involving large campaign contributions to cooperative politicians, have been instrumental in setting up and protecting the shadow economy. Two of the major onshore offshore tax havens in the world are Delaware in the US and the City of London in England. When was the last time that you heard of either of these tax havens being attacked by first world politicians holding office? Vice-President Joseph Biden represented Delaware in the Senate for 36 years. When attacks are launched against any entity in the offshore world it is almost always against individuals avoiding taxes, and never a mention of corporations and their “legal” tax evasion.

The establishment and maintenance of the shadow economy, plus other unfair advantages working against social justice, also occurs by means other than campaign contributions. In third world countries, and to a lesser but still substantial extent in first world countries, cash bribes play a major role. A classic example of this is evidenced by the alleged rampant corruption of many Quebec politicians taking cash bribes from construction companies. Being more “civilized” in first world nations, consulting contracts promised to elected politicians and senior administrators are typically preferred. Regulating agencies that might intervene and oppose corporations and the financial elite, are “captured” by revolving door employment between industry and these agencies, either in the form of regular employment or consulting contracts, as we learned in the Irregular Regulation chapter. Have no doubt about it, the system is structured to favor the financial elite and we have all allowed it to occur. Presently, democracy only seems to be a pretense giving the illusion that we can vote for politicians who will represent us.

Adding to the confusion is the message that we all need corporations and the economy cannot be strong without them, hence they should have substantial entitlements. As we learned in

the Defending The Indefensible chapter, positive spins are a key aspect of our psychological defensive ability. Those with good mental health routinely spin things in a positive way, while those with depression and anxiety disorders tend to spin things in a negative fashion, the illness capturing the defense in a sense. To maintain good mental health it is then natural for people to accept positive messages. However, the interests of corporations do not align with those of most people. Heads of corporations are required to generate large profits for shareholders, and are hugely rewarded for this achievement in terms of very high salaries and mind-boggling bonuses. Members of the financial elite influence politicians and regulators to set individual taxation rates, such that the highest portion of their income is taxed at a moderate rate. This nice structuring of taxation rates means that they get to keep most of the income qualifying them as the financial elite. Of course whenever feasible these individuals set themselves or a portion of their financial activities up offshore, where no taxes are typically paid. In order to generate solid profits for shareholders, and hence for themselves, senior members of corporations are guided by a philosophy of endless economic growth, preferably at double-digit levels. As we learned in the Taking The “Devil” Out of Development chapter, endless growth is absolutely impossible mathematically and practically, and any attempt to achieve the impossible at double-digit levels is insanity. Markets naturally correct due to the impossibility of the process explaining why good runs never continue.

To achieve the impossible for some years what the corporation must do is cut and cut and cut, and certainly not give back to society for all the entitlements granted. Corporations merge or buy out others in order to downsize, and those who keep their jobs are expected to do the work of more than one person. Every job is assessed for the option of sending it offshore to another unique offshore entity-special economic zones-where employees are paid very low wages, work long hours often in deplorable conditions, and have no health benefits. Of course what people are willing to tolerate even in these places relates to their skill and education level. Unskilled laborers have to endure a lot more adversity than university educated engineers and computer programmers, but wages and benefits are almost always far below

that found in first world nations. Some might argue that this shift of jobs gives poor people in third world nations a chance to grow, but the nature of the beast is that when these people start to demand higher wages, better working conditions, and benefits, corporations shift jobs to another special economic zone where workers are less demanding. As more and more jobs are shipped offshore manufacturing disappears from first world nations, and even third world nations not willing to accept low wages, poor working conditions, and lack of benefits such as health care. How can countries that make nothing continue to have so much? Answer, they will not for long as the fabric of society erodes. Lower paying service jobs replace higher paying manufacturing jobs eroding the standard of living. Income disparities grow with the financial elite getting richer and everyone else declining. However, so long as the endless economic growth illusion is adhered to the financial elite is secure.

So far it sounds as if corporations, the financial elite, and captured politicians and regulators are the only culprits in the self-destructive mess we find ourselves in. The average person contributes via hyper-consumerism supporting hyper-growth. Approximately 70% of hyper-growth occurs via consumer purchases. If anyone doubts the allure of consumer products to the average person a review of the Development chapter is useful, or a quick scan of those frenzied “Black Friday” mob scenes will cast any doubts aside. We are all prone to hyper-consuming due to our inherently greedy nature. Fueling hyper-consumerism is advertising and marketing oriented to making people equate wants with needs, and believe that a higher-class lifestyle is really a middle-class one that can and should be aspired to. Debt levels rise as people decline in financial standing, but still want and expect more. In an attempt to maintain their lifestyle people insist on cheap products that must be made in offshore special economic zones. More well paying manufacturing jobs are lost and financial stress increases from a combination of declining income, rising debt, and the certainty that so many consumer products are essential. Just on time delivery, typically affording only three days of supplies, puts everyone at risk in the event of a major catastrophe. Meanwhile the natural capital of the planet is rapidly

being exhausted to service this hyper-consumerism and hyper-growth.

Compare our corporate dominated world to one where a level playing field exists. Corporations pay the same tax rates as individuals in first world nations, and the shadow economy is eliminated meaning vastly more taxes paid by corporations. These changes allow for taxes to be moderately reduced for the average person, giving them more breathing room and financial stability. In such a world local businesses run by people in the community stand a much better chance of taking off and surviving. What this translates into is higher paying jobs offered by a greater diversity of businesses, and more regional stability. We have all sold the farm by allowing for a system dominated by corporations and the financial elite. Local produce offers a way to ensure food stability, and also reduce the carbon costs of long range just on time delivery. However, the capture of municipal politicians by the housing development industry has left us with a car-dependent sprawl model of urban development, whereby fertile farmland is paved over for roads, housing developments, and strip malls. The potential of local farming to provide any significant portion of the food required is then greatly diminished. Low or no taxation rates on parking lots in strip malls creates an unfair advantage in favor of corporate big box stores. To get to these strip malls and anywhere else in most sprawl development areas requires cars and many of them. This car dependent scenario increases fossil fuel emissions worsening global warming.

Hyper-growth, hyper-consumerism, and sprawl development all contribute greatly to rising atmospheric CO₂ levels and global warming. Also contributing enormously to this problem, as covered in the Too Hot To Handle: Global Warming chapter, is our current system of agriculture. The Green Revolution is often flaunted as a miracle of modern science and industry, but it is really only a short-range ramping up of annual crop food production based on excessive input. Machinery is required along with intensive application of fertilizer, pesticides, and water, all requiring fossil fuel input. Prior to our 10,000 or so year experiment with annual agriculture, perennial vegetation dominated. The intensive carbon based fuel input required for large-scale annual crop agriculture, is greatly adding to carbon dioxide emissions. Annual crops also have the net effect of releasing

carbon dioxide, thereby increasing global warming. Furthermore, the enormous amount of water required for this form of agriculture is rapidly depleting ground water throughout the world, and once these water supplies disappear so do the annual crops.

Agriculture based industries reap enormous wealth from the current system of annual seed agriculture, with equipment (for planting, reaping, and irrigation), pesticides, fertilizer, and of course genetically modified organisms designed to resist massive quantities of herbicides, such as with Monsanto's Roundup Ready, or express substances toxic to harmful insects. As we learned in the, *A Conflicted World: Research Bias* chapter, research conducted by industry pertaining to genetically modified organisms is extremely biased almost always concluding that the technology is safe, despite more objective evidence raising serious concerns. Regulatory agencies grant licenses based on research conducted by industry, while politicians promote the widespread application of these products, demonstrating all the signs of industry capturing regulators and politicians. In North America and other parts of the world citizens are unknowing and unwilling, for the most part, guinea pigs or rats in a large experiment to see if genetically modified crops are safe or harmful. Instead of prudent caution politicians and regulators advance the aims of the biotech industry, promoting the use of genetically modified crops wherever and whenever feasible, and block labeling informing consumers they are ingesting a genetically modified life form. Once again, elected politicians and regulators of all stripes work on the behalf of industry.

Then there is the fiasco of extensive bias in pharmaceutical product research, leaving us not knowing exactly what works and for what condition, such that benefits exceed side effects. Academic institutions and the researchers connected to them can be seen as working for the pharmaceutical industry, and many academic journals have become one of the marketing arms of "Big Pharma." Due to extensive pharmaceutical and biotech research bias, the health of all of us is at risk despite the advances in health care that have been made. Financial resources that could be applied to effective health care interventions are being wasted on biased, and hence meaningless research, and the purchase of products flowing from this research.

We are also engaging in self-destruction with the enormous amount of weight many of us are piling on, as covered in the Weighing Down The World: Obesity chapter. We cannot seem to get enough processed high calorie food despite how it is killing us. These foods deliver a source of low entropy fuel in a condensed form, something that would have been almost impossible to imagine for our hunting-gathering ancestors. Perhaps the odd batch of honey, but a never-ending supply would have been inconceivable. Unfortunately, compared to our ancestors we are very sedentary, preventing the high calorie food from being converted into muscle mass. Instead it sits in storage in the form of fat tissue, building and building as more low entropy body fuel is ingested. Our health suffers because obesity contributes to diabetes and cardiovascular diseases, such as heart attack and stroke. Another major contributor to obesity-obesogens-invade our bodies, and we can do nothing about the problem due to the lack of objective testing. Typically either no testing occurs, or any that is conducted is funded by the company making the chemical, virtually ensuring biased results, with politicians and regulators supporting this process.

We are destroying the fabric of society, jeopardizing our health and wellbeing, and damaging the natural environment that we rely so heavily upon, due to the current system that shows no signs of changing fundamentally. The Arab Spring and Occupy Movement suggest the possibility of widespread revolution, given that first world nations are advancing towards the imbalance seen in the Middle East. Young people with no jobs, money, or hope, will only put up with the status quo favoring the financial elite for so long. Add social media based communication to the anger and energy of youth, and you get a volatile mixture resulting in revolution. In the case of the Arab Spring it appears that nothing has really changed, given that one form of dictator seems to replace another, as occurred in Egypt. Hence, the story of revolution in the Arab world is only beginning. Could revolution occur in first world nations? Of course not you say because we are too civilized. Increasingly young people seek greater levels of education, incurring more debt for fewer and fewer opportunities. In several European nations youth unemployment is at staggering levels, and hope is vanishing. Meanwhile, governments barely even address

the shadow economy and massive benefits provided to corporations. Prosperity for the financial elite marches on while citizens in many parts of the world are asked and expected to endure more and more austerity. Yes, revolution can and likely will occur unless we make changes. By engaging in positive cognitive distortions such as—"It will all work out," "The current system is sound," "Our leaders know best"—we are setting the world up for a very unique form of revolution that will transcend borders. The Occupy Movement is a polite protest growing out of youth discontent, that might best be taken as a warning flare of what will come if the status quo persists.

It appears to be true that the only thing we learn from history is that we learn nothing from history. Perhaps it is time to learn a thing or two from history. Even a quick glance demonstrates that when resources become concentrated in the hands of the too few revolution often follows, as occurred in France, Russia, China, and Cuba years ago. At a more refined level of analysis, there is a link between resources and mass aggression, in that aggression amongst the masses is more likely to occur when resources are so limited that people suffer major hardship. Would there even have been a Nazi Germany if the reparations demanded by victorious nations following World War I, did not inflict so much suffering on the people of that country? Even now in Greece and other European nations the typically highly marginalized Nazi movement is gaining followers. Cast aside the, "It will all be okay," positive cognitive distortion and see where this might well end up going. Revolution is nasty and many people suffer. Perhaps it is time that we bite the softer bullet now and bring about the necessary changes before things progress to revolution.

WHAT WE HAVE TO DO TO SAVE US FROM SELF-DESTRUCTION:

In reading books and articles describing how and why things are so bad, I typically find myself feeling down and discouraged. To a large extent this is because I feel the losses and suffering described, but it also results from either no or inadequate solutions offered. To describe how and why things are failing, and not provide ways of resolving the problem, leaves most readers feeling sad and angry, and without hope. As a psychiatrist I fully appreciate the value of

hope, instilling it in people by “shrinking” problems down to a manageable level, and offering ways to improve or resolve the issue. Simply telling a patient what problem they have and why does not cut it clinically. Even if the person feels better knowing what the problem is, the issue will typically persist producing the same negative outcomes. In this book I have provided solid strategies, some also advocated by others, for dealing with the various ways that we are damaging ourselves. I am confident that these strategies will work, but if the implementation is corrupted than the outcome will be less ideal. Let us now review the solutions proposed. For a more complete description please refer to the relevant chapter.

To start we have to limit our natural tendency to spin things in a positive fashion. Although positive spins characterize good mental health, the process allows problems to persist and fester. We need to address the reality that we no longer have a true democracy where elected leaders and regulators, often appointed by these leaders, look out for our interests. Instead they look out for the interests of corporations and the financial elite, with lobbying involving campaign contributions and consulting contract stints after leaving office for politicians, and revolving door employment for regulators. If you believe that corporations and the financial elite should rule then your vote provides what you want; otherwise democracy has largely become a farce. To address this problem it is necessary to eliminate campaign contributions from corporations (and unions), and severely limit donations by members of corporations made as individuals. Very tight restrictions must be applied to consulting contracts, arguably the major form of corruption in first world nations.

Capture of regulatory agencies by a wide range of industries, creates the ludicrous scenario of taxpayers’ dollars being wasted on agencies that essentially work for industry at the expense of the people. Engaging in a reassuring positive cognitive distortion, many people assume that regulatory agencies are looking out for our welfare. Meanwhile, they are by and large looking out for the welfare of those they are supposed to be regulating. By establishing both people and computer based higher-level regulatory bodies, overseeing on the ground regulatory agencies, and giving these higher-level regulators solid

enforcement powers, the current status quo of highly irregular regulation could be rapidly cleaned up. Motivation for changing the nature of our regulatory processes can be derived from an appreciation of how essential regulation is for maintaining the integrity of ecosystems, physical and mental health, and the stability of societal systems. It is important not to confuse regulation with control or micro-management. Regulatory control sets the parameters, while actual performance of people within these parameters is up to them. In fact, solid regulation should reduce the need for tight control and micro-management of an individual's behavior, because the expectations and guidelines are clearer.

Ultimately, with an end to irregular regulation and corrupt politics favoring corporations and the financial elite, the door is open to changes that will benefit the majority of people. A key component of this change is ending the ridiculously low rate of taxation paid by corporations and the financial elite. As a starting point the shadow economy must be eliminated, end of discussion. Some people suggest advantages to this murky world, but the only purposes are to escape taxation and clean "dirty" money by mixing it with more legitimate money. If the trillions of dollars associated with "legitimate" tax evasion were taxed fairly, and the proceeds invested in social justice reforms, then universal healthcare, education, old age support, and childcare could be a reality. This would certainly be feasible if the proceeds from crime and corruption hidden away in the offshore world were seized and applied to social justice concerns. In addition corporate tax rates in first world nations must be set at the same rate paid by individuals. At least let us make corporations equal to people and not superior, and give small local businesses a chance to compete on a level playing field. As a further step a very high rate of taxation needs to be set for individual income over about \$500,000 per year (the approximate level making someone part of the financial elite). With the trillions of dollars diverted away from corporations, the financial elite, and the shadow economy, tax rates for most people could be moderately reduced. A universal taxation system is crucial because the economy is global, as is the offshore shadow economy. Corporations and businesses truly furthering social and environmental justice, and creating well paying jobs in a given

location might be rewarded with limited tax cuts. The system created might best be referred to as social justice capitalism.

A world where people have a say (whatever happened to democracy?) can produce some amazing changes. A crucial one is making corporations fully accountable for negative externalities. How can we expect corporations to be responsible global citizens if they are not held to account for negative outcomes? Try raising a child with zero consequences for bad behavior. No wonder that corporations demonstrate antisocial psychopathic behavior. Industry influence on politicians and regulators has ensured that corporations realize the profits of products, without incurring costs for negative externalities. Instead the average person absorbs these costs paying from their tax dollars and suffering the health consequences. Frequently, the environment that our health and wellbeing is so intimately connected to also ends up suffering. This travesty of social and environmental justice must end, with corporations and all businesses being made fully accountable for negative externalities. Although some progress has been made, such as with select mining operations in first world nations, the effort so far might best be characterized as window dressing creating the illusion of corporate social and environmental responsibility.

If genetically engineered crops produce adverse effects on the health of people or ecosystems, then the corporation producing the modified organism must pay. When a pharmaceutical product induces serious side effects, the corporation must be held accountable in the absence of class action lawsuits that take years to resolve, and often primarily benefit the lawyers. Large-scale annual crop agriculture is depleting and polluting fresh water reserves, and contributing hugely to global warming, due to the intensive input of fossil fuels required for relatively limited output, plus how these crops produce a net release of CO₂. If industries involved in this form of agriculture are held responsible for their share of global warming costs, and depletion of fresh water supplies, much more sustainable and environmentally friendly agroecology practices, demonstrating vastly superior output for a given level of input, could gain some traction.

Developers by capturing municipal politicians have created an urban environment that sprawls over prime farmland capable of

providing local produce, and forests that can absorb carbon dioxide. This urban sprawl is almost fully reliant on the car and just on time delivery of goods, both adding enormously to global warming. If these developers had to pay for the increased carbon dioxide emissions and costs of lost local farmland, perhaps they would engage in more environmentally and socially conscious development projects. The financial industry generates complex derivative based products representing financial weapons of mass destruction. When the financial system unraveled in 2008, largely due to these products, guess who paid? Yes, a rhetorical question. If the financial industry was held accountable and forced to pay for the losses, then perhaps they would be less inclined to promote unstable and dangerous products. In a world where people rule corporations will be held accountable financially for negative externalities.

Ensuring that corporations take responsibility for negative externalities plays a major role in improving health outcomes. If corporations pushing processed high calorie food on consumers via intensive marketing campaigns are required to pay for a portion of the health related costs, the manufacturing and marketing of healthier alternatives might become a wise business decision. As it stands, or more appropriately sits, obesity is on the rise despite already being at very high levels. The solution for many is weight loss with countless diets and exercise programs promoted. The providers of these weight loss strategies often make considerable money, while weight for the vast majority returns due to our homeostatic control mechanisms. Indeed, it appears that only the small fraction of the population able to resist these homeostatic mechanisms can keep weight off.

Reduced activity is a prominent ingredient in weight gain and excess fat mass, instead of healthy muscle mass. This occurrence applies even more to those suffering from psychiatric ailments. The key to managing obesity is then increasing activity. Throughout our evolution we appear to have walked about an hour a day, but in our modern day society, and even more so in car dependent urban sprawl, an hour per day walk might as well be a walk on the moon for many people. Walking does not require special equipment, skills, or a gym membership, and can occur even if health is impaired. By walking approximately an hour per

day, percent muscle mass improves and percent fat mass declines, with subtle but very significant health and fitness benefits. Over time this activity might even adjust homeostatic regulation of weight to a lower set point. People who shift from inactivity to activity are also typically more open to changes in diet, such as selecting healthier options that can further augment health. Of course increasing activity by walking and other means does not sell many books, and is difficult to package into a program, but it works, and is by far the best and easiest option we have.

A further major contributor to poor health outcomes and wasted tax dollars is research bias. Funding from the pharmaceutical and biotech industries has transformed research into a massively biased scenario, and in the process trust in medical science has shifted to distrust. Fully independent and objective product testing and approval centers for pharmaceutical, biotech, and chemical products, will ensure greater health for everyone, and restore lost trust. No longer will industry control research that benefits itself. Furthermore, by removing industry influence from the political and regulatory process crucial changes can be made, such as product approval based on the best two out of three studies conducted in the independent and objective product testing and approval centers. Currently in the US, the pharmaceutical industry can typically run as many studies as they like until two positive results are produced. Although industry funds most research, vast amounts of taxpayer money are still spent, that are essentially wasted on biased and hence meaningless research. Diverting this money to programs that truly improve health outcomes will benefit many people.

One of the major ways that we are damaging ourselves is by advancing global warming. A common positive cognitive distortion is that global warming is a farce, or even if true is a natural event. Carbon dioxide levels are rising rapidly due to us, period. It is also clear that we are doing essentially nothing about the problem, ensuring runaway levels based on feedback cycles, such as melting permafrost releasing methane, with the methane and its conversion to CO₂ further heating the planet, melting more permafrost, and so on and so forth. Ongoing development of the vast Alberta tar sands alone is ensuring runaway atmospheric CO₂ levels, and as Al Gore has mentioned, treat the atmosphere like an

open sewer. Global warming is a problem that we cannot blame exclusively on corporations, because we are all greedy for low entropy fossil fuel energy, and once the approximately 1.5 billion people currently off the grid get on it the problem will only be much worse. Of course in line with social justice, they are entitled to have access to affordable energy. When cognitive distortions suggesting that global warming is not real are dispensed with, despair often follows. This feeling is spreading as nothing is being done to deal with the problem, governments almost universally putting economic growth far ahead of managing global warming. Adherence to the endless growth economic model is so strong that no global warming moderation strategy has a chance unless it aligns with economic growth. However, as we have learned there is a very natural one that does align with it.

Throughout time most vegetation on the planet consisted of perennials, with some remarkable attributes relevant to global warming. Perennials absorb far more CO₂ than they release, stabilize soil and retain water due to their deep root structures, and are more resistant to pests. Even common (or previously so) perennial grasses can absorb and store a staggering 500-2,000 kilograms of carbon per hectare! With the advent of agriculture for about 5% of our evolution, annual crops have been grown. These crops produce a net release of CO₂ instead of absorbing it. Agriculture based on annual plants is not endlessly sustainable due to the very high input of fossil fuels, fertilizer, pesticides, and fresh water required, and its contribution to the runaway CO₂ levels in the atmosphere. By shifting our major crops to perennials, we can absorb massive amounts of atmospheric CO₂, thereby eliminating or controlling global warming, spare valuable and diminishing fresh water supplies, and reduce or eliminate the use of fertilizer and toxic pesticides. This conversion is feasible to implement even within the current economic model characterized by endless growth, because perennial agriculture reduces costs.

Industries supplying products for annual seed agriculture can be expected to oppose perennial agriculture, despite the enormous benefits. In a world where corporations and the financial elite rule, opposition by the agriculture industry will likely win the day, blocking efforts to transform our major crops to perennials. The spin machine will downplay the pluses of perennial crops, and

play up the benefits of annual crop agriculture and the promise of genetically modified crops. Captured politicians and regulators will support the message of the agricultural industry, ensuring that nothing changes. If people stop engaging in cognitive distortions that falsely reassure, and politicians and regulators start working on behalf of citizens, we can bring about the shift from annual to perennial agriculture and reverse global warming. Based on solid research funding and effort the change could even occur in 20 to 30 years!

Despite the ability of perennial crops to reverse global warming, the transition to these crops will not be enough if we continue with hyper-growth supported by hyper-consumerism, given that these highly enmeshed entities are largely responsible for rising atmospheric CO₂ levels. Quality and endurance of products must replace the current demand for an endless supply of lower quality products not designed to last. People must take ownership of the problem and resist the potent media marketing messages to shop endlessly. Beyond escalating atmospheric CO₂ levels, hyper-growth is depleting the natural capital of the planet including freshwater supplies throughout much of the world, forests, readily accessible fossil fuel reserves, certain minerals, and marine resources. Hyper-growth is not endlessly sustainable, and when much of the population now excluded from hyper-consumerism adopts this approach, it is fair to say that we will all be in a race to the ultimate bottom.

Shifting to a low or no growth sustainable economic model, applying the strategies outlined in the Development chapter, will preserve and even restore natural capital, and put the brakes on rising atmospheric CO₂ levels. For example, adopting forestry practices such as harvesting high yield tree species, allowing natural forests to regenerate. The shift to a minimal or no growth sustainable economy will require a reframing of the current blind obsession with endless economic growth, that is ultimately doomed to fail because endless growth is not endlessly sustainable. Of course corporations and shareholders focused on profit, ensure that the endless growth economic model dominates, and is promoted aggressively by agencies such as the World Trade Organization, representing the interests of industry. If consumers realize that we are ironically destroying ourselves with hyper-consumption and

curtail it, then hyper-growth will end, and a more sustainable and stable economic system will be a possibility. Politicians and regulating agencies, actually acting on behalf of the people, will help ensure that the economic system shifts to this sustainable model.

The changes advocated can and will advance the financial position of the many, the health status of everyone, and vastly improve the environment. Those favoring the current system of rule of the elite might point to this book as leftist. The labeling of points of view as left, right, or center, is a travesty because it predetermines the reaction. The center is boring and most people just give it a pass. If something is labeled "leftist" those on the left are preset to agree with it, and those on the right automatically reject it. When the "right" label is applied those on the right will almost certainly endorse it, while those on the left reject it. Labeling a work left, right, or center, is then a convenient way to suspend due process and consideration. I see myself as a seeker of the truth in regards to formulating patient problems, theoretical research, and the issues covered in this book. I receive no funding from the right, left, or center, exempting me from any influence based on reciprocal obligations. In addition, my voting history has included left, center, and right over time, depending on the issue and politician.

Supporters of the current status quo, characterized by the endless growth economic model, and in particular those who believe in "rational" free-market economics, will accuse this book of being biased. In the sense that it is advocating for social and environmental justice there is a bias, much as with the alternative perspective. In fact, it would be all but impossible to not show some bias in a written work. The key issue, though, is the evidence that the bias is based upon. The belief that greed and the aggressive monopolization of wealth are good for the economy and the world simply reflects a defensive rationalization for such behavior, the evidence clearly showing that there are unsustainable and mounting social and environmental justice costs. I try to be a fair umpire calling them as I see them, and while not perfect, I do believe that the material presented represents an accurate assessment of what is transpiring in the world.

It would be nice if resources were limitless and we could just go on consuming them endlessly, and even better if everyone could be well-off with some exceedingly so. Unfortunately, that is not the world or universe that we live in, ours being characterized by limited valuable resources and substantial costs associated with the depletion of them. Currently we are hyper-exploiting the last major forests, remnants of marine resources, reasonably accessible oil and gas reserves, certain key minerals, and fresh water supplies for agriculture. Income disparities are increasing despite the enormous imbalance that already exists, and atmospheric CO₂ levels are going completely out of control. We support a system that exposes us to damaging biotech and pharmaceutical products, and chemicals with toxic effects, such as obesogens contributing to the modern day epidemic of obesity. In addition, many people seem intent on killing themselves with food. The damage that we are inflicting upon ourselves and the natural environment is not taking us anywhere we want to be going, nor that we want our children or grandchildren to be experiencing. To avert this self-destructive scenario it is up to all of us to take the steps advocated. If we follow the blueprint laid out here, including the creation of new political parties that actually represent our interests, then changing the status quo can be a reality. Social stability will be restored in a very balanced and hopefully enduring fashion, the worsening financial and health status of so many people will be vastly improved, and the natural environment that our health and wellbeing is so intimately connected to can be preserved. It is a very worthwhile endeavor because it will save us from self-destruction. The choice is truly yours to make, as all change of significance starts with individuals!

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