The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

# Why We Disagree on Peak Oil and Climate Change: Part III - Our Belief Systems

Posted by nate hagens on May 1, 2007 - 9:16am

(EDITORS NOTE: The below post was edited and updated in 2007 as Peak Oil - Believe it or Not)

In the first two parts of this series, we looked at some of the factual reasons why people disagree on the timing and importance of Peak Oil: gross versus net oil production, better technology vs depletion, productive capacity vs flow rates, differing definitions of "Peak", etc. This post will address some social and psychological reasons why the urgency of our energy situation may not be being addressed on an individual level and only at a snails pace on the governmental level. Among the phenomena we will explore are a) why we have beliefs and how they are changed, b) our propensity to believe in authority figures, c) our penchant for optimism, d) cognitive load theory, d) relative fitness, e) the recency effect, and several others. The fact is, even if the world's energy data was transparent and freely available to everyone, it would be an open question whether people would agree on any near term action to mitigate future oil scarcity. This post is a first stab at examining our cognitive belief biases.

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Our societal infrastructure was built with and expected to continue on *cheap liquid fuels*. This fixed infrastructure coupled with a human demand drive for more may result in a once-in-a-species crisis once our planetary resource and ecosystems can no longer keep pace. But Peak Oil ultimately is not about geology or technology. At its core it is a human problem. An overlooked human attribute will play the pivotal role in our failure or success in mitigating and adapting to long term challenges of both Peak Oil and environmental challenges like Climate Change - that of our collective cognitive belief systems and the resulting behaviours they engender.

This post will outline many of the behavioral tendencies we can expect to encounter as we attempt timely and logical solutions to declines in per capita energy availability. It will culminate in an examination of our belief systems themselves, and how we process new information. As in my recent posts, I preface this one with a discussion I had this weekend with my friend Thomas, (who fittingly has still 'not had time' to read the oildrum story on steep discount rates):

> N: Thomas - Im writing another story for theoildrum.com and would like your comments since you seem to represent the 'non-believer camp'.
>
> T: Its not that I don't believe that oil will peak someday - its just that the doom and gloom people are always wrong - somehow something will come along and in 5 years you'll say "well, how could I have known about 'XXX'? No one knows the future - including you Nate.
>
> N: Ive never said when Peak Oil would be, only that it would eventually mean the end of economic growth as we know it - and that technology and capital can't 'create' energy. The market will be too late to react to the signals once they come. The asset allocators on Wall St have used a formula for the 70 years of stock market history based on cheap oil and high energy gain. That era is over - new rules or maybe a new game.

T: No offense buddy - I know you're very intelligent. But there are thousands of smart people on Wall St and elsewhere analyzing data - don't you think its a little odd that YOU'RE opinion is the right one over all those people whose full time jobs it is to pore over oil demand and supply figures?

N: Well, when put like that it always shakes my confidence, but I do believe the street is missing the main tenets of Peak oil - that environmental limits and declining net energy will overtake conventional market and technology solutions. And by the way - there ARE a lot of analysts are talking about Peak and its implications - the new GAO report on Peak Oil came out last week and pointed out how unprepared we are..

T: Now you trust what the Government is saying? You used to say the government energy forecasts were terrible and we shouldn't believe in them -now they write something that fits your position and you use it for support?

N: Were you always this argumentative? Wait -don't answer that -Ive known you since grad school. Can you honestly say that you've read things on theoildrum and other sources for objective information on this topic?

T: I have 3 kids and work 60 hour weeks so I choose how to spend my reading time. Can you say YOU'VE read all the research saying we have plenty of oil until at least 2040 after which there will be plenty of substitutes?

N: I've started from scratch 3 or 4 times on the core Peak Oil tenets, thinking I might have something very wrong, but Ive been over it enough to unfortunately feel pretty confident I'm right, though less certain on the timing.

T: Nate, I shouldn't tell you this but our asset management arm is in the top 10 in the world in terms of assets and do you know what our number one position is?

N: Starbucks?

T: No. We're short oil futures. We think its going back to $40 well before it goes to $100.

N: Thomas this is all besides the point. I'm not predicting what will happen in the next 3 months or next 3 years - what I'm saying is that very soon, in our lifetimes, energy is going to be scarce and cause ripple effects we cant even imagine. The bullish supply forecasts either siphon that 'energy gain' from other economic sectors via inflation or by robbing it from the environment via water and ecosystem depletion and increased GHGs.

T: Whatever. And even if you're right. We're here to live life. I'm not going to sit around waiting for 'the next big change' when I can enjoy life with my kids and live large. I work hard you know.

N: Actually you're a grifter. But you're still my friend, even though you're closed minded at times. Later.

The above discussion is in many respects a synopsis of this post - that despite *facts*, we exhibit certain cognitive biases that prevent us from acting on complex or frightening subjects outside of our day to day realities. What follows below is a brief overview of 10 cognitive phenomenon that may inhibit wider understanding and action on oil depletion. (*Caveat - Neuroscience is a complex and growing field that has many valuable contributions to offer. In discussing human tendencies for various behaviours, I am of course generalizing, as are most of the scientific studies - when I say 'people value the present more than the future', I make that claim in the same vein that 'men are taller than women (on average)'* )

## COGNITIVE LOAD THEORY

*"Chocolate Cake?"*


"or Fruit Salad?"

Cognitive load theory suggests humans have a maximum capacity of working memory. At around 7 'chunks' of information, our working memory maxes out and we can't accept anything else without losing some of the previous 'chunks'. Try remembering the following numbers 1-9-1-4-7-6-7-5-9-5-9. Its quite hard to do. But if they are rearranged in chunks 1-914-767-5959, it becomes much more manageable. Numerous studies have measured this phenomenon - a notable study by Shiv and Fedhorkhin(1) asked a group of people to memorize a two digit number, walk down a corridor and at the end choose a dessert - either chocolate cake or fruit salad. A different sample of people were then asked to memorize a 7 digit number and walk down the corridor (while internally reciting this 7 digit number) and also choose a dessert. When required to memorize the 7 digit number, almost twice as many people chose the chocolate cake as in the sample only memorizing the 2 digit number - the implication being - *'my short term memory is full - I cant access my rational, long term decision-making hardware - just give me the damn cake'*.

Of course, in a society with cell phones, taxi-cabs, internet, coffee, soccer practice, *Grays Anatomy*, corporate ladders and a plethora of other chocolate cake-like stimuli, meaningful contemplation and education about oil depletion and the environment usually represents the *fruit salad*. Many people are just too cognitively taxed to take on much more.

## RECENCY EFFECT

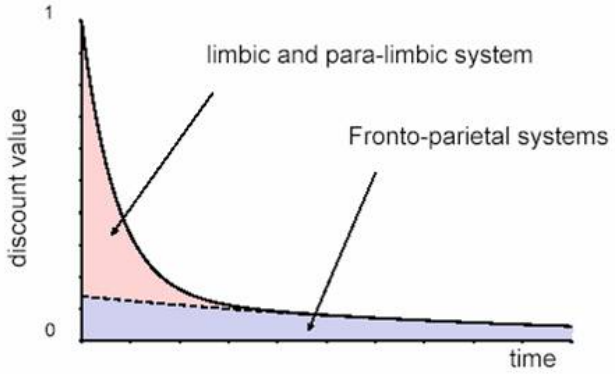
Cognitive psychologists have recognized that people tend to overweight the most recent data and stimuli they receive in their decision-making processes. A possible reason for the recency effect is that these items still linger in working memory when recall is solicited. This recency effect has two important relationships to the peak oil and global warming issues. First, we collectively assume that today will be much like yesterday and tomorrow will be like today - grocery stores chock full of oil-subsidized tasty treats, gas stations with cheap and easy fill-ups, and a plethora of novel entertainment and diversion options preclude our mind from thinking tomorrow will be any different. Second, in the various campaigns to educate and inform the public and policymakers on the dangers of oil depletion, any 'recent' optimistic piece in the mainstream media that dismisses Peak Oil has a tendency to mentally 'overwrite' some of the prior Peak Oil education one might

have achieved.

Part of the reason I looked into research on the recency effect is that I noticed myself yo-yo-ing on peak oil and climate change depending on who I talked to or what Id seen. I started to notice a pattern that my 'belief' was highly correlated to whatever I'd read or whoever I'd spoken to most recently. Since there are so many unknowns on both topics, to hear demonstrative language from confident sources does a lot to sway ones opinion, until and if one has time to methodically explore the arguments during subsequent individual research.

I am not a climate expert but do know enough to believe global warming is being anthropogenically influenced and is of at least moderate concern. As a graduate student under Robert Costanza, a scientist very concerned about climate change , I felt almost embarrassed after viewing The Great Global Warming Swindle. Even though I recognized a few factual mistakes, the rhetoric and confident tone in the movie pulled me in - the general tenor made me feel that climate change is relatively benign and concerns about it are overblown. That is, until the next morning when I got a series of emails from my professors about its content after which my opinion completely flip-flopped again. I expect this is a common experience. The central issues of climate change and oil decline are so broad and complex that both *science* and *advocacy* fall victim to the recency effect. Advertisers however, must be aware that the recency effect is both valid and powerful, otherwise we would have long ago decided on which product is superior between Miller Lite and Bud Lite on the facts alone.

## STEEP DISCOUNT RATES




***"The rational vs emotional discount rate"***

As discussed in a recent oildrum post, we have evolved neural mechanisms to steeply favor the present over the future (measured by what economists call 'discount rates'). The higher the rate the more one is 'addicted' to the present moment. Lower discount rates suggest more control of the neocortex in subverting mammalian impulses of 'living for the moment'. Different products are discounted at differing rates. Different subsets of people (drug addicts, young people, gamblers, men, risk-takers, low math scorers, alcohol drinkers, etc) have steeper discount rates - are less able to act for the future and are easier pulled in by short term desires.(2) Steep discount rates work backwards as well - the oil crises and gas lines in the 1970s are like stories in the history books - nothing that carries too much emotional weight in the present - its almost as if our action and motivation triggers are like a daylight map, only caring about the areas that are lit up -

the dark areas are too far beyond our ken.

We have evolved to have instant access to our emotional minds in times of stress or danger - a million years ago too much rational thought would have essentially been suicidal. Oil depletion, climate change and loss of planetary ecosystems are long lead time problems. As such, information leading us to believe a peak in global oil production is either a) no big deal or b) beyond 2030 is essentially not 'received' by our emotional minds. The average person and politician will process such information as a free pass to continue the business as usual path. This is especially true if the assessment comes from a confident, respected, mainstream source (such as CERA), because it trickles down through corporate hierarchical society. Collectively it will be difficult to act until these issues become 'in the moment' too.

## BELIEF IN AUTHORITY FIGURES

***"I have it from high authority that there is plenty of Oil Resource"***

**theoildrum.com contributor says *"Net energy to fall - society needs to change 'metrics of success' quickly"***

Think about your initial reaction to the above two assertions. Depending on your walk of life, your gut reaction and thought process might differ. However, science (and history) has shown that

humans have a propensity to be externally validated - we believe in and follow instructions from confident authority figures. Though theoildrum.com contributor is clearly confident, he certainly is not an authority figure, at least outside pike fishing circles. The Pope however, influences billions. With few exceptions, most voices advocating immediate steps for mitigating peak oil are not what society would perceive as 'authority figures'.

*But what if the tables were reversed?*

**NEWS FLASH ---"EXXON-MOBIL SAYS THE WORLD HAS PASSED PEAK OIL – THEOILDRUM.COM SAYS NOT TIL 2030"**

Imagine if that headline ran through the media around the country. Corporate leaders would hold emergency meetings on how to lock in prices or even supplies. (Some might liquidate their 401ks and not even show up).... Politicians would be on television urging people to wear sweaters or even winter coats.... A gasoline tax would be quickly implemented.... Purchases of wind turbines and solar panels would soar... Tuna and chocolate hoarding...Cats living with dogs – real Old Testament stuff.

However, the situation is precisely opposite that. Astute, reasoned analysis by concerned individuals gets easily drowned out by rhetorical op-ed pieces in respected newspapers. Portrayal of concern for peak oil as a 'chicken little', 'Cassandra' and 'boy who cried wolf' phenomenon by a credible news source effectively erases what nagging concern or belief about oil depletion someone had started to foment.

Sociology recognizes that we have a propensity to believe in authority figures. Though the why of this is yet to be sussed out, Richard Dawkins believes it is an adaptive byproduct of children who unquestioningly followed adult instructions during the thousands of generations of our ancestral environment.(3) Presumably, the penchant for adults to easily believe things that are confidently told to them is a carryover from the children who did NOT eat the berries, touch the snake, or swim over a waterfall – these children survived to have children of their own. Social psychologist Robert Cialdini has written a book related to this phenomenon, on how certain people can have outsized influence on others using certain authoritative tactics. (I wonder aloud if Messrs. Jackson and Yergin own copies)

Irrespective of its origins and as uncomfortable as it sounds, we DO inherently believe in authority figures, as the famous and controversial Milgram experiments evidenced. 65% of volunteers delivered what they thought were fatal doses of 450 volt electric shocks to human subjects while being calmly assured to continue by the experiment 'administrators' (doctors in lab coats). The other 35% of participants still delivered high voltage shocks to the point of unconsciousness but refused to administer the 'highest level' shocks. Interestingly, none of these 35% insisted that the experiment itself be terminated, nor left the room to check that the victim was O.K. without first asking for permission. So much for independent thinking. In interviews prior to the experiment respondents predicted that only the most 'sadistic' 1.2% of participants would be willing to hurt another participant with electric shocks, yet 100% of the participants DID administer the shocks. The power of authority figures is indeed strong.

To be honest, when preparing this post, I read and reread CERAs analyses and interviews – the recency effect combined with the utter confident tone they were written in made me (again) question that maybe I have this all wrong – that we have smooth sailing until 2030. But, after some malted milk balls and a quick review of my colleagues work, which at a minimum shows CERA does not incorporate net energy, understand Hubbert Linearization or include environmental externalities, Peak Oil again had me very worried.

## RISK AVERSION

Risk aversion is a financial and psychological concept that posits consumers (people) prefer a certain but possibly lower payoff than an uncertain but possibly higher payoff. With respect to Peak Oil, there is such a societal Sunk Cost that even if the average person or politician is on board with the understanding of fossil fuel depletion, the risk of stepping outside the warm cocoon of modern grid-connected energy intensive society can be emotionally daunting. Too, there aren't too many blazed paths as of yet illustrating exactly what one person or family can and should do to adapt. Our society is SO dependent on oil that most alternatives are too risky for the average family to pursue. Or at least that may be the perception.

## RELATIVE FITNESS

**My Dad is stronger than your Dad. And Peak Oil is not a 'theory' buddy**

As evidenced by the size difference between males and females (sexual dimorphism), our species is midway between a tournament species and a pair bond species. This is suggestive that in our evolutionary past, selection pressures for male/male competition at least partially contributed to higher mating success (though not as much as in sea lions). The advent of language in tribal living expanded the scope of reputation and its influence on mating competition. An individuals comments, actions and opinions thus contributed to increasing or decreasing his status within the tribe. One could argue that a good part of human communication is concerned with getting other people to think, behave and believe as we do. At the same time, those others are trying to get us to behave and believe like they do – it's the culmination of our biological and political (social) heritage.

This concept has many demand side implications for Peak Oil not the least of which will be some variant of resource grab when per capita liquid fuel availability declines. But it also plays a large role in peoples differing and sometime entrenched viewpoints on the topic of Peak Oil, irrespective of their future actions. My friend Thomas has a career in finance - his income is dependent on his clients buying stocks, which are in turn dependent on the economy growing. He has 3 children and a huge house full of gadgets and requires alot of fuel to continue his planned trajectory (though he admits he could be happier on much less). A Peak Oil world as I've painted it could be perceived as a threat to him, his family and his lifestyle. For him to accept my worldview is in some ways admitting that his own life is built around the wrong premises. Similarly, if our current Disneyland culture continues to extract resources and environmental costs and the day of reckoning comes well beyond my lifetime, perhaps I have wasted some of my time on this planet unnecessarily calling attention to what I view as urgent risks associated with net energy decline and human social traps.

> *Oh, How sweet it is to hear ones own convictions from another's lips.* - Goethe (1749-1832)

Some who are very vocal about the urgency of Peak Oil will take a 'perceived fitness hit' if information comes to light that delays or moderates the impact of a peak and decline in world oil supply. Similarly, those who think we have plenty of oil production and flow capacity for the next 20-30 years will look foolish (e.g damage their reputation leading to a 'perceived' drop in fitness status), if it turns out we never see 90 million bpd and have 5% annual depletion rates beginning in a few years. In truth, for many the facts are mostly irrelevant - their belief systems are relatively immutable and new facts coming to light that support their convictions are viewed as 'victories' even if they add pain to the world as a whole. Similarly, new facts contrary to their beliefs are perceived as 'failures' and are responded to defensively. Curiously, it puts certain people, myself included, in a position of cognitive dissonance - I sincerely hope society manages to amass an armory of silver BBs and reduces consumption enough so that Peak Oil is a seamless

transition to a sustainable future, but if that happens, most everything Ive written about in the past few years will have been incorrect. (But maybe I impacted the experiment...;)

Those oildrum.com readers who've participated in these forums for some time now are especially aware that certain people seem to be 'rooting' for peak oil and an end to the current capitalist consumptive system. I believe at least part of this is even though post peak oil they will have less 'absolute fitness', their 'relative fitness', compared to Joe-Mortgage-Trader-Millionaire-Next-Door, will increase. In the end, we are wired to respond to relative fitness.

## BELIEF IN OPTIMISM

People vocal about the risks of Peak Oil are often viewed as pessimists, though I suppose they prefer the word 'realists'. We are taught from an early age to 'look at the bright side' and 'every cloud has a silver lining'. Humans do in fact have a penchant for optimism, and this sets up for an immediate bout of cognitive dissonance when discussions of peak oil nasties are undertaken.

Individuals have a tendency to be overly optimistic, and therefore naturally discount 'pessimistic' viewpoints and worldviews. Adults are particularly vulnerable to self-deception when comparing their own intelligence and attractiveness to others.(5) Research has shown that we systematically exaggerate our chances of success, believing that we are more competent and more in control than we really are. 88% of people think they are better drivers than average. 94% of professors believe they are better at their jobs than the average professor, etc. (By definition, almost half of those surveyed are 'overly optimistic'.)

There are good neural explanations for being optimistic. Even if the pessimistic view may be the more accurate, the stress of incorporating the particular negativity into ones worldview releases a cascade of stress-activated hormones that can seriously compromise a persons health.(6) In addition, pessimism can lead to depression, which suppresses the normal functioning of important neurotransmitters such as serotonin, which in turn can lead to reduced physical activity, mood swings, and a number of other physical symptoms and diseases. Optimistic attitudes also reduce secretion of cortisol, a stress hormone that inhibits the immune system, as well as produce more helper T-cells (4). The placebo effect is a well known but little understood medical phenomenon that improves patients physical response with no actual medication. In depression patients, placebos increase wellbeing by an average of 30-50%. Apparently, when we 'think' positively that something is helping us medically - even if its a sugar pill, it 'works'. We are now seeing that the brain is helping this healing to occur through a different neurotransmitter mix.

***"Peak Oil - Glass Half Full or Half-Empty?"***

An optimistic outlook actually is neurochemically self-fulfilling. Optimism leads to increased frontal cortical activity which itself is a strong predictor of idea generation, positive emotion and overall liveliness of thought. Similarly, sadness is marked by decreased activity in the frontal cortex, which has the negative side affect of reducing the number of overall thoughts and ideas produced. Cognitive neuroscientist Antonio Damasio points out that our brain exaggerates reality - when the glass is half full - the brain adds a little more for zest - when the glass is half empty, the brain subtracts some and things seem worse than they really are.

Being introduced to peak oil can be quite a shock. Its tough to be cheerful about the facts and

implications about oil depletion, though ultimately we definitely could (and should) be happier with less energy. But initiation to the concept of upcoming shrinkage of the lifeblood of society can easily cause internal conflict in a species obviously wired to gravitate towards optimism.

## GROUP THINK / HERD MENTALITY

We originated in tribal settings where consensus was important. Consensus building and group projects are taught and experienced in our culture from an early age - though in an era facing true scientific problems, the warm fuzzy group decisions can backfire. One famous example of 'Groupthink' was the Bay of Pigs invasion, where President Kennedys key advisors had serious misgivings about the strategy, but in group strategy sessions refused to speak up for fear of disrupting the seemingly overwhelming consensus. The invasion went so badly that the President specifically ordered his staff to speak up and offer dissenting opinions in future discussions, an order that may have averted a war during the Cuban missile crisis. As most media is quick to dismiss Peak Oil, our nation could use another such warning against 'groupthink'.

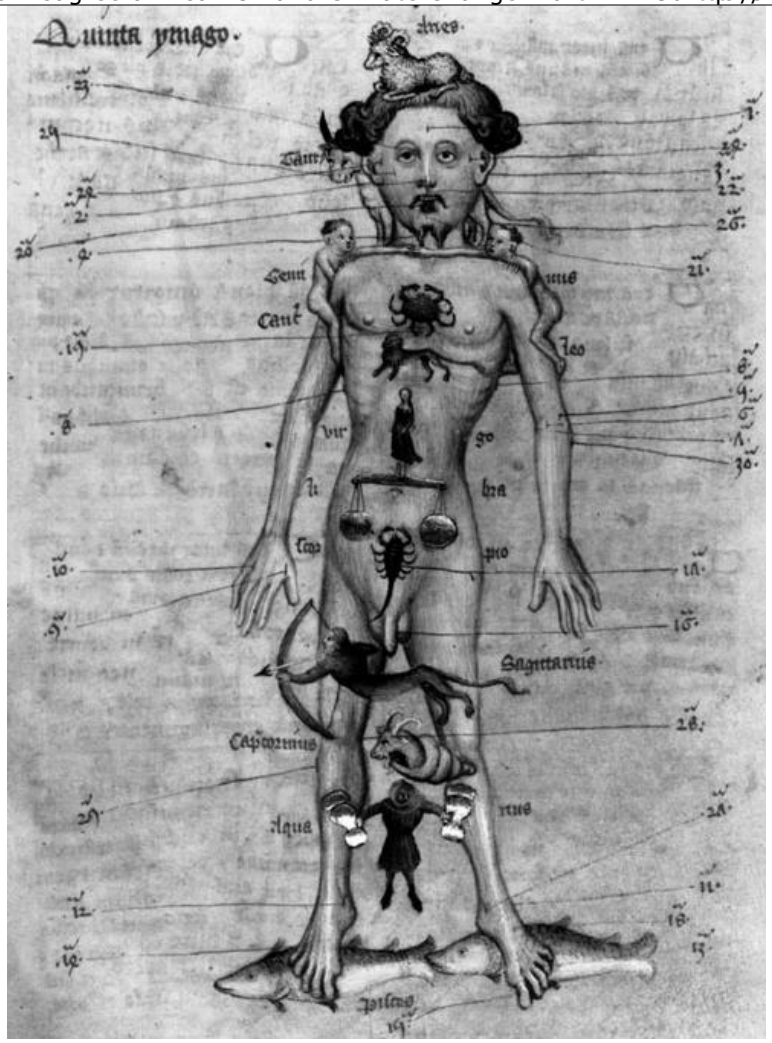
***"Monkey-see-activate mirror neuron Monkey-do"***

There is comfort in the herd. The recent discovery of mirror neurons helps explain why our brains are prone to absorb the beliefs and behaviours of others. Neurobiologically, when we see someone performing an action, whether it is a yawn, a smile or eating an ice cream cone, unique parts of our brains respond in the same way as if *we* were performing the action ourselves.(4)

Homo Sapiens See - Homo Sapiens Do.

Interestingly, USC neuroscientists (Arbib and Rizzolatti) are suggesting that the origin of language began as facial expressions and hand gestures - these communication tools, along with actual speech, are regulated by Brocas area, a small knob found in the left hemisphere of the cortex. As we will see below this has important implications.

## BELIEF IN MAGIC, MYSTICISM, CORRELATION, ETC. (AS OPPOSED TO SCIENTIFIC METHOD)




> *Knowledge is a disposition to behave that is constantly subject to corrective modification and updating by experience, while belief is a disposition to behave that is resistant to correction by experience*. Eichenbaum, Howard – Boston University (5)

The previous nine points were tenderizer for the meat of the article to follow. If you've read this far you're either unemployed, retired, a psychologist, a blood relative, my girlfriend or someone on the edge of a paradigm shift. Thank you in any case.

The difficult transition to a lower energy gain society by definition has a 'best path'. Also by definition we won't ever know what that path is, or at least until well into the future. How we collectively assimilate beliefs, attitudes, science and policy will be the key determinant in how we sink or swim with the Peak Oil tide. Unfortunately, we have baggage.

So far we've looked at our propensity to believe in authority, optimism, recent events, group behaviour, etc. Taken together, these leanings might suggest that we have some sort of pre-packaged neural software for abstract systems of 'belief'. In truth, we actually have no choice BUT to believe. From the moment of birth we depend on others to instruct us about the world. While young, we are given a specific language, a specific religion, a smattering of science and history and all the while we implicitly assume we are learning *facts* about the world. But we are not. We are simply being told *what* to believe. Though this is of course practical, it has resulted in 6.5 billion different (but overlapping) belief systems, somewhat modifiable as we grow up but increasingly less malleable as we get older.

**What is a belief?**

> As defined by the Oxford English Dictionary, 'belief' is:
>
> 1. A feeling that something exists or is true, especially one without proof.
> 2. A firmly held opinion
> 3. Trust or confidence in.
> 4. Religious faith.

The English word 'belief' originated in the twelfth century, as an adaptation of the German word *gilouben*, which means 'to love' or 'to hold dear'. It was first used in association with religious doctrines referring to one's trust and faith in God - faith rather than fact being the operative word, as this particular type of belief cannot be tested by the rigorous proofs developed by science.

**What is the Scientific Method?**

> a. Observe some aspect of the universe.
> b. Invent a theory that is consistent with what you have observed.
> c. Use the theory to make predictions.
> d. Test (attempt to falsify) those predictions by experiments or
> further
> observations.
> e. Modify the theory in the light of your results.
> f. loop back to "c" above for another test. (8)

Famed scientist Richard Feynman offers an excellent description of 'good science' vs. 'cargo cult science' here.

At the cottage where I write this, there is the unmistakable sound of sandhill cranes calling for mates - when I first heard it I had no idea what it was. The fourth time I heard it I was with my father who identified it as a mating pair of sandhill cranes. The 10th time I heard it I witnessed the actual cranes by a pond. Mentally, my brain created a *hypothesis* and eventually 'tested' it to be 'true'. A certain sound represents sand hill cranes mating. Our ancestors discovered all they needed to know about the natural world in a process something like this one.

However, many stimuli in our society are much less clear cut. If I see a blue BMW sedan with an attractive blonde in the passenger side 2 or 3 times in a week, my mind will naturally extrapolate the 'ownership of a blue BMW' as a signal of successful male competition, when there could be myriad other explanations for the womans presence (the mans personality, his looks, his intelligence, his sister etc) The fact that he owned that particular car could have been completely random - yet my brain observed this pattern and extrapolated it forward.

*"An early hominid couple, forming beliefs.."*

During the 2 million+ years of hominid brain growth and development, the environment was roughly constant – in most cases for at least for thousands of years at a time. Here we developed 'pattern-recognition' systems of beliefs, the precursors of what economists today call 'correlation'. The human brain was exquisitely designed to favor correlation over causation. We did not evolve mechanisms to follow regimens like the scientific method because our species would have been systematically snuffed out by predators on the african savannah and a different species might be facing oil depletion. Our neural architecture was being built to adhere to correlations we observed in everyday life, because in these stable environmental timeframes, most correlations DID lead to causations. The periods of largest brain size increase in hominids were probably when some tribal leaders got good at noticing patterns and successfully made tools, or repeated routines that added fitness - these genes and thought processes then multiplied.

> *"The human mind evolved to believe in gods... Acceptance of the supernatural conveyed a great advantage throughout prehistory, when the brain was evolving. Thus it is in sharp contrast to [science] which was developed as a product of the modern age and is not underwritten by genetic algorithms."* The Biological Basis of Morality, E.O. Wilson

Our stimuli laden modern world presents us with millions of small sample size events that offer our built-in pattern recognition systems plenty of fodder for creating 'beliefs' in situations where the scientific method never comes into play. Our pattern recognition system is essentially misfiring in a world of too many patterns – "NFC wins Superbowl and stock market goes up" (I had clients investing on that one) – "I can't date guys who are Virgos" – 'Walk under a ladder with a black cat and get *really* bad luck' –'Your second Chakra looks a little weak today' 'The market will solve it' etc. We unknowingly conflate correlation with causation, a danger that is learned to be avoided early on in the career of a scientist. And overriding it all is the theme of relative fitness where we attempt to justify, through social persuasion, that our 'patterns' are the correct ones. The upshot of this tendency is that charisma, rhetoric, advocacy, and politics can all too easily trump the scientific method, just when our species will need it most to tackle climate change and the attempted transition to renewables. (Note: Scientists are humans too, and are not immune to these neural processes – clearly when they write and publish they are accessing the rational neocortex gray matter and take their time to get facts and figures right – but in everyday communication – once emotion gets involved, the built-in genetic priorities fall back on belief systems.)

Our individual constructs of reality are based on beliefs - some beliefs are changed by new

information, reflection, and analysis - others are virtually immutable. (Though my friend Thomas has a decent 'factual' understanding of Peak Oil - he may never incorporate it in the larger sense into his belief system.) From recent results of research into brain injury along with those from experiments on animals, we have begun to chart the neural processes active in distinguishing emotions, fantasies and facts. With fMRI and PET scans we can watch as a priest prays or a monk meditates or even when a person encounters new information that is discrepant with a prior held belief. On brain scans, meditative and transcendent states are in many ways similar to when a person experiences pleasures from sex, music or a good meal.(4) The very concept of the peaking and subsequent decline of oil - a vital resource to our lives that may become less and less available is a very difficult one to understand let alone accept. The 'knowledge' we obtain from scientific research on energy largely depends on how our brains interpret the evidence. These interpretations are subject to the same rules that govern our perceptions of reality - they are replete with generalizations, assumptions, misunderstandings and mistakes. By the time newly acquired knowledge reaches consciousness, each of us transforms it into something that fits with our own unique worldview. This process of reconstructing reality is the foundation from which we build all of our beliefs about our world.(4)

But sometimes, reality is not *reality*, even to ourselves.

> *Our time bomb is mysticism. It's delivery system is language. And it's hiding place? The unfathomable coils of our DNA*. Reg Morrison *The Spirit in the Gene(9)*

And finally we come to what (for me) is the most fascinating piece of the human neural puzzle. In the discount rate post last month, I pointed out that we have developed a 'triune brain', with the 3 layers representing the 3 main periods of our organismal development (reptilian, mammalian, neocortex regions largely corresponding to primitive, emotional and rational thought). However, the neocortex itself is split into two hemispheres, the left and right, separated by a thin straplike connector called the corpus callosum. Neurobiologist Roger Sperry states that patients who have the corpus callosum removed (split-brain patients) behave as if they have 'two separate minds, two separate spheres of consciousness…in regards to cognition, volition, learning and memory.'

Only our left brain hemisphere has a 'voice' for communicating with others – emanating from 'Brocas area', the speech control center of our brains. Any findings and opinions analyzed by the perceptive and intuitive right hemisphere must first travel through the left hemisphere before leaving our mouths as communication. If you've been following along, you might see how this might relate to Peak oil or climate change.

In a famous split brain experiment by Michael Gazzaniga at Dartmouth, a patient with his corpus callosum removed, was shown two large pictures – in front of the left eye – some snow – in front of the right eye, a picture of a bird's foot. Beneath each image were a series of smaller images, only one of which was related to the image above. When asked to point to the picture below that was linked to the birds foot, the right hand (left brain) correctly pointed to an image of a chicken. Similarly, the left hand (right brain) correctly chose an image of a shovel to relate to the larger snow image. When asked to explain the decisions, the verbally controlling left hemisphere offered the obvious explanation linking its own choice of a chicken to a bird's foot. HOWEVER, when asked why the left hand (right brain) had chosen the shovel (for the snow scene), the left brain replied that the shovel had been selected for cleaning out the chicken shed! Though our brains are not privy to their own internal workings, the left brain should have admitted it did not know why the right brain chose the shovel because it had *never seen the snow scene* –but instead it fabricated an answer to fit its own part of the story.(10)

Though most of us fortunately still have our corpus calllosums intact, new research is suggestive that the socially conforming and editing power of our left brains is powerful when dealing with pre-existing or strongly held beliefs, like 'we have plenty of oil', or 'the market will find a solution'.

Reg Morrison succinctly concludes the following:

> *"It seems our loquacious left brain cannot abide a vacuum. As it ghostwrites our right-brain narrative, it obsessively fills in any gaps and injects snippets of its own propaganda wherever it can. Here then is the source of the so called 'false-memory syndrome', and no doubt the origin of most of our mystic visions and spiritual fantasies...By endowing the human brain with its language facility, evolution has ensured that human genes will continue to bypass the cerebral cortex at will, disguising fact with significance and imagination into perceived fact"* Reg Morrison – *The Spirit In The Gene(9)*

## CONCLUSIONS

As humans, we have tendencies towards certain behaviours that can now be scientifically measured. While the neurosciences are still expanding and are now asking more questions than they have answered, it is clear that our minds are not entirely rational - providing us with 'facts' does not automatically guarantee we will use them to solve problems. Competing voices, both from within and without, can easily morph those facts into something different than the pure scientific form they originated in.

Our modern education system, from which arises the standard for our culture and the education of our children, is anchored by an archaic and incorrect premise: that knowledge can come from the human mind based on assertions that require no proof or verification. The origins of this error go back to ancient philosophers who were likely geniuses but did not have access to the real scientific data and physical methodologies available to us today. Many modern philosophers and social scientists still adhere to the fallacy that knowledge comes from thought. New evidence from the cognitive neurosciences is demonstrating that pure thought cannot spontaneously come from a brain designed for correlation, emotion and relative fitness. Special steps need to be taken to teach, understand and adhere to the scientific method, which in turn builds knowledge.

In the calm before the storm, we need to take stock in what our assets and liabilities really are. We have energy assets and liabilities and we have mental ones as well. As energy events conspire, and the average person becomes more stressed, we may distance ourselves even further from the rational aspects of our collective behaviour. Plans should be made ahead of time to address local, regional and national energy (and environmental) problems with hope but careful skepticism, for its unlikely we will get too many second chances. Robert Rapier and I share some viewpoints and disagree on others, but one thing I have always respected about him is his immediate skepticism of high claims. Whether he is an expert on a topic or a novice, he approaches a problem from a scientific, provable, verifiable foundation. If more of our countries civic leaders followed the scientific principles of 1)observe something in nature 2) make a hypothesis 3) test the hypothesis using physical methods and 4)repeat until statistically satisfied, we would find ourselves better served and better prepared for an era of energy declines. We must marry facts about geology and the environment with facts about our neural tendencies.

## THE BOTTOM LINE

1) Facts are important and we need to continue to analyze and accumulate them about the natural world. But knowing how our brain will respond to these facts is equally important.

2) Peak Oil is a geologic phenomenon. Global warming is atmospheric climate science. But the words that define them both also represent belief systems. Certain people will 'believe' they are real and others will not, largely irrespective of what future facts come to light.

3) Humans have been the most successful species on the planet. On a planet now full of humans, our neural tendencies to look for magic solutions will be a blindspot that needs to be acknowledged. Seeking causative forces through scientific methods as opposed to offering correlation as proof is an important step.

4) The stigma of determinism and fear of sociobiology needs to be discarded. The answers to the large scale human problems cannot be solved by facts and science of the outside world alone - we need to incorporate facts about who we are into the equation. The nature and nurture debate has raged for too long without meaningful synergy - there is no nurture without nature.

5) The mere recognition of our tendencies to react positively to authority figures, optimism, recent information, etc, gives our brain a neutralizing agent against these real human phenomena.

6)The motion picture "Homo Sapiens Sapiens" is nearing a climax. Lets collectively write a happy ending.

P.S. Though my conclusions may seem a little strong, I too am subject to the recency effect and *The Spirit in the Gene* and some articles on the scientific method were the last pieces I read for researching this piece...;)

## References and Further Reading

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