COMPLEX ADAPTIVE SYSTEMS

Insight respecting Individual and Organizational Evolution

bob mccue

Written between August 5 and October 2, 2006

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"The foundation of morality should not be made dependent on myth nor tied to any authority lest doubt about the myth or about the legitimacy of the authority imperil the foundation of sound judgment and action." Albert Einstein

Introduction[1]

As is the case with most of what I have written about religion in general, and Mormonism in particular, this essay was not designed to be read by other people. Rather, I wrote it for myself near the end of my roughly five year period of intense study of the question: "How could Mormonism, as a belief system and way of life, suddenly appear to me to be obviously false and pernicious after I had completely believed in it throughout my entire adult life, and literally built my life (marriage, family, career, etc.) on it?"

During the course of this study, I found many lenses helpful. In particular, social psychology and the study of the way in which cognitive biases influence individual perception and individual behavior within groups, was helpful. The history of religious movements, layered over my improved understanding of Mormon history, was also helpful. The last, widest and possibly most helpful lens of all, is what I have attempt to describe in this essay: the way in which the study of complex adaptive systems helps us to understand massive shifts in perception, as well as individual and group behavior, such as what I experienced. As it turns out, the same physical principles are at work in: a brain that suddenly perceives things in a radically different way; the formation of new galaxies; earth quakes; species extinction; and phenomena in the quantum world that are only coming into dim view.

What follows is culled from the notes I made just prior to, during, and following the Institute on Religion in an Age of Science conference I attended with my family during the summer of 2006, on Star Island, New Hampshire. The image on the front page is an iconic aspect of the architecture on Star Island – the lookout at the tiny island's highest point.

The conference topic was EMERGENCE: NATURE'S MODE OF CREATIVITY. These notes are part of my attempt to understand complexity theory and to digest what I had learned at the conference relative to the question I described in the first paragraph above.

So, how might different types of readers profitably use this essay? I have a few suggestions.

First, I note that the text under the first several headings below is almost completely dedicated to explaining the basic principles of complexity theory as they relate to complex adaptive systems. By time we get to "Phase Transitions", I have shifted toward the examination of examples (such as: the behavior of religious and other social organisms; individual belief or behavioral transitions; the evolution of intimate relationships; etc.) that we can learn about by thinking in complex adaptive systemic terms. Most of the remainder of the essay is dedicated to that.

There will be a few odd ducks like me who will find the science and complex systems stuff interesting. The first part of the essay will be interesting for them, as well as the technical references that are embedded throughout the rest of the essay. For most readers, that material will be so dense and boring that if they had to plow through it, they would stop reading. For this type of reader, I suggest skipping through the essay looking for stories or examples that encapsulate the most important complex systems principles I am trying to explain.

[1] This introduction was added in May, 2017, to what until then had been notes that were compiled for another purpose. It is hard to improve on the summary of complex systems theory, and SOSs in particular, that is found at http://www.calresco.org/sos/sosfaq.htm#1.1. What follows in this introduction borrows liberally from that.

For example:

- Phase transitions are explained by way of examples at pages 29-32. A phase transition is what occurs when: water suddenly boils; a landslide occurs; or the collective firing of neurons within the brain suddenly allows something that has been in plain view, but was suppressed by the need to remain comfortable with in a social group, to be perceived. Think of an abused spouse with no independent financial means who has always maintained that her husband is "good man who gets upset sometimes", and changes her tune to "He beats me and I'm am leaving him!" when an unexpected inheritance comes along. An understanding of the principles on which this happens within individuals and groups is crucial to understanding religious behaviour. Search "phase transition" to find other ways in which the term is relevant to various aspects of human behavior.

- The "edge of chaos" is explained by text and a diagram on pages 6 and 7. Examples of how the edge of chaos works are found on pages 21-23, and are scattered from there through the rest of the essay. Search "chaos" to find the bits that may be interest. The section on intimate relationships will interest many readers.

    - The edge of chaos is one of several important concepts for which we may thank the theoretical biologist Stuart Kauffman. It has to do with the complex system attributes that cause the most stable systems (rocks, or crystals, for example) to be inhospitable to life. The most chaotic systems (boiling water, for example) are similarly inhospitable.

    - Life, and the growth and creativity that come with it, is only possible at the "edge of chaos", where complex systems have just the right mixture of stability and chaos. Within that the narrow band of physical systems in which life is possible, the potential for growth and creativity increases as we move along the spectrum toward greater chaos, until suddenly (see "phase transition") we reach that point at which there is too much chaos, and the system begins to fall apart. Think of a marriage that needs to be "spiced up", until it becomes so spicey that one or both partners can't cope and they need to "settle down".

    - One of the many important ideas with respect to the edge of chaos is that as individuals, we are unlikely to be able to find those niches within our world in which the most satisfying personal growth is possible, given our individual quirks, as long as we remain embedded within conservative social organisms, such as Mormonism, that are designed to prevent individual growth that will reduce individual willingness to continue to give massive amounts of energy and other resources to the social group.

    - Another important "edge of chaos" idea is that our biological and social worlds continuously evolve. Each organism, whether individuals such as each of us, or social organisms such as Mormonism, must remain sufficiently connected to their evolving environments in order to extract the energy they need to survive. The most conservative social organisms – and Mormonism is within that group – are at risk of extinction because they consciously evolve as slowly as possible, and restrain the evolution of their individual members, in order to maximize the energy they extract from those members. In this Internet fueled world, social

evolution is occurring more rapidly than ever, and therefore the risk of organizational death for slowly evolving social organisms is higher than ever.

- The "adjacent possible" (again, thank you Stuart Kauffman), is the idea that within biological evolution, a fish does not suddenly become a bird. See pages 17 and 18 for the way in which this idea explains my evolving beliefs on the way out of Mormonism. Search "adjacent possible" to find the concept used within easily digestible examples.

    - The essence of the adjacent possible is that the way in which genetic evolution occurs means that fish gradually evolve the ability to survive on land, and eventually their descendants – other species that were unimaginable as we looked at fish – gradually evolve the capacity to fly. Think of ostriches, for example.

    - The same sort of thing occurs in the evolution of social organisms, and the behavior of individual human beings. For example, it is extremely unlikely that a faithful Mormon will evolve in one step into an "amoral" atheist. The adjacent possible, in terms of belief and behavior, for a faithful Mormon, are much more likely to include metaphoric Christianity, Buddhism, etc. However, after spending some time in the metaphoric Christian camp, another set of adjacent possible beliefs and behaviors will open up. Some of those might even seem amoral from the Mormon perspective. And so it goes.

    - It is impossible to predict where of this process will end, as perspective changes in what with the benefit of hindsight will seem to be a reasonable fashion.

Hopefully, this taste of ideas will provide some readers with a reason to poke around in the material that follows.

I will conclude this introduction with a reference back to the Fulghum and Einstein quotes at the beginning of the essay. I did not have either/or in mind when I used them. Both are accurate, as well a deeply insightful. I will repeat them here to avoid the need to flip back:

> "I believe that imagination is stronger than knowledge - myth is more potent than history - dreams are more powerful than facts - hope always triumphs over experience - laughter is the cure for grief - love is stronger than death." Robert Fulghum

> "The foundation of morality should not be made dependent on myth nor tied to any authority lest doubt about the myth or about the legitimacy of the authority imperil the foundation of sound judgment and action." Albert Einstein

At one time, I regarded the "truth" of these statements as a fascinating paradox. In part through my study of complex adaptive systems, I've come to see in them the pedestrian operation of human systems.

I certainly will not attempt to provide the last word with regard to these powerful statements, while noting that Fulghum poetically and accurately describes short-term human belief and behavior. However, if these day-to-day beliefs and behaviors are plotted over generations, we would see in their often radical ebbs and flows, precisely the type of phase transitions complex adaptive systems theory would predict.

Fulghum, unsurprisingly, does not mention this broad context, because it is precisely this perspective that is suppressed by the brains of the people who are most comforted by, and hence attracted to, what he has to say. Most people believe that their myths (not called myths, of course) are unchangeable descriptions of reality. This is the short term, micro perspective that dominates the thought and behavior of most individuals, and supplies much of the glue that keeps social groups intact. The more conservative and resistant to change the group, the more important is this glue. The essence of the glue is found in the cognitive biases that social psychologists such as Daniel Kahneman have so beautifully elucidated.

Einstein, on the other hand, speaks to principle from the macro perspective. Without specifically mentioning them, he is clearly referencing the phase transitions in human belief and practice that mark our history, and asserting that our social foundations should be constructed on something more reliable than the tenaciously held beliefs that, over time, regularly and radically change. He does not specify where we will find that more reliable foundation. And I will stop there, because to attempt to deal with that question would open an entirely different topic that I have addressed elsewhere, at length (of course) and expect to ponder for the rest of my life.

Complexity Theory in Context

Complexity theory – and particularly the part of it that applies to self organized systems (SOSs) or complex adaptive systems (as SOSs are sometimes called) – is a particularly powerful explanatory paradigm.

Questions about how and why nature is organized fascinate humankind. Observations of nature, and theories to explain those observations, gave us religions of many kinds, proto-science, and science.

One of the basic questions is, "Why is there not more variety?" That is, the forms we observe in nature are only a small sub-set of those theoretically possible. The answer to this question seems to be found in the order that gives rise to the forms we observe.[2]

Many natural systems produce similar kinds of form or organization (e.g. galaxies, planets, chemical compounds, cells, organisms and societies). Traditional scientific fields attempt to explain these features by reference to the laws applicable to their component parts. Gravitation and chemical bonds, for example, are used to explain many forms. This is a kind of micro analysis. The study of complex systems is an attempt at macro analysis. That is, instead of looking for explanations for the form of individual parts in the details of a system, the study of complex adaptive systems examines overall system characteristics that many different types of systems have in common, to explain a wider variety of forms. This pattern finding exercise has disclosed the same basic form within every level of physical reality, from the cosmic through the planetary, geological, biological, chemical, atomic and quantum. I was in a state of awe that I at one time only associated with religions phenomena as this stunning picture gradually came into focus for me. I remain deeply grateful to the scientists at the IRAS conference who gave me this gift.

In both micro and macro scientific analyses we tend use a process resembling what is depicted below.

[2] See Stephen Wolfram, "A New Kind of Science" at http://www.wolframscience.com/ for a monumental treatment of the work currently being done in this field.

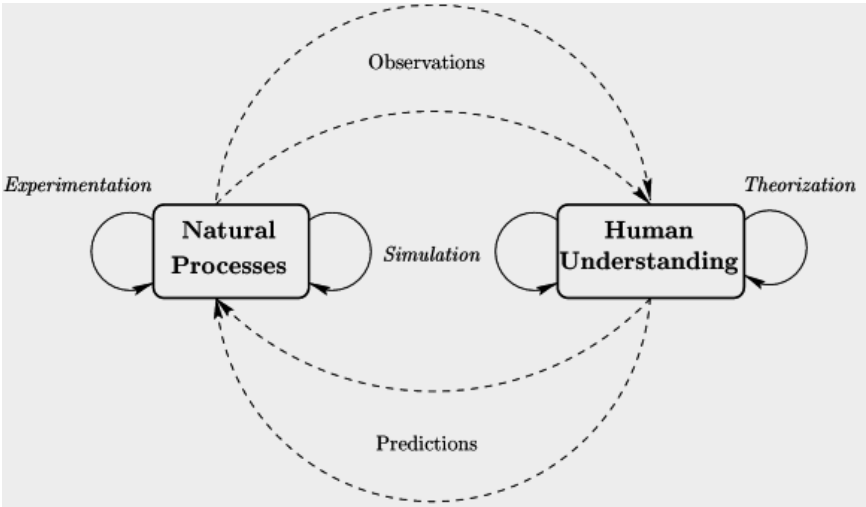


Figure 24.2 The universe of natural processes related to scientific understanding

We face time and scale problems when attempting to study many natural systems. That is, the scientific study (ie. study based on testing and falsifiability) of any phenomenon requires time scales appropriate to the phenomenon in question. This for the most part restricts our studies to qualities that are reproducible in laboratory conditions. We can reproduce certain chemical reactions, for example, and hence study many of their aspects in detail. However, the study of cosmology, or even geology and sociology, is much more difficult because the processes we are attempting to understand cannot be replicated in a laboratory or other kinds of precise experiment. Complex systems theory deals with this by modeling the phenomena in question using computers, while acknowledging that models are not reality. Given the nature of the part of reality in question, models are the best we can do.[3]

Mathematics is a language that can describe (approximately, at least) most aspects of reality with which we are familiar. We can create mathematical models of dynamic, non-linear[4] systems that produce results that resemble what we observe with regard to phenomena like weather, financial markets, biological evolution, etc. We can run computer simulations to test the results produced by the model against our observations of the real phenomena. In this way we are able to explore many starting positions and combinations of system variables, and analyze the patterns that result.

Even small systems have almost infinite initial options, so even with the fastest computers currently available we can model only a small part of the possibilities. Yet this is often enough to produce unexpectedly insightful outcomes and generate new theories regarding the nature of complex systems that can be tested through traditional scientific means.

[3] See Joshua Epstein's thoughts on this topic at http://www.econ.iastate.edu/tesfatsi/Epstein.ABMIntro.pdf#search=%22%22joshua%20epstein%22%20brookings%20agents%22, and http://www.pupress.princeton.edu/titles/8277.html.

[4] See http://en.wikipedia.org/wiki/Dynamical_system.

What is an SOS or CAS?

Self organizing systems (SOSs) and complex adaptive systems (CASs) are terms that are for the most part used interchangeably. I will use SOS.

SOSs tend to be balanced on the edge of chaos, to use Stu Kauffman's term. That is, SOSs occupy a part of complex systems space that is on the border between the more ordered and more chaotic of those systems, as illustrated below in the space labeled "complex".

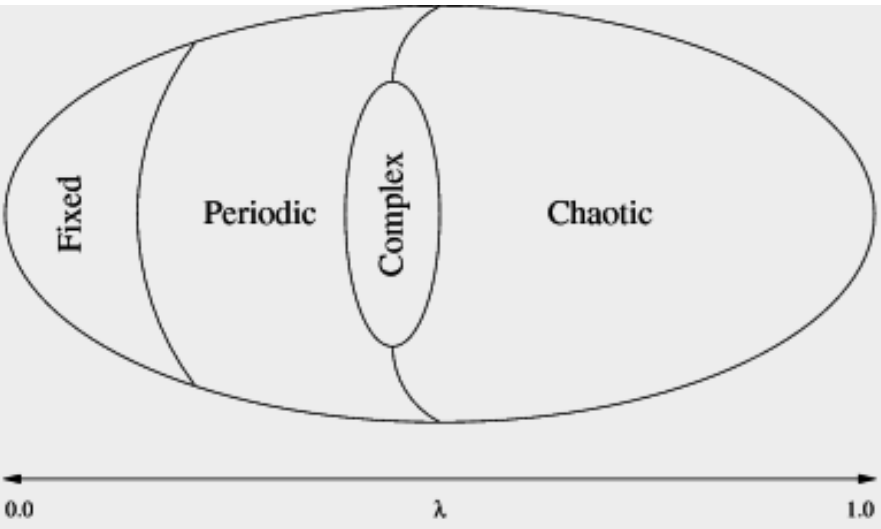


Figure 15.9 Langton's schematic representation of CA rule space characterized by the λ parameter

This straddling of order and chaos produces the "whole is greater than the sum of the parts" phenomenon that is at the heart of emergence, and the capacity to stay sufficiently connected to a changing environment in order to survive. Here we find life's dance.

The study of SOSs looks for general rules that govern the growth and evolution of systemic structures.

Aspects of SOS structure often appear without influence from outside the system. That is, some of the main constraints on form (i.e. organization) are within the system. These result from the interactions among the system's components. The system structure sometimes evolves and at others is stable.

The main current scientific theory related to self-organization is Complexity Theory, which can be summarized as follows: Critically interacting components self-organize to form potentially evolving structures exhibiting a hierarchy of emergent system properties.

The elements of this definition[5] relate to the following:

- Critically Interacting – SOSs are information rich and have elements of both order and chaos;
- Components - Modularity and autonomy are both involved;
- Self-Organize - Attractor basin structure is generated by contextual interactions;
- Potentially Evolving - Environmental variation selects attractor characteristics;
- Hierarchy - Multiple levels of structure appear;
- Emergent System Properties - New features appear and require new vocabulary

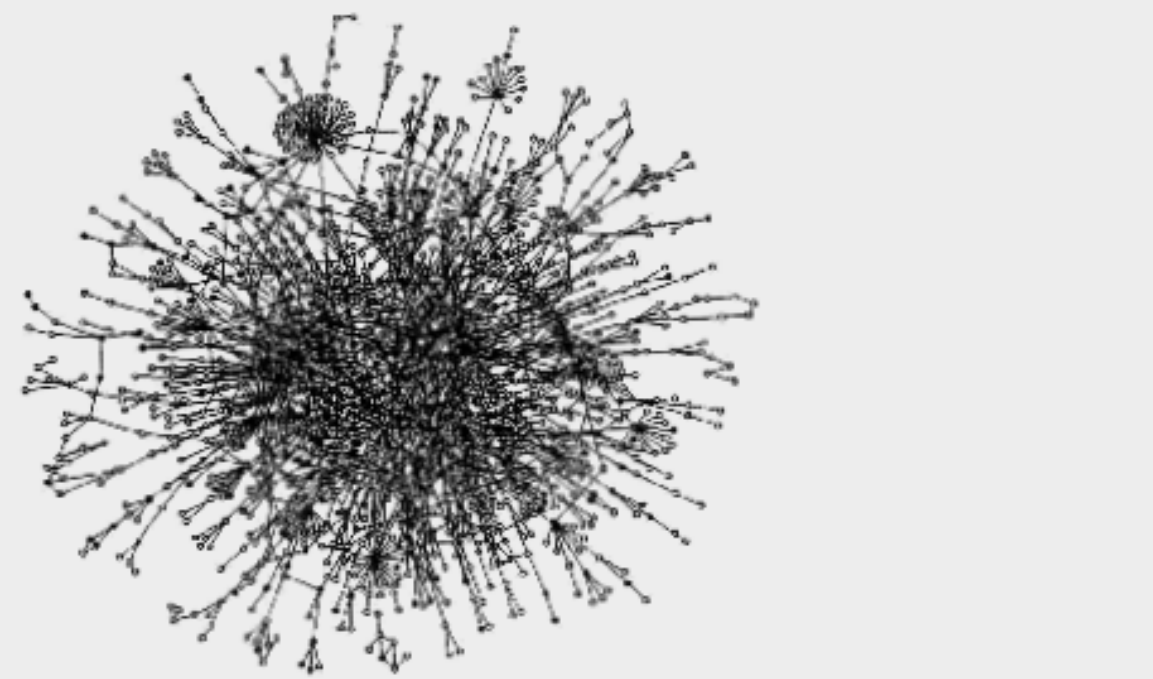
With that background, let's move into some examples of how an understanding of SOSs and complexity theory can be used as a basic explanatory paradigm for many aspects of life.

I am consciously extending complexity theory beyond its borders in much of what follows. This can be thought of as the proposition of hypotheses for further study, as well as a mythology[6]. Mythologies have always been ideas about what is real, but not testable, and that are consistent with our basic beliefs about reality. As a methodological naturalist[7], I restrict my beliefs as to what is real by the probabilities that can be reasonably inferred from scientificly verifiable knowledge. Hence, I accept the explanations offered by complexity theory for many social phenomena as the most likely to be correct of those we have to work with, while admitting that they are speculative to some degree. My beliefs in this regard fit the classic definition of mythology. This is a scientific or naturalistic mythology in the sense that it attempts to be consistent with science and naturalism.

The Universal Diagram[8]

Imagine a typical diagram of the interactions between agents within a complex system such as the one below[9].

[5] See http://www.calresco.org/sos/sosfaq.htm#1.1 for a discussion of these terms.
[6] See http://en.wikipedia.org/wiki/Mythology.
[7] See http://en.wikipedia.org/wiki/Naturalism.
[8] A special thanks to Guy Hoelzer for the Universal Diagram, Traffic Analogy and several of the other concepts that follow. He spent several hours on the porches at Star patiently tutoring me, and provided me with a number of useful metaphors on which many hours of my previous reading was immediately hung.
[9] From Philip Ball's "Critical Mass". A number of the diagrams and concepts that follow come from Ball's book, which I highly recommend. It is the single most useful source I have found in terms of understanding how the physical science of complexity might be carefully applied to the social sciences.



16.6 A part of the yeast metabolic network. The vertices are molecules either supplied to or manufactured by the network, and the links (edges) are defined by the enzymatic chemical reactions that convert one molecule to another.

The nodes on graph are agents or organisms – like individual humans, or ants, or molecules. The lines are connections over which energy, information etc. flow between agents.

As Guy Hoelzer puts it, we can think of all reality as being composed of nothing but things and processes that define the interaction between things. But when you look at any one thing carefully, you find that it is also composed of smaller things and that those smaller things interact with each other within a system that is the larger thing.[10]

For example, start at the lowest possible level – say quarks – and draw a graph showing how the quarks relate to each other. Then, stand back and look for clusters. These are often other "things". We then treat those as agents and draw a graph that shows the communication among them. Then again, stand back and look for clusters. Atoms? Molecules? Etc.

We can do the same for cells, individuals, social groups, ecosystems, the Earth, the solar system, galaxies, the known universe and countless other "things" and "processes" in between. We end up with a set of nested, multidimensional systems within multidimensional systems. Our graphic illustration of the concept helps to understand what is going on without accurately describing it.

[10] Interestingly, this is precisely the way in which Alan Watts and others teachers of Eastern worldviews present the big picture of reality. We are a part of the whole, which is itself The Divine. A number of people have attempted to correlate both Eastern and Western religious or philosophical ideas with the best social theory current has to offer, and have found that the Eastern approach fares well in this analysis. See Marvin Levine, "The Positive Psychology of Buddhism and Yoga" for example.

We can analyze each system in isolation to a degree. But some effects at very low levels ripple a long way up, or at high levels ripple a long way down. That is, we are dealing with a single integrated system.

For example, changes in large scale patterns of social behavior can start with a neural tipping point[11] caused by one bit of information within one brain, and the formation of important patterns of neural connections can be triggered by a small change at the societal level. It is all one massive system. There is connectivity – if not turtles – all the way up and down.

How Patterns Form in Complex Systems

The definition of "agent" relative to "system" as we work up and down the universal diagram works on the basis of information flow. That is, there is lots of information flow within agent, and relatively little between agent and the system that contains it – its environment. Think of information flow within a cell v. inter-cellular communication. Or information flow within a human individual v. between members of a social group. Or information flow within a small social group (like a religious congregation) v. communication with other groups.

Boundaries between agents and systems, and between attractor basins within systems, are areas of low information flow – a kind of membrane created by an absence of information. These information differentials create differences between the properties of agents and hence different behaviors between attractor basins. Think of the behavioral differences between the Danish and most Muslim Arabs in the Near East.

Attractor basins are often the product of conditions and histories that cause a certain type of relatively consistent behaviour among agents, like the weather patterns in the Artic v. the US Gulf Coast, or Federal voting patterns in New England v. Utah. They can be imagined as the basins between peaks on a graph like that found in the figure below.

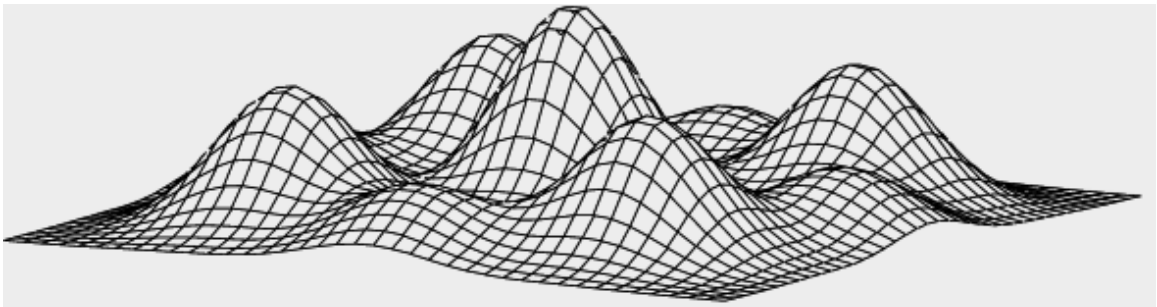
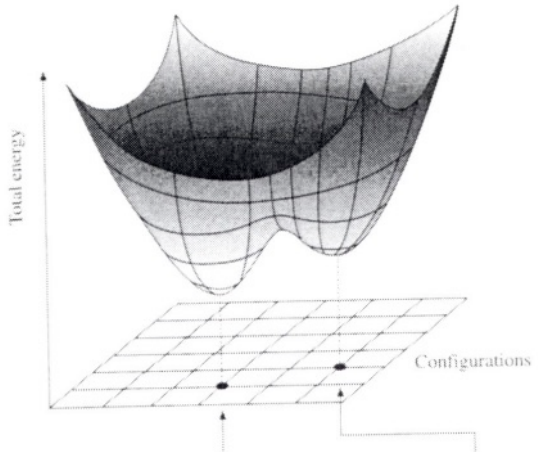


Figure 20.2 A two-dimensional function to maximize

[11] A colloquial term for what is often a phase transition.

A particularly deep ideological attractor basin might looking something like this:



Attractor basins create clustering that could lead to something that would be defined as an agent at a higher order of analysis in the universal model. Think of individuals clustering into religious groups. Religious groups are organisms of a sort that can be depicted as nodes on a graph illustrating how religious groups interact.

The kind of three dimensional representation shown above and others that follow are crude models of our partial understanding of how reality works. For example, landscapes of the type depicted above have been used to understand how biological evolution works. There is a huge number of variables that influence biological evolution. The relationship between these variables is non-linear, thus creating the kind of system that complexity theory helps us understand. Since we can't visualize more than four dimensions, those many variables are collapsed into three and depicted as a three dimensional landscape. A fourth dimension is added by showing how the landscape changes over time.

For example, if the landscape changes so that trees darken due to soot during the industrial revolution, the basin that once comfortably housed white moths hiding on the bark of light colored trees would turn into a hill as the moths find themselves being devoured by birds in the chaos between attractor basins. Many religious literalists are now going through something that to many of them seems similar. This causes them to react violently in some cases.[12]

We recognize that our models do not capture reality and are in most cases crude caricatures of it. And when trying to visualize and hence understand how those models work, we further simplify them relative to the reality they attempt to describe as we reduce many dimensions into three or four dimensions. It is important not to lose sight of the relatively tenuous connections between our models as we graphically represent them, and the reality we are attempting to understand.

[12] See Karen Armstrong, "The Battle for God".

That having been said, Guy Hoelzer used the following thought experiment to help us visualize the kind of results produced by the computer model that was the center piece of his lecture.

Imagine a world where the decision as to whether we will drive on right hand side or left hand side of the road has not been made. The first day we drive out onto the road, we will make our decision as to which side to drive on based on our first few interactions. If two of the first three cars we encounter are driving on the right hand side, we will do the same.

If the environment is the same in all directions (same number of cars per square mile, same pattern of roads, etc.) pockets of left or right side driving would develop by random chance, with areas of turbulence between them as drivers transition from one way of doing things to another. Guy's model showed that random variation is enough to cause this patterning, just as is the case with Bernard cells[13].

In a "real" environment where there are variations in how many cars there are in different places (cities v. rural areas, for example), how the roads are patterned, histories with regard to left or right handed driving habits, etc. traffic would be influenced by more than chance. But still, it would go one way in some places and the other in others. Sparsely populated regions would be turbulent and hence dangerous, and clear boundaries would reduce turbulence, as is the case between England and the rest of Europe.

The need for safety and proximity to other drivers in densely populated areas creates an "attractor basin" that causes a consistent behavioral pattern based on lots of information circulating within the basin. The disorder between attractor basins is a function of the relatively small amounts of the information (and hence its lack of pattern) in circulation between the attractor basins.

The degree of similarity within attractor basins in complex systems forms a "fractal"[14] pattern. Fractals have information carrying capacities and other characteristics that are important components of complex systems. Hence, one of the ways to determine whether a particular system is likely complex is to look for fractal patterns.

In sociological terms, we can think of the relatively ordered patterns that represent different religious groups as intellectual or social attractor basins (as well as often physical attractor basins since people with similar beliefs and other social characteristics tend to group together[15]) that display a particular order in a landscape that is characterized by different kinds of order or disorder. Human cities (as well as ant hives and other biological forms) spontaneously form on this basis[16], with certain kinds of business and industrial sectors grouping together (the shoemakers here, the silk merchants there, etc.) while residential neighborhoods tend to be dominated by ethnic and other social groups as long as they perceive themselves to be distinct (Italians here; Chinese there; Jews across town; etc.)

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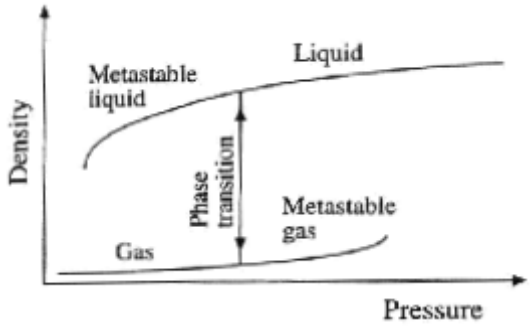
[13] Patterns in boiling liquids.
[14] See http://en.wikipedia.org/wiki/Fractal.
[15] See http://mason.gmu.edu/~mmakowsk/AccidentalAtheist.pdf#search=%22iannaccone%20accidental%20atheist%22.
[16] See Steven Johnson, "Emergence".

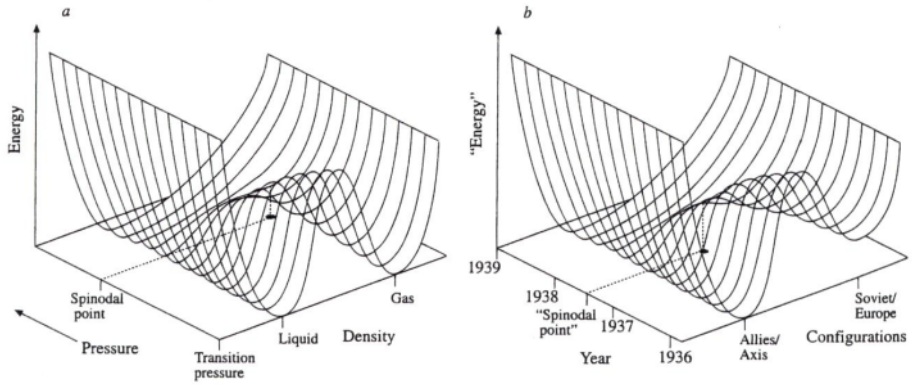
Phase Transitions

A "phase transition"[17] occurs when the state of a system changes radically, as indicated by the diagram below.



13.6 The first-order phase transition between a liquid and gas (evaporation or condensation) can be induced suddenly by only a slight change in pressure. Each state can persist metastably beyond the transition point, until the branch ends at a spinodal point (see page 292).

In this case we are dealing with a change from liquid to gas that suddenly occurs as certain combinations of temperature and pressure are reached. Another depiction of the same process is as follows:



12.5 At a spinodal point, the less stable of the two possible configurations of a fluid (the metastable state) vanishes (*a*). Something analogous happens in the landscape model of national alliances between 1936 and 1939: history seems to pass through a kind of spinodal point at which the anti-Soviet alliance ceases to be viable (*b*).

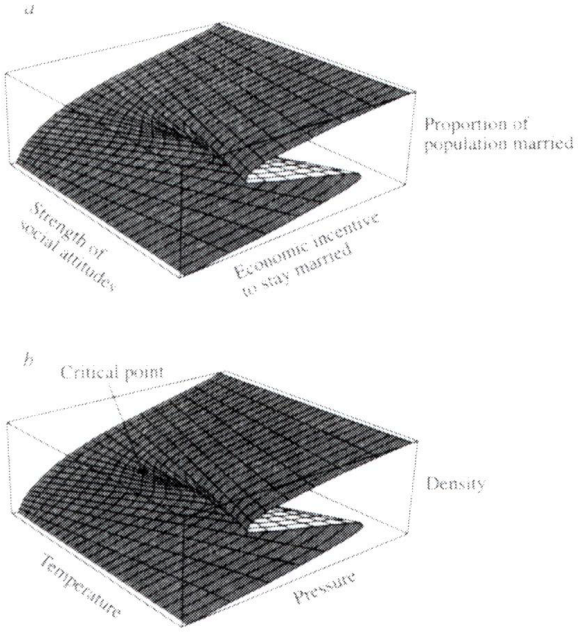
The same concept can be applied to Guy's traffic flow example as follows: Gradually increasing traffic flow in the relatively "empty" chaotic state between cities would eventually produce a systematizing of traffic flows there. This change would likely be sudden, even though traffic

[17] See http://www.calresco.org/sos/sosfaq.htm#3.4.

flows increased slowly and steadily. This can be thought of as a movement from one attractor basin (dominant pattern of behavior) to another.

Or how many Italians would have to gradually move out of an Italian neighborhood before it lost its "Italianness" and there was a flood of non-Italians into the area?

Similar patterns have been observed with regard to divorce rates, as indicated below.



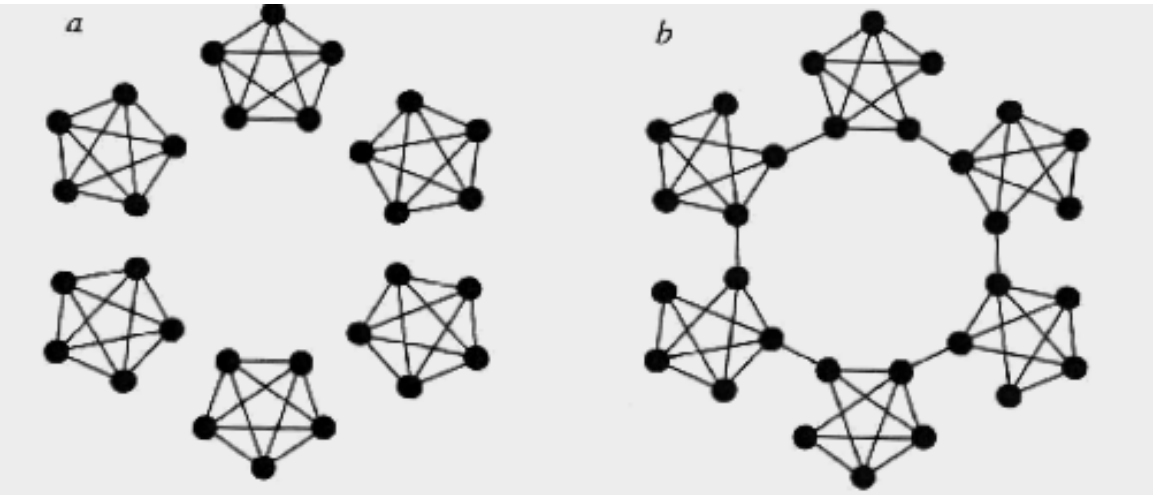
13.8 The dependence of the marriage rate on *both* of the factors in the model—social pressures and economic incentives—can be represented as a surface in a three-dimensional plot (*a*). This surface has a fold: outside the fold, a given set of social conditions allows for only one state of the system, while inside the fold there are two possible states. The fold ends at a kind of critical point. Exactly the same behavior is found in the dependence of the density of a fluid (liquid or gas) on its temperature and pressure (*b*).

A phase transition on an energy landscape[18] would be shown by an attractor basin leveling out or changing into a hill, and the agents formerly held by it shifting to one or more other attractor basins.

To continue our traffic analogy, a phase transition could occur in a "right side" town if people from "left-side" towns started moving in, and over the course of a period of time came to dominate the place, then occasionally started to drive on the left-hand side in their own neighborhoods or on special "left-side" occasions, and eventually changed the driving habit for the entire town as a show of political force (or whatever).

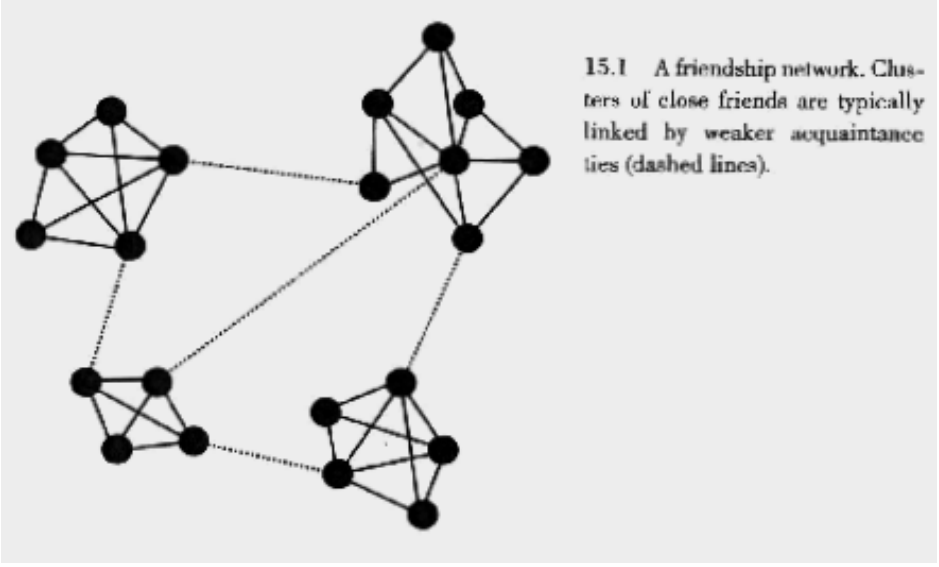
[18] See the "mountain-like" diagram above.

For example, consider the following possible ways of configuring the flow of information within a group.



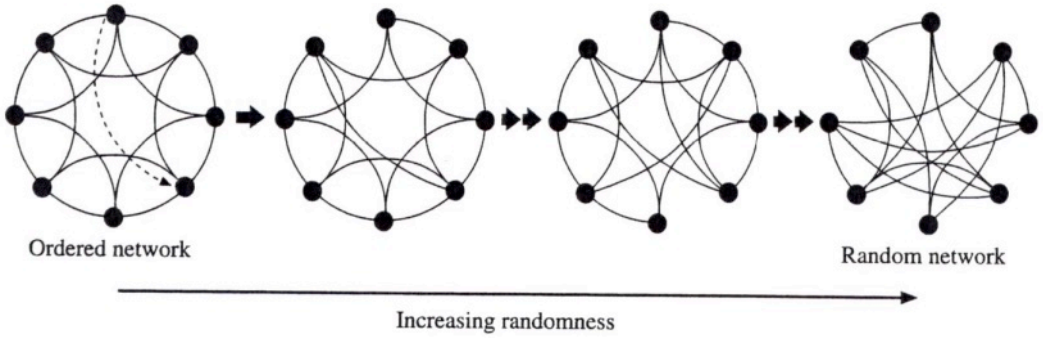
15.6 In the "caveman world" (*a*), people form social clusters that are closely linked internally but are isolated from one another. Even if this graph is made fully connected by linking the "caves" (*b*), the characteristic path length is long.

This illustrates the relatively disconnected structure of primitive, or inefficient, communications systems. As systems become more developed and robust, their form changes to something that is more interconnected, like this:



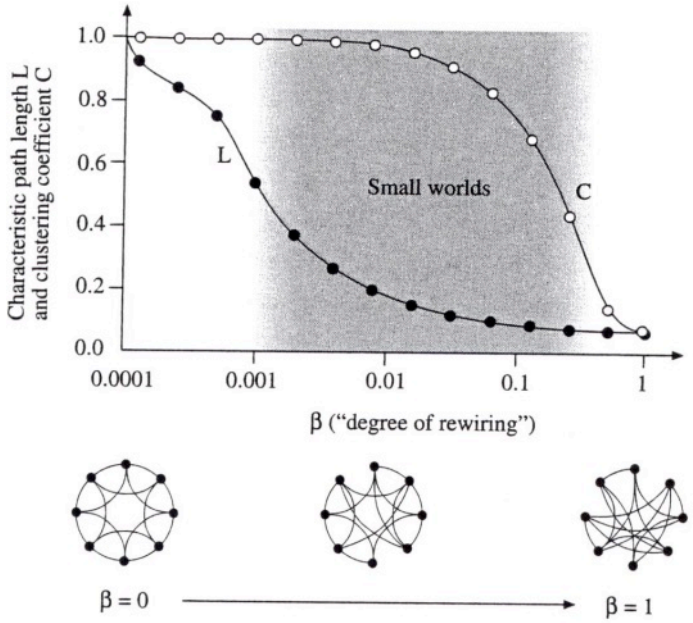
15.1 A friendship network. Clusters of close friends are typically linked by weaker acquaintance ties (dashed lines).

Communications networks can be understood in terms of their degree of orderliness v. random (chaotic) organization. This is one way of determining whether a network is likely SOS. If it is too random (chaotic) or too ordered, it will not have the SOS pattern. See the different networks below, for example.



15.7 Random rewiring of a ring of vertices gradually converts an ordered graph into a random one. Somewhere between these two extremes lies the small world.

This illustrates the transition from an ordered network or system toward a chaotic or random system. The effect this change has on the average length of communications links, and hence how efficiently and quickly information should flow within the system, can be illustrated as follows:



15.8 The characteristic path length L and the clustering coefficient C for a rewired ring graph change rather abruptly as rewiring proceeds. The quantity ß here is essentially a measure of the extent of rewiring. Notice that the horizontal axis has a logarithmic scale, which means that small values of ß are "stretched out." This is so that it is easier to follow the changes in L, which happen mostly in the first few rewiring steps. L and C are both large in the ordered ring graph and small in the random graph. But they do not both change at the same stage. Graphs with large C but small L are small-world graphs.

That is, as random communications links are added little seems to occur for a while in terms of the average length of communications links between agents within the system. And then the average length suddenly plunges. This represents a phase transition from a communications perspective since each agent has access to much more information from other parts of the system. This would often cause a social phase transition as well. See my comments below under the heading "SOSs and Social Phase Transitions" for more on this topic.

In social groups, deep attractor basins often become high mountains after a phase transition. Think of the anti-military attractor basin that resulted in Japan after WWII. And it is common for former literalist religious people who have rejected their inherited beliefs to feel near allergic to certain kinds of religious discourse or behavior. Those who have interacted with Benton Stidd and me on the IRASRN listserve will know what I mean.

The collapse of an attractor basin causes the agents formerly in that basin to roll into one of the adjacent basins, thus giving us the idea of the "adjacent possible". That is where an agent has some chance of ending up as her dominant attractor basin changes. This idea can be used to think about what is likely to happen to an individual as her beliefs change in a landscape of alternative religious beliefs and communities with which to associate, or how a religious institution or organism is likely to change as the political, information and other aspects of its environment change.

The relationship between the individual and her attractor basin is unique. That is, the Mormon attractor basin for me was different than it was for other Mormons. In some cases those differences would be minute, and in others they may be huge. The landscape models we use to try to understand how religious communities work are hence representations of the relationship between particular individuals and their religious communities, that are aggregated into an average that should be thought of as representing a probability distribution. The nature of the probability distribution will be a function of the nature of the group. Some tolerate more diversity than others, for example.

My case is instructive. My life used to be deep in a Mormon attractor basin. As a combination of information and personal events leveled that basin out for me, I first rolled into an adjacent basin that used a form of New Age mysticism, Intelligent Design and other concepts to make sense out of the world. But this was a relatively shallow basin since my experience with Mormonism gave me an intense allergy to deep ideological basins[19] of most types. These would be represented by hills in the landscape. As I got to know my new attractor basin, it too fell apart. But it had served me well since from it a variety of other attractor basins – new adjacent possibles – were within reach that were not in the set of adjacent possibles from my Mormon basin.

This kind of analysis brings a number of useful concepts into focus. For example, it illustrates why we should not expect religion to be monolithic in its effect on people. My attractor basin related to religion, and set of adjacent possible attractors, is a unique reflection of me – my genes, historical interaction with my environment (Mormon and other), etc. This landscape and my place on it is a function of countless prior emergences out of the many interconnected complex systems that comprise and affect me. So the Mormon attractor basin for me is different than it is for anyone else, and while there are some powerfully predictive patterns in that attractor that at some point will likely be relevant to most Mormons, its ability to hold me (or

[19] Most of these are dogmatic basins.

not) should be expected to be different than for other people. Another way to think of this is that Mormons will be more like each other than they will be like Muslims, but there is still a large range of different kinds of Mormons, and hence Mormon environments. Guy Hoelzer showed us that random variation can account for the kind of patterns we see in nature. Hence, we should not be surprised that in social settings where things like geographic separation, differences in host cultures (urban New York circa 2006 v. urban Berlin circa 1935 v. rural Utah anytime, etc.) are taken into account, radical differences between Mormon communities and individuals are possible. And these not only affect the nature of particular Mormon attractor basins, but also their sets of adjacent possibles.

For example, what might be attractive to a Mormon living in Tokyo or Montreal as a possible alternative to Mormonism may repulse most Utah Mormons. And as Mormonism continues to emphasize practice over belief[20], the Mormon range of belief will continue to widen and eventually this will result in Mormons tending to think more for themselves and ceding less control to Mormon authority.

This analysis draws our attention to the kinds of personal factors that tend to result in the collapse of attractor basins related to religion. Among the important of these are the behaviour of a person's closest half dozen or so associates, her access to information that disconfirms the religion's truth claims, her personality (and particularly her openness to new experience and tendency to need to know where things come from and where they are headed), and the appearance in her life of emotionally moving experiences that highlight the religion's shortcomings such as falling in love with someone who does not accept the religion's beliefs or practices or experiencing first hand the negative effects of dogma (like being, or being close to, a gay person in a fundamentalist religious group).

Agents and Systems; Giving up the Adjacent Possible

As noted above, at any given level within the universal system[21], agents must be simple relative to the system of which they are part. And agents invariably give up some properties in order to give the system it's higher order properties and hence ability to process information and create new orders of various types. That is, the agents must give up some of their adjacent possibles to create the system.

For example, fathers and mothers often give up the chance to pursue other relationships and/or career opportunities in order to parent children; members of military alliances or trade unions or business partnerships agree to do, and not do, certain things thus giving up part of their adjacent possibles in return for being able to tackle projects together that they could not undertake on their own.

The physical laws that determine how energy (and information) flows from one part of a system to another seem to have analogies that run from top to bottom of the physical and social worlds. For example, think of how economies become more productive through specialization. At a subsistence level, a human group of a few families could provide for all of their needs – raising food; creating shelter; protecting against certain risks. Agricultural practices eventually made it possible for a few members of the group to produce more food than the group needed, freeing

[20] That is, as long as you attend, do what you are told, pay tithing, and don't talk about your beliefs that conflict with Mormon orthodoxy, we don't care what you believe.
[21] We tend to think of each level as a separate system, such as human societies for example.

up human energy for other tasks. But no one forces us to live differently than our hunter/gatherer ancestors did, and in fact some people choose to live that way. However, most of us specialize given the chance to do so. Hence, I might focus all of my attention on making ever more useful and attractive shoes, rely on others to produce food, and trade my shoes for their food. By using my time and energy to learn to produce shoes I have given up the chance to farm my own land and become self sustaining – I have given up an "adjacent possible" and so have traded the chance to be independent for the chance to integrate with a larger, more complex, more powerful, community. As a result, I know more about less. On my own, relative to my environment, I am "dumber" as is clear in my case each time I return to the farming and ranching environment in which my ancestors thrived to help with calf branding. But the collective economic power of my group radically increases as we develop complementary knowledge and abilities. We also become dependant on each other, and as Jared Diamond has chronicled[22], these dependencies can cause social orders to collapse in unexpected ways. The more substitutes and other forms of redundancy we have in the system, the less likely system collapse will be.

The selection and competitive pressures of biological evolution pushes biological systems toward a fine balance between overall system complexity and power and the redundancy required to make the systems resistant to failure when attacked by disease or other deleterious forces. For example, the universal diagram above approximates the pattern of most metabolic systems as well as the Internet and most other spontaneously created human communication structures. And there is a lot of evidence that other important aspects of human social groups evolve toward a similar state for similar reasons – the need to balance the capacity to produce certain kinds of goods and services in the most efficient manner possible against the need to withstand certain kinds of shocks to the system. The Internet is a good example. Its structure illustrates a near ideal balance between the efficient transmission of messages and protection against the failure of even quite a few communications links.

Social rules tend to reduce the decision making scope of individuals. Think of rules that direct young people into shoe making instead of farming or nuclear physics; that cause us to drive on the right side of the road instead of the left; that cause us to tend to agree with our dominant social group regarding religious, political, environmental etc. questions. These rules all prune our adjacent possibles. Denial, lack of consciousness etc. help to hold these rules in place by allowing us to maintain the illusion that we are more self-conscious and self-determining than the objective consideration of our behaviour indicates us to be. Thus denial and the complex of cognitive biases[23] and other mechanisms that contribute to it prevent us from knowing how much freedom we have in social contexts, thus simplifying behavior, thus making complex social interaction possible. Denial is hence adaptive to a degree from the perspective of the social organism if not the individual.

And as is so often the case, system characteristics that developed for adaptive reasons are used within the system for exploitive purposes as well. As long as the adaptivity of the trait outweighs its dysfunctional uses, it will survive. Hence, cheaters, free riders and parasites of various kinds take advantage of the human tendency to be influenced by social authority and other cognitive biases. We see the same behavior in this regard in the business, religious and other communities. Because of the privileged place religion occupies in our social groups, it is exempted from many of the rules that restrain immoral behavior in other spheres. This is part of

[22] See "Collapse".
[23] See http://en.wikipedia.org/wiki/Cognitive_bias.

what several recently published high profile books have criticized about the religious aspect of modern society.[24]

Rule structures are required to restrain cheating, parasitic behavior. Rules, mores etc. of this type are a form of group wisdom. Democracy exemplifies this in the way it restrains the exercise of power, as do the securities laws that require "due diligence" and "full disclosure"[25] before shares can be sold the public. As noted above, rules of this type are not applicable to religious institutions and their sales practices.

The more energy there is within a given social system, the more rules (the more giving up of the adjacent possible; the more agent cooperation) are required to maintain it. More people, more wealth, more consumption, more technology – all lead to an increase in the amount of energy within a social group. The human energy on planet earth is rising. We will need more ordering principles to sustain the pattern that is human society. These may include new international laws like those that were recently put in place to form the European Union or to deal with the hole in the Ozone layer[26]. Others may take the form of the kind of social order that has made crowded places like Japan and India function for many centuries. And we may invent new rule forms by combining Eastern and Western ideas, or creating new ones. The most recent data collected regarding the rising generation in the Developed world[27] indicates that its values regarding work (less), consumption (less), respect for institutional authority (less), concern with regard to the environment (more) are quite different from their parents'. For the most part, this shift in values indicates that the ordering principles we need are in the process of forming. However, as KKR emphasized, while it is important that we do all we can, that may be too little or too late.

Examples of Self Organizing Systems (SOSs)

As noted above, SOSs are a particular type of complex system (nodes and communication between nodes) that exist on the "edge of chaos". That is, these systems are poised on the boundary between chaotic systems (like weather, for example) and highly ordered systems (like a pendulum swinging or car motor functioning). This means that there are two ways for an SOS (like an ecosystem or human group) to evolve. It can move toward chaos, in which case the energy levels within the system rise (think of a pot of water starting to boil) and the system must either evolve to contain and channel this energy or it will blow apart. Or, the system can move toward greater order – stasis (think of a pot of water cooling toward the freezing temperature) in which case new energy sources must be found or the system will eventually die.

The SOSs we are most interested in (like the ecosystems that support life, us as individual biological systems and us as we interact in groups) interface with changing environments. Importantly, SOSs have the ability to change in response to a changing environment - they are capable of "co-evolution" (see http://en.wikipedia.org/wiki/Coevolution) and hence survive in the long term.

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[24] See Sam Harris, "A Letter to a Christian Nation" and "The End of Faith"; Daniel Dennett, "Breaking the Spell"; Richard Dawkins, "The God Delusion".

[25] See http://en.wikipedia.org/wiki/Full_disclosure.

[26] See http://en.wikipedia.org/wiki/Ozone_depletion.

[27] See Renata Siemienska, "Intergenerational Differences in Political Values and Attitudes in Stable and New Democracies", at http://www.worldvaluessurvey.org/.

SOSs that are moving toward stasis (greater order) become less able to change and hence sometimes fall so far out of step with their environment that they can no longer survive in it. That is, too much stability will kill you. Consider, for example, the dinosaur. A radical change in the nature of earth's ecosystem was too much for that organism to withstand. Its success in a particular environment had caused it to become heavily dependant on the characteristics of that environment. Mammals, on the other hand, were more flexible and flourished once the dinosaurs were gone. Another example in this genre is transportation companies that defined themselves as exclusively railroads while other means of transportation evolved.

On the other hand, SOSs that are moving toward chaos sometimes also lose touch with their environment and are also eliminated. Cancer is an example. It multiplies wildly, often killing its host and hence itself. Current human activity on Earth is aptly compared to this in some ways.

The SOSs that survive long term are those that drift back and forth between stasis and chaos. Creative bursts in biological evolution are usually caused by a step toward, or into, chaos that disorders the system - loosens it up - and from that disorder a new, higher form of order, emerges. Human culture has evolved in much the same way. For example, some scholars see the development of modern democracy as a creative response to the rising human consciousness (and hence energy) in Europe that resulted from the printing press and other social forces. This increased disorder (or caused chaos) as the Divine Right of Kings and Papal and other forms of authority were called into question.

Mythology of all kinds celebrates the dip into chaos, testifying to the importance of this phenomenon in human history. The Arthurian legends and the need to enter to "dark forest" in pursuit of the Grail and its mystic power exemplify this. Think of Adam and Eve leaving the Garden, Jonah and the Whale, many of the Greek myths, etc. Joseph Campbell's book "The Hero with a Thousand Faces" shows how common the descent into chaos theme is.

It is helpful to think both of our personal evolution (some speak of this in spiritual terms) as well as the evolution of social groups using the SOS paradigm.

Human beings and groups that excessively insulate themselves from their environment tend to drift toward stasis. Some of the most seemingly successful kill themselves in a sense through this process. Consider the Shakers (see http://en.wikipedia.org/wiki/Shakers) who came into being not long before Mormonism. They thrived despite their doctrine of celibacy during a time when government social services were non-existent and the supportive community they offered performed a crucial role in many lives. As the dominant social ethic changed and publicly funded social services increased, they failed to attract new converts and since they did not reproduce, the Shaker movement collapsed. I think something similar will likely be said in the future about the Fundamentalist Mormons. And the recent experiment with command economies and a particular form of communism is more of the same. Insulated top down control often causes an inability to evolve that is deadly to social organisms.

The best way to ensure a drift toward stasis and death is to eliminate feedback mechanisms (heresy, for example) that contradict the dominant current in a social group. The best way to ensure a healthy society is to seek the SOS balance between order and chaos. Measuring this in social groups is problematic, and the agent based simulation models now being used for this

purpose provide some of the best tools so far developed to illustrate the principles on which SOS can operate in a social context.[28]

Many examples of similar phenomena can also be found in nature. Our decision to eliminate small forest fires, for example, eventually produced the conditions for cataclysmic forest fires we cannot control and that do immense ecological damage, such as sterilizing the seed bed in the soil from which the forest habitually regenerated after its regular "pruning" by smaller fires. Avalanches of various kinds exhibit similar characteristics. What do we prefer, a series of small avalanches that can perhaps be managed or the rare, and immensely destructive, huge avalanche? Studies related to traffic control notes the same tendency – too much effort to control traffic may reduce small traffic jams, but will increase the probability of the occasional immense problem.

Social organizations that attempt to prevent change for dogmatic reasons are in many ways like the well-intentioned forest rangers who were successful in their goal to put all fires out by the morning after they started. This seemed in the best interest of the forest and those who depend on it, but produced disaster because the rangers did not understand the healthy, transformative effect of naturally occurring forest fires. They were renewing bits of chaos in the forest ecological system.

I suggest that what is perceived as heresy in many religious groups is analogous to this. Joseph Campbell, in fact, referred to heresy as the "life blood" of religious institutions because it functions as a kind of external nervous system, alerting the religious organism to important issues that it would not have spotted on its own as a result of its inward looking nature.

A good social example of a dip into chaos that caused renewal is found in the Mennonite tradition which has evolved from being like the Order Amish to embrace a wide range of different groups, a few of which are at the liberal protestant end of the religious and political spectra. The Reorganized Church of Jesus Christ of Latter-day Saints (recently renamed "The Community of Christ") can be analyzed in similar terms. Or how about Mormonism when polygamy was forcefully taken from it after years of prophetic deception (see http://lds-mormon.com/sc.shtml). Had that not occurred, Mormonism could not have gone mainstream and international as it did. A jolt of chaos made Mormonism what it is today.

Our democratic institutions have evolved significantly and continue to do so through what is an undeniably, and at times disturbingly, chaotic process. This chaos has been institutionalized within and is hence controlled by the electoral process and the representational democracy that flows from it. However, as society becomes more global and the degree of environmental and social changes accelerates, we are likely to have to evolve radically new social structures that will span nations and limit sovereignty to a degree. It is an open, and crucially important question, as to whether we will be able to do this in time to restrain phenomena like runaway population growth and the use of limited sources by those who do not bear the full cost of this use. This is the case as much when either a tank of gasoline or tree in the Amazon jungle is burned.

[28] See Joshua Epstein, See Joshua Epstein's thoughts on this topic at http://www.econ.iastate.edu/tesfatsi/Epstein.ABMIntro.pdf#search=%22%22joshua%20epstein%22%20brookings%20agents%22, and http://www.pupress.princeton.edu/titles/8277.html.

And on a personal level, we are all familiar with the need to "shake things up", and how successful relationships and other aspects of our personal lives require a delicate balance of stability and change.

My suggestion is that some literalist religious groups have been drifting toward stasis for decades now, mere nanoseconds on nature's clock. They have been trying to insulate themselves from disruptive information flows and social forces, and have been largely successful in this regard. So successful, in fact, that as information regarding the reality of literalist religious foundations is being rammed through ideological walls by the Internet, many feel a massive social shock either personally or as relationships rupture while family members find themselves unable to communicate across an ideological chasm that suddenly, and terrifyingly for many, opens beneath their feet.

So chaos is increasingly in the blood that runs through literalist religious social veins. This will cause change. The question is, what kind of change will it be? Will religious leaders continue to seek isolation, stasis and so inadvertently court social death, or will the religious organisms in question evolve? And if evolution, in what direction?

I expect to see extinction events as well as the emergence of new species.

SOSs and Intimate Relationships

Complexity theory offers some deep insight into intimate relationships that I am just starting to process. For example, human relationships produce qualia[29] of various kinds. These emergent phenomena are sometimes satisfying and other times deeply disturbing. Each potential relationship partner presents us with a different set of choices relative to the adjacent possibles we must give up (beliefs, behaviors, etc.) in order to function as part of the complex system that would be our relationship. That relationship would be unique, and would have a range of potential emergent properties. To optimize those, we must give up adjacent possibles as required to make the system function. If we don't do that, the system will fail unless the partners can modify sufficiently to make it function on different terms.

As we age, our ability to change becomes more limited, and truth be known, was likely never that great. The worst of all worlds is to give up some adjacent possibles but not enough to make a would be relationship function so that it can produce the emergent, intimate qualities most of us crave. In this state we are betwixt and between, neither hot nor cold. The New Testament God said he would spew such out of his mouth[30].

One of the basic lessons of complexity theory is that in deterministically chaotic systems[31], change occurs faster than the possible rate of computation. Therefore it would be impossible to predict the nature of the emergent properties of any relationship even if it were possible to understand all of the relationship factors and measure the data relative to them. However, we can predict to some degree the freedom we will have to give up to make a relationship work, and we can estimate a probability distribution of the potential emergent properties that are likely to be created by looking at other relationships that are similar to the one into which we are

[29] See http://en.wikipedia.org/wiki/Qualia.
[30] See Revelations 3:16.
[31] See http://134.184.131.111/CHAOS.html.

invited. Going through this exercise and thinking in complex systems terms, should improve our relationship decision-making.

As SOSs break down, the self-similar pattern that facilitates communication and co-ordinated behavior within the system breaks down. This is either because the system has gone into chaos or stasis. This is the same old story. Too much chaos means that one part of the system disconnects from the rest as it evolves and the pattern of behavior that makes the relationship what it is breaks down. Think of what happens when one spouse changes radically. He was conservative and becomes liberal. He was religious and becomes atheist. He was faithful and becomes a libertine. He was risk averse and starts motorcycle racing and hang gliding. Etc. It would take an unusual partner to adapt to this.

Too much order also often causes one part of the system to disconnect from the other. What happens, for example, when over the years one spouse does not change in any way while the other, and the rest of the environment, change dramatically?

John Gottman's work regarding relationships in this regard is seminal[32]. He is measures breakdowns in the fractal relationship field without using that theoretical framework. For example, the hierarchical behavior Gottman identified as the most potent relationship killer (what he called "contempt" but is really something much more subtle than that, more like disrespect) can be viewed as the communication of the concept that one party to the relationship views himself as operating at a different and higher level than the other partner in the nested framework of complex systems that is all reality. That is, he is more like a system of which the other party is a subsidiary part than they are like two parts of a single system. Regrettably, Biblical and other metaphors in our patriarchal culture supports this idea by suggesting that the woman is part of the man[33]. And Gottman's research shows that this is a two-way gender street. From a purely pragmatic point of view, it is now clear that ideas of this kind are toxic to relationships except those that are based on the kind of hierarchy Gottman says kills most North American marriages. In some traditional cultures, this kind of relationship is still standard operating procedure.

It also occurs to me that the mirroring studies most of us are familiar with in the human context (and that Barb Smuts nicely illustrated in her Star Island presentation apply to animals as well), are consistent with this conceptual approach to relationships. And it is another behavioral vector Gottman tracks. Absence of mirroring (when you tilt your head, I tilt mine the same way; when you smile, I smile; etc.) is a sure sign of disagreement on the point under discussion. The consistent absence of mirroring is a sign of intimate relationship distress, and usually indicates the presence of the kind of disrespect/contempt Gottman identifies as a relationship killer.

It may be more than mere metaphor to think of this kind of communications breakdown between intimate partners as the dissolution of a fractal system of information, values, behaviors, etc. that support intimate relationships. Likewise, a similar breakdown within a religious institution would be a good indicator that major change within that system is on the way.

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[32] See http://www.helpguide.org/mental/improve_relationships.htm and http://www.soc.ucsb.edu/sexinfo/?article=communication&refid=021 for summaries of John Gottman's work on marriage relationships, and see my comments re. same starting at page 9 of http://mccue.cc/bob/documents/rs.a%20few%20thoughts%20about%20Mormon%20Marriage.pdf.

[33] Eve coming from Adam's rib; the man caring for the woman as Christ cares for the Church; etc.

I should note that self similarity does not mean identity or anything close to it. Many of the best relationship combinations are likely to differ radically from each other while being complementary or resonant in some ways and providing important negative feedback in others. For example, people who hold the same general worldview but approach it from radically different points of view (the scientific v. the artistic, for eg.) are likely to have reasons to deeply respect each others' talents. On the other hand, it is well known that relationships that attempt to bridge significant religious or cultural differences are difficult. A master's degree thesis project found an 80% divorce rate in a large Mormon population where one party stopped believing and obeying Mormon religious authority while the other continued. I recently read reference to another study that showed a large jump in the probability of divorce or relationship breakdown after near death experiences because these often produce fundamental changes in values.

As noted above, negative feedback is important to maintaining relationships. Spendthrifts tend not to do well together. Depressed people tend to further depress each other. And Pollyannas tend to make poor pairs too. We of course evolve (to an extent) toward the niches in relationships that are suited to us and required in order for the relationships to function. One (or both) of the spendthrifts may change, for example, after some painful experience.

Back to the basic lesson of SOSs - too much order (the giving up of too much of the adjacent possible) kills us and too much chaos (the availability of too many adjacent possibles) does the same. Open relationships work for some people, but in many cases may cause failure as a result of too much adjacent possible, for example. And what often happens to a marriage where the parties become so involved in their own professional, social, etc. lives that they seldom see each other? Relationship failure in this regard can be seen as the result of an inadequate pruning of the adjacent possible. And what is too much or too little adjacent possible is a function of the environment from time to time.

Eventually it is my bet that people will take Gottman's and other similar work and will format it into an SOSs framework, and then allow people to take tests that will give some insight into the kinds of degrees of freedom they should expect to give up to make a relationship between them work, and what kind of potential that relationship has. The question to ask about this kind of analysis is not whether it produces "truth", but rather whether it adds to our insight into self, other and relationship potential. Given Gottman's stunning record of predicting divorce with 95% accuracy based mostly on small amounts of non-verbal, unconscious communication, it is reasonable to continue down the path he has blazed.

SOSs and Social Phase Transitions

Philip Ball's[34] "Critical Mass"[35] is a fine book about complexity theory. He uses this paradigm to explain why it was reasonable to expect human groups to suddenly change their characteristics on the basis of a phase transition similar to what happens when a liquid starts to boil.

Different human groups will react in different ways to environmental changes due in large measure to how information or energy flows within them. Something analogous occurs within each human brain. Ball uses the analogy of grains of sand being added to a pile and

[34] See http://en.wikipedia.org/wiki/Philip_Ball.
[35] See http://books.guardian.co.uk/reviews/politicsphilosophyandsociety/0,6121,1178982,00.html for a review.

occasionally starting avalanches of different sizes. Avalanches will occur as the pile grows larger. That is how the pile deals with the energy created by grains being added at the top of the pile. A probability distribution can be created (if you know enough about the nature of the sand grains in question and how they are added to the pile) in terms of the size of the avalanches that are likely to occur. The smoother the grains, the more and smaller on average will be the avalanches. But occasionally there will be a big one. The more angular and fissured the grains, the fewer the avalanches there will be and the larger their average size.

Large avalanches at the individual level are analogous to what happens to people like me within rigid traditions like Mormonism: the sand gets piled very high, and so some of the grains roll a long way once they break loose.

At the group level, large avalanches represent the collapse or complete restructuring of a group. Smaller avalanches represent change of a type that most group members simply accept. Those who manage mountain areas that are involved in recreational or industrial uses tend to trigger snow slides on a regular basis so as to avoid huge, unexpected slides. This is similar to how democracy works – it has institutionalized a controlled kind of chaos around the electoral process and at other crucial system junctures that encourages change to regularly occur in manageable increments. This is an attempt to avoid revolution – the social equivalent of a destructive landslide or forest fire.

As noted above, another phenomenon that illustrates the landslide principle is forest fires. The radical reduction in small forest fires due to the diligence of the various forest services around the world created heavy undergrowth and eventually produced huge fires.

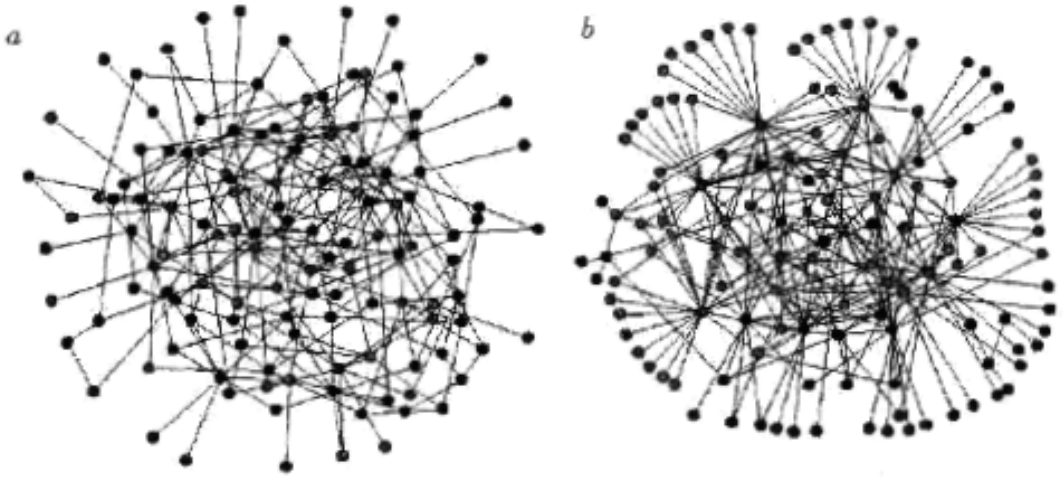
Something similar is observed in traffic control studies. It is possible to regulate traffic flows so carefully that most small traffic jams are eliminated. But this careful calibration means that when a traffic jam does occur, it will tend to be enormous. The very controls that enable regulation of small events create the conditions for catastrophe.

Economic studies are producing similar insights. It appears likely that too strenuous attempts to avoid recession will increase the probability of occasional, severe, depressions.

Human brains and many types of social groups have been shown to operate on the basis just described. Those who attempt to carefully regulate the small changes by which social groups tend to evolve increase the risk of huge phase transition events that may destroy the very thing the well intended regulators seek to protect.

Ball went on to show how we tend to overestimate the importance of our individual psychology and “free will”, and underestimate the extent to which our lives are influenced by how we, in effect, “bounce off” other individuals and the boundaries established by social rules.

The sand pile, forest fire, traffic, economic and political examples demonstrate SOS vulnerability to cascades. This is a function of the key distribution nodes that exist in these systems. Consider the difference, for example, of the two diagrams below. The one on the left is random, and the one on the right is SOS.



16.3 Random graphs (*a*) are rather homogeneous, whereas scale-free networks (*b*) seem to be "pinched" at a few highly connected vertices.

Notice the nodes in the SOS system (on the right) that are obviously more important than the rest. Here is how Philip Ball describes these systems[36]:

> "Perhaps the deepest principle of life is metabolism: the conversion of raw materials from the environment into the energy and the molecules that cells need every moment of their existence. Cells need access to a variety of building blocks: our own cells, for example, are supplied with amino acids, sugars, and lipids from food, as well as vitamins and mineral nutrients, water, oxygen, and other essential substances. They use enzymes to rearrange the atoms in these molecules to form new enzymes, nucleic acids, hormones, energy-rich molecules, and so forth. The sequence by which a raw material is converted into a useful molecular form is called a metabolic pathway.
>
> Almost without exception, these pathways are not linear but branched and interlinked. A single raw material such as glucose is reconfigured or fragmented in many different ways. The energy-rich molecules made during the breakdown of this sugar are used to power many other metabolic processes. So metabolism defines a large network of chemical reactions in which particular molecular substances can be treated as nodes, and reactions (usually catalyzed by enzymes) can be considered as edges that link one node to another.
>
> Barabasi and his colleagues looked at the metabolic networks of forty-three different organisms ranging from bacteria to plants to "higher" life forms like the nematode worm. They found that the connectivity distribution function in every case was scale free [that is, SOS]: the probability of a node having a certain number of links followed a power law. This implies there are a few highly connected "hubs" in the network that play a crucial role in holding the web together. Many of the molecules representing these hubs, and their relative importance in the network, are the same for all organisms - a reflection of the life's common evolutionary origins.

[36] See "Critical Mass" at pp. 389-391.

> The scale-free structure of metabolic networks makes sound evolutionary sense, because it makes metabolism relatively insensitive to a small incidence of random failures. If one or two enzymes are defective, perhaps due to a genetic defect, this weakens or even severs the corresponding edge in the graph. While this can have harmful consequences for certain biological functions, it need not, in a scale-free network, break up the whole web and make life impossible. Thus we can regard the scale-free network as an example of good 'engineering' wrought by the trial-and-error exploration of options that is natural selection."

After describing how the "key node" feature of SOSs makes them surprisingly robust when under random attack, Ball goes on to tell us that[37]:

> "On the other hand, the weakness of scale-free networks is their sensitivity to planned attack. If the hub nodes are removed, the network rapidly falls apart. This suggests opportunities for the inventive design of drugs to combat bacterial infection[38]. Drugs that interfere with the most highly connected molecules will have a disproportionate effect on the viability of the attacked cells. Understanding the network structure would be a first step toward selecting appropriate targets. In this scenario we are the "cyto-terrorists," and our intentions are, from a human perspective, purely benign. …
>
> Barabasi points out how systems such as the power grid are prone to cascades of failure where a malfunction at one point shifts power to other lines, leading to an escalation of overloading. 'Cascading failures are common in most complex networks,' he says. 'While celebrating that everybody on Earth is only six handshakes from us, we need to accept that so are their problems and vulnerabilities.'"

Think of the literalist religious communities that operate on the basis of shunning. This is an effort to control the flow of information and hence determine where the important communications nodes will be. Hence, all potentially competing communications nodes must be knocked out.

Think of the various apologist organizations for literalist religion, or ideological efforts like that related to Intelligent Design[39]. FARMS[40] and FAIR[41] are Mormonism's primary apologetic organizations. They are essentially fog machines in the finest post-modern tradition whose purpose is to reduce the influence of potentially dangerous information nodes that the institution cannot control and might, if left unattended, produce a phase transition. So the apologists produce noise in the system that will obscure all signals that may compete for authority with institutional leaders, hence reducing the probability that information transmission will cause change. Confusion works in favor of conservative forces.

And, just as is the case when fighting a potential epidemic in an SOS network, all one has to do is keep the spread of disease ("bad" information) below the critical point to prevent a phase transition. Hence, in many fundamentalist organizations we find the rule that no one should communicate about anything that questions institutional authority.

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[37] See "Critical Mass", at page 391.
[38] These use an SOS structure.
[39] See http://en.wikipedia.org/wiki/Intelligent_design.
[40] See http://farms.byu.edu/.
[41] See http://www.fairlds.org/. As the name indicates, these people have no sense of irony.

These principles can be turned around for use by those who would change fundamentalist (or other) minds. People who remain nominally at least on the "inside" take on new importance. Anonymous internet bulletin boards become crucially important, as does information that questions literalist religion on the basis of scientific principles in the newspapers, schools etc. These forces are outside the control of the ideologues, and often have an authority of a different kind (science) behind them.

Perhaps the most important issue may become the public declaration of belief by respected people and the reporting of this in the media. This kind of peer to peer influence has been shown to be powerfully influential in many contexts. Think, for example, of what would happen if there were a steady stream of respected, successful LDS men and women saying in public in city after city across North America, one after another, month after month, "We have not sinned; we have made the most careful prayerful decisions of our lives; and we have concluded that Joseph Smith and all who have inherited his authority have grotesquely misled us and abused our trust".

At present, these people are leaving Mormonism, but quietly. Several have told me lately that when they announced that they were leaving Mormonism to their immediate families, THE issue quickly became silence. It is one thing to leave, but if you announce your disbelief publicly that is a much more grave sin – that is an open rebellion against God and his Kingdom that will be punished in a much more severe fashion and it incidentally will embarrass your family. All the stops are pulled out on this issue to try to persuade the decamping Mormon to keep her mouth shut.

The more I study this the more uncanny the Mormon (and other) social defence systems seem to me. They must be the product of evolutionary forces as surely as are life's metabolic processes.

It is interesting to use Ball's analysis to think through what sometimes happens as new and disturbing information enters a group. It would have little noticeable impact for a long time, and then finally one individual would experience a phase transition at the neural level. That is, enough neurons would fire in a new pattern, consistent with the new information, to change one mind. Then, that individual would interact with others and help to cause mental phase transitions in them, and as they did the same with other individuals, a social avalanche of changing attitudes and behaviour could occur. This would abruptly release social or intellectual pressure that had built mostly unnoticed over a long period of time, just as avalanches release accumulated physical energy. Most avalanches would be small, and occasionally a landscape changing event would occur.

A social phase transition of this sort is likely what brought down the Berlin Wall and changed Eastern Europe in a few ticks of history's clock.

The Mormon and other literalist information systems have few links between distant system parts, and far more that run through a central hub that controls information flows. What happens when the Internet – a SOS system – is suddenly laid on top of the institutional information network? Massive amounts of new information starts to flow through the system in a fashion that can't be restrained by the central hub. As a result, there are many people currently inside literalist religious traditions whose faith is going to come under a great deal of pressure. That is, they will begin to question the direction in which large amounts of their

energy have gone as a result of the priorities dictated by their social group. The research related to cognitive dissonance[42] and other biasing factors speaks to how this will look and feel. These forces hold literalist belief systems together inside individual crania and social groups. As levels of cognitive dissonance rise within these religious groups relative to the point I just described, individual members and ministers will increasingly look for approaches at the fringes of their traditions that will enable this pressure to be relieved and/or contained.

Enter theologians and scientists who are "folders" of the type described above. My experience with this kind of person is typical in many ways. As long as I was a fully faithful Mormon the "folders" had zero appeal for me. My mind was compartmentalized. I was a rational, critical thinker regarding everything except religion, and used a magical belief system in that regard without knowing it. This is because I accepted a few unjustified premises. The leaders of the group went to great pains to keep the rickety foundations of those premises under wraps. Once I encountered solid information that questioned those premises, I went into a state of crisis. Then I needed the folders – the bridge builders – and quickly found their counterparts at the fringes of Mormonism.

Most Mormons who go through the process I did stop at the outskirts of their tradition. However, once a sled has broken out of the ice it is hard to predict where it will stop. The sand pile and other analogies above explain this.

The folders work at the fringes of religion and science (particularly ecology, I hope, as time passes) and help to weave what could become a global mythology. They also provide the basic materials from which many others will rationalize the conflict between their particular traditions and the scientific/rational worldview that is entering their groups in new ways.

Think of a Mormon teaching at BYU, or an Adventist or Baptist minister whose congregants are increasingly troubled by the conflict between the scientific, secular worldview and their religious beliefs. These "defenders of the faith" read broadly in attempts to find ways to shore up the walls around the attractor basins that define their communities. They don't see it that way, however. They think that they are looking for "truth". But truth often manifests itself to people of this type as whatever will work to preserve as much of their faith as possible. Their favorite philosophers tend to be people like Heidegger[43] and Rorty[44]. And liberal theologians or new agey scientists who are criticized in some quarters for being so hard to pin down are for that very reason manna from heaven for those who defend the borders of various literalist religions. And so what was literal in these communities gradually metamorphs as far as an increasing percentage of the population is concerned. For most, this change will take generations.

Many bridges of different types need to be built in order to change our culture related to religious belief. The more literalist the believers, the more angular and fissured (and hence sticky) are their grains of sand. The radical Muslims are so extreme in this regard that we might call them Velcro grains. In certain times and places, this kind of sand grain and social group would have been highly adaptive. But not now, in our shrinking and increasingly interdependent world.

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[42] See http://en.wikipedia.org/wiki/Cognitive_dissonance.
[43] See http://en.wikipedia.org/wiki/Heidegger.
[44] See http://en.wikipedia.org/wiki/Richard_Rorty, http://www.cscs.umich.edu/~crshalizi/reviews/haack-manifesto/ and http://www.newcriterion.com/archive/16/nov97/menand.htm.

In these "sticky" cultures, sand piles grow very tall and avalanches are massive and destructive. We should place a high priority on encouraging forces within these sand piles as they grow that will knock edges of grains of sand, and most importantly, reform the conditions under which angular, fissured young grains are created. I see liberal theology and spiritually oriented science as potentially important in this regard.

Finally, SOSs are characterized by a pattern that includes a few highly influential nodes. Think of the Internet. Its central hubs both make it efficient and vulnerable to attack. Think of epidemiology. Certain molecular interactions have great influence. If enough of these (or even one in some cases) can be knocked out, an epidemic can be defeated and through inoculation, future epidemics avoided.

Malcolm Gladwell[45] uses the terms "mavens" and "salesmen" and "connectors" to describe the key players in social phase transitions. In the religious context, we should add those who are institutionally influential since some of them do not fit into Gladwell's categories.

To change religious institutions one needs to find the levers Gladwell has identified. They won't likely listen to those who are the most harshly critical of religion[46]. That means that those who get the science right and have the ear of these opinion shapers are extremely important folders. In the right doses, properly focused, they can both take significant, sticky edges off these people and far more importantly, cause them to change the very processes by which new grains of sand are formed within their cultures.

Within hours of reading Ball's account of how information systems work, I had lunch with a new post-Mormon friend who told me the following story.

He had been for years a metaphoric Mormon – skeptical of literalist Mormon claims and authority, but committed to his tribe and not anxious to rock a boat that would disturb his marriage, family relationships and friendships. In that situation, about two years ago, he was serving as a member of a Bishopric[47] and had recently discovered post-Mormon oriented Internet bulletin boards and while not participating much, was doing a lot of reading on them.

One Saturday night he arrived home from a trip and decided to do a little catching up on his post-Mormon bulletin board reading, and ended up at a place called "The View from the Foyer"[48] and came across some posts by a fellow named "philo", the name under which I posted for the first few months of my Internet life. One string in particular caught his eye that dealt with the nature of Mormon marriage[49]. He became fascinated. At about 4 am he stopped reading, and was cursing philo as he went to bed knowing that in a couple of hours he would have to get up to start a full day of church meetings.

At church he went through the usual run of meetings, starting with Bishopric, Priesthood Executive Committee, and then the congregational meetings. Half way through, he was told that the man responsible for the Priesthood lesson had not been able to come and did not have

[45] See "The Tipping Point", and http://www.gladwell.com/tippingpoint/tp_excerpt2.html.
[46] I have in mind here people like Richard Dawkins, Steven Weinberg, Daniel Dennett and Sam Harris.
[47] The group of three Mormon males who preside over a Mormon congregation. They are lay persons. Mormonism does not use a paid clergy at the congregational level.
[48] See http://www.aimoo.com/forum/freeboard.cfm?id=418550.
[49] See http://mccue.cc/bob/documents/temple%20marriage.pdf starting at page 36.

a substitute. As the person in charge, he had to present a lesson. Since he had nothing prepared, and philo's odd take on Mormon marriage was still running through his mind, that is what he decided to present. So he told the assembled Mormon adult priesthood holders to put their lesson manuals away, and that they were going to talk about marriage.

As he started to present some odd sounding ideas, one of the older members of the group challenged him, and asked where he was getting his information. He said that he had found it on the Internet in some stuff a former Bishop had written. This led to a brief discussion about the merits and demerits of what is on the Internet, which he ended by indicating that nothing in books, on the internet, or elsewhere should be accepted without checking it carefully, and the information he was presenting was no different. It has to stand on its own merits, and the discussion they were having was part of that vetting process.

It did not take long for the group to be fully involved in a discussion about the pros and cons of the Mormon conception of Celestial marriage and its extreme orientation toward benefits in the future (after death) in exchange for current sacrifice[50]. He told me that this kind of vigorous discussion was unheard of in this group, and that at the end of the class a number of people thanked him for presenting such a useful lesson, and said it was the best they could remember hearing.

This story illustrates the difference between communication networks that are organized along SOS lines, and those that do not have enough of the long links that characterize this structure as described above. The long links are what make rapid distribution of information possible, and so facilitate change.

The Mormon information system has not had many of these links. As already noted, Mormons tend to have smaller and less diverse personal connections than others. And they tend to have access to less information that questions their point of view than do similarly educated non-Mormons. Enter the Internet. It is organized along SOS lines, and as Mormons and other literalist religious people plug into that, phase transitions suddenly become possible within that community.

So, my new friend, as a participating Mormon in a leadership position, becomes a long link. With a few mouse clicks he finds some ideas in the head of a now apostate, former Mormon Bishop, finds them appealing, dresses them up a bit, and spikes them straight into the middle of a Mormon congregation where they are enthusiastically received. This largely circumvents the elaborate system the Mormon institution uses to ferret out disturbing forces and neuter them. This is why I was told that I either had to stop communicating with anyone outside my family about ideas that questioned Mormon authority, or resign my Mormon membership. In the former case, I would not spread dangerous ideas. In the latter, I would be viewed as a sinner who had lost God's spirit and hence anything I had to say would be ignored by the faithful.

The internet makes it far more difficult for the "cancers" Mormon leaders fear to be eliminated. This means that chaos and its renewing force is far more likely to be felt within the Mormon body than it used to be. And far from cancerous, this change is likely to restore circulation to a near moribund body.

[50] See http://mccue.cc/bob/documents/future%20orientation.pdf and http://mccue.cc/bob/marriage.htm.

SOSs and Mimetic Behavior

Larry Iannaccone's application of rational choice theory[51] to religion in general is in the process of bearing a lot of fruit. In particular, his model of religious preference and religious or social capital is helpful in a variety of ways when thinking about religion[52], and can be used in conjunction with SOS theory to both better understand what we experience and how we form hypotheses for further investigations.

Iannaccone notes, for example[53], that there are different proportions of religious and irreligious people on coasts v. interior and south of the US. And, while there is lots of migration between regions but proportion does not change, therefore religious behavior is changing as people move. The key factor in this regard appears to be the behavior of the few other people closest to a person. This was shown through the usual regression analysis economists use. Iannaccone used an agent simulation model to illustrate how a small increase in the factor for social influence could explain the data.

Similar patterns of long term stability in religious behavior by region found in Europe and elsewhere[54]. But Mormon behavioural patterns seem to contradict this. This is likely because Mormonism is more homogenous and portable than most religions. That is, similar Mormon congregations exist in most US cities, leading to the derisory term "McMormonism". Mormonism uses a centralized membership tracking system and assigned "friends" to further strengthen its system for people who move from place to place.

The insight from these studies is that the religious and other behaviour of our few closest associates is a strong behavioural attractor. That is, humans are highly mimetic. Religious and other social groups that are organized to take advantage of this human trait will tend to do better than others in the short term at least, whether that is good for individual members of those groups or not.

And conversely, as pluralistic[55] points of view become more common, this will make it harder for steep, deep religious attractor basins to form or persist.

SOSs and Social Capital

Social grouping facilitates the creation of social capital.

Iannaccone also notes that "high cost" religious groups, like Mormonism and the Jehovah's Witnesses, are growing more rapidly than most other groups. Evangelicals are mixed in this regard.

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[51] See http://en.wikipedia.org/wiki/Rational_choice.

[52] See http://www.metanexus.net/spiritual_capital/pdf/review.pdf#search=%22iannaccone%20%22religious%20capital%22%22, http://www.religionomics.com/erel/S2-Archives/Iannaccone%20-%20Religious%20Extremism%20Origins%20and%20Consequences.pdf and http://www.religionomics.com/erel/S2-Archives/Iannaccone%20-%20JW%20Growth.pdf.

[53] See http://mason.gmu.edu/~mmakowsk/AccidentalAtheist.pdf#search=%22accidental%20atheists%22.

[54] See http://www.religionomics.com/erel/S2-Archives/Iannaccone%20-%20Looking%20Backward.pdf.

[55] See http://en.wikipedia.org/wiki/Pluralism. The opposite of pluralism is "monism", the view that there is only one "right" or "true" way to live or believe.

Why do high cost groups do relatively well while most low cost groups, like most of the traditional and mature religions, are losing members? Iannaccone hypothesizes that high cost groups weed out those who will not remain committed. This strengthens group as a whole and increases perceived benefits of membership. For small groups in particular, it is only necessary to capture a tiny percentage of the population to maintain high growth rates. Thus, clear definitional boundaries around the group and a relatively high cost of membership is likely adaptive from the organization's point of view, while regularly breaking up family and other relationships that attempt to operate across the organization's boundaries.

A big part of the weight that holds social groups together by creating perceived benefits is related to the concept of social capital, which Iannaccone has called "spiritual capital" in the religious context. That is, by investing time in learning the organization ropes: its liturgy; its people; its social game; and by doing things like developing friendships within the organization, developing status in the organization, etc., a non-portable asset is created. The greater this asset the less likely it will be that the person who possesses[56] it will leave the organization. Hence, the more social capital a religion causes to be created, the deeper its attractor basin will likely be.

However, if the cost or remaining in the organization is too high relative to the benefits perceived to be derived from membership, this could cause large scale defection. The trick appears to be to cause the create the perception of significant differences without raising real costs too high.

History matters in complex systems. For example, one of costs the Mormon Church must bear in mind as it charts its future course is that it has created in its membership a strong commitment to rationalism and integrity. Hence, a perceived breach of these standards would likely impose a high perceived cost on the average Mormon which might outweigh some of the benefits Mormonism tries to create.

Likewise, Mormonism is strongly connected to most mainstream social values in terms of the use of technology, the value of science, the importance of education and democracy etc. Changes in the Mormon social system that would run against this grain would be perceived as imposing a high cost by most current members. Mormon leadership behavior is also constrained by these historical factors.

And finally, attractor basins are also to some extent a function of group age. Ant colonies demonstrate this. The colonies themselves have life cycles of over a decade. When members of a young colony run into each other they generally fight. When members of mature colonies encounter each other, they seem to simply nod and continue on their ways. This might be a simple function of group learning – fighting costs more than it produces. See the analysis of human compassion below for a large scale consideration of the same issue.

Human groups, like religions, have similar attributes. The Mormons and other relatively young religions are aggressive missionaries while the older faiths are more laid back. Hence we can predict in general more conciliatory, less aggressive approach to group interaction as any particular group ages and comes into greater contact with other groups. This gives us cause for long term hope in terms of the more aggressive branches of the Muslim faith. And, it may explain much of what Iannaccone has observed with regard to high cost religious faiths – they

[56] Or as can be the case with all property, is possessed by it.

tend to be young and seem to find as they age and become more diverse that their cost – benefit equation changes.

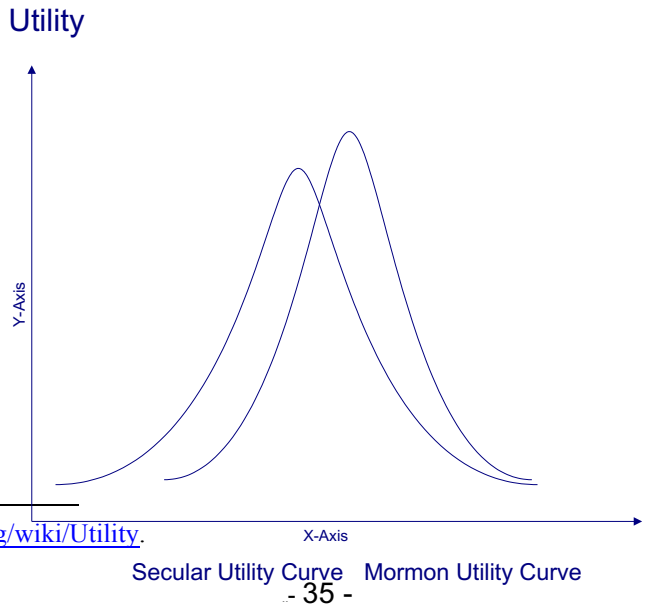
SOSs, Values, Utility[57] and Social Capital

Another way to think about social capital is through the use of "utility theory". That is, we are prepared to pay for what we perceive to be useful by giving up money, time and other things we value. The degree of usefulness – or utility – is determined by our beliefs as to what is real. For example, if I believe that my family and I will go to heaven and live forever in wonderful circumstances if I commit suicide while killing my people's enemies, there is a much higher chance that I will engage in that act of self sacrifice than if I believe the only thing at stake is which boss gives the orders I will have to take.

Religious and secular groups have widely divergent beliefs about what is real, and hence different utility functions. Another of Iannaccone's contributions to the understanding of religious behaviour relates to how these differences between the utility functions affect the behaviour of religious people who live at the same time in religious and secular cultures.

When we think about this in light of how SOS has us working with attractor basins in energy landscapes, it highlights what I noted above about how these landscapes are in some ways ridiculously simplified representations of reality. That is, the landscape attempts to capture the relationship between a human being and his religious group by simply showing where she is relative to an attractor basin of a particular shape. Is she at the bottom or near the edges; how deep is the basin; etc. Iannaccone helps us unpack this a bit by pointing us toward the way in which many religious people must ride two (at minimum) horses, and how the relationship between those horses is important.

For example, consider a religion that does not differ much from secular society. Its values and customs may have a distinctive flavour of some kind, but in substance it is very similar to the mainstream of the society around it. Hence, the fundamental values that the perception of utility drive behavior in the secular culture and this religious culture are similar. Liberal Judaism and Christianity (including liberal Mormonism) are fairly described this way, and the relationship between religious and secular values in this context can be represented by the graph below:



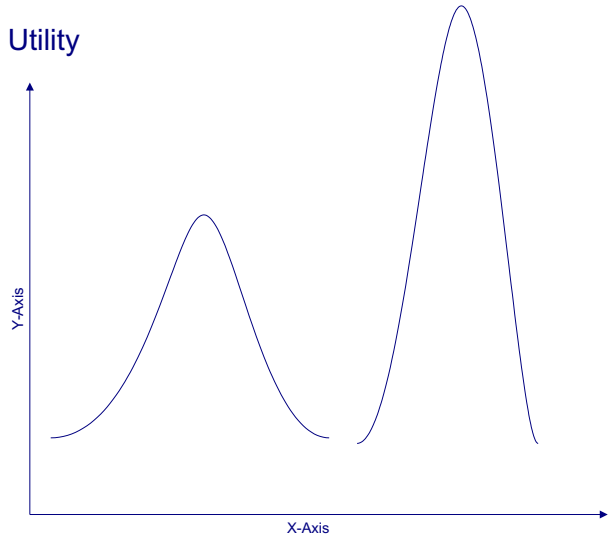
[57] See http://en.wikipedia.org/wiki/Utility.

On this chart, the distance between the tops of the two curves indicates how different in objective fact the values in question are from each other, and the height of the curves indicates the perceived relative superiority of the religious system from the believers' point of view.

In the case depicted above, Iannaccone tells us, rational choice theory would predict that the religious person's behavior would likely gravitate toward where the two lines intersect so that she maximizes the utility she can derive from the two "worlds" in which she lives.

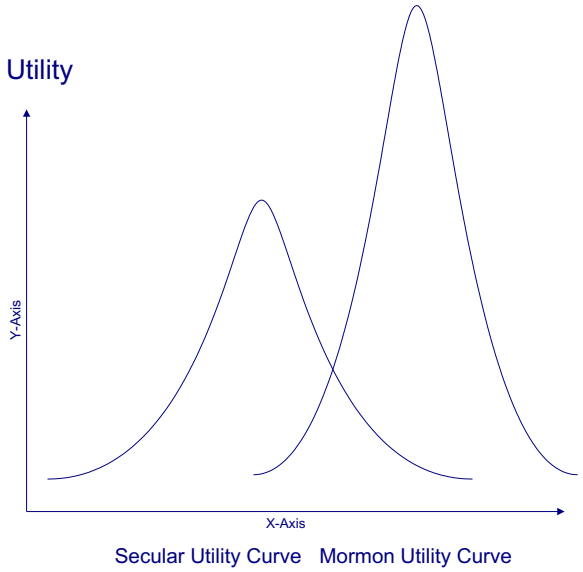
This relationship means that there is not a great deal of difference between the two worlds and hence the relatively little unique social capital will be created by the religious group and its attractor basin created will not be that deep. This would put it in the class of the liberal Christians, which means that people will tend to decamp with relative ease and frequency to other groups that have deeper attractor basins. Studies have also shown that agnosticism or atheism tend to hold even fewer adherents across generations than any of the religious groups, indicating how shallow that attractor basin is and how likely it is that relationship and emotional factors will overcome intellectual positions. This suggests that until cohesive social groups form around secular values, the culture wars should be expected to continue to go in favor of the religious groups.

Let's now consider another example. What if the religion in question is radically different from the secular culture that surrounds it. This would be the case with literalist religions of many types, including the fundamentalist Mormons now and mainstream Mormonism 100 years ago. Here is how this relationship could be depicted.



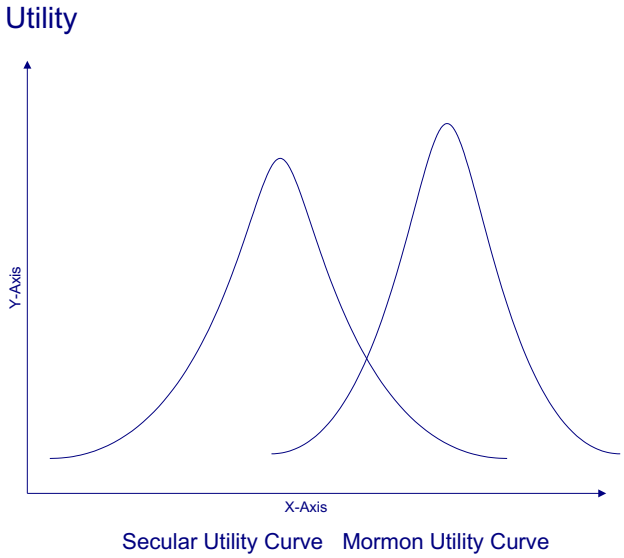
This is the "We are really different, and really better, than you" model. This forces members to choose between the two world and live almost completely in one. Think of the Old Order Amish, for example.

What happens as these worlds move a bit closer to each other, as shown below.



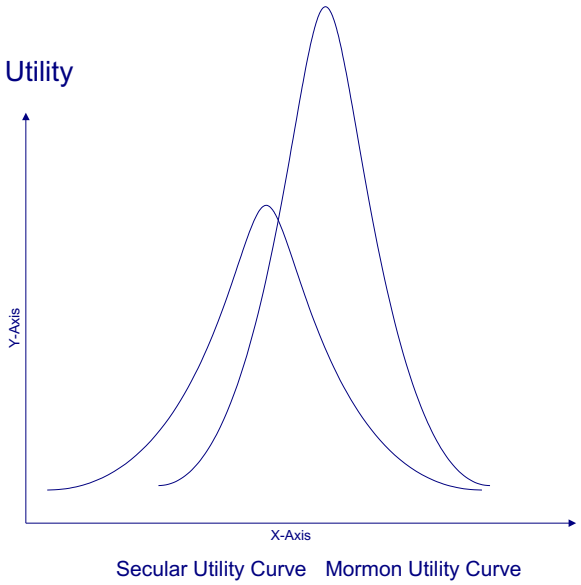
As literalists learn more about other religions, they see more similarities but may also continue to perceive a large difference in terms of utility. This is what has happened to innumerable one-time radical sets, like the Mormons. For example, as non-Mormons moved into Utah during the late 1800s this began to occur within the Mormon community and that continues to this day. The point at which the two curves overlap indicate that there is still a huge cost to be paid by those who move to the edges of the religious system, but do not leave it, as they try to take advantage of secular life.

And as the diagram below illustrates, it does not help much as the perceived utility of the religious life comes down relative to that of the secular life. Those who wish to remain in both systems are stuck in a place that can be counted on to produce lots of cognitive dissonance.



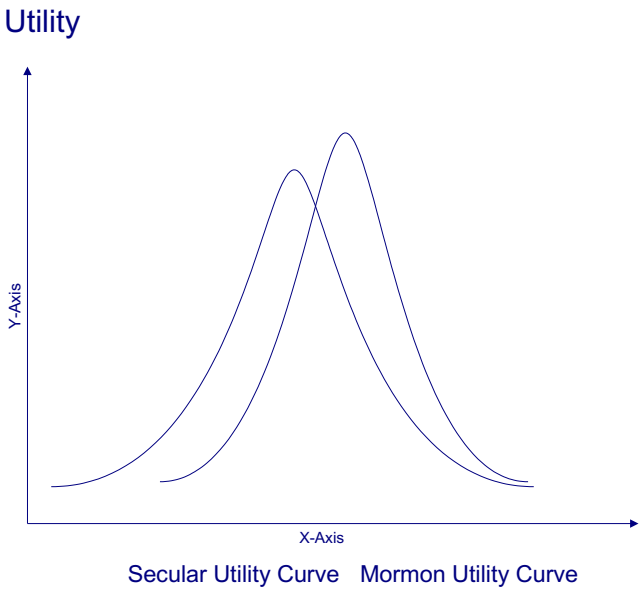
So, as long as the gap between the two groups is too wide, it is unlikely that people will try to play both sides.

What about the situation shown just below.



This is a risky position for the religious organism. It has established very high perceived utility without much difference in fact from the secular culture. If the basis for that perception comes undone, many people will perceive that as a loss and may defect on that basis alone. The Internet has dramatically increased the risk that this may occur as more people learn about the foundational problems of their faith and realize that most religions operate on the basis of similar values.

It seems clear to me that from a global social point of view, it will be healthy for religious groups to gravitate toward the kind of relationship to society, and relatively shallow attractor basins, that are illustrated below.



However, this means that individual religious groups will lose power and hence can be counted on to resist this trend just as the Catholic Church resisted the forces that reduced the size and depth of its once massive attractor basin.

The space that is left open in this case for religious groups would be like the one occupied by David Oler and his group of atheistic Jewish synagogues[58]. That is, there is not much difference in objective utility, but I wish to remain within "my tradition" and enjoy its unique aesthetic experience and meanings. This creates enough utility to keep a religious group together. This is consistent with the "evaporation of creed" trend mentioned above with many faith traditions. I think this is healthy since it will cause the orientation of energy within a religious group toward the same kind of thing that creates secular utility, such as averting the KKR Emergency.

SOSs and "Restorying"

We can tie together a number of concepts related to social capital and utility theory by thinking about the role narratives or personal mythologies play in how we live our lives.

As noted above, we are prepared to pay in terms of giving up money, time and other things we value in exchange for experiences of different kinds – things we perceive to be useful. And the degree of usefulness – or utility – is determined by our beliefs as to what is real. These beliefs are generally captured in a grand narrative within which we perceive ourselves to be living. We don't perceive this to be a narrative. We perceive our lives to within a framework of what is real. Other people, however, would often consider our beliefs to be laughable, and we would

[58] See http://www.exmormon.org/Why%20We%20Believe%20-%20The%20Edmonton%20Series.htm#_Toc136829240.

perceive theirs in the same way. Paul Ehrlich[59] captures this nicely with a story about the Inuit, as follows:

> "Some may consider today's Western religions to be an evolutionary advance from hunter-gatherer religions, but as with language, there is little basis for placing the religions of modern people on a scale from primitive to advanced. People tend to think of their own religion as the one true religion, of course, and adherents of the religions that have become 'organized' as societies have become more complex tend to look down on those of the hunter-gatherers. This was brought home to me during my Inuit summer. Father Rio was a Belgian Catholic Oblate missionary stationed at Coral Harbour in the Canadian Arctic, part of the 'the largest diocese on Earth.' He was also battling with a native Anglican priest for the souls of the local Inuit. Father Rio made great raisin wine, and I spend many a pleasant evening helping him consume it. It was 1952, and in his view the Inuit, with their 'simple' religion, were 'just like children.' The 'simple' Inuit religion was actually a form of animism based on a complex of spirits, ghosts, human and animal souls, and several major gods, employing shamans, numerous taboos, magic words, and the like. It was anything but simple. …
>
> Interestingly, Father Rio's contempt for the religion of the people whom he sought to serve and convert was reciprocated. Once, when I was taking a language lesson with Tommy Bruce and several other Inuit, the talk turned to the feud between the Anglican priest and Father Rio, which had become intense. Why, Tommy wanted to know, if their religion was based on loving one's neighbors, did the priests shoot at each other's dogs with shotguns? Then he said, 'Do you know what Father Rio believes?' and regaled me with the story of the virgin birth. By the time he had finished, all the Inuit were laughing so hard that tears were running down their cheeks."

Our ideas about what is real are generally passed down to us by those we trust the most. Some of this comes to us during our formal education, but much of it (and often the most important parts) come to us from our families. It is there, generally speaking, that we learn about God, an afterlife, etc. and many of us accept without serious question the reality of these entities (god, spirits, angels, etc.) and events (rewards and punishments to be delivered both during life and after death on the basis of obedience or disobedience to God's commandments).

This reality is always framed as a story. Ancient mythologies worked this way, and our modern mythologies are no different, even those based to one degree or another on the scientific account of what is real.

The Diagnostic and Statistical Manual, version IV[60] is the manual used by psychiatrists to diagnose their patients. It provides perspective with regard to the causes, and recommended treatment, of certain religious or spiritual problems[61], and uses a narrative framework for this purpose.

As noted above, we conceptualize ourselves by way of stories and the role we play within them. This aspect of ourselves is referred to as the "narrative self". The story in which we see ourselves playing a role can be called our "personal mythology". In order to have sound mental

[59] See "Human Natures" at pp. 219-220.
[60] See http://en.wikipedia.org/wiki/DSM-IV
[61] See http://www.spiritualcompetency.com/jhpseart.html for a summary.

health, it is essential that we feel secure within a personal mythology. It is through our role within this mythology that we perceive meaning in our lives.

A disruption of one's personal mythology related to religion can cause a form of mental dysfunction that is dealt with by the DSM – IV through a disorder known as "Religious or Spiritual Problem". This includes distressing experiences that involve loss or questioning of faith, problems associated with conversion to a new faith, or questioning of other spiritual values which may not necessarily be related to an organized church or religious institution.

For example, if my personal mythology is derived from Mormonism, I likely perceive myself as doing God's work here on earth and making many sacrifices in order to do so, and in exchange I am earning wonderful blessings that will mostly come to me and my family after death in the Celestial Kingdom[62]. I perceive the world as dominated by unseen forces of good and evil that are locked in an eternal struggle, and through my action or inaction, good or sinful acts, etc. I can either harness the forces of good through my priesthood and literally subject nature to my will (as long as it is consistent with God's will), or alternatively if I am not righteous I may fall under the influence of evil forces that can harm and deceive me in many ways.

If my belief in the reality of the entities and events that make this belief system work is shattered, I should be expected to feel somewhere between disoriented and suicidal. The DSM – IV provides the tools necessary for a psychiatrist to assess the degree of trauma likely to result from a mental dysfunction of the kind I just described. And I note that this is only one of several kinds of spiritual problem that the DSM – IV identifies.

Dr. David Lukoff[63] describes the recovery process with regard to a spiritual trauma such as what should be expected to result from leaving Mormonism. He says that this kind of recovery requires that we learn to "retell" our personal mythology. That is, in my case either my Mormon based beliefs regarding what is real must be stretched to become believable and hence workable again, or an entirely new mythology must be developed to ground me. I must find a version of reality that I can trust, develop a narrative around that[64], cast a part for myself in that narrative, and then grow new neural connections and likely a lot of new neurons[65] to be able to do what my new role requires of me.

For example, as a Mormon a lot of obedience was required of me and hence I did not have to make personal decisions about how to act in many circumstances. "The thinking has been done", as a Mormon leader infamously said, and so all I had to do was show up and obey. All of the roles that seemed functional to me once my Mormon beliefs crumbled required much more autonomy. This is not the kind of behavioural change a person can simply will themselves to make, any more than I could get out of bed one day and decide that I would be an accomplished pianist without having ever played. Some skills take a lot of time and patience to develop.

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[62] See http://en.wikipedia.org/wiki/Celestial_Kingdom.

[63] See http://www.virtualcs.com/blackboard/lessons/lesson7.html and http://www.spiritualcompetency.com/jhpseart.html.

[64] This will often look a lot like my old narrative. We tend toward using as much of our inherited narratives as we can in this new context in order to cut down on the energy and time required to re-tool ourselves.

[65] See Quartz and Sejnowski, "Liars, Lovers and Heroes".

The re-grounding and skill development process I just described gradually creates the stability that we need to make plans; to invest energy in relationships; etc. This is the same principle that causes capital to be invested in far greater amounts in societies that are stable and orderly than in those that are chaotic. If I think that my savings are likely to be taken from me by the big guy in town, I won't let him know I have them and hence won't invest in my farm, or a factory, etc.

Likewise, if I don't know what is coming in my personal future, I will have a hard time convincing myself that the investment of personal energy required to build relationships makes sense. And our perception of stability depends upon our belief in some version of reality. Little stability; few relationships. We are small herd animals. Hence, evolution has ill-equipped most of us to get along on our own.

Lukoff suggests that the best way for most people to deal with the process I have described is to engage in a lot of self expression. Ideally, a therapist who understands the process would be found and a lot of time would be spent allowing the patient to tell the old narrative, explain why it does not work; talk about hopes; dreams and fears; talk about new sources of information that are being ingested as the therapy proceeds; write about this in a journal and other formats if this is helpful[66]; and from all of this reading, talking, writing, thinking, etc. a new personal mythology will eventually emerge, and as time passes, stabilize.

Here is how Lukoff puts it in part:

> "Psychotherapy can be seen as a process of helping clients construct a new narrative, a fresh story of their lives. In this narrative understanding, psychotherapy does not consist in the cathartic healing effect of releasing traumatic repressed events and their emotions, but in reconstructing a person's authentic story. In making interpretations, the therapist retells the patient's stories, and these retellings progressively influence [the] what and how of the stories told by patient. The end product of this interweaving of texts is a radically new, jointly authored story. Or as Hillman describes it, the client comes to therapy to be "restoryed": 'The patient is in search of a new story, or of reconnecting with her old one. . . .The story needed to be doctored, not her.'"[67]

Later in the same article, Lukoff provides the following description of a particular kind of spiritual problem that will sound familiar to many post-Mormons:

> "Persons transitioning from the "culture of embeddedness" with their teachers into more independent functioning often seek psychotherapeutic help (Bogart, 1992). Vaughan (1987) reports that many individuals who have left destructive spiritual teachers reported that the experience ultimately contributed to their wisdom and maturity through meeting the challenge of restoring their integrity. One such case was described by Bogart (1992):
>
> 'Robert had spent 8 years as the disciple of a teacher from an Asian tradition that emphasized surrender and obedience. Robert had become one of the teacher's attendants, and reported that he "Loved the teacher very much." Yet there were difficulties. … Robert left the community after the guru's sexual and financial misconduct

[66] My self administered therapy was largely this – reading and then writing about my ideas as they formed.
[67] See http://www.spiritualcompetency.com/jhpseart.html at pp. 17-18.

were revealed. Upon leaving, he had intense and at times even paralyzing feelings of betrayal, anger, fear, worthlessness and guilt.

Robert went into psychotherapy with a spiritually sensitive therapist. Later in psychotherapy, he realized that his relationship with the guru replicated his relationship with his father--an angry alcoholic who had humiliated and physically injured Robert, but whose approval he had nevertheless sought. He also worked on major issues around establishing a life outside the structure of the spiritual community and integrating his spiritual beliefs and practices into this new life."[68]

And finally, Lukoff distinguishes between emergencies and the process of spiritual emergence that many people undergo as their religious beliefs change:

"In spiritual emergence, (another term from the transpersonal psychology literature), there is a gradual unfoldment of spiritual potential with minimal disruption in psychological/social/occupational functioning, whereas in spiritual emergency there is significant abrupt disruption in psychological/social/occupational functioning. The Benedictine monk, Brother David Steindl-Rast, describes the process:

'Spiritual emergence is a kind of birth pang in which you yourself go through to a fuller life, a deeper life, in which some areas in your life that were not yet encompassed by this fullness of life are now integrated or called to be integrated or challenged to be integrated (cited in Bragdon, 1994, p. 18). While less disruptive than spiritual emergencies, emergence can also lead persons to seek out a therapist to help integrate their new spiritual experiences (Grof, 1993).'"

I believe that I suffered a spiritual emergency when I discarded my Mormon beliefs. I could think and speak of little else for months. My work suffered. My family life suffered. Etc. Another DSM – IV category that is relevant to this process is posttraumatic stress disorder. Many recovering Mormons show many of the symptoms that define this disorder.

Here is what Lukoff has to say about dealing with the "emergency" aspect of this process:

"However, for spiritual emergencies, most of the models of intervention come from the transpersonal psychology literature. Grof and Grof (1990) recommend that the person temporarily discontinue active inner exploration and all forms of spiritual practice, change their diet to include more "grounding foods" (such as red meat), become involved in very simple grounding activities (such as gardening), engage in regular light exercise (such as walking), and use expressive arts (such as drawing, clay and evocative music) to allow the expression of emotions and experiences through color, forms, sound and movement. In the case described above, Kornfield made use of most of these elements to avoid hospitalizing the individual who entered a spiritual emergency during a meditation retreat. Reliance on the client's self-healing capacities is one of the main principles that guides transpersonal treatment of spiritual emergencies (Perry, 1974; Watson, 1994). In addition, psychologists should be willing to consult, work closely with or even refer to spiritual teachers who may have considerably more expertise in the specific types of crises associated with a given spiritual practice or tradition. Unfortunately mental health professionals rarely consult with religious

[68] See pp. 4-5, 16-17.

> professionals or spiritual teachers even when dealing religious and spiritual issues (Larson, Hohmann, Kessler, Meador, Boyd, & McSherry, 1988).
>
> Another key component of treatment of spiritual emergencies is normalization of and education about the experience. While this is a common technique in therapy, it plays an especially important role with spiritual emergencies because persons in the midst of spiritual emergencies are often afraid that the unusual nature of their experiences indicates that they are "going crazy" (as described in some of the above cases). An extremely abbreviated version of normalization of an unusual spiritual experience is reported by Jung (1964) in the following case: 'I vividly recall the case of a professor who had a sudden vision and thought he was insane. He came to see me in a state of complete panic. I simply took a 400-year-old book from the shelf and showed him an old woodcut depicting his very vision. "There's no reason for you to believe that you're insane," I said to him. "They knew about your vision 400 years ago." Whereupon he sat down entirely deflated, but once more normal.' (p. 69)"

I first note the "normalization" point. That is what brings many people on their way out of literalist religion to places like the "Recovery from Mormonism" (RMF) bulletin board[69]. They seek validation. That is why the storyboard at RFM is so powerful. Mormonism restricts its members from talking about the reality of their experience. The only expressions of belief that are permitted in public are those that support the institution, thus isolating and invalidating all who do not resonate with what is publicly stated. This, over time, causes one's real feelings to be suppressed and creates an inauthentic manner of relating to reality and other people that can itself cause various forms of psychoses.

However, Lukoff's suggestion for those in the initial stages of crisis was counter intuitive for me. He did not suggest digging in and figuring things out (as I tried to do), but rather withdrawing from direct contemplation of the problem to engage in what amount to strength building, healing exercises that would create a greater ability to both see and bear reality. I think this idea needs a little reworking to be useful from a Mormon point of view, and took a shot at doing that, as well as describe my recent experience with these modes of therapy, in another essay[70].

It seems clear that Lukoff is referring to people who have acknowledged that they have a problem, and so have sought out a therapist. The main problem on the way out of Mormonism or other literalist religions is that the organization has its hooks into us in so many different ways that it is not easy to get to the point at which one can look herself in the mirror and say, "I have been duped. What am I going to do about it?" A destructive act is required to get to that point. Until that extraordinarily painful destruction occurs, the "patient" will not acknowledge that she is ill and hence will not seek, or in most cases be prepared to accept, treatment. Places like RFM play an important role in providing the information that people on the fringes of Mormonism need to validate their feelings, destroy unjustified beliefs, and find sources of information to start to re-work their personal mythologies. This requires focus on the problem – precisely what Lukoff recommends we avoid while in an emergency state. I think that it is fair to say that the state of emergency – if it will become such – will not occur until a person has accepted that his most basic beliefs are false. So, I suggest that Lukoff's advice be followed as soon as the penny has fully and truly dropped. Until then, it is necessary that the focus be internal – on the

[69] See www.exmormon.org.
[70] See http://mccue.cc/bob/documents/rs.art%20therapy%20for%20recovering%20mormons.pdf.

issues required to falsify unjustified beliefs and particularly, those beliefs that enable religious authority to be able to control the believer's behavior.

My moment of truth is described at http://mccue.cc/bob/documents/rs.revelation.pdf. It is my belief that had I done what Lukoff recommends (disengaged from Mormon studies and began to explore my artistic side), it would have saved months of thrashing around and a lot of stress on some of my most important personal relationships.

It is common for people emerging from literalist religions to go through what might be called an emergency, and then later settle into a period of emergence that may last for a long time. I hope my emergence never ends. Near the end of his life, the great artist Goya wrote "Aun aprendo" (Yet I learn) on one of his drawings. To this we may all aspire. My experience with the "emergence" side of this experience so far still seems like a miracle most days, after over four years.

By way of summary, developing artistic skills[71] has powerful therapeutic benefits for those who are recovering from the effects of a domineering institution like Mormonism and are trying to develop a new personal mythology or worldview. And I can see particular wisdom in pulling away from the analysis of the "religious problem" in one's life once the crisis has been reached and we have accepted that our belief system is in disarray. At that point, as we begin to develop a new worldview, it is more important than ever that we perceive things accurately, as wholes, and in their essences, instead of in booming, buzzing detail. The disciplines of drawing, painting and creative writing as I experienced them in different ways suppressed my tendency to see, think and feel as I have been taught, and enabled me to see and feel more of what was in front of me; of what was important about the scene in front of me; and perhaps most importantly, to reinterpret various incidents in my past and to see new ways of dealing with both life as it is now and as it will become. It makes sense to me that this process would both help to calm the emergency, and would become wonderful creative fodder during the creation of a new world view.

I note in particular the analogy between what Lukoff recommends for those who are in a state of spiritual emergency and what I was being taught to do in different ways while learning to draw, write creatively and paint. Lukoff says, in essence,

> "Stop trying to understand the thing through analysis, introspection, etc. Just let it be. Go draw, paint, jog, garden. Be good to yourself. Don't be strict with yourself. Don't worry. Be happy."

And from each of our art and writing instructors I heard continually in a variety of different ways, "let go". They told me to stop trying to control my story. Let it tell itself. Let it tumble out. Accept, even embrace, a "shitty first draft". Concentrate on what is really there in front of you. Keep asking yourself, "what do I see?" Squint at it. Move around and look at it from different angles. Ask out loud why it appeals to you. Play with it and how it makes you feel. Just throw paint on the canvass in shapes and colors that seem consistent with how you feel, not what you see. And don't worry about how it looks because you can always fix it later. Let it stay in the realm of feeling and vague image for as long as possible because there it will develop in ways that will often surprise you.

[71] See "Drawing on the Right Side of the Brain", for example, at http://www.drawright.com/.

Restorying ourselves is the ultimate artistic act. Our palate is life itself, both already lived and as we can imagine it. We paint with our own blood and tears; write with our dreams. The more of ourselves and the reality around us we can perceive – in essence rather than detail – the more satisfying the story will be and the more authentic the role we can cast for ourselves. Nothing makes more sense to me now than developing our ability to use the right side of the brain to reframe our relationship to ourselves and the world, and to chart our path through life as the story unfolds.

I told myself several years ago after taking the first big steps out of Mormonism that I would never again allow myself to be convinced that anything was absolutely, unshakably true. I still feel that way. What I did not realize, however, that this attitude requires of me a continual restorying. As long as I live and continue to have energy, I will be redefining myself and my relationship to the world around me. This will largely be a function of becoming more self aware, and aware of my relationship to the people around me and other aspects of my environment. One of my most important insights of the past few years is the critical nature that the artistic disciplines to which I have been exposed will play in this process.

The process of becoming more self-aware is like peeling an onion. Trying to see and feel like an artist, and then creating something (anything), teaches us to suppress our prejudices in a way that will be helpful in allowing more of what is in my subconscious to come to the surface and more of the reality around me to be appreciated instead of sliding by. This excites me, and does not require anything of me beyond some of my time. I do not need to become an artist to gain the benefits I just described. All I have to do is act like an artist. This is what will teach me about both myself and anything else I care to consider.

My wife and I took a trip to France about a year ago that was particularly helpful to our process of growth and renewal. Juli suggested that this might have a lot to do with the fact that in the old parts of France, it is hard to avoid being reminded that the world is full of different possibilities. Everything is different. The streets are narrow. The houses and other buildings look different. The people speak a language that we don't understand. The food is different. The experience of recovering from jet lag is itself a kind of rebirth that gives the impression that one has emerged into a new world. The environment we chose for this experiment in creativity was close to ideal for our purposes. However, we cannot go to France often, and there are many opportunities to write, draw, paint, etc. around us where we live. We have both committed to incorporating this kind of creative endeavour into our weekly routine, and are excited to see where this may lead.

SOSs and Education About Religion

It is trite to note that our educational institutions have a profound effect on the shape of our social institutions. Various commentators regarding literalist religion's negative consequences have recently pointed to this. For example, Richard Dawkins[72], while discussing his recent BBC documentary "The Root of All Evil" noted that many of the religious problems in Northern Ireland can be traced to the religiously based educational system there. It has created, he suggested, tribes out of people who for the most part come from the same gene pool and have the same cultural heritage.

[72] See http://www.pointofinquiry.org/?p=36.

Daniel Dennett[73] followed a similar tack with his comments respecting religious belief in general. He is floating a proposal regarding a change in the US's religion related school curricula and says he is getting lots of positive feedback. He says that we should have a national curriculum on world religions for all school children – home-schooled, private, public etc. This should include the study of the major religions' (and some minor religions') history, texts, symbolism, rituals, prohibitions, beliefs, etc. These should be presented as facts, without evaluation. These facts, he says, are as important as geography, politics and other things taught in school, and if a religion can't survive without its children learning these facts, it does not deserve to survive. Any institution that must enforce ignorance to survive is not worthy of survival. Inculcating ignorance in children is a kind of child abuse, in his view, and should not be permitted. Dennett believes his proposal is an extension of education policy the US already has that requires all kids to receive certain basic and important information.

I would add to Dennett's proposal that the presentation of the sociology of religion as a scientific theory, along with its limitations, is an important part of this matrix. I don't see how the "facts" Dennett references can be otherwise presented, and suspect that he was perhaps a little disingenuous about this since it is harder to argue against the presentation of facts than teaching the sociology of religion.

I have been advocating Dennett's position (modified as just indicated) since shortly after leaving Mormonism about four years ago and becoming familiar with differences between the way religion is dealt with in various European and North American schools systems.[74]

It is useful to frame the educational issue Dawkins and Dennett are forcing up the public agenda in SOS terms. For example, how should we expect Dennett's proposal to affect religious attractor basins? Would they tend to become deeper and more resistant to change, or shallower and more amenable to evolutionary pressure?

And what of the way in which charter schools and various kinds of home schooling are being used by various interest groups to control various aspects of the educational experience? Will these tend to deepen or shallow religious attractor basins?

A common educational foundation creates common social capital and hence works against the creation of social capital that ties an individual to one social group. This would tend to shallow out religious attractor basins.

Speaking practically, the less information flowing between parts of a system, the more each group would know about itself and the less about other groups. This tends to create feeling of in-group superiority. And the less we know about other people the easier it is to dehumanize them, and abuse them.

Hence, separate religiously oriented education creates intellectual and social barriers between groups. This can be thought of as a form of "silo-ization". As noted above, complexity theory explains that the absence of information creates a form of membrane between systems that

[73] See the 25 minute mark of http://www.pointofinquiry.org/?m=200603.

[74] Dennett is advocating something that approximates the way religion is dealt with in the curriculum of some European countries. I can't cite chapter or verse for this, but Susan Blackmore (see http://en.wikipedia.org/wiki/Susan_Blackmore and http://www.susanblackmore.co.uk/) told me this at a conference I attended at Caltech in May, 2005.

defines separate organisms. A common religious education would work toward breaking down these membranes and reducing the potential for conflict between the organisms in question, and perhaps even dissolving certain organisms.

The smaller our world becomes the more important it is that these human tendencies be explicitly resisted. The educational system has an important role to play in this regard.

This ties into the evaporation of creed concept that Dennett also mentioned during the podcast referenced above[75]. He noted that many religions now teach that it is more important that we act in certain ways to express our devotion to Jesus, for example, than we have any particular beliefs about Him. So, don't worry about what the Trinity means or other points of doctrine, but rather live with compassion toward other humans, or life, etc. as Jesus taught.

This is radical change for many religious people, caused in many cases by the cognitive dissonance members of religious groups feel as they become aware of how similar they are to other religious groups. The creeds are, as it turns out, not of practical significance. They are roads to a similar behavioral place[76]. So the creeds are being quietly put aside, to be forgotten, leaving behind love and allegiance as the core of the religious experience. Dennett notes that he does not say that evaporation of creed is a good thing, and that it is only one trend among many.

In has been my view for some time that the evaporation of creed will become an increasingly dominant and important feature of the monotheistic faiths. I think that this is likely our best bet for defusing the religious based violence Dennett and others rightly decry. This is a stepping stone toward pluralism based on a more philosophically stable foundation.

The evaporation of creed does several very important things for religious organisms. First, it makes it harder for religions to compete with each other, and so defuses the tension between religious groups. I see this move happening within Mormonism and have often noted Mormonism's calculated move toward mainstream evangelical Christianity and Mormonism's abandonment of once fundamentally important beliefs in order to fit within that house. This is a well trod path. It is a coping technique for monistic cultures ("We have THE truth") in an increasingly information rich, pluralistic world.

And, perhaps more importantly, I thought it odd that Dennett did not connect the dots between the evaporation of creed phenomenon and the point he so nicely made earlier in the interview about how resistant religious people are to the scientific examination of their truth claims. The evaporation of creed takes this issue off the table. This is part of the lengthy process by which religious people have sought to render their foundational claims unfalsifiable. They go metaphoric in some cases, admit that some ideas are flatly false (remember Galileo) and as science continues to advance, these social organisms must continue to evolve defense mechanisms. The evaporation of creed is one of the best current examples of evolution working its magic in the religious space.

SOSs and the Emergence of Social Compassion

Now for a massive social phase transition.

[75] See minute 29 of the podcast.
[76] See Karen Armstrong, "The Great Transformation".

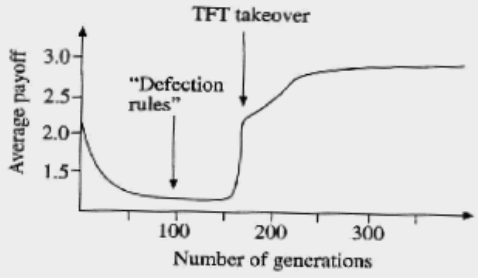
My time on Star Island this year reminded me of the connection between the Axial Age[77] and the modern notion of social (in-group at least) compassion that came into being then. This is when the "eye for an eye" rule in the Hebrew world gave way to the golden rule. While Christ is commonly credited with this social innovation, most scholars now believe that it pre-dated him by at least a couple of centuries. And we now see another expansion of human compassion to include more life forms and the planet itself. Some people have attempted to understand this through the application of group evolutionary theory[78], which I think has some traction but is likely not the important factor in this case.

I think both the Axial Age and what is happening now are better understood using complexity theory. Karen Armstrong's "The Great Transformation" offer's one of the best treatments of the Axial Age I have seen from an historical point of view. Philip Ball in "Critical Mass" has a nice chapter in which he uses game theory to explain the Axial Age shift toward compassion without mentioning the Axial Age.

Ball summarizes the game theory research that uses the prisoners dilemma to show that the best way to break out of a pattern of constant cheating (the law of the jungle) is "tit for tat", straight up. That is, "a eye for an eye". However, more wealth (opportunity) is created for all players if they moderate tit for tit into something that might be called "compassionate tit for tat".

We start out assuming our partner will be trustworthy, and even if he cheats us once or perhaps twice, we will forgive him and give him the chance to become trustworthy and maximize the size of the pie for everyone. But if he cheats enough times, we label him a cheater and expend more of our resources than is justifiable from our individual point of view alone to warn the group that we have a cheater in our midst. This trusting pattern allows the group to be the most productive, it is hence the most efficient state for the group – an attractor basin[79].

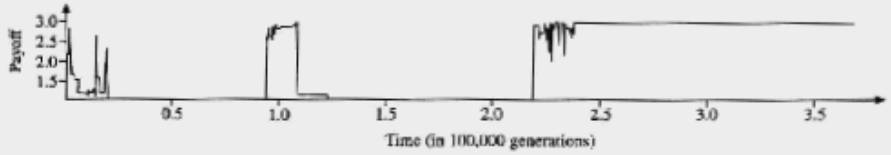
This is modelled in the short term as follows:



18.1 In a mixed population of Prisoner's Dilemma strategies subject to "natural selection" of the most successful, Tit for Tat emerges from a population that has initially become mired in defection. This is accompanied by an abrupt rise in the average payoff for encounters between agents, since TFT allows a greater degree of cooperation.

[77] See http://en.wikipedia.org/wiki/Axial_Age.
[78] See for example, David Sloan Wilson, "Darwin's Cathedral".
[79] See the graphics linked to http://www.learning-org.com/01.09/0053.html .

"Defection rules" is the law of the jungle – cheat and take whatever you can. "TFT takeover" is the point at which the compassionate tit for tat rules begins to dominate the population. Over many generations, the game theory models produce patterns that look more or less as follows:



18.2 The changes in proportions of strategies over many generations of a Prisoner's Dilemma simulation are revealed by the changes in average payoff within the population: higher payoffs reflect a higher proportion of cooperative strategies. In these simulations the strategies evolve according to Darwinian selection, and they can take into account both their own last move and that of their opponent. There are several outbreaks of cooperation, the first two of which eventually collapse. The third is persistent.

This shows that once in the compassionate tit for tat model there is a reasonable chance that the population will fall back into chaos at least a few times before the group behaviour stabilizes.

One of the inferences from these models that lines up with many social science observations is that human behavior is drawn to what is most efficient - what "works" - to produce the things the individual or group needs to achieve what they need or want, and particularly, to survive and propagate.

We don't need to rely on group evolutionary theory to support this idea, though the same kind of principle could be at play in the altruistic behaviour of flocking birds (warning against predators, etc.) and other small group animals. In the human case, the observation that another group is using a social or other technology that gives them an advantage is enough to cause new behaviours to emerge. We would not need to wait for biological evolution. And the groups who adopted the more efficient practices would tend to amass more resources than the others and hence take over. The compassionate tit for tat social environment would tend, for example, to facilitate technological innovation. And so when war breaks out, the "compassionate tit for tat" people had more technology and resources of other kinds, and tended to win. And of course, compassionate tit for tat only applied within the social group. A completely different set of rules existed for group outsiders.

This concept is exemplified by the way in which Christ talked about families breaking up, the eye being plucked from the body, etc. as a result of differences in religious belief. Compassionate tit for tat was mostly limited to in-group interactions. Differences in religious belief drew important lines between groups.

I don't like to use meme theory to explain the move from tit for tat to compassionate tit for tat. Meme theory is only useful in a loose metaphoric sense. I think other paradigms are more useful for understanding how and why culture forms and evolves. And eventually, an information theory like what Terry Deacon is working on (as previously discussed), coupled with far better measurement capacity than we have now, will be required for the foundation of a rigorous, falsifiable theory of social evolution.

So, when I add up Armstrong's history and Ball's game theory regarding the Axial Age, I see human social groups in four different parts of the world (Europe, the Near East, China and India) all reaching an age, size and complexity at which the conditions were right for compassionate tit for tat to emerge. Since this state represents an efficient state or energy minimum for groups of the kind we are talking about, it was only a matter of time before this happened. It may have emerged separately in all four places, or seeding events could have resulted from the relatively little social interaction between these regions. It would not take much given the conditions just noted. This is the old biological story of organisms growing together, giving up adjacent possibles, becoming interdependent, and eventually becoming a single organism.

Now we come to what we see emerging currently. The planet is on the verge of being overrun by humans. In complexity theory terms, this amounts to more energy in the pot; so much energy that the pattern that sustains life is starting to break down. In order to maintain this pattern, more ordering principles are required to channel, diffuse, or reduce the energy we produce. The rule of social compassion to in-group members amounted to this kind of social ordering principle in the Axial Age. The energy that would have been released against a fellow human being as the result of a slight was muted by compassion. And when fellow humans were suffering (needing an energy infusion) in cases where the old rules would not have elicited any help, the new rules required that help be given (energy released). So the compassionate rule controlled energy during times when the social pattern was at risk of being destroyed because more people were living in close quarters with more resources than ever. It also caused more energy to be released in cases where it was helpful to the social order to do so. What a brilliant adaptive response.

The same kind of thing is happening now. Our numbers and the resources under our control (machines, fossil fuel, etc.) have us bouncing off each other and other life forms and releasing more energy than ever, by far. Hence the problem Al Gore[80] and others point out regarding global warming. Social conflict of various kinds is similarly explained. Likewise for some new diseases that result from our exercise of power over the microbial environment.

The necessity this situation creates is that we constrain or re-channel some of the energy we now produce. Feeling compassion toward other life forms (including humans on the other side of the globe and yet to be born) is a means to this end. And that is what we are seeing start to spring up all around us. Europe is far ahead of us in this regard. Parts of the East never joined the western trend toward technology and consumption and we are now ironically learning to live from them in some ways while they are adopting our technology and in many cases trying to do what we now feel we need to avoid doing.

So, new mores related to our interconnectedness to all life will come into being for the same reasons as compassionate tit for tat (including the golden rule) did in the Axial Age. This process can be aided by international conventions related to the great commons of the planet (sea, air, rainforests, etc.) since the golden rule does not work well unless there is a fairly close connection between humans. I doubt that most humans are capable of conceptualizing the relationships over time and space required to make the kind of short term consumption decisions required to avert disaster. But we humans are well suited to following rules established by credible authority figures and connected to a compelling story - a mythology.

And that is what many of our folders are working on.

[80] See http://en.wikipedia.org/wiki/An_Inconvenient_Truth.

Metaphor, Reality and Ontology Shifting

As I have thought about our Star Island experience, I have felt an increasing synergy between life's theoretical and narrative aspects.

For example, Edmund Robinson noted during one of the discussion groups we were in at Star this year that his preaching has moved toward the narrative from the paradigmatic or theoretical, because he finds narrative preaching to be more effective. I agree, but narrative's effect is limited by its theoretical framework. That is, narrative and metaphor based in science like complexity theory cannot move a Biblical literalist who knows nothing about complexity theory. And conversely, by learning the scientific theory I did while preparing for and attending Star Island this year I have entered a new world of potential narrative and metaphoric meaning.

Put another way, our most basic beliefs about reality[81] limit our ability to comprehend narrative and metaphor. And ironically, because brilliantly crafted metaphor[82] is so flexible and memorable, it will tend to solidify our current beliefs about what is real, no matter how erroneous they are.

If we wish to change society in a constructive fashion, it is important that we use metaphor and other persuasive tools to help people become better connected to realistic ontologies. This requires that we balance our narrative and metaphoric discourse with scientific concepts. One way to do this would be to inject clear, and hence challenging, ontological statements into the kind of great metaphors that people like Karl Peters and Brian Swimme use.

One example of how complexity theory as the scientific paradigm might be used to shift the ontology of a literalist religious person who also takes science seriously, as most do, is as follows:

- A lot of literalist religion's problems can be traced to the trust adherents to those systems place in other humans who hold themselves out as God's authorized agents. Metaphors related to god as nature, god as creativity etc. do little to disturb these beliefs, and in fact are used by literalist religious leaders to cement their power.

- Religious literalists live in the same world we do, and most (in North American and Europe at least) extensively interface with secular communities. Hence, they face problems related to trying to understand and influence social processes both within, and outside of, their groups.

- A complexity theory based understanding of social patterns can be easily demonstrated to be helpful for a wide variety of purposes, such as understanding how financial and other markets work, how political alliances form and function, how marriages work, etc.

- It would then be easy to demonstrate how the same kind of patterns that have just demonstrated their utility in a secular context are also highly explanatory of how religious groups and their belief systems have evolved.

[81] Our "ontological beliefs. See http://en.wikipedia.org/wiki/Ontology.
[82] And most narrative is metaphor.

- Think, for example, of the general pattern of religious belief[83] in light of Goethe's famous statement, "As man is; so is his god; thus is god; oft strangely odd". A quick run through a few religious traditions (but not the one to which the listeners in question are faithful) would likely produce agreement with the idea that most of them are likely products of SOSs in particular environments, and that in each case the willingness of a large group of people to accept on faith the idea that a particular leader was speaking for a particular kind of god was responsible for the social coherence that allowed the group to form and prosper at some point, and then later in many cases develop terrific social problems. Any number of literalist Christian, Muslim and Jewish groups could be offered as exhibits in this regard.

- Furthermore, it should be possible to show that, consistent with complexity theory, differences between religious groups in terms of both belief and behavior are far more a function of differences in factors that affect all social phenomena than any underlying reality. And again, as long as the religious group to which the listeners in question belong is not expressly examined, these modes of thought are likely to be accepted.

- Having thoroughly engrained the importance and utility of looking at social systems through the complex systems lens, the tricky question then is to what extent is it useful to challenge directly the ontological beliefs of the particular religious group under consideration. In most cases, it will be best to leave that connection to be made in private by the listeners as they develop "ears to hear".[84]

Throughout this process we would be upfront about how tempting it is to confuse our theories – our ideas about what is likely real – with reality itself. We cannot be 100% certain about reality. And we all have a deep-seated tendency toward this very certainty.

So, as we put forward models of social reality based in complexity theory we will explicitly do so as the most reliable representation of and explanation for reality we have found, but something that is far from certain. We can use the many well studied historical case studies where people (even good scientists) have confused their models with reality[85].

Having again established a pervasive pattern of human behavior in the secular realm, we have the opportunity to return to the tendency of religious people throughout history to observe a pattern in the world around them (storms and plagues come from time to time; sometimes wars are won and at other times lost; etc.) and to explain these patterns using a theory that involves the deities in which their group believes[86]. And it is not a coincidence that religious belief systems have evolved to be non-falsifiable. The falsifiable systems tend to die out as they are falsified.

Hence, once again we see theories coupled with observations that may or may not be accurate and the certainty people tend to have about all important ideas, and how these combine to produce powerful social currents.

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[83] Particularly, think of the recursive nature of self organizing systems.
[84] See http://www.semanticbible.com/hyperconc/E/Ear.html.
[85] See Peter Godfrey-Smith, "Theory and Reality: An Introduction to the Philosophy of Science", or Sudarshan and Rothman, "Doubt and Certainty".
[86] See Karen Armstrong, "A Short History of Myth".

So, while we can't be sure whether God exists or not, we can be sure that communication from God to man is unreliable, if it exists at all. This is established by the number of different groups of people who all purport to hear God's voice, but hear conflicting messages.

The final question is given how well complexity theory coupled with the social sciences explains this pattern in many aspects of the secular world, whether it is more likely that it provides the best explanation for the same kind of occurrences in the religious world.

What I have just outlined is an example of what Stacey Ake described as the "judo" approach to religious dialogue. That is, if one wishes to help someone to change their point of view, the best way to do that is to get to know their position well enough that you can use what they believe to illustrate problems with their own worldview. For example, if they believe that science is generally a reliable source of information, then we can get them to acknowledge the usefulness of certain scientific ideas in one context (as noted above) and then show how their scientific beliefs are in probable conflict with some of their religious beliefs. This will produce cognitive dissonance for them[87]. Thus are new ears grown. The philosopher Hans Georg Gadamer[88] called this painful process "undeception".

Alan Watts describes the approach of the Zen masters in much the same way. They used various techniques to steer their students into the dead ends of their cultural tradition and to force them to deal with – and hopefully make peace with – the fundamental paradoxes of human existence. That is, they determine the ideas to which their students were committed, and then force the students to address conflicts within those ideas, thus creating a form of ideological chaos out of which new beliefs would emerge within the order created by the Zen system of thought.

Again we find ourselves courting the edge of chaos. Here is Watts' delightful description of one aspect of this process[89]:

> "There is not life on the one hand and you on the other. It is all the same. But you see, you can't tell people that and get them to see it. It is just exactly this way with people who know that the earth is flat. They can't be reasoned with. People who believe that the Bible is the literal word of God – absolutely impossible to reason with them at all because they know it is so. So in the same way, we tend to know that we are all separate "poor little mes" and that we are in need of salvation or something. And we know that this is so. And so when someone says, 'Well, you know its not really that way – that feeling of separateness is just an illusion.' [The reply is usually] 'Well, that's all very nice in theory but I don't feel it.'
>
> So what will you do? What will you do with a person who is convinced that the earth is flat? No way of reasoning with them. If it is for some reason important that he discover that the earth is round, you've got to play a game with him; play a trick on him. You tell him, 'Great, the earth is flat. Let's go and look over the edge. Wouldn't that be fun? Of course, if we are going to look over the edge of the earth we have to be careful that we don't go around in circles or we will never get to the edge. So we've got to go

[87] See http://en.wikipedia.org/wiki/Cognitive_dissonance.
[88] See http://en.wikipedia.org/wiki/Hans-Georg_Gadamer.
[89] See podcast Buddhism as Dialogue, #3 at .

consistently along a certain line of latitude westwards and then we are going to come to the edge of the earth, just so long as we are consistent.'

In other words, in order to convince a flat earthist that the earth is round, you have got to make him act consistently on his own proposition and go consistently westward to find the edge of the world. Now at last, when he has gone consistently westward and come back to the place where he started, he's been convinced that the earth is at least cylindrical and he may believe you – take it on faith – that if he goes along a line of longitude the same thing will happen.

But you see, what you did was to make him persist in his folly. Now that's the whole method of Zen. To make people become perfect egotists, and so explode the illusion of the separate ego."

The Rider on the Elephant

Social phase transitions require consciousness. So, how unconscious are we and can we become more conscious? And what should we do; where should we go; with whom should we associate if we wish to raise our consciousness?

I like the psychologist Jon Haidt's[90] metaphor of "the rider on the elephant". We, the conscious riders on our elephants, perceive ourselves to be in control. But we can't help but notice that things regularly don't turn out as we want them to and we have all kinds of elaborate explanations for this. Some of us become aware that we are on top of, or part of, a beast of unseen proportions and tremendous power.

We realize that we, the conscious riders, recently evolved to serve our elephants and that shockingly, the best way to understand this relationship is that "I" am a mere glimmer in the elephant's eye. I am part of it. So most of "me" is unknown and unknowable. As Jeff Dahms so nicely put it in one of the emails he sent to our religious naturalism email list, "we are slivers of consciousness floating on unconscious oceans".

Our beast is the sum of our evolved instincts. For example, we are small herd animals, and have been programmed by our evolutionary experience to seek security and meaning within small groups of people . For most of human history, our connection to a small social group was immensely important. Without our group, survival was extremely unlikely. So we evolved to accept the authority of our group and to reject or not even perceive information that might break our group up or cause us to be thrown out of it, or even marginalized. And this kind of perceptual deficiency shows up relative to all kinds of groups.

Try talking to a hard core baseball fan about a close call at home plate that went against her team, causing it to lose an important game. The chances that she can objectively assess the merits of that call are slim. Or try talking to a committed Republican about Bush's failings, or a committed Democrat about Clinton's.

The bottom line is that we only control our elephant insofar as we help it to get what it has been conditioned by genetics and history to want. We can continue the conditioning process, which

[90] See http://www.happinesshypothesis.com/.

for the most part is slow and laborious. Thus are most of our adjacent behavioral possibles defined.

Our best bet as riders is to steer the elephant during its pliable moments into environments where it will likely want what we think we want. And we can make it more pliable through the use of things like meditation, engaging in artistic activities and various other ways. In the meantime, the rider loses all contests in which the conscious will is pitted against the unconscious beast.

My elephant (and most elephants), for example, does not do well in buffets or where food is sitting around. It eats, even through I tell it not to. It eats even though it is already full and "knows" that more eating will make it pay a stiff physical price of various kinds. But all I have to do to fix this problem is order off the menu instead of visiting the buffet, and put the food out of my elephant's sight when I get home.

My elephant is unusually stubborn and competitive. This can be good or bad. If I want my elephant to work or exercise, for example, he is easy to trick into it. All I have to do is find a competitive game that requires my elephant to do what I want him to do, or just go to the gym and watch other people for a while.

My elephant is terrifically mimetic. So if I want to be artistic (or scholarly, or golferly (?), or whatever), all I have to do is take a few art classes and hang with the artsy crowd. My elephant will do the rest. If I want to be IRASian – to raise my consciousness while flirting with chaos – I come to Star Island and spend some time on the Internet each week with my consciousness oriented friends.

We could walk through a long list of issues related to cognitive biases (like our tendency to defer to certain kinds of authority) that can help us understand what will make our elephant tend to do things, whether we want him to or not.[91]

Elephants that have been raised in strict, rule bound social groups look a little like circus animals to those raised outside the group – they do the damnedest things. And when released from the circus, they sometimes have a hard time coping in an environment where jumping through flaming hoops, for example, is not rewarded while big prizes are given for things he has not learned to do very well or at all.

Ironically, many things that my elephant has been programmed to do by its evolutionary path and social rules depress me (in the clinical sense). While they were once adaptive, in our current environment of abundance they no longer are. For example, the elephant wants to accumulate as much as possible while the getting is good; it measures status on the basis of what it has hoarded; it eats too much when food is available (as it always is now); it often favors short term over long term relationships; etc.

And most measures of human satisfaction show that less work, more variation in how we spend our time, more time spent with people in intimate community, make us more satisfied with life. Our elephants will not do those things without a lot of training or the careful choice of environment on their riders' parts.

[91] See http://mccue.cc/bob/documents/rs.denial.pdf.

Ritual has long been part of society's ordering structure. The more crowded the group or more harsh the environment, the more ritual. Again, think of the East Indians, Japanese and Chinese. Think of the military.

Ritual one way to harness our elephants' mimetic tendencies and train them. To do this we need to understand the relationship between our ritual acts, our behavior and how we feel. For example, studies have shown that in many instances feeling comes from doing. That is, we can be made to feel happy by forcing a smile or laugh[92]. Many other facial muscles are connected to different feelings in such a way that if the muscles move in a particular way, they cause a feeling. Hence, rituals that force the movement of these muscles in certain ways will cause us to have certain feelings, and this will in turn make certain behaviors more likely than would otherwise be the case. Listening to certain kinds of music has a similar effect.[93]

Hence, ritual in combination with musical and other sensory experience can cause us to do things that make us feel things, from joy to sorrow to gratitude to empathy to fear to hate. The thoughtful creation of new ritual, or re-working of those evolved within traditional religions, should be expected to be among the ordering mechanism that we develop as we attempt to guide our elephants towards minimization of the KKR Emergency.

The Denial of Consciousness

A review of human history makes us wonder how much consciousness; freedom; choice; can we stand? We consistently act as though our most precious natural gift – our consciousness – is a burden. That is, some of the most attractive experiences in the human realm involve a loss of a consciousness – a return to something that is more like our primitive mental state – the state in which other animals now live – the temporary merger of rider with elephant.

Andy Newberg[94] describes the powerful and extremely attractive feelings that result from deep meditation and the loss of the sense of self; the sense that we are separate from the rest of reality. Similar feelings are created by being part of a huge crowd, experiencing sudden relief from angst, being in deep sleep, making love, or being absorbed by a task at work or play.

Social groups all work on the basis of ritual and other rules that simplify, and order, human behavior. These reduce the decisions we are called upon to make, and so make us less conscious as well. And these rules are essential to the maintenance of the pattern of human behavior that is society.

The more energy and the smaller the space, the more ordering rules are required. This contributes heavily to the likelihood that the more crowded a place and the longer it has been

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[92] See http://www.phayul.com/news/article.aspx?id=294&article=The+43+Facial+Muscles+That+Reveal&t=1&c=5 and http://www.findarticles.com/p/articles/mi_m1175/is_v20/ai_4077522.

[93] See http://www.pbs.org/wnet/gperf/shows/tchaikovsky4/index2.html Click on "Keeping Score". Let it load. Then click on "Primal Moves". Let it load. Then click on "Emotional Roots", do the little bit of reading required there, experience the types of music illustrated and feel them work up and down your emotional spectrum. And then go back one page and click on "Matching the Music" which is where the fun begins. I recommend the following experiment: (1) Select Edvard Munch's "Scream" as your painting for the first frame, and match it with the music clip from the bottom right hand corner of the selection, which is from Alban Berg's "Three Orchestral Pieces". (2) Save this as frame one. (3) Make the same selection for frames two and three. (4) For frames four through six select "Scream" but match it with the first music clip (top left hand corner), which is a Brahms violin concerto. (5) .

[94] See "Why God Won't Go Away".

crowded, the more elaborate and restrictive its social ordering system will be. Think of Japan, India and China in this context. Complexity theory tells us that this is not a matter of cultural style but rather a survival imperative.

For example, the rule of law is shown to be important to economic growth and security of many kinds – without the assurance that our investment of effort and capital will be protected, we don't tend to work as hard or invest as much. This does not prove that lawyers are a good thing after all. Rather, it is a classic illustration of irony – good often comes from bad.

The role of rules in stabilizing society is balanced against the need for society to evolve as its environment changes. Some groups are less flexible than others. Yeats spoke of social masks[95]. He said that society gives us a starting place by virtue of its rules. It puts a mask on us. In some societies, these masks are applied more rigidly than others. Traditional Hindus, for example, are subject to a caste system that prescribes a large percentage of their behavior and people are still killed or maimed when they break the rules that define their caste.

Masks are applied in the west as well. My Mormon ancestors had a huge rule book. The rule book for my children while we lived as literalist Mormons until about 4 years ago was still large by Western standards, but small by traditional Hindu standards.

Part of the genius of the west particularly is that while societal masks are applied on the one hand to create the stability society needs, subversive voices whisper "Rip it off!! You are so much more than your mask!!! Rip it off!!!"

And so generation after generation, in the west more than the east, have challenged the social order that would prescribe their roles, have torn off their masks, and have plunged into what seems like chaos to be reformed – reborn – through its influence.

Western society has flourished under this creative tension[96] between those attempting to stabilize society, and those seeking to change it as well as themselves. And as already noted, the world's great myths speak of this process. The Arthurian legends called for entering the dark forest – chaos – to seek the Grail. Jonah was swallowed by the whale as he tried to avoid his quest. Hercules suffered a similar fate during one of his adventures. Countless other myths tell the same story.

The cry of those who fear rule breaking within society is that if we disobey, chaos will reign. And chaos has engulfed many social groups. Hobbes preferred "Leviathan" – the omnipotent force that would impose order in society – to this chaos. Rousseau's suggestion that members of the social group should willingly don the chains required to be a member of society and obey its "social contract" was a response to the same fear of chaos.[97]

And out of this social soup, democracy evolved and has proven capable of supporting a far greater diversity of behaviour than people like Hobbes and Rousseau dreamed possible. In fact, it is the empowering of the individual and restraint of centralized power that is a large part of democracy's secret. The other large part is that the rules imposed by the empowered people

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[95] See http://writing.colostate.edu/gallery/phantasmagoria/spore.htm and http://www.postmormon.org/exp_e/index.php/magazine/pmm_article_full_text/199.

[96] This is complexity theory's edge of chaos.

[97] See http://mccue.cc/bob/documents/rs.are%20mormons%20free.pdf.

upon themselves to channel their power are put up for grabs every few years when elections are held and governments change. This institutionalized, controlled flirtation with chaos causes democracy to continually evolve.

As noted above, one of the lessons of complexity theory is that the individual agents that make up a group that has the creative, emergent behavior that has characterized human society to date must be relatively simple. Simple agents interacting on the basis of relatively simple rules can produce enormous complexity and a breathtaking collective intelligence, much of which is found in the mores and laws that regulate society. And if the agents become too individually or collectively powerful, the reliable, rule oriented behavior necessary to build complexity and collective intelligence through many iterations of the system does not occur, complexity will decline and disaster may result in a significant pruning of agents. The agents might perceive this as a catastrophic event or series of events, after which, new complex patterns could be built on the interaction of simpler agents. Remember the dinosaurs? One does not have to stretch too far to find that this is already occurring relative to humanity, as KKR forcefully reminded us.

So, it is somewhere between possible and likely that the blindness; the denial; the unconsciousness that characterizes a large percentage of human social behavior is a result of the same mechanisms that are required to keep us – the agents – simple enough to allow the complex system that is society to function.

How do we distinguish between the wisdom embedded in the mores and rules of some social systems, and what appears to be ignorance or blindness? This is too large a question to tackle here. But we can note that when we look at religious fundamentalists of all stripes and lament their blindness and denial, we should recall the ordering effect systemic social blindness provides in some cases. Many of these groups do not have the social and legal fabrics that we have grown and paid for dearly over many generations of democracy. Recall what happened when capitalism and democracy were introduced at once into the former Soviet Union. Far more chaos resulted than was healthy. The social system could not support the autonomy – the power – thrust upon its agents. A massive international effort shored up that part of the world and arguably was responsible for preventing the spread of chaos. There is no reason to believe that democracy and capitalism would perform any better in large parts of the Arab world were it possible to simply install them there without a long period of preparation.

Democracy has provided us with a platform that supports far more individual consciousness, and hence freedom, than any social system that preceded it. We should consider carefully encouraging consciousness in those who do not have the means to contain it. As our recent adventures with terrorists all over the globe indicate, distant disasters now often come looking for us.

And what of our own increasing individual consciousness and power? We have a long ways to go before we exceed the degree of freedom and consciousness that democracy can handle. And we should recognize the restraints on human freedom that have become part of our democracy, and supported by agreement of most members of our society, as a form of wisdom.

I am concerned that our power has far outstripped our wisdom, and that we are in danger of the kind of systematic stripping down complexity theory predicts for agents that are too individually complex, or powerful, relative to the system of which they are part. This is the KKR Emergency. People like Jared Diamond and Al Gore use different terminology to reach the same conclusion.

We need more collective, systemic wisdom, not more individual or collective power. This will hopefully come from grassroots efforts and newly agreed upon social mores (like buying gas guzzlers is immoral) as well as legislative initiatives (like new international legal structures like what we are seeing in the European Union, as well as conventions along the Kyoto line).

Complexity Theory and A Covenant with Mystery

Ursula Goodenough coined the term "covenant with mystery", and used it in her book "The Sacred Depths of Nature"[98], to convey the idea that not knowing nourishes us, and that we should resist the persistent human tendency to think we "know". The better we are at resisting this tendency, the richer life tends to become.

One of the basic ideas of complex systems theory is the future outcomes of SOSs are not predictable. It is not that we lack information or the time to do calculations. The systems are so complex that brand new things are created through the interaction of the system parts. And these, as well as much more mundane system outcomes, are inherently unpredictable.

Here, we look into creation's womb. This is as deep a mystery as anything theology has to offer. And it is a real mystery. It is not manufactured out of ideas that are disconnected from the reality we can scientifically study. This mystery is offered to us by our best apprehension of reality.

The broader our perspective and more aware we become, the more clear it is that we are not justified in the belief that we can accurately apprehend what is within our view, let alone all that is. Godel's theorems[99], deterministic chaos[100], quantum mechanics[101] and other phenomena, as best we can now understand them, underscore this. And more is on the way. For example, the implication of Godel's theorems have recently been extended by Greg Chaitin[102] to suggest that there are limits to what math can describe, and that we are hence limited in our effort to apprehend what is real.

And yet we must make important decisions. In the face of our ignorance, well-understood perceptive foibles and in mystery up to our eyeballs, we need to find ways to avoid mental paralysis and make the best decisions we can. Science, properly used instead of slavishly followed, provides the most reliable means of doing this in a thoughtful fashion, while denial, cognitive bias, etc.[103] as well as our amazingly efficient heuristics[104] are our *de facto* decision-makers in most cases, for good and ill.

As a group becomes more self aware, its members tend to rely more on the wisdom of diverse crowds[105]. And yet the confirmation and other biases in the scientific community (one of our

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[98] See http://www.sofn.org.uk/Bibliography/ursula.html
and http://mccue.cc/bob/documents/rs.the%20sacred%20depths%20of%20nature.pdf.
[99] See http://www.exploratorium.edu/complexity/CompLexicon/godel.html
and http://www.ams.org/mathmedia/archive/03-2005-media.html.
[100] See http://pespmc1.vub.ac.be/CHAOS.html.
[101] See http://en.wikipedia.org/wiki/Quantum_mechanics.
[102] See http://www.cs.auckland.ac.nz/~chaitin/summer.html.
[103] See http://mccue.cc/bob/documents/rs.denial.pdf.
[104] See http://en.wikipedia.org/wiki/Gerd_Gigerenzer.
[105] See Surowiecki, James, "The Wisdom of Crowds", reviewed at http://www.csmonitor.com/2004/0525/p15s02-bogn.html.

most self-aware groups) are still so strong that Max Planck famously said that science progresses "one funeral at a time".

Somehow, in spite all this, technologies that make us more powerful continue to come into being. This is irrefutable evidence that we have enough knowledge of realty to manipulate a few of its bits.

Meanwhile, some of our most farsighted fellow travellers[106] are trying to understand the connection between what we can control - our power - and the rest of what is. They tell us that as we exercise control over small things (like our desire to travel large distances and heat or cool large houses) we set in motion forces that we can only dimly perceive as a result of the frames of time and space over which they operate, a bit like the monkey who having discovered a saw and figured out how to use it, is about to cut off the tree branch on which he sits far above the jungle floor, and is thrilled with his "progress".

And so our seers, knowing something more about saws, trees and gravity than the rest of us, are deeply disturbed by what they see in the tea leaves available to them. The warning they and others sound have aroused signs that parts of humanity are becoming conscious enough of our power to choose self restraint. Whether this will be enough to defuse KKR Emergency is arguably our most important social imperative.

So, what are the consequences of a human act? Can we act otherwise than through mostly mental and social inertia? Are we building our future or sawing off our tenuous ties to existence?

We will never run short of mystery. Mysteries can be created out of any nonsense. We don't need more of these chimera that are at best entertaining and at worst increasingly dangerous distractions or deceptions. And the extent to which we perceive and react to the wonderful mystery at the core of reality is more relevant now than ever to how long and well the human aspect of life's drama will continue.

Now, more than ever, certainty and false mystery are our enemy, while mystery of the most real and hence most sacred sort – our *mysterium tremendum et fascinans*[107] – is our inspiration and may be our Savior.

[106] See for example, Diamond, Jared "Collapse"; Wright, Ronald "A Short History of Progress"; Ehrlich, Paul "Human Natures".
[107] See http://academic.brooklyn.cuny.edu/english/melani/gothic/numinous.html.