KNOW THYSELF:
HOW ANTICIPATORY SYSTEMS THEORY CAN INFORM MEDICAL SCIENCE AND PSYCHOLOGY

Judith Rosen

Habit patterns: We all have them. This is a universal reality of human experience. We acquire them from two distinct sources-- The human mind generates countless habit patterns as does the human body. Sometimes the two work together to generate and/or reinforce each other's habit patterns, other times, they seem to work at cross purposes to each other. Good habits, bad habits… these habit patterns can take many different forms or manifest their presence in different ways such as set-points, over-use injuries, calluses, tendencies (like having "a sweet tooth"), having a hair-trigger temper, or cravings and aversions-- which can sometimes become full-blown addictions and phobias. Oscar Wilde's famous line, "I can resist anything except temptation!" (from Lady Windermere's Fan) illuminates everything from a weakness for pastries to a pyromaniac's compulsion to start fires. Temptation represents something about a pre-existing habit pattern. Another universal reality of human experience is that, all too often, our own habit patterns seem to be beyond our conscious ability to control. Why is that? And, what causes them?

Robert Rosen's scientific work in Theoretical Biology and BioPhysics has been referred to, collectively, as "relational complexity" or "relational science". It includes a sub-theory he referred to as "Anticipatory Systems Theory". Every living organism, he said, represents an example of a self-organizing, naturally occurring, *anticipatory system*. Since human beings are living organisms, this applies to us. An anticipatory system is one that can encode and utilize information about self and environment, which then acts as a set of predictive models for the purposes of system guidance and control. The observable behavior pattern of such systems is distinctive because they routinely change their behavior in the present based on *events which have not yet occurred*.

The capacity for anticipation is one of the singular hallmarks of life. As such, it does not require a mind, a central nervous system, or any intelligent "thought process" -- as human beings experience it-- whatsoever. In fact, it is logical to conclude that the reason human intelligence can anticipate is because life is already organized to be anticipatory. If so, then the human mind is merely an evolutionary concentration of the living capacity to encode information, build models out of it, and use those models to predict *what will happen* in various situations in the future, as a continuous bodily function.

The ability to predict recurring patterns of behavior in the environment allows an organism to do two important things. It can evade those aspects of the environmental pattern that would be detrimental to its stability and it can also put itself in a position to take full advantage of the recurring aspects of the environmental pattern which protect and support its stability. In this way, organisms evolve to be extremely compatible with their native environment's normal behavior pattern, over cycles of time. It is this same

anticipatory capacity, arising from our organization as living systems, which also turns out to be the source for ALL of our human habit patterns.

I think this is significant for several important reasons, three of which are:

1.) The current paradigm of science is based on a presumption that this universe is a purely reactive one and, therefore, the only mode of interaction possible between systems is action/reaction.

2.) Medical science and Psychology (which includes "Cognitive Theory") are firmly grounded using the same conceptual foundations and theory that were developed through the history of Science: a conglomeration of Physics and Thermodynamics.

And;

3.) Medicine and Psychology represent those aspects of science which attempt to understand human physiology, human mental health, and human experience—with an eye towards increasing the optimality of all three.

The upshot of all of the above is that we are anticipatory systems and yet we are trying to understand ourselves using a scientific paradigm limited by, and burdened with, a built-in presumption that, like a machine, all we can ever do is react. This disconnect has been responsible for all manner of problems in the areas of science which deal with living systems in any way.

This paper will examine some of the situations where using the current paradigm has caused impediments to extending our knowledge, or even serious harm to human health and well-being. We will re-examine the same situations using the expanded scientific paradigm as developed by Robert Rosen, to see whether more productive and useful results can be obtained by doing so.

Food: We Are What We Eat?

One thing that all living organisms have—regardless of species-- that no other type of system (known so far) has, is a system-based value for *health*. Medical science seeks to understand what this means: What is human health and how can we best optimize and maintain it? Among the avenues for protecting health, one clearly stands out as being fundamental: nutrition. Guidelines for what we should be eating and how much of each type of food is required for optimal health have been developed and this information is part of every child's grade-school experience in the Western world. We are certainly inundated with exhortations through all channels of the mass media as to what science says is "good for us".

However, food has traditionally been analyzed by science according to the same reductionistic methods by which it analyzes anything. It is a method which breaks complicated things down into the elemental material ingredients from which they are supposedly made. Because this is also how the process of human digestion is analyzed in science, there is an implicit assumption that our digestive process essentially does the same thing—breaks everything we eat down into its elemental components, absorbs those components, and then constructs what we need out of them. To some degree, there is truth in that concept, but it is not entirely true—as we shall see.

One of the main measures of food value has been the energy value, or calorie count. Charts have been drawn, calculating how many calories humans of various developmental stages, of various gender and activity levels, etc., require daily to maintain what is considered to be general good health and a "normal" weight (which has its own charts, often based on a concept called "body mass index"). Other charts have been drawn, such as the food pyramid, to describe the optimal number of servings of various food groups, in order to maintain healthy nutrition.

Despite all of these measures, human health in the Western world is far from optimal. Obesity is rampant as are metabolic disorders such as Type 2 Diabetes. Similarly, digestive dysfunction, such as the formation of gall stones, are widespread in the developed world. Food allergies and sensitivities are also rampant, with problems like Irritable Bowel Syndrome (IBS) and Crone's Disease afflicting increasing numbers of people. Is all this merely a case of people ignoring what medical science tells them is best for them and eating the wrong foods? Or is there something more at work, here?

Certain realities have become known via trial and error, over time. One is that not all food combinations are equal, in the gut. The way that the human digestive system breaks down what we eat and then absorbs the nutrients from it is definitely impacted by the various combinations of foods *as they are being processed in the gut*. For example, consuming vitamin C along with iron helps in the absorption of the iron. What this means is that context matters, even here. What we eat includes a whole set of invisible relations which can either help or hinder the efficiency of our digestive process and, thereby, the nutrition we can absorb from it. The necessity of the proper relations extends much father than this.

Another example from common experience is that eating a preponderance of carbohydrates, without adequate protein and fiber *at the same time,* generates a fast increase in blood sugar with a cascade of responses in the body. This includes a huge surge of insulin, which then socks away the influx of incoming calories as quickly as possible-- as fat. Excess insulin and sugar in the blood are both toxic to body tissues, including the Islets of Langerhans, the insulin-producing cell bodies in the pancreas. Since a great many processed foods involve carbohydrates in some way (often washed down with carbonated drinks high in simple, fast-absorbing carbohydrates like corn syrup), it's no great surprise that the health of the body is negatively impacted over time by the constant roller-coaster of bathing the tissues first in excess blood sugar, then in excess insulin, triggering behaviors associated with hypoglycemia (*"I need to eat*

something, fast!!!"), which starts the process all over again. A type of metabolic damage called *insulin-resistance* generally shows up first and, if the pattern continues, the damage progresses to Type 2 Diabetes.

Another reality we have learned the hard way is that human bodies cannot digest everything we need to digest all by ourselves, nor can we produce all the various nutrients and vitamins from our digested food that we need on our own, like vitamin K, for example. What we depend on to do these things for us are a thriving and diverse ecosystem of living micro-organisms in the gut. How do they get in there? And, how do we protect and maintain the optimal ecosystem for our own health and well-being?

There is a tendency on the part of science to identify individual micro-organisms as being necessary, like acidophilus for example. This is certainly useful. However, there are many different subspecies of acidophilus, each with their own modes of digestion and producing different waste products, such as hydrogen peroxide, etc. Sometimes, it turns out that the waste product of a micro-organism is the desirable aspect of its presence (as in the human female genital tract). Secondly, a large number of a single species is a mono-culture, not diversity.

The difference is that the *relations* which are generated *between* different micro-organism types, within the environment of the human digestive tract, are equally important for maintaining the versatility and health of the entire gut ecosystem—which, in turn, helps maintain the health of the human being. Mono-cultures are not natural ecosystems because they represent extreme vulnerabilities which are weaknesses; they can be quickly wiped out by a single pathogen. A mono-culture represents a lovely opportunity for some other organism to exploit, and they do—as we have seen in our factory farming methods.

What Anticipatory Systems Theory says which pertains to all of this is that the environment in which an organism evolves becomes encoded into its systemic organization. In other words, various aspects of the evolutionary environment have literally become part of the organism, itself. Those aspects are then *required* to be there—because the organism's encoded models predict that these aspects *will be there*, and if they are not actually present in the environment anymore, then dysfunction will inevitably ensue. Not all somatic models are changeable in "real time". Our bodies continue to interpret the present environment according to evolutionary encodings, even if those encodings are no longer appropriate for present environment.

In the evolutionary environment of human beings, our food was never entirely "clean"—we foraged for roots and plants, pulling a tuber out of the ground and… what? I imagine we wiped the bulk of the visible dirt off, or rinsed it off if water was available, and then we ate it. In the process, we routinely consumed billions of living micro-organisms every day which originated in a diverse soil ecosystem. What factory farming and modern sanitary practices in kitchens (and food processing plants) have collectively done is alter what micro-organisms are available from the soil and, ultimately, being consumed. What is required for optimal human health and nutrition goes way beyond acidophilus. It even goes beyond micro-organisms in general. In some very real sense, we need to consume

relations along with foods, and we need to begin to study these relations with the same attention as we have used to study the component nutritional building blocks of individual foods.

Bio-Rhythms and Health

Insomnia is a common affliction in the developed world. Medications to induce sleep are easily available and run the gamut from antihistamines like dyphenhydramine to prescription items including narcotics. If an insomniac wants to avoid medications as much as possible, one of the common recommendations is: *Rather than lie in bed worrying over your inability to fall asleep, get up and read for a while, until you feel tired. Then try again to go to sleep.*

Medical science has learned, fairly recently, that human physiology includes various regulatory capacities which produce distinct rhythms of activity. These rhythms are usually cyclical in nature, have various time signatures, or periodicities, and are commonly referred to as "bio-rhythms". One of the most well-known of these bio-rhythms affects all human beings equally, regardless of gender or age. It's a bio-rhythm that includes both sleep and awake time in each cycle. In fact, it has been proven quite dramatically that human health requires sleep of a certain duration every cycle. The total cycle spans roughly a 24 hour period. We can, and do, deliberately interfere in our natural sleep/wake cycles all the time but it we habitually skimp on sleep, eventually our health suffers. But, why do we need sleep? Why does using drugs to prevent sleep cause extreme loss of cohesion in both body and mind?

Applying Anticipatory Systems Theory to this situation reveals some interesting answers. If the behavior of our evolutionary environment is encoded into our systemic organization, then the diurnal behavior of Earth, as manifested/experienced on the surface of the planet, would naturally become encoded into us. That means that the rhythm of the cycle produced by Earth's rotation has become a part of our systemic organization and, as such, the presence of that rhythm of light and dark is now *required* to continue because our somatic models predict that it will. I think the fact that somatic models are responsible becomes visible with such things as the ongoing discoveries surrounding the human pineal gland and its principle hormone, melatonin.

When melatonin was first identified in the late 1950's, it was initially recognized as a bio-rhythm regulator—and it certainly is that. But, in humans, this product of the pineal gland also has shown itself to be doing multiple other important physiological jobs at the same time, including a nocturnal down-regulation of sex hormones/growth hormones such as estrogens and critical work in the body as part of the immune system. The roles of melatonin in human immune function are still being discovered, but to date it has shown itself to be an extremely potent free-radical scavenger, a regulator of apoptosis (scheduled cell-death and resorption), and DNA repair. All together, Melatonin has a powerful oncostatic function in human physiology—protecting the body from growth and proliferation of cancer cells. Cancer is another of the rampant and increasing scourges of human health in the developed parts of the world. It turns out that the increasing threat of

cancer over time in the modern world is a consequence very much in keeping with the types of dysfunction predicted by Anticipatory Systems Theory: Our bodies are interpreting the modern world according to evolutionary models.

Circulatory melatonin is only produced during dark-phase time. The pineal gland, in humans, is connected to light sensors located in the retina of the eyes. These sensory receptors are not involved in vision, however, and don't report to the visual cortex at all. Their function is to send information to the pineal gland about the quality and quantity of light in the environment. The short version of the story is that light hitting these sensors in the eyes shuts down the pineal gland's nightly production of melatonin. Different wavelengths of light have been proven to have differing effects on the pineal gland's output: Short wavelengths of light are much more effective at shutting down melatonin production than are longer wavelengths of light, with red light found to be the least intrusive and blue light, the worst. This suggests an encoded somatic model that is involved in guiding pineal function and which interprets blue light as "morning".

Artificial light at night is a fairly recent phenomenon in human evolutionary time scales. It has now become ubiquitous in developed parts of the world—to the extent that natural levels of "dark" at night are hard to find in many locations on the planet, anymore. "Light pollution" has been regarded as a nuisance, particularly for star-gazing and the building of new long-range telescopes, but has never really been considered a serious health hazard, before. Perhaps because artificial light in most domestic uses does not burn the skin the way natural light from the sun can, it has generally been viewed as entirely harmless. However, it is not biologically neutral even though it doesn't do direct damage to living tissue. It is interpreted *by the body* according to encoded models that we evolved with. Given what has been discovered about the connections between the pineal gland, nocturnal melatonin production, the multi-faceted roles of melatonin in human immune function, and the effects of light on the whole system, artificial light at night is clearly not harmless in the bigger picture.

Indeed, the advice to insomniacs—to get up and read for a while before trying again to get to sleep (i.e.; get up and turn on a light)—doesn't sound like such a good idea anymore. Better advice would be to maintain a completely dark sleep environment and if any "night light" is needed for safety in the home, make sure it's a red light-bulb. If those steps are not possible, then melatonin supplementation at bedtime could be a logical alternate strategy.

Body, Brain, and Mind: An Evolutionary Trilogy

People often wish they could simply *decide* to change one or more of their own behavior patterns and that doing so would be enough to make it happen. Unfortunately, it is not that easy—as anyone who has tried to change one of their behavior patterns will know all too well. There is, apparently, a disconnect between our higher-level decision-making process and the encoded models responsible for the habit patterns. So, does this difficulty mean that our higher mind has no influence at all on the "auto-pilot" workings of the body? No. Getting at those models has proved to be rather difficult but I think the proof

that they are encoded models, as well as proof that they are at least in communication with the conscious mind, can be found in the situation known to medical science as "the placebo effect".

The placebo effect is a therapeutic response in an individual human being to the administration of inert material that the person receiving it *believes* is actually *powerful medicine*. The critical ingredient, here, is BELIEF: The mental model which predicts "powerful medicine→feel better". Belief generates an expectation and shapes future perception. Examples of mental models which can generate changes in how we perceive/interpret future incoming sensory information: "If you do that, you will go to hell."; "If someone puts a voodoo curse on you, nothing can save you."; "If we can understand the atom, we will understand the whole universe."; "If you take this potent medicine, you *will be healed*."

The placebo effect is one example of a much larger pattern of behavior shaped by anticipation. It is also of the most well-documented unexplained effects in the history of medical science. It is the bane of pharmaceutical companies working to develop the next big money-making drug because any potential new drug being tested *must work better than the placebo effect can*. So, it is not that the placebo itself works or has any therapeutic activity. Rather, it is the effect that a mental model about taking the placebo can have on the functioning of the somatosensory apparatus. Clearly, the higher mind and the rest of the human organism *must be* in active communication in order for the placebo effect to happen.

In fact, if we look at this a different way, the placebo effect offers us proof that communication between the models of the conscious mind and those of the soma (body and brain) is not only possible but that such communication can generate quantifiable positive changes in the soma. This communication can actually generate healing. So, the next question becomes, "How can we bring this communication into the province of human will?" Before tackling that question, we need to backtrack a little bit.

Currently, science is locked in a virulent debate over whether the human mind is merely the expression of electrical and chemical activity in the brain or whether it is something which transcends the biological into the supernatural. Perhaps both of these are incorrect. Robert Rosen's view was that any system existing in the universe is a "natural" system; there is no such thing as "super-natural". Secondly, he characterized the human mind is an emergent entity which arises from a certain type of somatic organization. In other words, the mind is very like life in that it spontaneously comes into being when a certain type of organization develops in a material system. Just as life is not the same as the material ingredients of the living body, mind is not the same as the material architecture of the brain. And yet, both life and mind are natural consequences of certain types of organization. What these two emergent entities have in common is *anticipation*; they are both anticipatory systems.

It seems a logical progression to postulate that the human mind (as distinguished by human imagination, or creative thought capacity, plus intelligence) is an independent,

secondary anticipatory system which has evolved within the original, living/somatic one. As such, it has the same model-building capacity, but it is independent in how it goes about accomplishing the same feat. For one thing, the mind is much faster at encoding information, and at catching errors in encoding—and re-encoding—than the soma. In large part, the soma requires evolutionary time to adapt to changes in environment which have made its encoded models incorrect. It generally requires multiple generations of mutation in order to re-encode many of the somatic models. The mind, on the other hand, travels through time effortlessly—back and forth, and back again, at will, and can accomplish all of it in nanoseconds. Insight, inspiration, the "eureka moment"… all describe this capacity of the human mind to suddenly realize how to correct an error in some encoded mental model and come up with a much better version which can perform more accurately in predicting the behaviors of systems in the real world.

Clearly, such a tool would confer a fitness benefit in adapting to the constantly changing natural world. The human capacity to work around the limitations of our somatic selves, to generate technologies to extend our physical abilities—such as our senses, our strength and stamina, our ability to communicate—far beyond what could evolve in multiple generations, and do it all in a fraction of a single lifetime… this increases our chances of survival—to the extent that we are now extremely overpopulated on this little planet of ours. Indeed, we are collectively generating rapid changes in regional and global environment that could seriously challenge all the organism species which have no other option but to rely on their somatic models for system guidance and control—because that's all they've got.

On the other hand, if we take a long enough time horizon into account, how does human intelligence pan out in terms of fitness? The jury's still out on that one. Everybody's got their own mental model making predictions about it. Some see the human mind as a cancerous overgrowth that will be selected, by nature, for extinction based on hubris and short-sightedness. I don't agree with that prediction.

I think that humanity has at least a fighting chance of pulling out of this seeming evolutionary nose-dive into oblivion, because our capacity for imagination and creativity allows us to expand our own perspective in ways that include the recognition of interdependency. As soon as we can see that we depend on a healthy environment for our own health, then the perceived separation between "self" and "environment" vanishes. In a sufficiently large world-view, it becomes a matter of self-preservation to care about the welfare of the biosphere on which we depend for life.

I think humanity has another capacity that will help secure our survival and can also, perhaps, be considered to be our "saving grace" as a species: altruism. To care about the welfare of other beings besides our own species for their own sake—and to use that concept as a guiding principle in our lives… that's unique.

But to get back to the issue of whether we can figure out a way to access the communication between our mental models and our somatic ones, in order to achieve a

healthier and more balanced mode of interaction between the two… I have an answer, but to describe it requires a somewhat more personal narrative.

The only reliable method I have come across, so far, for integrating the higher and more primitive levels of the mind, brain, and body, I discovered as I was looking for a means to heal the after-effects of Post Traumatic Stress Disorder (PTSD) in myself. There are not many approved treatments specifically for PTSD and, in my own case, the treatments for other issues such as clinical depression were unable to resolve the symptoms arising from the PTSD. The most obvious symptom also provides a benchmark for diagnosing PTSD; something called "an exaggerated startle reflex".

PTSD is basically an encoded trauma pattern. From my perspective, the exaggerated startle reflex represents a set of models which predict the future thusly: *Anything unexpected is BAD.* Curiously, a recognition of the model-based dependence of the symptoms, even in conjunction with the knowledge that the trauma which had initiated the encoded pattern was well-and-truly over, did nothing to alleviate the PTSD or the startle symptom. This is a very stubborn set of encodings which seem to reside in more primitive parts of the brain; the limbic system. Ultimately, I tried multiple approaches to force a reset of that system, including acupuncture and hypnotherapy, all to no avail.

In desperation, I attended a ten day course to learn an ancient form of Vipassana meditation, as taught by S. N. Goenka. I resisted the idea until desperation drove me to it, because the courses had been characterized as "Goenka's boot camp for the mind". It turns out that this characterization is quite appropriate! However, to my astonishment what I found was that a single ten-day course actually did what had been impossible, up till then, even with the big guns of modern medicine and pharmaceutical ingenuity. A single course cured the startle symptoms of my PTSD. Since then, I have been involved in research trying to figure out how and why it works.

This meditation technique can be described as a systematic method for somatosensory mapping and integration that is done in conjunction with two aspects of the higher mind. One is an awareness of constant change, as manifested via sensations on the body from one circuit through to the next. The other is a conscious policy of non-reaction to whatever sensations are present during each hour-long period of meditation (using common sense as a guide, of course—if one senses that injury is immanent, one must act).

At the ten day courses, the first three days are spent generating the physiological connections in the brain, which are required for gaining access to the encoded models at the most primitive levels of one's systemic organization. This is done using something they call Anapana meditation, which focuses on the sensation of the incoming and outgoing breath, at the location of the nose and upper lip. Because breathing is one of the few functions in the human body that are accessible by both conscious mind and the auto-pilot aspects of the soma, it serves as the mode by which bridges are built between the two.

On the fourth day of the course, one begins to practice Vipassana meditation, which involves a systematic progression through the body, simply seeing what physical sensations are being manifested in each part, at that moment, and not allowing yourself to react to them. (If your nose itches, you don't scratch it, you just observe.) From one circuit to the next, the sensations in any part of the body have invariably changed anyway, and this is a realization that is reinforced over and over again. The combination of sensory awareness, non-reaction, and noticing change—all in a systematic, repeating progression, or cycle—seems to be a collective force that triggers resetting of all sorts of encoded models, at all levels of soma and mind. While the resetting is apparently beyond conscious direction, in that one cannot choose a specific habit pattern out of one's inventory of old habit patterns, the ultimate result is a beneficial re-balancing of how one interacts with self and environment, generally.

Presumably, if one progressed on this path for long enough, one would reset/rebalance ALL one's old habit patterns, and thereby achieve "enlightenment". If so, then this ancient technique represents a concrete, quantifiable method for individual, self-directed evolution—*in one's own lifetime*. Speaking for myself, enlightenment is not my goal. I am happy to have found a method for healing old psychic wounds that were negatively impacting my physical health and my ability to live my life fully. Enlightenment, if I ever achieve it, would just be additional icing on my cake.

However, there is more to this, in terms of expanding our knowledge in medical science and psychology. Given the physiological changes that the activity of practicing this technique of Vipassana meditation is capable of generating, I see it as revealing certain access points our conscious mind has to the rest of our organization as living systems. It further offers opportunities for study into how mind, body, and brain all interact; how their interactions influence function and health; how the encoded models at one level influence the building of new models at other levels; how these various different encoded models shape our behavior patterns; and how we can intervene when we notice that we are entering into counter-productive patterns of behavior that we seem powerless to choose to stop.

The truth is that our bodies don't "just react" to things, the way a snowflake reacts to a rise in temperature by melting. Instead, bodies react according to system-based values that are generated by interpretation of sensory information via encoded models. All living systems have an *optimality meter.* Any sensory information that is interpreted to be harmless or to actually preserve and support system stability (health) lands on one side of the optimality meter and triggers either neutral behavior or active attraction/acquisition behaviors. Anything that is interpreted to be dangerous falls on the other side—sub-optimal—and triggers avoidance behaviors. That is how an anticipatory system shapes its behavior patterns—it does so according to encoded values of health and additional encoded interpretations based on optimality.

What the mind does, as a second, emergent, independent anticipatory system, is *it has the capacity to inflate values of optimality and sub-optimality beyond all recognition*. It begins at levels of craving or aversion and can wind up at addiction or phobia.

When we react to something with our minds, there is an enormous back-story fueling the reaction. Anger, or any other human emotional response, is not a simple entity. When we react with anger to something, what we are reacting to is really not the actual external "thing" that we presume to be the cause of our anger. Instead, we are reacting to what our internal models are telling us about that external thing. If our models are improperly encoded, our reactions are unlikely to be appropriate.

Recognizing that our reactions are out of proportion to the situations we are reacting to is only one side of the equation, as important a step as it is. The other side is managing to reset or re-encode those models, and this is a much harder task when the models in question are either somatic or are mental models that reside in levels of the mind beyond conscious control. Figuring this out is not just a matter of individual harmony, either. It is also a social concern.

Racism and bigotry are examples of improperly encoded mental models—fortunately they are ones which we do generally have complete access to revising. Education and experience can often trigger us to deliberately toss out our "old thinking" and replace incorrect models with new, more useful, more accurately encoded models. Learning is really nothing more than model-building.

However, it's not so easy to revise the models that have seemingly assembled themselves and which reside at more primitive levels of the mind/body/brain. Anxiety disorders and obsessive/compulsive disorders are, like PTSD, representative of dysfunctions that are caused by inappropriate predictions generated via improperly encoded models. But re-encoding at those levels cannot be achieved by an act of will, directly. I believe that what we can learn from studying how and why Vipassana meditation is able to achieve its results will ultimately enrich far more than medical science and psychology. All of science will benefit from the understanding we gain of such things.

The most urgent problems facing humanity in the 21st Century, and beyond, all involve interactions between living organisms in multiple contexts and across multiple scales. Therefore, expanding our scientific paradigm to finally be able to approach issues having to do with relational complexity and, especially, anticipation is not only desirable, it is *required*. The good news and the bad news are the same in this effort, namely; that the only thing in our way… is us.

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Notes:

Robert Rosen's epochal book, Anticipatory Systems: Philosophical, Mathematical, and Methodological Foundations, is being re-published as an expanded Second Edition by Springer Verlag, in late 2010.

For more information regarding S.N. Goenka's courses in Vipassana: www.dhamma.org (There is no charge for these courses; they are free.)

My website is currently down for reorganization (as of this writing, in June, 2010). When the reorganization is finished, later this year, you will be able to find me at www.rosen-enterprises.com.