The Shanghai Mirror:

The Mathematical Psychology of Integration, Mindscapes and Synchronicity – 2

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Abstract

Practical solutions to integration problems have been crucial to research for: Information Technology, NASA (National Aeronautics and Space Administration), and The Human Genome Project. This paper applies General Systems to integrate the successful methods from these organizations and apply them to behavioral science. Finally, a mirror analogy is used to achieve clarity without undue simplification.

There are clear and obvious differences between information, as employed by genetic DNA/RNA (G-Information) systems and information as defined by 101010 computer systems (IT-information); but distinctions become blurred and the two definitions merge in advanced applications when emerging technologies use Information Technology to transform Homo sapiens into cyborgs.

Two types of living systems patterns (inextricably linked to a changing environment and to each other) produce two types of G—Information, one structural the other procedural. The first, DNA and RNA, are generative patterns. Generative patterns are structural patterns. In contact with the proper living environment, (mammal's DNA in a womb, virus RNA in a cell) these structures induce the environment to produce one or more living organism that conform to a plan specified by the genetic code. DNA/RNA codes force us to view information as structures that are not merely plans, but executors; they are the very foundation of organic structure and function.

The second pattern, the evolutionary pattern, is a process pattern that seems to be an invariant developmental pattern for all of Earth's living organisms. Phylogeny, morphogenesis, learning and cognition, advanced human thought, all adhere to the evolutionary pattern.

Nearly symmetrical forms and/or opponent pairs are characteristics of the generative structures. Opponent processes are characteristic of evolutionary patterns. Called a synchron and synchronicity respectively, the generative structure and the evolutionary patterns are believed to be the basis of the fractal like, psychological, organization of mindscapes as well as conscious and unconscious events.

Keywords: game theory, genetics, behavioral analysis, personality

Genome Patterns

Gregory Bateson's (1979) *Mind and Nature* ascribes to MIND two global characteristics; a necessary unity with Nature and the pattern that connects. The strategic genome fulfils this and much more. Not only does the strategic genome connect, given an appropriate environment it collects and organizes the necessary materials; induces construction of a replica of itself, integrates the various systems; and synchronizes the resulting complex with a constantly changing environment—all of this while navigating the semi-conscious phenotype (the mother) through the complexities of Eigen & Winkler's (1983) Life/Death Game.

Were a human being capable of demonstrating systems building competence consisting of; selecting, connecting, synthesizing, integrating and finally synchronizing the resulting complex system with a changing environment, there are those who would fear him/her, but none who would deny that such competence far exceeds all criteria for genius. The genome accomplishes all of this and more—simultaneously. Nothing the Homo sapiens' brain does can compete with the morphogenesis that generates the brain—*among other systems*. In respect to integration, what psychologists have been calling "conscious mind" is pathetic compared to the prowess of either the genome or the brain (which includes both a conscious and an unconscious mind).

But here we are faced with the first of many paradoxes. After all, we are genomes! We are genomes with about 30,000 genes at our service. Though the weight of this concept does not lead to a complete semantic meltdown, our languages do tend to either lead us in circles of conflict or cripple us with strained analogies. In the context of the strategic genome, one of the most deadly of the circles is the concept of *invariance*.

In a work that is a much revered classic among mathematical psychologists, Stevens (1951) cites Keyser,

"Invariance is changelessness in the midst of change, permanence in a world of flux, the persistence of configurations that remain the same despite the swirl and stress of countless hosts of curious transformations." (pg. 19)

According to Stevens, whether he/she knows it or not, the scientist is usually looking for an answer to the question, under what transformations is the relationship invariant? The strategic genome shocks researchers seeking invariance by presenting them with a contradiction. In the world of the gene, variation is obviously a rule, invariance a handicap and survival the judge. Stevens was right about scientists, but for reasons reviewed above, the semantics of mathematics and physics are no match for the strategic genome. Try, for example, to force the double helix of genetics into the semantics of invariance as represented by Steven's quote. The genome might best be described as a *varying invariant*. But the problem of integration takes us far deeper into the human psyche than mere semantics.

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The strategic genome's solutions to integration problems require modifications to meta-systems and epistemologies, modifications analogous to rewriting a computer registry in machine code. An added difficulty, to make integration possible the new code must facilitate sharing among four radically different source codes. The rationale for the changes is solely experimental; and is a direct consequence of Chaitin's discovery of Omega numbers; and the effects of Omega numbers on mathematics and mathematical psychology. See Dockens (2004). The epitome of hidden and adverse psychological consequences of a faulty meta-system is Ewald Hering's (1961) theory of color vision. Many of experimental psychology's problems and their solutions seem to have converged in his opponent process theory of color vision.

Color and the Integration Problem

Integration problems came disguised as a subtle problem with logic that occurred at the interface between physiology, physics, philosophy and psychology. Hering's theory suggested that three dyads of color receptors (BLUE/YELLOW, RED/GREEN, and BLACK/WHITE) worked in opponent pairs to generate the millions of visible colors. His theory contradicted that of Hermann von Helmholz (physiologist, physicist, and mathematician; who contended that three receptor types (RED, GREEN and BLUE) were sufficient to produce the whole color range of the visible spectrum. Originating in physiology, the conflict spilled over into philosophy where Helmholtz represented the empiricists (experience, "nurture") and Hering the nativists (heredity, "nature"). Though Boring (1950) noted, "the Hering-vs.-Helmholtz difference had not yet fully surrendered to the conception that nature and nurture always work together, neither ever alone"; the conflict is important because it brings into sharp focus advocates of epistemologies that would, like Helmholtz, dominate nature and those who, like Hering, would be content to obey her. See Benjafield (1996).

Unlike Boring's position, which would make integration possible, Helmoltz's and Hering's precluded integration; Helmoltz's due to procedure and Hering's due to logic. For Helmholtz and other Homo sapiens phenotypes (who are a very small, and definitely not an essential part of Nature) to attempt to dominate Nature is not only arrogant, it is like the eye attempting to see itself—without a mirror. Too, the inclination to dominate rather than integrate is so common an obstacle to harmony in all forms of human organization, that it would be only a technical (as opposed to practical) exaggeration to consider dominance the opposite of integration.

Hering's obstacle to integration is much more subtle, because his theory was almost identical to the genome's solution to integration problems. Due to two research teams, (Hurvich & Jameson, 1974 and DeValois & DeValois, 1975) Hering's theory has, in essence, become firmly grounded in experiment. However, modifications to both the logic and the theory were necessary to reveal the potential of opponent pairs reasoning outside of the specialized area of color vision. The modifications are based on both real world observations and extensive, multidisciplinary, laboratory research.

In its original formulation, Hering's opponent pairs excluded any possibility of a harmonious combination of an opponent dyad. The RED/GREEN dyad could never produce either reddish green or greenish red; and the BLUE/YELLOW dyad could never produce either bluish yellow or yellowish blue. Though this aspect of the theory remained unchanged for over a hundred years, both of these assumptions were easily proven false when greenish red and reddish green were observed in high fashion materials; bluish yellow and yellowish blue were observed in sky light. Here Nature not only permits what Western logic forbids, the color vision system applies the forbidden rule to generate four "impossible" consequences.

Though a theory that suggests that four colors (all readily observable in natural environments!) are "impossible" may not inspire confidence, Herring's theory redeems itself handsomely; first in its accurate description and predictions of color vision phenomena; then as a prototype model of neural integration, and finally as a means of correcting fundamental flaws in a prevalent meta-system. See Chaitin (1999) and Dockens III (2004). Of highest priority in the present context, the connection between neuro coding and Herring's theory proved essential to demonstrating how advanced information concepts are crucial to integration of living systems.

Finally, by using the color vision patterns from Herring's theory as integration prototypes, clear distinctions can be made between the consequences of integration, as observed in living systems, and dominance. Dominance presents very different problems from those presented by integration. Practically indistinguishable in simple organization systems (like a wolf pack) in human societies conflicts between hierarchical systems based on dominance and networks demanding integration are being decided in favor of integration. And systems that are mixtures of dominance and integration are proving increasingly, and sometimes dangerously, unstable. The complexities of the dominance/integration problem, that seems to be a bit too daunting for conventional experimental and theoretical paradigms, may be a windfall for General Systems. For most, however, the benefits of General System's solutions are far from self-evident—even for our allies.

Three Questions in Shanghai

In connection with presentation of the first paper in this series at the 46th International Society for the Systems Sciences in Shanghai, two citizens of the host country raised three questions. A young computer programmer who could not see a possible use for psychology in Chinese society was curious about psychology's utility. A Chinese/English translator had two questions. Was what she was doing significant to General Systems? Was General Systems essential for what I am doing? The title of this paper, The Shanghai Mirror, honors the origin of the three questions and signifies a single answer—a mirror.

Seemingly trivial in everyday life, the psychology and physics of mirrors mark the boundaries of Homo sapiens' knowledge. What people see in mirrors radiates subtly from the darkest recesses of the subconscious to the narcissism of grease paint. What scientists and technicians invest in mirrors ranges from polished metal and coated glass in designer bathrooms, through the radiant power of optic lasers, to the sophisticated digital transmissions from the Hubble telescope.

What is reflected in mirrors is admittedly not truth; nevertheless, a virtual truth is almost miraculously derived from mirror images. To philosophy and mathematics, the meta-system serves as a mirror.

It is different with psychologists. Psychologists must, like thespians, produce a mirror capable of very special affects. In what is probably his greatest play, time's greatest thespian describes its purpose,

"Be not too tame neither, but let your own discretion be your tutor: suit the action to the word, the word to the action; with this special observance, that you o'erstep not the modesty of nature: for anything so overdone is from the purpose of playing, whose end, both at the first and now, was and is, to hold as 'twer, ***the mirror*** *up to nature; to show virtue her own feature, scorn her own image, and the very age and body of the time his form and pressure. Now, this overdone or come tardy off, though it make the unskillful laugh, cannot but make the judicious grieve; the censure of the which one must, in your allowance, o'erweigh a whole theatre of others. O, there be players that I have seen play,--and heard others praise, and that highly,--not to speak it profanely, that, neither having the accent of Christians, nor the gait of Christian, pagan, nor man, have so strutted and bellowed that I have thought some of nature's journeymen had made men, and not made them well, they imitated humanity so abominably."*
Shakespeare, Hamlet, Prince of Denmark, Act III, Scene II, line 3.

While 20th Century thespians have been swift to adapt to Information Technology and have produced remarkably integrated mirrors in the forms of modern films and TV series, 20th Century psychology holds an exceedingly poor mirror up to Nature; and worst, most psychologists are not flattered when they view themselves in thespian mirrors. DVDs that include production notes and the credits listed at the end of films attest to the amazing imagination necessary to achieve the integration between people and technology essential for the production of films like *Lord of the Rings*, *Planet of the Apes*, and *Matrix*.

Behavioral Science and science in general are obviously tortoises in the race to catch up, first with common sense and then science fiction. However, huge deficiencies in organization and purpose have been overcome with successful completion of two major projects, landing on the moon and completion of the human genome.

The Origin of Thought

Still, the administration of science poses increasingly formidable problems for public and private organizations, especially for those with a combination of a strict hierarchical structure and multidisciplinary research programs. From a General Systems perspective, the problem has at least one elegant answer, NASA (National Aeronautics and Space Administration) an organization created to first design itself, then “pioneer the future”. NASA is the prototype of organizations that have to resolve “mixed metaphor” problems by converting “why” questions into “what and how” questions then applying the answers in extremely diverse environments. At least part of NASA’s magic can be attributed to giving an uncontestable, universal, first priority to physical space-time; a priority that not even warring governments could deny. Integration is a key word.

Before NASA, research on the United States space program was divided among three competing military agencies, Air Force, Army and Navy. The three branches of service and the government were using a 19th Century approach to find solutions to administrative and technical problems that would require “thinking” far into the 21st Century and beyond.

As far as the United States Government was concerned, the problem of “blind” competition, duplication of effort, and lack of creativity in space research was primarily an integration problem that insightful administrators solved by creating an administrative agency. The alternatives were obviously between founding an administrative organization like NASA and defeat in the race for space. It is important to note that the choice the administrators faced was in evolution’s typical standard form, a form it has presented to all organisms facing a new phase in evolution. Either find a *solution* or suffer the consequences of the *resolution*. In this case the USA solution was NASA, the alternative resolution—loss of the Cold War. USA’s USSR opponents had already made a similar choice. The consequences in both cases have been literally cosmic.

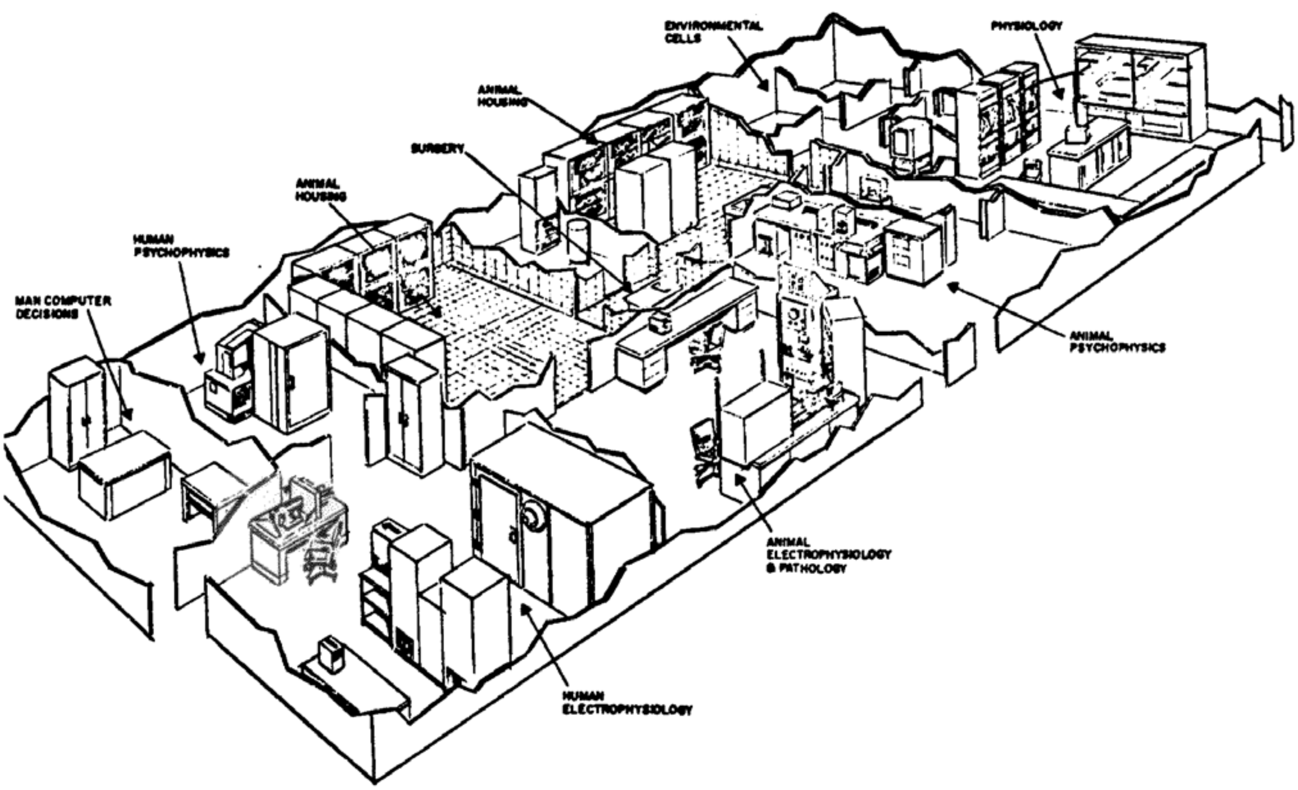
Once created NASA began functioning as a self-organizing open system, and a prototype for future, creative, administrative agencies. Using knowledge and experience from the aeronautics industry where calculation (of necessity![1]) replaced reason, NASA successfully administrated digitization of complex administration problems. It was the first evolutionary step toward a unity between Information Technology, all of science, and innovative administration. The story of their successes and failures demonstrated that both science and mathematics are not about consequences of rules; they are about creativity and imagination. Multiple perspectives also played a critical role. See Linstone (1999).

[1] See the first paper in this series.

NASA achieved *a perspective at the interfaces of everything*. Given Chaitin's (1999) conclusions about randomization's affects on mathematics, the evidence suggests that NASA's solution to the integration problem emerged because of an interaction between NASA's perspective, experiments and the consequences of digitization on scientific meta-systems. The NASA associated but U.S. Army funded project that served as a starting point for the present project is described below.

NASA as General Systems Prototype

Figure 1:
Bio-technical Color Vision Laboratories at Honeywell Inc.



In 1967, at the Biotechnical Laboratories of Honeywell Inc.'s Research and Development Division (see Figure 1), NASA's perspective, and the creative spirit of the research staffs were evident and obvious at all levels. Take a well funded, advanced, industrial color vision laboratory, where lasers, mirrors, monkeys, men are all subjected to joint, multidisciplinary scrutiny by a broad spectrum of researchers. Employ a variety of specialists; physicists, neurologists, biochemists, optometrists, psychophysicists and behaviorists. Add a common goal, overlapping environments, a deadline, mutual respect, and a connection to NASA's space project. The result, rigid boundaries between disciplines and paradigms (together with territoriality an/or implied hierarchies) either relax considerably or disappear altogether.

Like NASA, Honeywell succeeded in digitizing everything except people and animals. For that they needed behavioral scientists with NASA's perspective and creative spirits.

Conceptually, very little separated General System's perspective from the NASA perspective and the creative spirit of Honeywell's biotechnical laboratories. All three treated behavioral science as a branch of mathematical biology. All attacked problems from a multidisciplinary perspective. Only the cyborg concept separated General Systems from the other two.

Bertalanffy (1968) viewed cybernetics as a special case of a general system rather than the reverse. While Bertalanffy's General Systems was concerned primarily with the differences between open and closed systems, and the differences between living and dead systems, NASA and Honeywell's military interests meant that both were actively engaged in programs that required integrating machines and humans. To produce the optimal performance demanded by advanced fighter planes and space ships, an integration that erases most of the boundaries between them is a necessity. There was another serious obstacle to integration. During the late sixties, behavioral science was beginning what many researchers in human cognition would call the "cognitive revolution", an ugly, paradigmatic, turf war that pitted psychologists whose research was devoted to reflexology against those engage in research concerning human thought. Thus, behavioral science was divided in arguments as to whether humans were "robots", or "minds", while NASA and Honeywell were engaged in research that could ultimately lead to cyborgs that would inextricably integrate the reflexes of humans with machines that simulated human thought.

The database would be an important tool for NASA and Honeywell's integrative programs. Disciplines, researchers, results, projections, all could be defined, synchronized and integrated by means of their databases. Databases committed NASA and Honeywell to calculation and simulation, in addition to reasoning and speculating. The cyborg world was definitely a world of "both and" reasoning as opposed to "either or" logic. Research was both goal and process oriented rather than being either process oriented or goal oriented. Most important, this "both and" orientation extended to analysis and synthesis.

Most of behavioral science was (and still is) almost totally engaged in a form of analysis, that practically excludes synthesis. In contrast, NASA and Honeywell had to produce simulations and prototypes that required both integration and synthesis. Though specialists (like the blind men in the blind men examining an elephant cliché) were allowed to exist in their alternative universes, there was always somebody at NASA and Honeywell who viewed the project from a perspective at the "interfaces of everything." In this intellectual culture, subtly, almost by inference, applied mathematical psychology was being defined—a little more by biochemists than by biophysicists but with substantial contributions by both.

Applied Mathematical Psychology = 3 (Morphogenesis) ± Death

While a biophysicist, Ludwig von Bertalanffy (1968), was defining a general systems approach to behavioral science, a biochemist, George Wald (1970) (neither appeared in the other's references), was establishing the groundwork for a general systems approach to applied mathematical psychology. The distinctions between living and dead systems were paramount for both; though the biophysicists was primarily interested in differences between open and closed systems and the biochemist was concerned with the origins and evolution of life and death. Though the complex mathematics and laboratory evidence necessary to bear the weight of their concepts would be developed during the next three decades, a pseudo equation describing applied mathematical psychology's conclusion was possible within a decade.

In words, the pseudo equation would read, applied mathematical psychology is equal to three times morphogenesis plus or minus death. “Three times morphogenesis” refers to similarity between *mathematical* models of phylogeny (the evolutionary history of a species), ontogeny (the development of an individual from a fertilized ovum to maturity) and learning (environmentally induced changes in behavior). Von Bertalanffy’s basically thermodynamics reasoning suggested that, “From a general viewpoint, we begin to understand that besides visible morphologic organization, as observed by the electron microscope, light microscope and macroscopically, there is another, invisible, organization resulting from interplay of processes determined by rates of reaction and transport and defending itself against environmental disturbances”. Speaking from the background of a vision biochemist, Wald said, “In fact, death seems to have been a rather late invention in evolution. One can go a long way in evolution before encountering an authentic corpse”.

The pseudo equation makes two disparate statements that were disparate disciplines, in the 20th Century, inseparable companions in the 21st Century. No convergence of biophysics and biochemistry is responsible: but divergence in definitions of “information”. Instead of conflict, the definition of “information” according to Information Technology and the definition of genetic information, from genome research, work in concert to produce a single concept of integration within behavioral science. In the new context, integration is a fact to be discovered rather than a goal to be obtained. Focus is on the human genome in the context of Honeywell Inc.’s biotechnical laboratories. The focus is not on information theory, but on information fact.

Information fact refers to either RNA/DNA polymers or 1100 type binary switches. The first is natural, the second is artificial. The first defines life, death and information; the second only transforms or transmits information. The first is G-information; the second is IT-information. Each type can recreate itself, when introduced into proper environments; but the G-information defines life and is essential for defining the I-Information. G-information follows an ancient pattern of reasoning that has existed as long as life itself. I-information follows an extremely artificial pattern, inapplicable to life, and exceedingly limited—even; in the artificial environments for which it was created. While IT-information has yet to be integrated, G-information is thoroughly integrated. IT-information is innovative in that it can produce combinations and permutations of its own and other patterns. G-information, especially in Homo sapiens, is both innovative and creative in that it can, in addition to combinations, permutations and copies of itself, produce information (even elements) that have never existed before, either artificially or in Nature. Honeywell Inc.’s biotechnical laboratory had the potential of using the two in concert. However, Honeywell’s biotechnical laboratory’s primary focus and the primary focus of this study are on G-information.

More specifically, G-information permits General Systems to employ two variants of systems from opposite extremes of the behavioral science continuum, biophysicist Nicolas Rashevsky’s purely mathematical approach and behavioral-pharmacologist Travis Thompson’s purely experimental functional units approach. See Rashevsky (1960), Dews (1971), and MacCorquodale (1971). Mathematics was chosen as an unbiased meta-system within which a broad spectrum of diverse systems could be integrated. Functional units were specified for two reasons, 1) it would permit specialists from quite diverse disciplines, like psychology’s Skinnerian behaviorism and medical pharmacology, to cooperate in common experimental settings, and 2) the variables isolated determine (more or less!) the phenomena studied.

Behavioral Ecology

The resulting Behavioral ecology (Dockens, 1973) started as a combination of General Systems Theory and behavioral experimental techniques. The research strategy was simply to embrace, extend and integrate studies that would eventually lead to substitution of actual mathematical models for the pseudo equation. Professional psychologists recognize the role played here by the pseudo equation as a complex *intervening variable*. See MacCorquodale and Meehl (1948). Despite the non aggressive strategy and intentions, my results indicate serious problems for General Systems. Because without care and skillful politics, General System's contemporary challenges (as described in Kenneth D. Bailey's incoming presidential address) will set us on a collision course with powerful cultural forces and with virtually every specialty upon which behavioral science is dependent.

The problem is that each phase of the integration significantly changed each specialty, the way a mirror alters an image. Language (various professional jargons) is distorted, and in some cases a specialty's image in the Shanghai mirror becomes the clearly recognizable inverse of what the specialty experiences as its reality.

Honeywell's Cyborgs in the Matrix

In his introductory chapter, titled mathematics, measurement, and psychophysics, mathematical psychologist S.S. Stevens (1951) wrote, "In a sense there is only one problem of psychophysics, namely, the definition of the stimulus. In this same sense there is only one problem in all of psychology—and it is the same problem." The psychophysics aspect of Honeywell's spectral sensitivity studies, Sperling, Sidley, Dockens, & Jolliffe (1968), supported Herring's theory and suggested that spectral sensitivity might be mediated by the opponent cells in a part of the brain called the lateral geniculate. With bio psychologists DeVelois & Devalois' (1975) discovery of the role of the brain's neuro code in color vision, psychology was well on the way to fulfilling Stevens' criteria. But for applied mathematical psychology Dockens III (1969), the behavioral studies conducted in concert with the Honeywell Inc. raised far more exceedingly destructive questions than it answered. These questions led to others; until thirty-five years later the pseudo equation was replaced.

The monkeys in the experiment caused the problems by giving the right answers to the wrong questions. A monkey revolution overthrew the original research team when researchers attempted to motivate the animals with 600 volts electric shock while human participants were paid money for doing exactly the same thing. Aggressive behavior and mechanical sabotage by the Alpha monkey, Pepe, and passive resistance on the part of the Beta male and five females made data collection impossible. Definitely in revolt rather than on strike, the moneys produced the necessary curves only when orange juice replaced electric shock. The females, however, took vacations once a month and the males avoided work when the amount of orange juice exceeded a limit. Common sense by the new research team saved the project, but nothing could save the serious damage inflicted on behavioral analytical theories and procedures.

Windowless laboratories, experimental subjects in rigidly limited and controlled environments, sitting in chairs, hooked up to bio sensors and recording devices, their sensory inputs and rewards all logically programmed by means of Boolean algebra, this could be a description of a scene from the Wachowski Brothers' films, The *Matrix Trilogy*. From the simian perspective the psychological, ethical and philosophical issues were not merely analogous. David Premack's (1971) rats had reacted to reward like the monkeys had reacted to orange juice. Consequently, Premack, who had already suggested a R-R revision to Ferster & Skinner's (1957) S-R theory of reinforcement, had to revise his own revision. Premack titled his revision, "Catching Up with Common Sense"—a very appropriate title. But according to psychological theory the behavior of our monkeys and Premack's rats implied that common sense was chaotic. Still, the monkey's reaction to electric shock seemed quite rational, so did refusing to drink orange juice when they had enough. How could common sense be chaotic when the behavior, the explanation and the reasoning all seemed so rational?

Green & Swets' (1966) signal detection theory presented the most plausible and most integrative answer, but their answer created what appeared to be insurmountable behavioral and mathematical problems. According to signal detection theorists, the subject's sensitivity to the stimulus and the subject's decision-making criterion—two separate processes—combined to produce what classical psychophysical methods called a *threshold*. Their explanation for the monkeys made sense. Providing they could see the stimulus, like the human subjects, the monkeys would "play the game" of reinforcement schedules as long as they were properly rewarded. Changing the reward would not affect their eyesight, but it would affect their performance. Substituting numbers for the ambiguous concept "proper reward" was no problem—simply measure the amount of orange juice.

Though calculating the decision bias and the sensitivity using two normal distributions (one for the signal, the other for when background interference was added to the signal) presented no problem, the concept of using two normal curves to calculate the foundation of the human perception and information systems raised warning signals to hopes of integrating perception, learning and cognition. And when the modified Premack's principle of reinforcement was substituted for the reward that would influence subjective bias, the possibility of an integrated or unified mathematical approach appeared very remote.

"Honeywell / NASA." and two Mental Hospitals

Alphas versus Alphas

Consequently, the equations were never mentioned when a gun battle on the ward for psychopaths at a Swedish mental hospital in Vadstena prompted intervention. See Dockens III (1972). An exceedingly complex and politically difficult ex post facto study of psychiatric clinics, the range was quickly expanded to include a complete hospital complex and the town for which the hospital functioned as one of the chief employers. Miller (1964), (1965) and (1971) supplied the General Systems foundation for an analysis of multiple institutions that was conducted at four levels. Typical of psychological and government reports, important aspects of the analysis were omitted because of sensitive personal and/or political issues.

For example, According to ecologist and ethologists, the relationships between space and dominance are fundamental, not only to the study of human thought and behavior, but to the study of the behavior of all species of life. Ethologist John Calhoun (1960) demonstrated that simply limiting the amount of space induces the formation of pathologically aggressive hierarchies. If someone were to seriously contest this view, prisons all over the world could support Calhoun's observations with mountains of data.

Subsequent research by fellow ethologist, Colinvaux (1983) and Wrangham & Peterson (1997), supported Calhoun's findings by showing how relationships between dominance and competition for space were powerful determinants of the fates of nations. Colinvaux showed that learning was the driving force for large brain animals as they competed for niches of varying sizes. With nations, this learning focused primarily on ingenious strategies and creation of new, more destructive weapons. Success, however, gave only temporary dominance. The small variations in the boarders of sovereign states give Colinvau's observations healthy support.

Ominously, both ethologists indicated a biologically induced suicidal aspect to the blind struggle for niche space. This raised serious and sensitive questions regarding the conventional practices in contemporary prisons and mental hospitals. The reasons may be simple, but the solutions complex, because many of the seemingly complex problems of changing human institutions can be explained in the simple terms of *trying to dominate rather integrate*. In this case it was not monkeys but psychopaths and sociopaths who revolted against punishing contingencies. However, solutions often require organization changes like substituting open systems networks for closed system hierarchies. Consequently, the flow of information between and within that is usually critical to the function of open systems networks becomes detrimental to closed systems hierarchies. And swift adaptive change that is often an integral part of open systems networks is often responded to as a serious threat to closed hierarchical systems. While ethologists warn of the consequences of confining living, open systems, organisms to closed spaces such warning are often ignored and attempts at change thwarted by closed hierarchical systems.

Complexity reaches its zenith in systems with evolutionary patterns that impose change on all systems. Over long periods, systems in evolution tend to favor the rapid adaptive changes of open systems over maladaptive closed systems. That does not mean that in ensuing conflicts a large number of infant, open, network systems will not be destroyed by aging, closed hierarchical systems. The spectrum of competing strategies will undoubtedly pay a significant role in the outcomes, as will blind chance. Evolution, morphogenesis and learning have demonstrated, however, that outcomes are "more or less" determined.

Confirmation of general, systems properties and possible relevant variables were all that the ex post facto study of a community built around a mental hospital could suggest. Rare political and clinical circumstances permitted the psychiatric team to decapitate the prevailing hierarchical systems, both on the psychopathic ward and the total hospital complex. One alpha male replacing another alpha male made it easier to change the information flows and make both the ward and the hospital system *emulate* an open network.

It was clear that whether the concepts and techniques developed and modified theories in Honeywell Inc.'s biotechnical laboratories would be of any use in clinical setting *could not be established from an ex post facto study.* Additions were necessary. Psychologist Robert Sommer's (1969) *Personal Space* and anthropologist Raymond Birdwhistel's (1971) *Kinesics and Context* added powerful personal and social variables that were invaluable behavioral variables on a ward for psychopaths. Finally, Eric Berne's (1961) *Transactional Analysis* supplied two necessary links between behavior and Freud's clinical theories and the concept of games.

Homo sapiens Vs. Chemicals

An opportunity arose to test the clinical and organizational variables encountered on the ward for psychopaths; the bio-behavioral variables manipulated and measured at Honeywell Inc., in concert. See Dockens III (1975) and Götestam, Melin and Dockens III (1975). Twin clinical problems concerned management and therapy on a ward for amphetamine addicts and a methadone rehabilitation ward for morphine addicts. This time, the psychiatric team lacked the "ultimate" political authority, so organization problems with hospital wards (run like independent feudal fiefs), hospital administration (run as government bureaucracies) and outside organizations (that included government agencies, businesses and families), all had to be connected by *informal* open, information networks.

Ayllon & Azrin's (1968) *Token Economy* permitted an experimentally tested bio behavioral link between behavioral analysis, economic variables, and a growing list of complex organization variables. Ayllon & Azrin's method let us take advantage of the properties of a *general reinforcer*. Since, technically, money is general reinforcer; behavior on the ward could be controlled by the same behavioral mechanisms as are used by economies—thus the name "token economies". In the case of the drug addicts, points were assigned to "normal behaviors" (like cleaning up their own rooms, cooking their own food, looking for a job etc.). Taking suggestions from Berne's (1964) transactional analysis perspective, behavioral analysis was used to prevent patients from transforming the legitimate game of "Good Behavior" to the clinical scam "How Do You Get Out of Here?" Distinguishing between the games is crucial. Therapists and patients "playing" "Good Behavior" work together to achieve the patient's release, due to the patient's socially acceptable behavior. In "How Do You Get Out of Here?", the patient does not really want to be discharged; so he/she pretends to be playing "Good Behavior", but always does something to sabotage themselves so as not to be released. As was the case with psychopaths, when combined with Sommer's personal space and Birdwhistel's body language, transactional analysis proved indispensable in practical day to day evaluations of progress on the wards.

The drug studies validated all of the variables and a follow up study, Dockens III (1984), added critical demographic variables. While the dramatic increases in the number of variables increased the complexity to a point quite comparable to real world ecologies, the additional variables placed different demands on the formulas that were to replace the pseudo equation. NASA's biotechnical laboratories showed how behavioral and physical variables could be digitized. Behavioral pharmacology laboratories showed how relations between drugs and behavior and relationships between hormones and behavior could be digitized. Psychophysical laboratories showed how relationships between physical phenomena and sensory processes could be digitized through behavioral methods. But clinical variables described by games and organization charts created serious problems for the pseudo equation for integration, but not for the genome.

The complexities of wards for psychopaths and drug addiction stressed a need for something to fill the gaps between the variables studied in the biotechnical laboratory and a real world that often included irreconcilable conflicts, complex games, deception, secrets and lying. To make the fundamental links between the pseudo equation and all of the above, the professional dog show ring was treated as a real world game that could be won by applying the complete arsenal of what had been collected in the biotechnical lab, the follow up study and the two clinics. Stated briefly and simply, the strategy was to study the genome's integration strategy.

Human Genome Strategy

The genome's subtle integration strategy belies its truly shocking theoretical and practical consequences. The two aspects of the genome's strategy are clearly visible at large, international dog shows where representatives of over four hundred breeds are in competition, the strategy of the gene and the *conscious* genetic strategy of human societies. The dog show is dedicated to segregation of breeds, the maintenance of a broad genetic spectrum and the establishment of an absolute hierarchy. The genome is dedicated to the integration of breeds, the maintenance of a broad spectrum and the elimination of absolute hierarchies. The differences between dominance and integration separate the two strategies. Subtly, an integrated theory of behavioral science can use the results of the dog show ring study to distinguish between the unconscious, individual and species strategies followed by Homo sapiens' genes and the conscious strategies learned by cultures and individuals.

Contradictions between human conscious and unconscious suggest that the human brain is an organ of integration that is evolving into an organ of reason. Comparisons between dog show ring strategies and ecological necessities indicate that at its present, primitive state of evolution, the conscious mind is incompetent to deal with the problems associated with either integration or the genetic fate of our species. There is, however, no need for alarm, because the genome is doing an optimal job of determining, more or less, our evolution and resistance is not an option. Support for this thesis comes from empirical studies and the intuitive feeling that this is the only explanation that makes sense. The study was carried out in two phases.

Learning and Human Ecology

Learning, hormones and physiological were the main focus of Phase one that applied the techniques and theories accumulated from the biotechnical laboratory and clinical studies. Psychometric methods, especially constructed, were use to select two breeds, one sanguine the other melancholic (according to Teplov's typology). See Gray (1964). As was true in the biotechnical laboratory, Skinnerian shaping procedures and Pavlovian conditioning methods were inextricably linked in training environments, in the utility fields and in the show rings. The utility of functional units made them dominant in the training procedures. Nevertheless, phenomena associated with most of the predominant learning theories (see Bower, 1981), especially Estes and Guthrie, were encountered in the field. So it was impossible to completely eliminate theories on the basis of experience in the field.

French mathematician René Thom's (1975) catastrophe theory offered an elegant solution, a solution that combined two somewhat peripheral theories (see Honig & Staddon, 1977) in mainstream operant behavioral literature. A five dimensional butterfly catastrophe model (featuring a single behavioral surface that was divided into three parts) integrated behavioral and cognitive learning. See Dockens III (1979). Premack's (1971) behavioral priorities became a controlling dimension; Schoenfeld & Cole's (1972) reinforcement system's dual time system occupied two more control dimensions. The other dimension featured an index variable, the variable responsible for a single response being present in multiple frames and contexts. In addition to explaining erratic behavior for monkeys, dogs and humans, the catastrophe also suggested that sudden perception of opposite colors in the biotechnical laboratory may be a characteristic function of primate and human nervous systems.

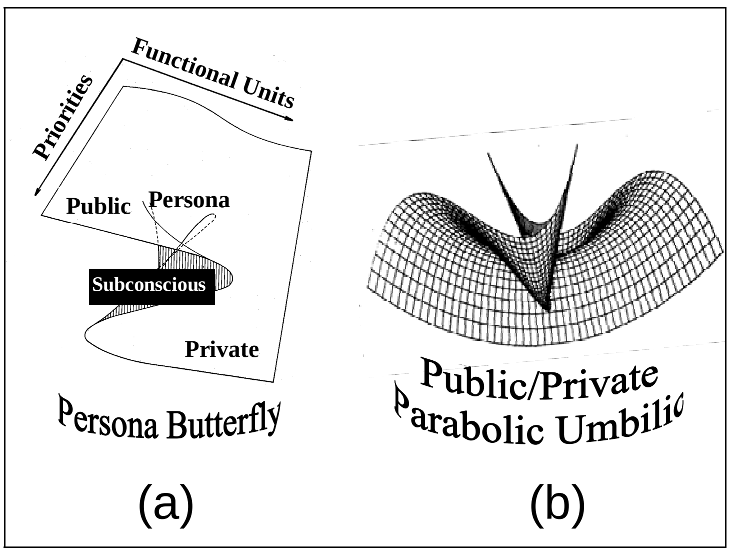
Over one hundred prizes (that included a major Best in Show win and major utility medals for each dog) added a pragmatic argument to support results. That the handler was a mathematical psychologist who had never competed in a dog show before the experiments added weight. Still, social, strategic and personality variables applicable to human cognition were left partially answered until completion of phase two.

Psychoanthropology

In phase two the addition G-information helped reveal subtle, yet surprising, psychological aspects of the human genome's tactics and strategies. Two dogs from the middle of Teplov's topology were select, but focus is on the role of genetics in optimizing long term social relationships. The final competition for Best in Show presents a visible sample of a species as defined by the invisible DNA. Also, that the winner is proclaimed as representing the highest standard of any dog (in any and all of the breeds!) makes the dog show the epitome of human aspirations for a genetic hierarchy. Besides individual merits, families are given awards, also breeders. That a successful greyhound breeder bred significantly different dogs for show and for dog races, a dog owner had a test fight in the pit to decide whether it would be Pit Bull (to be entered in dog fights) or a Staffordshire terrier (to be entered ins dog shows), testify as to the varying continuity between show standards and field standards. Analogies and anomalies in relationship to culture abound and are amusingly depicted by Stephen Budiansky (2000). However, the humor becomes the ominous aspect of a tragicomedy when the gnomic pattern is recognized as being connected to the pseudo equation and one of Thom's catastrophes are used to model it.

Stephen Oppenheimer's (2003) *Out of Eden*, and Luigi Cavalli-Sforza's (2001) *Genes, Peoples and Languages* map explicit examples of the evolutionary pattern. The same pattern that connects language and the genome, and the genome with culture also connects Homo sapiens' extensive breeding modifications of the dog. Jungian psychology furnished the necessary links between anthropology and clinical psychology. And the parabolic umbilic catastrophe model (see Dockens III, 1996) inextricably links the anthropological psychological aspects. Substitution in the pseudo equation yields the dual catastrophes in Figure 1.

Figure 1:
Dual Catastrophes: The persona butterfly (a) models personal thoughts and behavior. The Public/Private Parabolic Umbilic (b) models the individual's thoughts and behavior when interacting with others. After: Woodcock A. & Davis, W.1978. Catastrophe Theory, New York: E.P. Dutton



The personality of individuals is represented by the three partitions of the behavioral surface of the butterfly catastrophe; see (a) in Figure 1. The *public level* (showing variations of the prisoner's dilemma strategies described by Axelrod's (1984) simulation tournament) was by far the most obvious, because prisoner's dilemma analogues have to be played consciously and openly. In this context, Axelrod's computer simulation's function is to digitize prisoner's dilemma. The *private level* featured games similar to those described by Berne (1961) (1964) (1970) and was accessible, with difficulty, because private level games are played mostly by the subconscious. Berne's transactional diagrams are excellent graphic representations, but are not readily amenable to conventional mathematical procedures. Finally, the *personal level* was only partially accessible at best, and then, only with difficulty, because the Life/Death Game is played almost exclusively at the biological level by the unconscious. Eigen & Winkler's (1983) *Laws of the Game* combined with Wrangham & Peterson's combinatorial game theory supplies the best description. Unfortunately for behavioral researchers, a level's accessibility, and the complexity of the mathematics seem to be almost perfectly correlated—but negatively.

Genome psychological tactics and integration strategies that give rise to social and clinical variables are modeled in Figure 1 (b) and summarized by Table 1. Though it has six dimensions rather than five, the Figure 1 (b) catastrophe lacks a personal surface, because the personal surface is *accessible only to the individual*. The integration is based on DeValois & DeValois's (1975) research on color coding, the most complete mapping that psychologists have of the genome's fundamental bio psychological strategy. By color coding Ferster & Skinner's (1957) reinforcement schedules and anthropologist Maruyama's (1980) mindscapes General Systems can emulate the genome's integration tactics and strategies.

Table: 1:
Opponent-pairs theory of MIND: Opponent processing theory of color vision serves as a template for a basis for genomic "reasoning".

Conflict resolutions	**Positive sum**		**Zero-sum and/or Negative sum**	**Zero-sum**	**Integrated Taiji / Synchron**	
Color Dynamic	Blue	Yellow	Green	Red	Black	White
Re-inforcement Schedule	Variable Interval	Fixed Interval	Variable Ratio	Fixed Ratio	Con-tinuous	Discon-tinuous
Mindscape	G-Mindscape	S-Mindscape	I-Mindscape	H-Mindscape	Yin	Yang
Elements	Wood	Metal	Water	Fire	Earth	
Control Centers	Bottom up				Top Down	

Mindscapes are optimized epistemological as well as integration strategies. Like colors, schedules of reinforcement and nucleic acids, mindscapes can be classified in terms of four, convenient, categories: H-, I-, S- and G-. And also like colors, reinforcement schedules and nucleic acids, mindscapes can express themselves individually or in various combinations and permutations. H-mindscapes prefer strategies that employ homogeneous groups organized in hierarchies. I-mindscapes are individualists who prefer to work independently. S-mindscapes and G-mindscapes work well in heterogeneous non hierarchical groups. Though they agree on group and game strategies, S-mindscapes prefer balanced systems in equilibrium and G-mindscapes tend to create systems that are in a constant state of change. Inner conflicts are explained by the fact that the persona, the private and the public aspects of the personality *each has its own mindscape strategy*—collectively they are called *the Mindscape*. Ideally, a mindscape will function as a mode, to be applied when it is adaptive. Consequently, the vast superiority of our unconscious mind over the conscious our mind is due to two factors, the limited capacity of our short term memories as opposed to our long term memories (see Miller, 1956), and the *learned inability* of the conscious mind to apply the genome's integration strategy.

Here we make use of the fact that conflicts resemble Rapoport's (1970) description of games. For example, sharing of niche space is analogous to a positive sum game, where everybody wins. A winner take all competition is analogous to a zero sum game. Finally, destroying the niche space, rather than allowing an opponent to possess it, resembles negative sum games. Maruyama's formulation of mindscapes attributes positive sum strategies to S- and G- Mindscapes, zero sum strategies to H-mindscapes, and either zero sum, or negative sum, strategies to I-mindscapes. According to Eigen & Winkler (1983), genome strategy and tactics require an integrative strategy (the integrated/taiji synchron column in Table 1) that resembles that of a GO player. The genome can thus apply any strategy or combination of strategies necessary for adapting to changing environments. This conclusion suggests that dog shows are indicative of the primitive state of our conscious reasoning as opposed to our genome controlled unconscious mind. In any event, the genome is subtly but surely integrating Homo sapiens, *using methods our subconscious minds obey and our conscious minds do not comprehend*.

The genome strategy suggests that despite their pretensions toward higher knowledge; contemporary scientific paradigms appear to be trivial variations of partial genetic strategies inherent in organic brain function—with one important exception. The brain not only connects organismic patterns with environmental patterns it integrates them. The unconscious MIND manifests the brain's integration. Whether the conscious MIND manifests this genetic ability to connect and integrate depends upon its training. How, or if, MIND integrates on a conscious level also depends on its Mindscape. In any case, all aspects of MIND are inextricably linked to the strategies of genomes, and mindscape strategies are determined (more or less!) by the reinforcement schedules. Stated briefly, the brain, like the heart, is a magnificent organ of integration is a magnificent organ of circulation. Both are major components of critical systems, but neither is capable of directing our adaptive strategies. From romantic love, see Fisher (2004), to complex strategic decisions regarding the survival of living systems Homo sapiens' reasoning is safely in the competent hands of subtly brilliant genetic polymers.

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