Three Forms of Meaning and the Management of Complexity

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The complexity of the world

Most psychological models, even those as sophisticated as Gray's (1982), are based on the assumption that the world is made of objects, existing independently and given, or, more abstractly, of stimuli. That assumption is wrong: the boundaries between objects or stimuli are situation-dependent and subjectively-determined. Half our brain is devoted to vision. This indicates that we do not simply see what is there. The "frame problem"[1] encountered by AI engineers producing sensory systems for machines provides another indication of perception's complexity. This profound problem – the infinite search space for perceptual representation – looms over all other current psychological concerns. We live in a sea of complexity (Peterson & Flanders, 2002). The boundaries of the objects we manipulate are not simply given by those objects. Every object or situation can be perceived, in an infinite number of ways (Medin and Aguilar, 1999), and each action or event has an infinite number of potential consequences. Thus, as the robotics engineer Brooks (1991a; 1991b) points out, echoing Eysenck (1995), perception is the "essence of intelligence" and the "hard part of the problems beings solved." The world does not present itself neatly, like rows of tins on a shelf. Nature cannot be easily cut at her joints. We frame our objects by eradicating vast swathes of information, intrinsically part of those objects and categories, but irrelevant to our current, subjectively-defined purposes (Norretranders, 1998). How do we manage this miracle of simplification? We will address this question from a neurodevelopmental and evolutionary perspective.

The nature of reality

The reality of things consists in their persistent forcing themselves upon our recognition. If a thing has no such persistence, it is a mere dream. Reality, then, is persistence, is regularity. (C. S. Peirce)

[1] ("a new, deep, epistemological problem," according to Daniel Dennett (1984, p. 129)).

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. (J. J. Gibson)

Nothing exists except atoms and empty space; everything else is opinion. (Diogenes Laertius)

The objects and categories we use are neither things nor labels for things.[2] Instead, "objects" are entities bounded by their affective relationship to a goal.[3] We perceive *meaningful phenomena*, not the objective world. The intuitions that guide us are pragmatic and embodied (Gibson, 1979; Lakoff, 1987). Objects have certain properties, at the "basic-level" category system we are biologically prepared to use (Brown, 1986). They are solid, opaque, massive, and reasonably permanent – features that become salient because of their consequence for action. Solid objects can be gripped and manipulated. Density and solidity thus seem more real than experiences such as color. Our embodied, basic-level intuitions also lead us to understand the constituent elements of the objects we manipulate as bits of matter, increasingly smaller, but similar in kind. Gibson defined the "ambient optic array at a point of observation" as the central concept of ecological optics (Gibson, 1979, p. 65). This array is a heterogeneous, differentiated arrangement. Such an array necessarily surrounds the point of observation in ecological space. "The structure of an optic array, so conceived, is without gaps…. completely filled. Every component is found to consist of smaller components. Within the boundaries of any form, however small, there are always other forms" (p. 68). These observations are for forging an understanding of the *real*. Gibson also pointed out that the array is segregated, perceptually, into a

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[2] (as St. Augustine originally proposed)

[3] J. J. Gibson described such entities as affordances: "an affordance is neither an objective property nor a subjective property; or, it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychical, yet neither. An affordance points both ways, to the environment and to the observer" (Gibson, 1979, p. 129).

perspective structure, changing with every displacement of the point of observation, and an invariant structure, common to multiple points of observation.

Democritus, who formulated ancient atomic theory, noted that the void in which atoms were distributed was just as real as the atoms themselves. This seemingly self-evident observation has many interesting consequences. Atoms can differ in arrangement, given space. This allows for both randomness and ordered pattern, or array. Something random can only be represented by something as complex as the random elements themselves.[4] Ordered arrays, by contrast (where some elements repeat) can be represented by using elements within the pattern to stand for the whole. A square composed of an equally-spaced 4 X 4 array of dots is thus “1 line of 4 dots repeated 4 times.” Representation of the whole by the part, akin to Miller’s (1956) chunking, massively decreases computational complexity. Now, modern space is more complex than that of Democritus: it is spacetime, with 4 dimensions – height, length, width, and time. This means that the constituent elements of things are arranged in a (quantized) 4-dimensional array of varying heterogeneity.

Intelligible arrays have been identified at many levels of resolution: from that of the quark, $1/10{,}000^2$ as large as an atom, to the supra-galactic, at 10^{25} meters. All things-in-themselves exist simultaneously at all those levels, and partake in multiple arrays, at each level. A perceptible object is thus an array segregated, arbitrarily and for subjective, purposeful reasons, from its participation in endless other arrays. However, some aspect of the original array must be retained. Otherwise, the object cannot be said to truly exist, and must be regarded as fantasy. Those aspects of the spacetime array we perceive as objects tend (1) to be homogeneous at some resolution-level in some structural aspect against a comparatively heterogeneous background; (2) to persist for a biologically-relevant length of time; and (3) to serve as affordances or obstacles in

[4] This is something equivalent to Kolmogorov complexity.

relationship to a goal. Knowledge of these facts help us understand (1) how the object can have a subjective property (as an affordance, for example), (2) why the object is less than the thing-in-itself and (3) how the object can still be empirically "real." The perceived object is simpler than the thing-in-itself (a prerequisite to comprehension) – while remaining importantly related to the actual thing. This relationship is the encoding of some genuine regularity across some dimension(s). The perceived object is thus a low-resolution image of the thing-in-itself. The concept, in turn, is an abstracted simplification of the perceived object (but retains some not-entirely-subjective relationship to that object).[5]

The constituent elements of an object, the object itself, and the many objects and situations of which the object itself is a constituent element *are all equally real*. All of this extraneous reality must be stripped away, before a given object can be seen or put to use, by applying a pragmatic framework of reference to the object, specifying its relationship to a goal. Perception simplifies the world, without sacrificing functional grip. The perceiver learns what resolution-level is relevant to a given operation by interacting pragmatically with the patterns amenable to perception. The pattern that manifests itself at the appropriate level is granted object status. In every act of perception, therefore, entropy at some levels of resolution is reduced to a minimum, while at others it is allowed to approach the infinite. Thus the complexity characterizing the thing-in-itself can be successfully, if temporarily, dealt with.

When we see, we do not see much of what is there (Simons & Rensink, 2005). The fact that each object-pattern is involved in many invisible arrays means that things have many invisible properties. This is a good thing, when new problems emerge. Old objects can be investigated for new properties. However, it

[5] This implies as well, that the perceptual object is an axiom of the concept and, conversely, that an object may be nothing more than an well-practiced concept – of the species, the social group, or the individual, following Barsalou (1983). What is axiomatic about the object is that it is a representation of the thing-in-itself, sufficient for some delimited purpose. What is axiomatic about the concept is that it is a sufficient representation of the object.

is also a bad thing. Since each object-pattern is involved in many arrays, we can perceive incorrectly. Furthermore, the outcome of a hypothetically finite act cannot be definitively calculated. This means simplified knowledge and constant blindness – but also endless opportunity for error. What we fail to see can manifest itself, unexpectedly, forcing us to traumatically attend to objects of perception that appear utterly new (though they may have been lurking in the background, forever).

The Meaning of Meaning

The world therefore manifests itself to us, as religious thinkers and philosophers alike have insisted, in the form of *meaning*. Such meaning, however, does not take a single form. Instead, it makes itself known in 3 different classes. The 1st class includes the most basic, universal and evolved forms of functional simplifications. This class, *meanings of the known, familiar or determinate world*, includes the meanings of individual and social identity that simplify and structure the world. The 2nd class includes those that arise to challenge the integrity of our current known or determinate-worlds. This class, *meanings of the unknown, foreign or indeterminate world*, includes the meanings of anomaly or novelty – the unexplored world. The 3rd class includes those that arise as a consequence of the integrated interaction of the first two classes. This class, *meanings of the conjunction of the known and the unknown*, includes the meanings arising in the course of voluntary exploratory behaviour. These are the existential meanings intrinsic to individual experience. Consideration of all 3 classes provides a comprehensive, differentiated portrait of meaning, free from paradox.

The Known, Orderly, Explored, Determinate World: Motivation-Action-Perception (MAP) Schemas and their Hierarchies

MAP Schema, considered as individual units

If it is impossible to perceive the world, how do we do it? The simple answer is that we don't. We sense it well enough so that some live long enough to reproduce. We maintain our integrity, momentarily, while the complexity of the world swirls around us, and lays us low. Induction is a scandal because things change – on different timeframes and scales, but on every timeframe and every scale, eventually. Thus, no solution to the problem of perception is final. In the face of such change, Darwinian hyper-production of potential solutions, allied with severe post-production culling, maintains life. Life-forms vary, in tandem with the endless transformations of the world. Enough variation exists, so that a solution to each deviation from inductive predictability has so far been found. The price paid for this, however, is endless deadly failure. Most genes fail to propagate themselves across the generations. Most species go extinct.

Some forms and strategies, nonetheless, have proved themselves, and have been conserved. These are evident at different levels of resolution, from the sub-cellular, where the symbiosis between mitochondria and eukaryotic cell has lasted for several 100 million years, to the individual, comprised of the uneasy union between the single-minded personalities of thirst, hunger, sexuality, and aggression, through the social, where the dominance-hierarchy structure governing individual relationships has ruled for at least 100 million years. Such forms and strategies allow us to cope with the slowest-changing of patterned complexities: our biological structures presume air, water, light, and darkness, although some of these things have been and may again become scarce. More short-term psychological realities are also presumed: social structure, cooperation and aggression, to name a few.

It is motivation that provides the most stable of the psychological strategies. Motivation does not drive behavior, deterministically; nor does it simply set goals. Instead, it provides the current state of being with boundaries and values (Barsalou, 1983). These remain unquestioned, if current action produces its desired ends. These bounded states may be conceptualized as *determinate micro-worlds of experience* – as motivation, action and perception

(MAP) schemas. As there are qualitatively different states of motivation, such as hunger, thirst, lust or aggression (Rolls, 1999; Swanson, 2000), there are multiple MAP schemas, manifesting themselves singly and sequentially. The basic MAP schema consists firstly of perceptions of point *a*, the undesired beginning-state, and point *b*, the desired end-state, and secondly of motor actions designed to bring about the transformation of the former to the latter (Peterson, 1999). Objects and events relevant to the current schema are perceived; those assumed irrelevant fade into non-existence. Human beings are low-capacity processors, with an apprehension capacity of < 7 objects (Cowan, 2001; Miller, 1956). Our perceptions, tuned by our motivational systems, are limited by our working memory: a good goal thus requires consideration of no more things than we can track. Perhaps it is in this manner that we determine when to deconstruct a task into sub-goals – all goals are *motivated*; all *reasonable* goals are *perceptually and cognitively manageable*.

A given MAP schema arises as a consequence of insufficiency, emerging along a basic motivational dimension. This can be brought about by a decrement in the value of the present, or the imagining of a better futuret. The emergence of a particular motivation induces a state of radical world-simplification. Someone sexually deprived, for example, increasingly frustrated by the present, and increasingly sees the future, single-mindedly, as a place of physical satiation. The motivational significance of beginning-and-end states is given by biology, or secondarily and rapidly derived from biology through learning. We confront the environment with loneliness, playfulness, hunger, thirst and sexual yearning (Panksepp, 1998). We will work to increase wealth, however, after learning its association with pleasure, satiation, and dominance-hierarchy position.

How therefore might motivation be given its proper place, in the study of perception? We might start with an analysis of the most basic animal strategies, building in stages from there, seeing how evolution solves the problem. Swanson

(2003) describes the relationship between the simplest multi-cellular animal, the sponge, and the complex thing-in-itself. The sponge lacks a CNS, entirely. Instead, it is composed of "sensorimotor" cells, arranged in an array, all over its body. This array maps limited detectible environmental patterns directly on to a specialized range of motor actions, with no perceptual intermediation. At this primitive level, it is not objects that evoke responses. Instead, the same cells are used for detection and output, and one pattern evokes another. The hydra, a stage above the sponge, possesses a primitive, differentiated CNS, with sensory, neural and motor cells. Thus, it can detect a wider range of patterns, and map them on to more actions. Neural cell intermediation provides the precursor to perception, so that the same "thing" can produce different outputs, but the hydra still essentially pattern-matches. With such increased flexibility, the hydra appears to have an advantage over the sponge, but it is handicapped in one manner: speed. Information moving across more switches means longer reaction time. This problem becomes acute, as the nervous system increases in complexity. Conscious human perception can take .5 seconds (Libet, 1999). Sensory systems therefore retain dual branches: one to the motor system, for reflex-like speed; the other, to the cortex, for slower elaboration of response (Swanson, 2003). As behaviour proceeds from reflexive to voluntary, among complex animals, it is regulated by an increasingly complex control hierarchy (Swanson, 2000). At the simplest level, somatomotor neuron pools in the spinal cord ventral horn innervate the musculature of the major limbs. At the next level (the locomotor pattern generator), operations are are surprisingly sophisticated[6] although still spinally

[6] A "spinal" animal (one that is classically paralyzed as a consequence of surgical severing of the spinal cord from the brain) can still manifest coordinated limb movements characteristic of locomotion if suspended above a moving treadmill, with its limbs in contact with the surface of the treadmill (Swanson, 2000). This means that the spine, in isolation, is essentially capable of walking if sensory input reminiscent of locomotion is received by the spinal pattern generator. However, the spinal animal is not capable of any spontaneous or voluntarily-controlled or even complex involuntarily-controlled motor behavior. Note that what this means, at least from one viewpoint, is that the "representation" of the treadmill-stimuli is, from the spinal perspective, "move limbs in walking pattern" – without any intermediation of representation independent of or abstracted from the treadmill. The spinal animal is therefore clearly not using an object-

localized and reflexive. Animals with the brain-body connection severed at a higher level, midbrain, are still without spontaneous motor behavior. However, when severely stimulated, they can manifest complex actions, which can be adapted to new situations (Whalen, 1998). This midbrain region is a locomotor pattern initiator – a area producing action to more abstract stimuli than those associated with, for example, a treadmill.

The hypothalamus basically constitutes the next stage of the hierarchy, the locomotor pattern controller. Its presence in an otherwise decerebrate animal allows for spontaneous behaviour, of the fundamental, survival-oriented kind: ingestive, defensive, and reproductive. Hypothalamic animals are hyperactive in contrast to midbrain animals, who do not eat, drink, or manifest spontaneous defensive behaviors, and to intact animals, whose behavior is more specifically regulated.[7] It is the hypothalamic medial nuclei which are particularly involved in behavioral control. These may be divided into the rostral segment, governing ingestion, reproduction and defense, and the caudal segment, governing foraging and exploration. The rostral segment sets particular goals: food, a mate, escape from predation. The caudal segment, by contrast, controls the initial analysis of the unexpected and unexplored. It includes the mammillary body, controlling head direction, the ventral tegmental area, origin of dopaminergic incentive reward circuitry (Legault & Wise, 2002) and locomotor behavior, and the reticular part of the substantia nigra, regulating the orienting movements of the eyes, head, neck and upper limbs (Swanson, 2000). The hypothalamus thus functions as follows: The rostral segment generates a MAP schema, oriented towards some basic end, implementing appropriate perceptions and actions. If the

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like representation of the treadmill to initiate its locomotion behavior. Instead, the treadmill sensory pattern or array is mapped more or less directly onto a walking output motor pattern.

[7] The hypothalamus has developed subsystems providing integrated control of all three subsections of the motor system: somatomotor, governing the operation of skeletal, voluntary muscle; autonomic, innervating smooth muscle, cardiac muscle, and glands; and neuroendocrine, exerting its effects through the pituitary (Swanson, 2000, p. 116). The hypothalamus also regulates temperature and the sleep/wake cycle.

schema succeeds, another, based in a different primary motivation, rapidly supersedes it. If it fails, however, the caudal segment switches to exploratory mode, and gathers more information. Thus, at the psychological level of analysis, (1) the external world is mapped on to motor output, before it is perceived; (2) such mapping transforms itself into object-perception, as the CNS develops in complexity; (3) a tight connection remains between sensation and action, even when perceptual intermediation arises; and (4) – most importantly – that the schema within which an object is perceived is controlled by hypothalamically grounded, goal-directed motivation.

To identify some end as valuable means to grant it consummatory-reward status, formally, as "end" implies consummation. "Consummatory reward" has well-defined, relevant and oft-instinctive features (Rolls, 1999). The human capacity for abstraction means, however, that the hypothetical, arbitrary or symbolic may also come to function as consummatory reward; may serve as goal and indicate satiety, so that current behaviours can be terminated; may come to frame the perception of "objects," evaluated as incentives, threats and punishments (Peterson, 1999). Such consequences of goal-setting are universal, regardless of the specifics of the goal. This means that the cortex modulates archaic motivational systems by substituting abstractions for primordial goals and that goals might be considered, generally, as a class, so that the diversity of potential goals can be ignored, and the goalas serve as object of discussion. We establish point "b," the ideal endpoint of our linear activity. We specify and evaluate our starting point "a," and our actions, in reference to that ideal. We strive to transform "a" into "b," testing possible solutions to the now-bounded frame problem. We become anxiety-ridden or frustrated as a consequence of our failures, manifold and common. Alternatively, we embody a solution, as a consequence of favourable mutation, or stumble across an answer, communicate our successes, and move up the dominance hierarchy. Our MAP schema solutions are inevitably evolutionary, phylogenetically (as our successful genes accumulate) and ontogenetically (as we try many useless approaches, and conserve those that work).

MAP schema considered in their social/hierarchical multiplicity

Basic motivation helps solve the problem of pragmatic world simplification, but a multitude of problems remain. First are issues of sequence and time frame: in what order should a set of MAP schemas manifest themselves, over the day, or week, or year? Second is the related issue of importance: which MAP schemas should be granted priority of value? Third is the even more complex third problem, that of social being: how should I adjust my MAP schemas to those around me (who are facing, and trying to solve, the same problems)? It is identity, the idiosyncratic structure of personal integration, that solves these problems. Thus, personal identity shades into the social; personal and social identity is the emergent, unconscious, automatic consequence of the co-operative/competitive generation, sequencing and rank-ordering of MAP schemas. Such organization manifests itself intrapsychically and socially as the dominance hierarchy. Status is the most important determinant of survival and reproductive success. Establishment of a predictable dominance hierarchy allows for orderly resource access, so that every consummatory attempt does not end in competitive violence. Status tracking is so important (Abbott et al., 2003; Virgin & Sapolosky, 1997) that group and neocortical size are tightly correlated, among primates (Joffe & Dunbar, 1997), and advancement is worth fighting for. Juvenile chimps, our close cousins (Sibley & Ahlquist, 1984), share many MAP schema with children, including those related to dominance-hierarchy manoeuvring. These manifest themselves first, innocently enough, as teasing (De Waal, 1996). Teasing becomes more serious with age, but less frequent. The infant engages in little pushes from behind, jumping away when the adult reacts. The adolescent male manifests full-fledged charging displays, seeking to dominate peers and, eventually, higher-ranking adults. Adults form sophisticated coalitions, jockeying for position. Such jockeying can become horrifically violent (De Waal, 1996).

The fact of innate dominance striving, however, buttressed by aggression, does not mean that chimps or humans lack social feeling, or that they simply come to inhibit their aggression through fear or forethought. Primates are gregarious, as much as aggressive, even in the aftermath of violent encounters (De Waal, 1989a). Agonistic and cooperative behaviors are not simply opposed to one another. More aggressive social creatures may have to be more affiliative (De Waal, 1989a; Abbott et al., 2003). Interaction can be cooperative at one level, and competitive at another. The dominance hierarchy is in fact a form of extended cooperation, establishing the frame for within-hierarchy striving, and aggression is counterbalanced by two powerful regulatory processes. One is innate and internal;; the other, emergent and social. The internal process is empathy, the ability to feel another's experiences (Preston & De Waal, 2002).[8] The maternal circuitry governing empathy is deeply rooted (Panksepp, 1998), and modulates response to those deemed kin.[9]

Chimps are predatory. They hunt monkeys and raid foreign conspecifics (Wrangham & Peterson, 1996). A chimp might even maim or kill a troupe-mate, during intensely agonistic disputes. Clearly, there is no inevitable *internal* limit on their aggressive MAP schemas. De Waal (1989b) has suggested, instead, that it is the whole troupe that constrains the ambitious individual, becoming agitated *en masse* when any battle goes too far. Thus, a well-socialized individual may not generally need a super-ego[10] If he is acceptable to his peers, the modulating effect of their reactions will remain at hand, and effective. When human children are

[8] In addition, of course, to the basic inhibition produced by fear.

[9] A wide range of animals exhibit empathic reactions to distressed conspecifics, including rats, hyenas and rhesus monkeys (Rice & Gainer, 1962; Rice, 1964;Yoerg, 1991; Masserman et al., 1964). Likewise, human infants cry when others cry (Zahn-Waxler, Radke-Yarrow and King, 1979), imitate others' distress, and help, spontaneously (Zahn-Waxler, Radke-Yarrow & Brady-Smith, 1977; Miller, Eisenberg, Fabes & Shell, 1996).

[10] Something terrifying to consider, in the human case, given our belief in individual morality, but potentially sufficient explanation for brutality like that manifested at Nanking (Chang, 19XX).

socialized, they learn socialized alternatives to violence, which serve as more effective means to social status. They do not simply inhibit the primal aggressive circuits. Instead, they integrate these circuits into more sophisticated behavioural games. The child organizes her primary impulses into higher-order, low-resolution MAP schema, within the confines of the dominance hierarchies she inhabits.

Such organization is mediated by empathy, and then by play. Play is early social cognition: when children play, they adapt their actions to each other. They produce and then share a perspective, and work towards a common goal. They embody the same MAP schema, to the benefit of both. The capacity to do so unfolds developmentally, starting with the body, in direct physical contact with others' bodies (Smith & Boulton, 1990). The maturing child begins by constructing small-scale motor patterns, designed to attain individually-motivated ends. "Play is purely individual," at this stage. "Ritualized schemas" develop – skilled play habits – but no collective patterns, much less rules (Piaget, 1932, p. 16-18). The child plays alone, practicing a repertoire of functional actions and conceptions, from the spinal bottom of Swanson's (2000) control hierarchy to the cortical top. Before there are stateable rules, there are behavioral patterns. As the child progresses, complex social understanding emerges. The child imitates himself, using procedure to map procedure, at the initial, embodied stage of genuine representation. Any successful MAP schema is immediately replicated, practiced, automatized and readied for future employment (Piaget, 1932). Imitation then extends to others. Patterned social interactions begin to emerge, as the play partners' exchange information about which (re)actions are desirable, and a prototypical morality emerges (even among rats[11] (Panksepp, 1998). Control

[11] When juvenile rats are paired together, repeatedly, in rough-and-tumble wrestling bouts, one rat will end up on top more frequently. However, if the now-dominant rat pins its playmate more than 70% of the time, the subordinate, who initiates play sequences, begins to ignore the victor, and play diminishes (Panksepp, 1998). The dominant rat must learn to respond

over MAP schema formation shifts to emergent systems of more complex control. Hippocampal maturation allows for determination by context (LeDoux, 1996). The orbitofrontal and dorsolateral prefrontal cortices increasingly grant abstractions value-status (Krawczyk, 2002), removing the individual from the short-term horizon of basic motivation (Pochon, Levy, Fossati et al., 2002).

Higher-order, more explicit, cooperative morality emerges around 7 (Piaget, 1932). Each child now tries to win, to dominate the hierarchy of game achievement. At first glance, this appears competitive. However, all disagreements about the game have to be resolved before any attempt to play, let alone win, can begin, and all striving must remain civilized enough that the game can continue. Even these more complex play forms emerge procedurally, rather than explicitly. If the playing children are separated, and interviewed individually, they give disparate accounts of the emergent game's "rules." They still need the information provided by the others' presence to maintain the game. Once a game becomes, a regular occurrence, however, it can be explicitly codified. Then patterns that constitute the game, and the explicit description of the game, come into alignment. The children map their own socially-modified sensorimotor outputs, and become conscious players (Piaget, 1932), able to inhabit fictional, social, dramatic worlds (highly abstracted and communal MAP schema). It is the ability to establish these joint schemas that allows for the modulation of motivation and emotion toward some shared end. In a good game, there are many opportunities for joint gain. There is no need to be predatory, or defensive, so there is little need for violence. Well-socialized adults add their opinions to the process, insisting that the players' play fair, and act as good sports: "How you play the game is more important than whether you win or lose." The adults know, implicitly, that life is a sequence of games, and that those who play properly

to the cues of the subordinate, if it wishes to keep playing. Such modulation lays the foundation for the higher-order morality keeping aggression and other potentially antisocial schema properly regulated – even among rats.

during a given game become the popular players of many games, and benefit cumulatively from playing each. Thus, a vital form of meta-morality emerges: *the best player is he who is invited to play the most games*. Sacrificing a future invitation for present victory is a counterproductive long-term strategy.

A purely personal MAP schema specifies starting place, goal, objects of perception, and implication for emotion, dealing with the bits of the world relevant to a particular desire. The joint construction of such schema integrates perception across individuals, placing them in the same world of objects, aligning their emotions. Diverse individuals inhabit the same experiential space, cooperating both to reach a goal and to maintain the space's integrity. This is how fundamental agreements emerge, nullifying the very necessity for aggression – or for terror. For the socialized, within the intact dominance hierarchy, the unbearable present predictably turns into the desirable future. Everyone plays the same game, with the same rules, at the same time. Emotion remains controlled.

The specific circuitry mediating such concordance has been recently outlined. Rizzolatti, Fogassi and Gallese (2001) describe the behavior of certain visuomotor neurons, located in the ventral premotor cortex. Some are motor neurons, but also respond to visual stimuli. Some are activated by 3-D objects. The most relevant, however, "mirror neurons – require action observation for their activation" (p. 661). Mirror neurons, part of the system that uses motor-output patterning as the basis of perception, have remarkable properties. They do not respond to a motivationally significant object in isolation. Nor do they respond to the sight of a conspecific engaged in context-independent action, such as grasping. But they do respond to the sight of a conspecific grasping in the presence of a motivationally significant object. More to the point, their responses match, when a motivated sequence is observed *and* when it is enacted. This congruence can be strict, coinciding in goal and behavioral sequence. Sometimes, however, the congruence is broader; generalizing "the goal of the observed action across many instances of it" (p. 662). This is akin to a child's playing the role of father, rather than precisely imitating any of father's specific behaviors. A neural mechanism allowing both for imitation and the abstraction of imitation has thus been identified.

Mirror-neuron mediating understanding cascades downward from the abstract, through the emotional, to the physical. The mirror system accepts sensory, cognitive and circadian state inputs, and produces somatic, endocrine, and neuroendocrine output (Swanson, 2000). Area F5, which contains the mirror neurons, shares connectivity to inferior parietal lobe with area "a" of the superior temporal sulcus – part of a circuit including amygdala and orbitofrontal cortex (Amaral et al., 1992). This implies that mirroring extends beyond action, to its emotional, motivational, cognitive and neuroendocrine concomitants. F5 has other relevant functions, as well. It is the primate homologue of Broca's area, which has come to govern voluntary speech. The development of the mirror neuron system allows a maturing child to embody the action and motivational states of those he directly observes, with greater or lesser fidelity. The linguistic abilities of Broca's area, integrated with the mirror neuron circuitry, allow communicating children to verbally instantiate shared MAP schema, not at the level of precise imitation, but at a higher, generalized state. Thus, children engaged in pretend play can coordinate their motivations, emotions, actions, and perceptions. Such processes of coordination, within such schema, lay the groundwork for the understanding of imagistic and more abstract semantic thought, including drama and fiction, and the ability to engage in increasingly adult-scale social enterprises. A plan is the projection of a compelling fiction onto agreed-upon objects and contexts. The successful joint establishment of such a plan, motivationally significant, emotionally gripping, eliminates the very necessity for uncertainty, anxiety and conflict. This all means, as well, that it is not precisely *individuals* who occupy a given position in a given dominance hierarchy. MAP schema themselves cooperate and compete, within and between individuals. The intrapsychic and social structure that results is the consequence of that process. Thus, in a properly formulated dominance hierarchy, the presuppositions of the individuals match the structure of the group. *This keeps the group stable and the individuals affectively regulated*. Any challenge to this match (and not simply to the intrapsychic or social structures themselves) therefore simultaneously dysregulates motivation and emotion.

The Unknown, Chaotic, Unexplored, Indeterminate World: Novelty, Anomaly and MAP Schema Disruption

The frame consisting of point "a" and point "b" can well be considered a theory-laden MAP schema. Such a schema is also a story, however, in its simplest form, analogous to the necessary fiction of Vaihinger (1924) and Adler (Ansbacher & Ansbacher, 1956), the life-space/field of Lewin (1935), the Dasein of the phenomenologists (Binswanger, 1963; Boss, 1963) and the normal science of Kuhn (1970). A MAP schema is also a cybernetic unit (see Weiner, 1948). A broad, interdisciplinary consensus has emerged around the cybernetic framework, based on the assumption that goal-directed, self-regulatory systems constantly compare what is to what should be, while attempting to reduce mismatch. Piaget (1954) adopted many cybernetic preconceptions, including the belief that "all knowledge is tied to action… on the most elementary sensory-motor level and all the way up to the highest logical-mathematical operations" (Glaserfield, 1982, p. 613; Glaserfield, 1999). Luria (1960, 1980), Sokolov (1963) and Vinogradova (1961, 1975) were also heavily influenced by Wiener.[12]All four served as precursors to Gray (1982; 1987; Gray & McNaughton, 2003). Miller, Galanter and Pribram (1960) used cybernetic principles, as did Powers (1973a, 1973b) and Schank and Abelson (1977). Similar ideas have emerged with regards to emotions and their role in giving value to objects of apprehension (Damasio, 1994; Jung, 1971, pp. 433-436) and indicating the interruption of goals (Oatley & Johnson-

[12] who published *Cybernetics* in Moscow in 1958 and lectured there in 1960 (Feigenbaum, 1961).

Laird, 1987; Oatley, 1992; Oatley & Jenkins, 1992).

Luria, Sokolov, Vinogradova and Gray (LSVG) hypothesized, specifically, that complex organisms developed a complete internal model of the world and how it should unfold, as a consequence of current actions, and continuously contrasted this internal model, this *expectation*, with what was, *in fact*, occurring. When things go according to plan, according to this hypothesis, positive affect rules, ensuring that current goal-directed conceptions and actions dominate (Gray, 1982; Rolls, 1999). When something unexpected occurs, by contrast, the *orienting reflex*, a sequence of rapid preparatory responses, manifests itself. Current goal-directed actions cease (Gray, 1982), when mismatch between desire and world emerges, detected by the septal-hippocampal comparator systems. Lower brain circuit function, including the amygdalic, is disinhibited, activating circuitry in the right hemisphere (Tucker & Frederick, 1989) and, later in the processing chain, inhibiting the frontal and prefrontal systems of the left cortical hemisphere, associated with positive emotion (Davidson, 1992). The autonomic nervous system is engaged. Heart rate rises (Fowles, 1980), in preparation for non-specific action, and cortisol floods the bloodstream (Gray, 1987). Startle responses, primitive but fast, governed by brainstem circuitry, produce virtually instantaneous physiological defensive postures, designed to protect the body, particularly the head and neck (Yeomans, Li, Scott & Frankland, 2002). This is followed by activation of circuits in the superior colliculus, which direct the sensory systems of the head towards the environmental locale that quick-and-dirty systems have specified as the source of the anomaly (Dean, Redgrave & Westby, 1989). Hypothalamic systems, particularly those in the rostral segment, ready fight or flight, another aspect of defensive response, in concert with the pain-sensitive systems of the periaqueductal grey (Swanson, 2000). Finally, the extended amygdala (the bed nucleus of the stria terminalis) enhances vigilance, and provisionally associates the anomalous occurrence with anomalies that in the past have produced negative outcomes (Hooker, Germine, Knight & D'Esposito, 2006). This comparator theory, advanced most completely by Gray, has become exceedingly influential, across wide domains of psychological inquiry. It remains predicated, nonetheless, on four assumptions about perception that can no longer be maintained. Thus, the role the hierarchical arrangement of MAP schema plays in affect regulation has not yet been fully appreciated.

Sokolov's (1963) subjects responded with an orienting reflex to the tiniest alterations in lab stimuli. He used auditory tones, and elicited a galvanic skin response to any alteration in volume, tempo, or irregularity in tone onset or offset. It was this sensitivity that produced LSVG's first error: the hypothesis of complete objective modeling. Later researchers demonstrated that orienting only occurs toward "differences that make a difference" (Bargh & Chartrand, 1999; Simons & Rensink, 2005) –anomalies that interfere actively with current goal-directed activity – and not to all stimulus change. Modeling is thus far from complete. Consciousness attends selectively, to the minimum set of elements necessary to bring about the desired transformation. LSVG assumed, secondly, that the CNS compared *incoming objective sensory data* (reality) and *expectation* (construed cognitively). As behaviourists, they presumed that stimuli were objectively real and simply given, and they gave short shrift to motivation. Living creatures do not so much *expect* things as *desire* them. Desire is motivation, and it is motivational systems that fundamentally give rise to MAP schema. For LSVG, mismatch meant error, error meant anxiety, and anxiety indicated that behaviour must be retooled. Mismatch, however, is much more than the problem of erroneous action, but this cannot be understood without due consideration of motivation. If the desired future fails to appear, it is not only current actions that might be wrong: *current desire might be wrong*, as well. Perhaps the MAP schema is motivated by jealousy, for example, and the situation is such that jealousy merely makes things worse.

Thirdly, it is not *reality* that is compared with expectation (now: *desire*). We are not privy to reality, even in the present. Current "actuality" is modeled, much as future "possibility." Sometimes you cannot get from point "a" to point "b," because you are not actually at point "a." We compare a *motivated model of the present* to a *motivated model of the future*. In the case of error, this means that the very way we perceive things, present *and* future, might be incorrect. Failure re-presents us with the frame problem. This is a very serious problem indeed, given all the different ways that the complex world of things and situations can be perceived. Whatever anxiety might arise at the failure of our actions is nothing compared with the terror of having to recalibrate our perceptions. LSVG were not nearly pessimistic enough about error. When what is desired does not manifest itself, motivation and perception, as well as cognition and action, might all be incorrect – and anywhere in their structure.

This brings us to the fourth and final element missing in the standard account: the implications of *hierarchical* MAP-schema structure (see also Carver & Scheier, 1998). In the absence of such nesting, it would be impossible to disinhibit motivation and emotion at different levels of intensity, when anomalies of different significance emerge. All errors would be equally overwhelming or irrelevant. However, varying errors indeed produce various reactions. Each mistake cannot be evaluated, cognitively, however. There is insufficient time for that. Instead, potential meaning is bounded, *a priori*, by the breadth/import of the current MAP schema. Large-scale MAP schemas are built from the bottom up, following Piaget and Swanson, established at spinal levels; organized into more complexly sequenced routines, represented as abstractions, communicated and verbally organized into long-term plans. A large-scale plan thus consists of smaller plans, which consist of even smaller plans, which eventually ground out in muscle movement itself. Thus, the mind meets the body. Development is simultaneous higher-order organization of intrapsychic and social MAP schemas. Affective stability, particularly at higher-order levels, is dependent upon the match between them. Imagine an inverted neural hierarchy, representing MAP schema import: mismatch disruption of schemas closer to the point of the V are more upsetting. The meaning of a high-resolution schema depends on its role as a sub-element of a lower-resolution schema: grades in a pre-med class only matter in the broader context of wanting to be a physician.

The objects specified by a given MAP schema are positively valenced – the 1st dimension of emotion – if their appearance indicates (1) that progress is occurring, and (2) *that the structural integrity of the currently operative schema is valid and intact*. A working schema is therefore self-verifying, as well as providing direct, dopaminergically-mediated (Gray, 1982) incentive reward. Obstacles, by contrast, are negatively valenced (the 2nd basic emotional dimension). Their appearance indicates a schema-world mismatch, danger to current progress, and the fact that the current MAP schema (or hierarchy) may not be functional. If an obstacle does appear, it should first be evaluated for significance at narrowest and most specific level possible. Such use of Occam's razor limits the spread of chaotic emotion. Elements of self differ in degree, not in kind: the upheaval produced by an obstacle is proportionate to the area of space and time structured by the erroneous schema. The solution may lie close to hand, if the obstacle is merely something expected under different circumstances. Other times, however, the obstacle is too radically unknown for such easy dealings. Then the complexity of things re-emerges, with incomputable consequences. The borders between things become questionable, and everything is up for grabs. This is the problem of chaos, vs. order – *the* eternal problem, and the ultimate reality of the world.

We derive one important form of meaning –security and hope – from the match between our personal MAP schemas and the social world. Such ordered meaning emerges as a consequence of the delimitation of its paired opposite, chaos, whose manifestation produces the second kind of meaning. Maintenance of MAP-schema meaning keeps chaos in check, rather than revealing it (or allows it to be revealed in doses small enough to be tolerable). Determinate positive and negative events occur, as the world manifests itself as tool and obstacle. Irrelevant things occur, too, of course – but are in some important sense never realized. No one can pay attention to all activity; only to all relevant activity. But what of seriously anomalous events? Some occurrences are neither evidently good nor bad, nor immediately eradicable as meaningless. They are *not* understood, *not* explored. They cannot be placed into the context of the current MAP schema, nor encapsulated within that schema's hierarchically-ordered larger-scale conceptual surroundings. They violate the frame, interfering with its operation, its integrity, and its relationship to other frames. What must happen in such cases?

What is not comprehended but is still extant must logically be experienced as paradoxical: (Jung, 1967, 1968; Gray, 1982; Peterson, 1999): negative, in potential, positive, in potential, irrelevant, in potential – and self and world in potential, as well. That potential, the true complexity of the world, is chaos. Its manifestation, no mere threat, constitutes a challenge to the full adaptive capacity of the individual. The emergence of chaos produces more than mere anxiety; something more like generalized MAP schema disinhibition and competition, as new and potentially appropriate means of framing war with each other for dominance. Motivation for maintaining meaning is thus not merely desire to reduce anxiety: it is instead desire to avoid the internal and, frequently, external war of competing options – and there is something even deeper about the anomalous event. At some point in psychological development, however hypothetical, *all events* are anomalous, though they may be rapidly constrained by the social surround. This means that the schemas allowing for the determinate utilization of objects, situations and abstractions are dependent for their construction, initially, on information extracted from the overarching, ever-emerging domain of the unknown. It is for such reasons that chaos is meaningful, *a priori*, and the mother of determinate being itself.

The appearance of the anomalous involuntarily produces its own specific MAP schema, the orienting reflex, or complex, in more modern terms (Halgren, 1992; Ohman, 1979, 1987). The beginning point of *that* schema is the insufficiency of present knowledge. The desired endpoint is classification of the anomalous phenomenon, and its reduction to specified meaning. Increased sensory processing and exploratory activity is brought to bear on the uncomprehended circumstance, examined from the perspective of varying MAP schemas: Is it relevant to another motivational state? Can it serve as an affordance or obstacle, and at what level? It is like other irrelevant "objects," and treatable as ground? Such effortful exploration constitutes (1) the process by which identity originally comes to be (Peterson, 1999); (2) the elimination of possibility from the indeterminate domain of the anomalous to the finite domain of a determinate MAP schema; and (3) the reworking of identity, which is the sum total of all such schema. It is here where Swanson's work on hypothalamic function once again becomes relevant. The hypothalamic "rostral behaviour control segment" establishes narrow, biologically relevant MAP schema, ingestive, reproductive and defensive. The caudal segment, by contrast, *is the origin point of the ventral tegmental dopaminergic system, which governs approach and exploratory behaviour, and whose activation is experienced as incentive reward*. Thus, the hypothalamus has a powerful, primordial backup system, which grips control, when its more specific rostral systems fail in their efforts. Exploration in the face of the unknown is thus as ancient as hunger, thirst, sex and aggression. It is a *primary* "drive," manifesting itself in the form of the orienting complex, under the control of the septal-hippocampal and anterior cingulate CNS systems.

In 2001, shortly before her death, Vinogradova delivered her final opinions on orienting-complex system function. She described the hippocampus as an interface between primeval brain-stem systems and newer, learning-dependent cortical systems. Sensory information from the outside world is fed in a bottom-up fashion through the brain-stem systems into hippocampal subarea CA3, providing a quick-and-dirty portrait of ongoing events. After a lag, due to increased complexity of processing, information about what is currently desired is fed downward into the hippocampus, first into area CA1, where it is simplified, and then into CA3, where it is compared with the pre-processed brain stem input. If the two inputs match, CA3 sends a message to the raphe nuclei, in the brain stem. *These nuclei, in turn, suppress activity of the ascending, excitatory reticular formation, which is responsible for increasing brain "arousal," intensifying attention, increasing sensory throughput (via the thalamus), placing the body in a state of alertness and preparation for action, disinhibiting motivation, heightening anxiety and potentiating exploration.* This dissolution into chaos is the nervous system's response to the emergent chaos of nature: as order dissolves and transforms in the natural world, so it must in the intrapsychic and social worlds, so that adaptation can continue. A rat's *a priori* state in a novel environment, for example, is dysregulation of motivation and affect, heightened alertness, and a slowly developing inclination to explore (Blanchard, Blanchard & Rogers, 1991). This is a phasic behavioral analog to the state of affairs permanently characterizing an animal, decorticated such that its hypothalamus now occupies the highest level of CNS control remaining.

In a nonverbal animal, such as a rat, the transition from frozen anxiety to active exploration and mapping begins with cautious sniffing, under the spell of brain systems that minimize exposure to predators. The animal soon switches to vision, using appropriate head movements; then begins to move, assessing territorial layout and significance as something occurring in response to its own actions (Blanchard et al., 1991). For an isolated rat in a cage, "territory" is something as simple as spatial layout – hence the cognitive map or spatial models of hippocampus function (O'Keefe & Nadel, 1978), buttressed by findings of hippocampal "place cells" (O'Keefe & Dostrovsky, 1971). Other researchers, however, note hippocampal enabling of "transitive associations" (Bunsey & Eichenbaum, 1996) – relations between arbitrary stimuli (Howard, Fotedar, Datey, & Hasselmo, 2005) – and suggest that place cell function is broader identification of context. Context can also mean "behavioral task demand" or *meaning* (Smith & Mizumori, 2006). Representation of such context may well be equivalent to episodic memory, another hippocampal function (Milner, 19XX).

Investigators assessing"cognitive maps" study the behaviour of isolated animals. However, many animals are highly social, and their environment primarily the local dominance hierarchy they occupy. Primates, like rats, develop detailed maps of their social structures, as they transform across generations and decades. The "place" mapped by the "cognitive map" is thus a social structure, not just a geographical locale. This map is precisely the MAP schema hierarchy, grounded in motivation, expanded through individual socialization into complex human culture. Proper understanding of hippocampal function therefore appears dependent on the assessment of certain features of territories currently given no consideration.[13] Territories are not places of relatively predictable objects and their interactions, but complex and dynamic social dramas, whose behaviorally-associated contextual meanings depend upon on the reactions of potentially unpredictable conspecifics. Most animals solve this problem by consorting only with familiar peers, whose behaviours have already been mapped, and which are additionally constrained by their particular positions in the MAP schema hierarchy. The cortex can predict the outcomes of interactions with such conspecifics, and work so they remain positive. These predictions/desires

[13] A PubMed search for "hippocampus and "social cognition" reveals a mere 17 articles, only one of which, Spreng & Mar, 2010, is relevant, despite the overwhelming importance of the dominance hierarchy for the mapping of territory.

generally match information about a known conspecific's behavior, as it occurs, and is fed, bottom up, into the hippocampus, through the brain stem systems. The hippocampus registers "match," and the arousal systems (anxiety, aggression, panic, exploration, etc.) remain tonically inhibited. No threat is detected. No possibility for damage manifests itself. No disinhibition of motivation and emotion is necessary. No increase in allostatic load (McEwen, 2000), with its stress-induced physiological perturbation and damage, has occurred.

Rats, adapted to a predictable, ecologically-valid social and territorial environment, with nesting burrows, social interactions, and roaming space, react with sheer horror to the unexpected sight of a cat in their heretofore safe, predictable environment (Blanchard, 1989, 1991). The animals' behavior changes dramatically, for 24 hours (equivalent to a human month). Initial freezing, followed by flight to the chamber system, gives way to a period of immobility, during which the rats, petrified by motivational and emotional dysregulation, emit ultrasonic alarm cries, at a high rate. Immobilized crying gradually transforms into "risk assessment," where the cat appeared. The still-stressed but now curious rats poke their heads out of their burrows and scan the previously cat-contaminated open area, for hours. When the rats finally emerge, they explore in a manner that reduces their visibility to predators, employing short "corner runs" in and out of the open area. These exploratory risk assessment actions help the rats gather information about the possible danger source. The marshalling of such information provides the rationale for their return to nondefensive behaviors – "normal life."

The sensitivity of animals to disruption of the dominance structure, and consequent mismatch, can hardly be overstated. Children, much as adults, willingly punish rule-breakers (Piaget, 1932). Analogous behavior pervades the animal kingdom. If a well-loved rat is removed from its familial surroundings, provided with a new odor, and returned, it will be promptly dispatched (Lorenz, 1974). Rats identify one another by smell. A “new” rat constitutes “unexplored territory.” His presence is thus regarded, not unreasonably, as a threat to security. Chimps – perfectly capable of killing “foreign devils” – act in the same manner (Goodall, 1990). Why do such reactions occur? Because a conspecific in a known action/meaning context is predictable, even desirable. An unfamiliar conspecific, by contrast, could undermine the entire MAP-schema dominance hierarchy structure, as his capacity for challenge and revolution remains unspecified.

The importance of the MAP schema hierarchy, the utility of conceptualizing it as the structure within which experience manifests itself, and its simultaneous intrapsychic and social existence, may be additionally illustrated by the fact that social status transformation produces functional change in the most basic, serotonergic, neurotransmitter system.[14] High status elevates serotonergic tone, decreasing negative and increasing positive emotion. If your personal schemas come first, in the social group, your “environment” is stable, productive, and safe, and you are confident, upright, positive and emotionally stable. If your schemas come last, however, everything is negative and dangerous, you are confused, anxious, and depressed, hovering close to the edge of chaos and disintegration. It is for such reasons that hierarchy maintenance and protection is so important, to animal and human alike, and that position within that hierarchy is vital (see Wilkinson & Pickett, 2009).

The consequence of MAP schema shattering, particularly at low-resolution, fundamental levels (Janoff-Bulman, 1992) can be dramatic, neurophysiologically speaking. Post-traumatic stress disorder produces increased susceptibility to anxiety, depression, obesity, infectious illness and heart disease, as well as hippocampal shrinkage, as a consequence of chronically elevated cortisol levels (Brown, Woolston, Frol, et al., 2004). Such shrinkage may occurs

[14] The dominance position “counter” is so archaic that it is fully operative in crustaceans, whose physical posturing is adjusted by serotonergic tone, according to their hierarchical positions. They stand taller, more threatening, when victorious in battle, and shrink when they have been defeated.

because MAP schema-dependent inhibition of motivation and emotion by the hippocampus should be demolished, when the models the hippocampus relies on to "justify" such inhibition have been proven wrong. Recent research indicates that treatment with "anti-depressant" serotonin reuptake inhibitors – whose biochemical effect essentially mimics the pharmacological state characteristic of stable high-dominance animals (Kravitz, 2000) – allows for hippocampal neurogenesis (Becker & Wojtowicz, 2007), as well as improvement in episodic memory function (Vermetten, Vythilingam, Southwick, Charney & Bremner, 2003). This is likely the physiological manifestation of the reconstruction of a functional MAP schema hierarchy.

Vinogradova's (2001) work also sheds light on the neurophysiological instantiation of the MAP schema, allowing, in potential, for a developmental description of the relationship between the development of schema hierarchies, and their relationship to the tonic regulation of motivation and emotion, extending beyond that of Swanson (2000), to the very domain of abstraction. She points out, first, that "habituation" of the orienting response should be regarded, instead, as "negative learning," and that its disappearance is a consequence of the elaboration of an increasingly detailed model "of the stimulus." This modeling occurs as a consequence of sequential learning in structures that receive CA1 hippocampal field outputs: the mamillary bodies, anterior thalamic nuclei and, finally, the cingulate limbic cortex. The higher up the neural hierarchy above the hippocampus the structure, the more repetitions of the event are necessary to shape the "response." She believes that this hierarchy may be regarded as a chain of integrators, functioning such that each starts to respond only after reaction develops at the previous link, and as a delay line, "preventing premature fixation of spurious, irrelevant, low probability signals" (p. 579). The highest links in the system serve as the "ultimate signal for information fixation in the nonprimary areas of the neocortex." It is probable that the ultimate assumptions of the MAP schema hierarchy, derived from exploration, fixed through repetition, are precisely those governing the rules of social interaction, encoded at the highest level in our explicit conceptions of natural rights (Peterson, 2006). It is these universal "rules," after all, that best specify the nature of peaceful, productive shared territory. Disruption of these most fundamental presumptions – the active breaking of rules, or the verbal justification for such breaking – thus presents a threat to the structure that inhibits hippocampal disinhibition of chaotic motivational and emotional responses, corresponding in intensity to the hierarchical import of the MAP schema level such disruption affects. Thus, it is human societies with the largest differences in opinion with regards to "intrinsic human right" that possess the most capability for mutual disruption of presumption, and its attendant chaotic psychophysiological and social dysregulation.

The Balance between Order and Chaos: Meaning in its Redemptive Form

We have now considered two forms of meaning in detail: that of delimited, pragmatic order, dependent on the match between the intrapsychic and social MAP schemas; and that of chaos, the sum total of all meanings that all phenomena possess, in all the arrays they might occupy. Order structures such chaotic meaning, letting it shine forth in measured doses. When anomaly occurs, by contrast, chaos shines through of its own accord, with sometimes revolutionary and devastating results, and forces the alteration of the structures that delimit and constrain what would otherwise be the overwhelming significance of being.

Many approaches to the maintenance of meaning, including those focusing on terror management (REF), consider individual belief the primary source of meaning, and the purpose of belief the restriction of anxiety and fear. Within such conceptualizations, following Becker (1973) human life is a futile battle: death is the ultimate reality; all meaning systems serve to shield their adherents from that fact. Thus, the maintenance of meaning requires rigid allegiance to a structured system, and morality is merely the conventionality and cowardice described by Nietzsche. The fundamental problem of life, however, is not the terror of death, although that is an important sub-problem. The fundamental problem of life is the overwhelming complexity of being. Animals, like human beings, have to deal with complexity, although they do not necessarily have to deal with the terrors of mortality, at least in their self-conscious forms. They have, however, evolved means of dealing with chaotic complexity, as embodied in their psychophysiological structures. The same is true of human beings, although we have taken the elaboration of the psychological means of dealing with chaos to unprecedented levels of abstraction (and are uniquely aware of our own mortal limitations). In doing so, we have increasingly come to pursue a third class of meaning.

A human being comes into the world with a set of evolutionarily determined tools, some in the form of the very MAP schemas we have discussed. These general-purpose tools help individuals deal with the constant problems of existence, such as hunger and thirst. The problem of the complexity of being is, however, equally constant, or even more so. In consequence, very sophisticated means of dealing with that problem have also evolved. The innovation of social being itself is one such solution. Individuals group themselves into social dominance hierarchies, find their position within the phalanx, and employ the resources of the entire group against the challenges of nature and the unknown. To do so, they rearrange their internal natures, so that they can exist in productive harmony within their group. This grouping requires conflict, war, within or between individuals. As the child, for example, matures, he has to temper his passions so that they reflect his desires, and the desires of the group. Successful negotiation of this conflict of interests is no simple matter of subjugation, either, no mere dominance of the super-ego. The group wants the individual to manifest the possibilities of his being in the manner most beneficial across different spans of time and place and to the smallest and largest number of individuals, simultaneously. The group thus offers the individual the opportunity to extend his powers, as well as forcing their limitation. In what manner must an individual manifest himself, therefore, in order to address all of these intrapsychic and social demands? The answer can be found in a more elaborated analysis of exploratory behaviour and the communication and integration of its consequences. Consider the game, once again – and then, the game of games. The best player is not necessarily he or she who wins a given game, or even a sequence of games. The best player is he who plays such that the game continues, and expands, so that he and others have the greatest chance to play and to excel. When a child is told to be a good sport, this is how he is instructed to behave. The precise rules comprising the meta-game, "be a good sport," may yet be implicit, in large part, too complex to be fully formulated. This does not mean they do not exist. We dream continuously of the individual who will manifest that pattern most successfully, and search for him – or her – everywhere.

What is the best way to successfully play the largest number of games? The answer is not simply computable. Over time different modes of playing emerge, in the attempt to seek the solution. Each individual wants to be maximally valued. Pure aggression is one possible solution. The physically dominant individual can force others to value him as a player. Sufficient display of negative emotion can have the same effect: someone may be invited on multiple occasions into different games by appealing to the sympathy of the other players. These are not optimal solutions, however. Even among chimps, rule of the merely strong is unstable (De Waal, 1989b). Rule of the weak, likewise, breeds resentment: social animals want reciprocity, and will not give continually. Such behaviour is too costly and easily manipulated. Multiple modes of potential playing compete for predominance during childhood. Such competition, and cooperation, extends in a more sophisticated manner, across adult being. What is the victor among those multiple modes, across many individuals? Extend that question further: What is the victorious mode of play across many individuals, across many groups, over historically-significant epochs of time? Consideration of the ancient Mesopotamian myth, the Enuma elish – one of many stories of its type (Peterson, 1999), helps answer that question. Two deities exist at the beginning of time, according to the Enuma elish. Tiamat is the goddess of chaos, as chaos is the mother of all things. She is reptilian in nature, as the reptile has constantly threatened our lives and our societies, while increasing our vision (Isbell, 2009), for tens of millions of years. Apsu, her husband, is the god of order, the foundation of being. The pair nestles together, in the deep, like the two halves of the famous Taoist symbol. Their sexual, creative union gives rise to the elder gods, the primary motivational states. Their dysregulated and careless behaviour results in the death of Apsu, order, and the vengeful re-emergence of his bride. Hastily organizing themselves, in the face of this threat, the elder gods elect Marduk, god of exploration, vision and speech, as King, top of the sacred dominance hierarchy, and send him out to voluntarily confront Chaos, in the guise of his great-grandmother. Emerging victorious, Marduk cuts Tiamat into pieces, and makes the world (Peterson, 1999). *This is the oldest and most fundamental story that mankind possesses*. It echoes through ancient Egypt, and that state's conceptions of Horus, the redemptive, attentive eye; Isis, the goddess of chaos; and Osiris, the god of the state. It serves as the source for the creation story in the Hebrew bible, and profoundly influences Christianity; it is the story of St. George, and of Christ, the perfect man, the second Adam, and the deadliest enemy of death, and the eternal serpent (Peterson, 1999). Its existence and meaning should not be overlooked by psychologists, increasingly cognizant of the evolutionary shaping of being.

It is time to understand these stories, instead of considering them the superstitious enemy of science. The great myths of mankind are not theories of objective existence. They are, instead, imaginative roadmaps to being. They have emerged, painstakingly, piecemeal, as a consequence of our continual close self-observation, our developing understanding of the patterns of action that are essentially adaptive, and their representation in symbolic, narrative and dramatic form, during the transition from implicit behavioural pattern to explicit communicable form. We tell stories about how to play: not about how to play the game, but about how to play the metagame, the game of games. *When chaos threatens, confront it, as quickly as possible, eyes open, voluntarily*. Activate the neural circuitry underlying active exploration, inhibiting confusion, fear and the generation of damaging stress responses, and not the circuitry of freezing and escape. Cut the unknown into pieces; take it apart with hands, thumbs and mind, and formulate, or reformulate, the world. Free the valuable gold from the dragon of chaos, transform leaden inertia into gilded action, enhance your status, and gain the virgin maiden – just like the first of your tree-dwelling ancestors (Isbell, 2009) who struck a predatory snake with a stick, chased it away, and earned the eternal gratitude of mother and group.

The third form of meaning has little to do with group identity, except insofar as that serves as a precursor to its formation. It is instead the story of mankind, and the meaning to be experienced when that heroic story is imitated, understood, and embodied. Under the loving tutelage of the ever-virgin mother, guided by the wisdom of his forefathers, the always-threatened nascent hero masters known territory, and becomes keenly aware of its limitations and errors. He sees the danger threatening, before anyone else, because he is willing to see it, while others turn away their eyes: The patriarchal structure has become too rigid and self-serving. The widows and children are being ignored, and God's wrath, in the form of a watery chaos, threatens. Public morality has become too chaotic, and it is time for a return to the individual and collective values that have always ensured the survival of mankind. The hero sacrifices himself to God, offers up his own petty interests to the greatest possible good, confronts the too-rigid social structure or the looming chaos, with nothing but his own courage and truth. It is very easy to be cynical about such things, but we have many modern examples to consider. Gandhi stopped the British Empire dead in its tracks, following Tolstoy, whose morality was directly informed by Orthodox Christianity. Tough-minded observers have noted that Gandhi's strategies would not have worked against Stalin, or Hitler, who would have just had him executed. Nonetheless, single individuals brought down tyrannies of such magnitude in the 20th century, as well. Solzhenitsyn's (1975) *Gulag Archipelago*, an amazing example of individual courage – of individual use of the Word – demolished the intellectual and moral credibility of communism, forever. Vaclav Havel performed a similar role in Czechoslovakia. It is not for nothing that we consider the individual of the highest value in the West.

The third form of meaning is not to be found in slavish allegiance to a system of beliefs, nor to specific position in a given dominance hierarchy, nor to incautious and wanton exposure to chaos. It is to be found on the border of chaos and order, Yin and Yang, as the Taoists have always insisted. It is to be found in the voluntary pursuit of interest, that subtle prodding by the orienting complex, which turns our heads involuntary towards the most informative places in our experiential fields, and lets us see the glimmers of redemptive chaos shining through the damaged structure of our current schemas. That glimmer is the star that has always guided us, the star that signifies the birth of the hero, and, when followed, is the guardian angel who ensures that the path we trod is meaningful enough so that we can bear the burden of mortal limitation without resentment, arrogance, corruption and malevolence. Life is not the constant shrinking away from the terror of death, hiding behind an easily pierced curtain of beliefs. Life is the forthright challenging of the insufficiencies that confront us, and the powerful, life-affirming existential meaning that such pursuit instinctively produces. It is that which keeps the spectre of mortality at bay, while we work diligently, creatively, at work whose meaning is so powerful and self-evident that the burden of existence seems well worth bearing. Terror management, be damned! The path of the eternal hero beckons, and it is a doomed and dangerous fool who turns his back on it.

References

Abbott, D.H., Keverne, E.B., Bercovitch, F.B., Shively, C.A., Mendoza, S.P., Saltzman, W., Snowdon, C.T., Ziegler, T.E., Banjevic, M., Garland, T. Jr., & Sapolsky, R.M. (2003). Are subordinates always stressed? *Hormones and Behavior, 43,* 67-82.

Amaral, D. G., Price, J. L., Pitkanen, A. & Carmichael, S. T. (1992) Anatomical organization of the primate amygdaloid complex. In J. P. Aggleton (Ed.). *The Amygdala* (pp. 1-66). New York: Wiley-Liss.

Ansbacher, H.L. & Ansbacher, R.R. (1956). *The individual psychology of Alfred Adler: selections from his writings*. New York: Harper Torchbooks.

Bargh, J. A., & Chartrand, T.L. (1999). The unbearable automaticity of being. *American Psychologist, 54,* 462-479.

Barsalou, L.W. (1983). Ad hoc categories. *Memory & Cognition*, 11, 211-227.

Becker, E. (1973). *The denial of death*. New York: The Free Press.

Becker, S. & Wojtowicz, J.M. (2007). A model of hippocampal neurogenesis in memory and mood disorders. *Trends in Cognitive Sciences*, *11*, 70-76.

Binswanger, L. (1963). *Being in the world*. New York: Basic Books.

Blanchard, D. J., & Blanchard, D. C. (1989). Antipredator defensive behaviors in a visible burrow system. *Journal of Comparative Psychology, 103*, 70-82.

Blanchard, D.C., Blanchard, R.J., and Rodgers, R.J. (1991). Risk assessment and animal models of anxiety. In B. Olivier, J. Mos and J.L. Slangen

(Eds.). *Animal Models in Psychopharmacology (pp. 117-134)*. Boston: Birkhauser Verlag.

Boss, M. (1963). *Psychoanalysis and daseinsanalysis*. New York: Basic Books.

Brooks, A. (1991a). Intelligence without reason. *Artificial Intelligence Memo 1293*.

Brooks, A. (1991b). Intelligence without representation. *Artificial Intelligence,* 47, 139-159.

Brown E.S. Woolston, D., Frol, A., Bobadilla, L., Khan, D.A., Hanczyc, M., Rush, A.J., Fleckenstein, J., Babcock, E. & Cullum, C.M. (2004). Hippocampal volume, spectroscopy, cognition, and mood in patients receiving corticosteroid therapy. *Biological Psychiatry, 55,* 538-545.

Brown, R. (1986). Social psychology (2nd Ed.). New York: Free Press.

Bunsey, M., & Eichenbaum, H. B. (1996, January 18). Conservation of hippocampal memory function in rats and humans. *Nature, 379*, 255–257.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.

Cowan, N. (2001). The magical number 4 in short-term memory. Brain and Behavioral Sciences, 24, 87-114.

Damasio, A.R. (1994) *Descartes' error: Emotion, reason and the human brain*. New York: Avon Books.

Davidson, R.J. (1992). Anterior cerebral asymmetry and the nature of emotion. *Brain and Cognition*, 20: 125-151.

De Waal, F. (1989b). *Chimpanzee politics.* London: Johns Hopkins University Press.

De Waal, F. (1989a). *Peacemaking among primates*. New York: Harvard University Press.

De Waal, F.D. (1996). *Good natured.* Cambridge: Harvard University Press.

Dean, P., Redgrave, P., & Westby, G. W. M. (1989). Event or emergency: Two response systems in the superior colliculus. *Trends in Neuroscience, 12*, 137-147.

Eysenck, H.J. (1995). *Genius: The natural history of creativity.* Cambridge, UK: Cambridge University Press.

Fowles, D.C. (1980). The three arousal model: Implications of Gray's two factor learning theory for heart-rate, electrodermal activity, and psychopathy. *Psychophysiology 17*,87-104.

Gibson, J.J. (1979). *An ecological approach to visual perception*. New York: Lawrence Erlbaum.

Glaserfield, E.V. (1982). An interpretation of Piaget's constructivism. *Revue Internationale de Philosophie, 36*, 612-635.

Glaserfield, E.V. (1999). The cybernetic insights of Jean Piaget. *Cybernetics and Systems*, *30*, 105-112.

Goodall, J. (1990). *Through a window*. Boston: Houghton-Mifflin.

Gray, J. A. (1987). *The psychology of fear and stress (2nd ed.)*. New York: Cambridge University Press.

Gray, J.A. & McNaughton, N. (2003). *The neuropsychology of anxiety: an enquiry into the function of the septal-hippocampal system (Second Edition).* New York: Oxford University Press.

Gray, J.A. (1982). *The neuropsychology of anxiety*. Oxford: Oxford University Press.

Halgren, E. (1992). Emotional neurophysiology of the amygdala within the context of human cognition. In J.P. Aggleton (Ed.). The amygdala: Neurobiological aspects of emotion, memory and mental dysfunction (pp. 191-228). New York: Wiley-Liss.

Howard, M.W., Fotedar, M.S., Datey, A.V. & Hasselmo, M.E. (2005). The temporal context model in spatial navigation and relational learning: toward a common explanation of medial temporal lobe function across domains. *Psychological Review, 112*, 75-116.

Isbell, L.A. (2009). *The fruit, the tree and the serpent*. Harvard University Press.

Janoff-Bulman, R. (1992). *Shattered Assumptions: Towards a New Psychology of Trauma*. NY: Free Press

Joffe, T.H. & Dunbar, R.I. (1997) Visual and socio-cognitive information processing in primate brain evolution. *Proceedings of the Royal Society of London: Biological Science, 264*, 1303-1307.

Jung, C. G. (1971) Psychological types. R. F. C. Hull (Trans.). *The collected works of C. G. Jung* (Vol. 5). Bollingen Series XX. Princeton: Princeton University Press.

Kravitz, E.A. (2000). Serotonin and aggression: insights gained from a lobster model system and speculations on the role of amine neurons in a complex behavior. *Journal of Comparative Physiology, 186*, 221-238.

Krawczyk, D.C. (2002). Contributions of the prefrontal cortex to the neural basis of human decision making. *Neuroscience and Biobehavioral Reviews, 26*, 631-64.

Kuhn, T. S. (1970). *The structure of scientific revolutions* (2nd Ed.). Chicago: University of Chicago Press.

Lakoff, G. (1987). *Women, fire, and dangerous thing.* Chicago: University of Chicago Press.

LeDoux, J. (1996) *The emotional brain.* New York: Touchstone Press.

Legault, M. & Wise, R.A. (2001) Novelty-evoked elevations of nucleus accumbens dopamine: dependence on impulse flow from the ventral subiculum and glutamatergic neurotransmission in the ventral tegmental area. *European Journal of Neuroscience, 13,* 819–828.

Lewin, K. (1935). *A dynamic theory of personality*. New York: McGraw-Hill.

Lorenz, K. (1974) *On aggression*. New York: Harcourt Brace Jovanovitch.

Luria, A. R. (1980). *Higher cortical functions in man* (2nd ed.). New York: Basic Books.

Luria, A.R. (1960). Verbal regulation of behavior. In M.A.B. Brazier (Ed.), The Central Nervous System and Behaviour: Transactions of the Third Macy Conference (pp. 359-421). New York: Josiah Macy Jr. Foundation.

Masserman, J.H., Wechkin, S. & Terris, W. (1964). "Altruistic" behaviour in rhesus monkeys. *American Journal of Psychiatry, 121,* 584-585.

McEwen, B.S. (2000). Allostasis and allostatic load: implications for neuropsychopharmacology. *Neuropsychopharmacology, 22*, 108-124.

MEDIN DL and AGUILAR CM. Categorization. In Wilson RA and Keil F (Eds) *MIT Enclyclopedia of Cognitive sciences*. Cambridge, MA: MIT Press, 1999, pp. 104-105.

Miller, G. A., Galanter, E. H. & Pribram, K. H. (1960) Plans and the Structure of Behavior. New York: Holt Rinehart & Winston.Milner, 19XX

Miller, G.A. (1956). The magical number seven, plus or minus two. *Psychological Review*, *63,* 81-97.

Norretranders, T. (1998). *The User Illusion: cutting consciousness down to size*. New York: Penguin Books.

O'Keefe, J. & Nadel, L. (1978). *The hippocampus as a cognitive map*. Oxford: Clarendon Press.

Oatley, K. & Johnson-Laird, P.N. (1987). *Towards a cognitive theory of emotion. Cognition and Emotion*, *1,* 29-50.

Oatley, K. (1999). Why fiction may be twice as true as fact. *Review of General Psychology*, *3,* 101-117.

Oatley, K., & Jenkins, J. M. (1992). Human emotions: function and dysfunction. *Annual Review of Psychology, 43*, 55-85

Ohman, A. (1979). The orienting response, attention and learning: An information-processing perspective. In Kimmel, H.D., Van Olst, E.H., & Orlebeke, J.F. (Eds.). *The orienting reflex in humans* (pp. 443-467). Hillsdale, NJ: Erlbaum.

Ohman, A. (1987). The psychophysiology of emotion: An evolutionary-cognitive perspective. In Ackles P.K., Jennings J.R., & Coles M.G.H. (Eds.). *Advances in psychophysiology: A research annual.* (Vol. 2) (pp. 79-127). Greenwich, CT: JAI Press.

Panksepp, J. (1998). *Affective Neuroscience*. New York: Oxford.

Peterson J. B. & Flanders J. L. (2002) Complexity management theory. *Cortex*, *38*, 429-58.

Peterson, J. B. (1999). *Maps of meaning: the architecture of belief*. New York: Routledge.

Peterson, J.B. (2006). Religion, sovereignty, natural rights, and the constituent elements of experience. *Archiv für Religionspsychologie (Archives of the Psychology of Religion)*, *28*, 135-180.

Piaget, J. (1932). *The moral judgement of the child*. London: Kegan, Paul, Trench, Trubner, and Company.

Piaget, J. (1954). The problem of consciousness in child psychology: developmental changes in awareness. In H. A. Abramson (Ed.), *Problems of Consciousness: Transactions of the Fourth Macy Conference* (pp. XX-XX). New York: Josiah Macy Jr. Foundation.

Pochon, J. B., Levy, R., Fossati, P., Lehericy, S., Poline, J. B., Pillon, B., Le Bihan, D., & Dubois, B. (2002). The neural system that bridges reward and cognition in humans. *Proceedings from the National Academy of Sciences USA, 99*, 5669-5674.

Powers, W.T. (1973). *Behavior: the control of perception*. Chicago: Aldine.

Preston, S. D. & De Waal, F. B. M. (2002). Empathy. *Behavioural Brain Research*, *25,* 1-72.

Rice, G. E. J. (1964). Aiding behaviour vs. fear in the albino rat. *Psychological Record, 14*, 165-170.

Rice, G. E. J. and Gainer, P. (1962). Altruism in the albino rat. *Journal of Comparative & Physiological Psychology*, *55,* 123-125.

Rizzolatti, G., Fogassi, L. & Gallese, V. (2001). Neurophysiological mechanisms underlying the understanding and imitation of action. *Nature Reviews: Neuroscience, 2*, 661-670.

Rolls, E. (1999). *The brain and emotion*. New York: Oxford University Press.

Schank, R., & Abelson, R. (1977). *Scripts, plans, goals and understanding: An inquiry into human knowledge structures*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Sibley, C. G. & Ahlquist, J. E. (1984). The phylogeny of the hominoid primates, as indicated by DNA-DNA hybridization. *Journal of Molecular Evolution, 20*, 2-15.

Simons, D. J., & Rensink, R. A. (2005). Change blindness: past, present, and future. *Trends in Cognitive Science, 9*, 16-20.

Smith, D.M. & Mizumori, S.J. (2006). Hippocampal place cells, context and episodic memory. *Hippocampus, 16*, 716-729.

Smith, P. K. and Boulton, M. (1990). Rough-and-tumble play, aggression and dominance. *Human Development*, *33,* 271-282.

Sokolov, E.N. (1963). Higher nervous functions: the orienting reflex, *Annual Review of Physiology, 25,* 545-580

Solzhenitsyn, A.I. (1975). *The gulag archipelago, 1918-1956: An experiment in literary investigation* (Whitney TP, Trans), Vol 2. New York: Harper and Row.

Swanson, L.W. (2000). Cerebral hemisphere regulation of motivated behavior. *Brain Research*, *886,* 113-164.

Swanson, L.W. (2003). *Brain architecture.* New York: Oxford University Press.

Tucker, D.M. & Frederick, S.L. (1989). Emotion and brain lateralization. In Wagner H. et al. (Eds.). *Handbook of social psychophysiology (pp. 27-70)*. Chichester, UK: Wiley & Sons.

Vaihinger, H. (1924). *The philosophy of "as if:" A system of the theoretical, practical, and religious fictions of mankind* (C.K. Ogden, Trans.). New York: Harcourt, Brace, and Company.

Vermetten, E., Vythilingam, M., Southwick, S.M., Charney, D.S. & Bremner, J.D. (2003). Long-term treatment with paroxetine increases verbal declarative memory and hippocampal volume in posttraumatic stress disorder. *Biological Psychiatry, 54*, 693-702.

Vinogradova, O. (1975). Functional organization of the limbic system in the process of registration of information: facts and hypotheses. In Isaacson, R., and Pribram, K. (Eds.), *The hippocampus, neurophysiology, and behaviour* (Vol. 2, pp. 3-69). New York: Plenum Press.

Vinogradova, O. (1961). *The orientation reaction and its neuropsychological mechanisms.* Moscow: Academic Pedagogical Sciences.

Vinogradova, O. S. (2001). Hippocampus as comparator: Role of the two input and two output systems of the hippocampus in selection and registration of information. *Hippocampus, 11*, 2001.

Virgin, C.E. Jr. & Sapolsky, R,M. (1997). Styles of male social behavior and their endocrine correlates among low-ranking baboons. *American Journal of Primatology, 42*, 25-39.

Wiener, N. (1948). *Cybernetics: or, Control and communication in the animal and the machine*. Cambridge, Mass: Technology Press.

Whalen, P.J. (1998). Fear, vigilance, and ambiguity: Initial neuroimaging studies of the human amygdala. *Current Directions in Psychological Science*, 7: 177-188, 1998

Wilkinson, R. & Pickett, K. (2009). The spirit level: why more equal societies almost always do better. London: Allen Lane.

Wrangham, R., & Peterson, D. (1997). *Demonic males*. New York: Houghton Mifflin.

Yeomans, J.S., Li, L. Scott, B. W., Frankland, P. W. (2002).Tactile, acoustic and vestibular systems sum to elicit the startle reflex. *Neuroscience and Biobehavioral Reviews, 26,* 1-11.

Yoerg, S. I. (1991). Social feeding reverses learned flavor aversions in spotted hyenas. *Journal of Comparative Psychology, 105,* 185-189.

Zahn-Waxler, C., Radke-Yarrow, M., and King, R.A. (1979) Child rearing and children's prosocial initiations toward victims of distress. *Child Development*, *50,* 319-330.