When the world remains known and familiar – that is, when our beliefs maintain their validity – our emotions remain under control. When the world suddenly transforms itself into something new, however, our emotions are dysregulated, in keeping with the relative novelty of that transformation, and we are forced to retreat, or to explore once again.

2.2.1. The Valence of Things

"...anyone who considers the basic drives of man.... will find that all of them have done philosophy at some time – and that every one of them would like only too well to represent just itself *as the ultimate purpose of existence and the legitimate* master *of all the other drives. For every drive wants to be master – and it attempts to philosophize in* that spirit*."*[49]

"It is true that man was created in order to serve the gods, who, first of all, needed to be fed and clothed."[50]

We can make lists of *general* goods and bads, which might appear reasonable to others, because we tend to make judgments of meaning in a relatively standard and predictable way. Food, to take a simple example, is *good*, assuming it is palatably prepared, while a blow on the head is *bad*, in direct proportion to its force. The list of general goods and bads can be extended with little effort. Water, shelter, warmth, and sexual contact are good; diseases, droughts, famines and fights are bad. The essential similarities of our judgments of meaning can easily lead us to conclude that the goodness or badness of things or situations is something more or less fixed. However, the fact of subjective interpretation – and its effects on evaluation and behavior – complicate this simple picture. We will work, expend energy, and overcome obstacles, to gain a good (or to avoid something bad). But we won't work for food, if we have enough food – at least not very hard; we won't work for sex, if we are satisfied with our present levels of sexual activity, and we might be very pleased to go hungry, if that means our enemy will starve. Our predictions, expectations, and desires condition our evaluations, to a finally unspecifiable degree. Things have no absolutely *fixed* significance, despite our ability to generalize about their value. It is our personal preferences, therefore, that determine the import of the world (but these preferences have constraints!).

The meaning we attribute to objects or situations is not stable. What is important to one man is not necessarily important to another; likewise, the needs and desires of the child differ from those of the adult. The meaning of things depends to a profound and ultimately undeterminable degree upon the relationship of those things to the goal we currently have in mind. Meaning shifts when goals change. Such change necessarily transforms the contingent expectations and desires that accompany those goals. We experience "things" personally and idiosyncratically, despite broad interpersonal agreement about the value of things. The goals we pursue singly – the outcomes we expect and desire as individuals – determine the meaning of our experience. The existential psychotherapist Viktor Frankl relates a story regarding his experiences as a Nazi death camp inmate, which makes this point most strikingly:

> "Take as an example something that happened on our journey from Auschwitz to the camp affiliated with Dachau. We became more and more tense as we approached a certain bridge over the Danube which the train would have to cross to reach Mauthausen, according to the statement of experienced traveling companions. Those who have never seen anything similar cannot possibly imagine the dance of joy performed in the carriage by the prisoners when they saw that our transport was not crossing the bridge and was instead heading "only" for Dachau.
>
> And again, what happened on our arrival in that camp, after a journey lasting two days and three nights? There had not been enough room for everybody to crouch on the floor of the carriage at the same time. The majority of us had to stand all the way, while a few took turns at squatting on the scanty straw which was soaked with human urine. When we arrived the first important news that we heard from older prisoners was that this comparatively small camp (its population was 2500) had no "oven," no

> crematorium, no gas! That meant that a person who had become a "Moslem" [no longer fit for work] could not be taken straight to the gas chamber, but would have to wait until a so-called "sick convoy" had been arranged to return to Auschwitz. This joyful surprise put us all in a good mood. The wish of the senior warden of our hut in Auschwitz had come true: we had come, as quickly as possible, to a camp which did not have a "chimney" – unlike Auschwitz. We laughed and cracked jokes in spite of, and during, all we had to go through in the next few hours.
>
> When we new arrivals were counted, one of us was missing. So we had to wait outside in the rain and cold wind until the missing man was found. He was at last discovered in a hut, where he had fallen asleep from exhaustion. Then the roll call was turned into a punishment parade. All through the night and late into the next morning, we had to stand outside, frozen and soaked to the skin after the strain of our long journey. And yet we were all very pleased! There was no chimney in this camp and Auschwitz was a long way off."[51]

Nothing produces terror and fear like a concentration camp – unless the camp encountered is better than the camp expected. Our hopes, desires, and wishes – which are always conditional – define the context within which the things and situations we encounter take on determinate significance; define even the context within which we understand "thing" or "situation." We presume that things have a more-or-less fixed meaning, because we share a more-or-less fixed "condition" with others – at least with those others who are familiar to us, who share our presumptions and world-views. Those (culturally-determined) things we take for granted – and which are, therefore, invisible – determine our affective responses to "environmental stimuli." We assume that such things are permanent attributes of the world; but they are not. Our situations – and, therefore, our "contexts of interpretation" – can change dramatically, at any moment. We are indeed fortunate (and, generally, oblivious of that fortune) when they do not.

It is not possible to finally determine either how or whether something is meaningful, by observing the *objective features* of that thing. Value is not invariant, in contrast to objective reality; furthermore, it is not possible to derive an *ought* from an *is* (this is the "naturalistic fallacy" of David Hume). It is possible, however, to determine the *conditional meaning* of something, by observing how behavior (one's own behavior, or someone else's) is conducted in the presence of that thing (or, in its absence). "Things" (objects, processes) emerge – into subjective experience, at least – as a consequence of behaviors. Let us say, for the sake of example, that behavior "a" produces phenomenon "b" (always remembering that we are talking about behavior in a particular context). Behavior "a" consequently increases in frequency. It can be deduced, then, that phenomenon "b" is regarded as positive, by the agent under observation, in the particular "context" constituting the observed situation. If behavior "a" decreases in frequency, the opposite conclusion can be reasonably reached. The observed agent regards "b" as negative.

The behavioral psychologist B.F. Skinner[52] originally defined a reinforcer as a "stimulus" which produced a change in the frequency of a given behavior. He was loathe to become concerned with the "internal" or "intrapsychic" whys and wherefores of reinforcement, preferring instead to work by definition. If a "stimulus" increased the rate at which a given behavior was manifested, it was positive. If it decreased the rate of that behavior, it was negative. Of course, Skinner recognized that the valence of a given "stimulus" was context-dependent. An animal had to be "food-deprived" (in normal parlance, *hungry*) before food, for example, could serve as a positive reinforcer. And, as the animal being fed became less "food-deprived," the valence and potency of the reinforcer *food* decreased.

Skinner believed that discussions of an animal's (or a human's) internal state were unnecessary. If you knew an animal's reinforcement history, you could determine what "stimuli" were likely to have positive or negative valence. The fundamental problem with this argument is one of parsimony. It is impossible to know an animal's "reinforcement history" – particularly if that animal is as complex and long-lived as a human being. This is tantamount to saying, "you must know everything that has ever happened to that animal"; analogous to the old determinist claim that "if you knew the present position and momentum of every particle in the universe, you could determine all future positions and momenta." You can't know all present positions, etc. – the measurement problems are insurmountable, and the uncertainty principle makes it impossible anyway. Likewise, you don't have access to the "reinforcement history," – and, even if you

did, measuring it would alter it. (I am not making an formal "uncertainty" claim for psychology; just drawing what I hope is a useful analogy).

Skinner addressed this problem by limiting his concern to experimental situations *so simple that only immediate reinforcement history played a context-determining role*. This "implicit" limit enabled him to sidestep the fundamental issue, and to make inappropriate generalizations. It didn't matter how a rat related to his mother, six months earlier, if you could make him "food-deprived" enough. The (short-term) fact of the food deprivation, for example, overrode individual rat differences – at least in the experimental condition under question – and could therefore usefully be ignored. Similarly, if you starve human beings, you can be reasonably sure that they will become concerned with food. However, even in this extreme case, you cannot predict how this concern will manifest itself, or what (ethical) considerations might play an intermediate, or even determining, role. Alexander Solzhenitsyn examined this very problem during the time he spent in the Soviet "Gulag Archipelago" (the Soviet prison camp system):

> "At the Samarka Camp in 1946 a group of intellectuals had reached the very brink of death: They were worn down by hunger, cold, and work beyond their powers. And they were even deprived of sleep. They had nowhere to lie down. Dugout barracks had not yet been built. Did they go and steal? Or squeal? Or whimper about their ruined lives? No! Foreseeing the approach of death in days rather than weeks, here is how they spent their last sleepless leisure, sitting up against the wall: Timofeyev-Ressovsky gathered them into a "seminar," and they hastened to share with one another what one of them knew and the others did not – they delivered their last lectures to each other. Father Savely – spoke of "unshameful death," a priest academician – about patristics, one of the Uniate fathers – about something in the area of dogmatics and canonical writings, an electrical engineer – on the principles of the energetics of the future, and a Leningrad economist – on how the effort to create principles of Soviet economics had failed for lack of new ideas. From one session to the next, participants were missing – they were already in the morgue.
>
> That is the sort of person who can be interested in all this while already growing numb with approaching death – now that is an intellectual!"[53]

Past experience – learning – does not merely *condition*; rather, such experience determines the precise nature of the "framework of reference" or "context" that will be brought to bear on the analysis of a given situation. This "cognitive frame of reference" acts as the *intermediary* between past learning, present experience, and future desire. This intermediary is a valid object of scientific exploration – a phenomenon as real as anything "abstracted" is real – and is far more parsimonious and accessible, as such a phenomenon, than the simple "non-interpreted" (and non-measurable, in any case) "sum total of reinforcement history." "Frameworks of reference," influenced in their structure by learning, specify the valence of ongoing experience; determine what might be regarded, in a given time and place, as good, bad, or indifferent. Furthermore, inferences about the nature of the "framework of reference" governing the behavior of others (that is, looking at the world through the eyes of another) may produce results that are more useful, more broadly generalizable (as "insights" into the "personality" of another), and less demanding of cognitive resources than attempts to understand the details of a given "reinforcement history."

Valence can be positive, or negative, as the early behaviorists noted. "Positive" and "negative" are not opposite ends of a continuum, however – not in any straightforward way.[54] The two "states" appear orthogonal, although (perhaps) mutually inhibitory. Furthermore, "positive" and "negative" are not simple: each can be subdivided, in a more or less satisfactory manner, at least once. Positively valued things, for example, can be *satisfying* or *promising* (can serve as consummatory or incentive rewards, respectively[55]). Many satisfying things are consumable, in the literal sense, as outlined previously. Food, for example, is a consummatory reward to the hungry – which means that it is valued under such circumstances as a satisfaction. Likewise, water satisfies the man deprived of liquid. Sexual contact is rewarding to the lustful, and warmth is desirable to those without shelter. Sometimes more complex stimuli are satisfying, or rewarding, as well. It all depends on what is presently desired, and how that desire plays itself out. A mild verbal reprimand might well foster feelings of relief in the individual who expects a severe physical beating – which is to say, technically, that the *absence of an expected punishment* can serve quite effectively as a

reward (it is in fact the form of reward that the tyrant prefers). Regardless of their form, attained satisfactions produce satiation, calm and somnolent pleasure, and (temporary) cessation of the behaviors directed to that particular end – although behaviors which culminate in a satisfactory conclusion are more likely to be manifested, in the future, when "instinctive" or "voluntary" desire re-emerges.

Promises, which are also positive, might be regarded as more *abstractly* meaningful than satisfactions, as they indicate potential, rather than actuality. Promises – cues of consummatory rewards, or satisfactions – indicate the imminent attainment of something desired, or potentially desirable. Their more abstract quality does not make them "secondary" or *necessarily learned*, however, as was once thought; our response to potential satisfaction is often as "basic" or "primary" as our response to satisfaction itself. Promises (cues of satisfaction) have been regarded, technically, as incentive rewards, because they induce *forward locomotion* – which is merely movement towards the place that the cue indicates satisfaction will occur.[56] Curiosity,[57] hope[58] and excited pleasure tend to accompany exposure to cues of reward (and are associated with subsequent forward locomotion).[59] Behaviors that produce promises – like those that result in satisfactions – also increase in frequency, over time.[60]

Negatively valued things – which have a structure that mirrors those of their positive counterparts – can either be *punishing*, or *threatening*.[61] Punishments – a diverse group of stimuli or contexts, as defined immediately below – all appear to share one feature in common (at least from the perspective of the theory outlined in this manuscript): they indicate the temporary of final impossibility of the implementation of one or more means, or the attainment of one or more desired ends. Some stimuli are almost universally experienced as punishing, because their appearance indicates reduced likelihood of carrying through virtually any imaginable plan – of obtaining almost every satisfaction, or potential desirable future. Most things or situations that produce bodily injury fall into this category. More generally, punishments might be conceived of as involuntary states of deprivation (of food, or water, or optimal temperature,[62] of social contact[63]); as disappointments[64] or frustrations[65] (which are *absences of expected rewards*[66]), and as "stimuli" sufficiently intense to produce damage to the systems encountering them. Punishments stop action, or induce retreat or escape (backward locomotion),[67] and engender the emotional state commonly known as *pain* or *hurt*. Behaviors, which culminate in punishment and subsequent hurt, tend to *extinguish* – to decrease in frequency, over time.[68]

Threats, which are also negative, indicate potential, like promises – but potential for punishment, for hurt, for pain. Threats – cues of punishment – are stimuli that indicate enhanced likelihood of punishment and hurt.[69] Threats are abstract, like promises; however, like promises, *they are not necessarily secondary or "learned."*[70] Unexpected phenomena, for example – which constitute "innately recognizable" threats – stop us in our tracks, and make us feel *anxiety*.[71] So, arguably, do certain "innate fear stimuli" – like snakes.[72] Behaviors that culminate in the production of cues of punishment – that create situations characterized by anxiety – tend to decrease in frequency over time (much like those that produce immediate punishment).[73]

Satisfactions and their cues are *good*, simply put; punishments and threats are *bad*. We tend to move forward[74] (to feel hope, curiosity, joy), and then to "consume" (to make love, to eat, to drink), in the presence of good things; and to pause (and feel anxious), then withdraw, move backwards (and feel pain, disappointment, frustration, loneliness), when faced by things we do not like. In the most basic of situations – when we know what we are doing; when we are engaged with the familiar – these fundamental tendencies suffice. Our actual situations, however, are almost always more complex. If things or situations were straightforwardly or simply positive or negative, good or bad, we would not have to make judgments regarding them; would not have to think about our behavior, and how and when it should be modified – indeed, would not have to *think* at all. We are faced, however, with the constant problem of ambivalence in meaning, which is to say that a thing or situation might be bad and good simultaneously (or good in two conflicting manners; or bad, in two conflicting manners).[75] A cheesecake, for example, is *good* when considered from the perspective of food deprivation or hunger, but *bad* when considered from the perspective of social desirability and the svelte figure that such desirability demands. The newly toilet-trained little boy who has just wet his bed might well feel simultaneous satisfaction, at the attainment of a biologically vital goal, and apprehension, as to the likely interpersonal socially-constructed consequence of that satisfaction. Nothing comes without a cost, and the cost has to be factored in, when the meaning of something is evaluated. Meaning depends on context; contexts – stories, in a word – constitute goals,

desires, wishes. It is unfortunate, from the perspective of conflict-free adaptation, that we have many goals – many stories, many visions of the ideal future – and that the pursuit of one often interferes with our chances (or someone else's chances) of obtaining another.

We solve the problem of contradictory meanings by interpreting the value of things from within the confines of our stories – which are adjustable maps of experience and potential, whose specific contents are influenced by the demands of our physical being. Our central nervous systems are made up of many "hard-wired" or automatized subsystems, responsible for biological regulation – for maintaining homeostasis of temperature, ensuring proper caloric intake, and monitoring levels of plasma carbon dioxide (for example). Each of these subsystems has a job to do. If that job is not done, within a certain variable span of time, the whole game comes to a halt, perhaps permanently. Nothing gets accomplished then. We *must* therefore perform certain actions – by necessity – if we are to survive. This does not mean, however, that our behaviors are *determined* – at least not in any simplistic manner. The subsystems that make up our shared structure – responsible, when operative, for our "instincts" (thirst, hunger, joy, lust, anger, etc.) – do not appear to directly grip control of our behavior, do not transform us into driven automatons. Rather, they appear to influence our fantasies, our plans, and alter and modify the content and comparative importance of our goals, our ideal futures (conceived of in comparison to our "unbearable" presents, as they are currently construed).

Each "basic" subsystem has its own particular, singular image of what constitutes the ideal, so to speak – of what constitutes the most valid goal, at any given moment. If someone has not eaten in several days, it is highly likely that his vision of the (immediately) desirable future will include the image of eating. Likewise, if someone been deprived of water, she is likely to make drinking her goal. We share fundamental biological structure, as human beings, so we tend to agree, broadly, about what should be regarded as valuable (at least in a specified context). What this means, essentially, is that we can make *probabilistic* estimates about those things that a given individual (and a given culture) might regard as desirable, at any moment. Furthermore, we can increase the accuracy of our estimates by programmed deprivation (because such deprivation specifies interpretive context). Nonetheless, we can never be *sure*, in the complex normal course of events, just what it is that someone will want.

Judgment regarding the significance of things or situations becomes increasingly complicated when the fulfillment of one biologically-predicated goal interferes with the pursuit or fulfillment of another.[76] To what end should we devote our actions, for example, when we are simultaneously lustful and guilty, or cold, thirsty, and frightened? What if the only way to obtain food is to steal it, say, from someone equally hungry, weaker and dependent? How is our behavior guided, when our desires compete – which is to say, when wanting one thing makes us likely to lose another, or several others? There is no reason to presume, after all, that each of our particularly specialized subsystems will agree, at any one time, about what constitutes the most immediately desirable "good." This lack of easy agreement makes us *intrinsically prone to intrapsychic conflict*, and associated affective (emotional) dysregulation. We manipulate our environments, and our beliefs, to address this conflict – we change ourselves, or the things around us, to increase our hope and satisfaction, and to decrease our fear and pain.

It is up to the "higher" cortical systems – the phylogenetically newer, more "advanced" executive[77] portions of the brain – to render judgment about the relative value of desired states (and, similarly, to determine the proper order, for the manifestation of means[78]). These advanced systems must take all states of desire into account, optimally, and determine the appropriate path for the expression of that desire. We make *decisions* about what is to be regarded as valuable, at any given time, but the neurological subsystems that keep us alive, which are singularly responsible for our maintenance, in different aspects, all have a voice in those decisions – a vote. Every part of us, kingdom that we are, depends on the healthy operation of every other part. To ignore one good, therefore, is to risk all. To ignore the demands of one necessary subsystem is merely to ensure that it will speak later with the voice of the unjustly oppressed; to ensure that it will grip our fantasy, unexpectedly, and make of the future something unpredictable. Our "optimal paths" therefore, must be properly *inclusive*, from the perspective of our internal community – from the perspective of our basic physiology. The valuations and actions of others, additionally, influence our personal states of emotion and motivation, as we pursue our individual goals, inevitably, in a social context. The goal, *writ large*, towards which our higher systems work must therefore be construction of a state where all our "needs" – and the "needs of others" – are simultaneously met. This higher goal, to which we

all theoretically aspire, is a complex (and oft-implicit) fantasy – a vision or map of the promised land. This map, this story – this *framework of reference*, or *context of interpretation* – is the (ideal) future, contrasted necessarily with the (unbearable) present, and includes concrete plans, designed to turn the latter into the former. The mutable meanings that make up our lives depend for their nature on the explicit structure of this interpretive context.

We select what we *should* value, from among those things we *must* value. Our selections are, therefore, predictable – in the broad sense. This must be, as we must perform certain actions in order to live. But the predictability is limited. The world is complex enough not only so that a given problem may have many valid solutions, but so that even the definition of "solution" may vary. The particular "most appropriate or likely" choices of people, including ourselves, cannot therefore be accurately determined beforehand (not under normal circumstances, at least). Nonetheless – despite our final and ineradicable ignorance – we act – judging from moment to moment what is to be deemed worthy of pursuit; determining what can be ignored, at least temporarily, during that pursuit. We are capable of acting – and of producing the results we desire – because we render *judgment of value*, using every bit of information at our disposal. We determine that something is worth having, at a given time and place, and make the possession of that thing our goal. And as soon as something has become "our goal" – no matter what that something is – *it appears to adopt the significance of satisfaction (of consummatory reward)*. It appears sufficient for something to be truly *regarded* as valuable, for it to adopt the emotional aspect of value. It is in this manner that our higher-order verbal-cognitive systems serve to regulate our emotions. It is for this reason that we can play – that we can work towards "merely symbolic" ends; for this reason that drama and literature[79] (and even sporting events) can have such profound "vicarious" effects on us. The mere fact that something is desired, however, does not necessarily mean that its attainment will sustain life (as a "true" satisfaction might) – or that pure regard will make something into what it is not. It is therefore necessary (if you wish to exist, that is) to construct goals – models of the desired future – that are *reasonable*, so to speak, from the perspective of previous experience, grounded in biological necessity. Such goals take into account the necessity of coping with our intrinsic limitations; of satisfying our inherited biological subsystems; of appeasing those transpersonal "gods," who eternally demand to be clothed and fed.

The fact that goals *should* be reasonable, broadly speaking, does not necessarily mean that they *will* be, or that they *have* to be (at least in the short term) – or that what constitutes "reasonable" can be easily or finally determined. One man's meat is another man's poison; the contents of the ideal future (and the interpreted present) may and do vary dramatically between individuals. An anorexic, for example, makes her goal an emaciation of figure that may well be incompatible with life. In consequence, she regards food as something to be avoided – as something punishing, or threatening. This belief will not protect her from starving, although it will powerfully affect her short-term determination of the valence of chocolate. The man obsessed with power may sacrifice everything – including his family – to the attainment of his narrow ambition. The empathic consideration of others, a time-consuming business, merely impedes his progress with regards to those things he deems of ultimate value. His faith in the value of his progress therefore makes threat and frustration even of love. Our beliefs, in short, can change our reactions to everything – even to those things as "primary" or fundamental as food and family. We remain indeterminately constrained, however, by the fact of our biological limits.

It is particularly difficult to specify the value of an occurrence when it has one meaning, from one frame of reference (with regards to one particular goal), and a different or even opposite meaning, from another equally equally or more important and relevant frame. "Stimuli" that exist in this manner constitute *unsolved problems of adaptation* – still present us with a mystery, which is *what to do in their presence* (whether to *pause*, *consume*, *stop*, or *move backwards* or *forwards*, at the most basic of levels; whether to feel *anxious*, *satisfied*, *hurt*, or *hopeful*). Some things or situations may be evidently satisfying or punishing – at least from the currently extant "framework of reference" – and can therefore be regarded (valued, acted towards) in an uncomplicated manner. Other things and situations, however, remain rife with contradictory or indeterminate meanings. (Many things, for example, are punishing in the "short tem" but satisfying or promising in the "medium" to "long term.") Such circumstances provide evidence that our systems of valuation are not yet sophisticated enough to foster complete adaptation – demonstrate to us incontrovertibly that our processes of evaluation are still incomplete:

"A brain in a vat is at the wheel of a runaway trolley, approaching a fork in the track. The brain is hooked up to the trolley in such a way that the brain can determine which course the trolley will take. There are only two options: the right side of the fork, or the left side. There is no way to derail or stop the trolley, and the brain is aware of this. On the right side of the track there is a single railroad worker, Jones, who will definitely be killed if the brain steers the trolley to the right. If Jones lives he will go on to kill five men for the sake of thirty orphans (one of the five men he will kill is planning to destroy a bridge that the orphans' bus will be crossing later that night). One of the orphans who will be killed would have grown up to become a tyrant who made good, utilitarian men do bad things, another would have become John Sununu, a third would have invented the pop-top can.

If the brain in the vat chooses the left side of the track, the trolley will definitely hit and kill another railman, Leftie, and will hit and destroy ten beating hearts on the track that would have been transplanted into ten patients at the local hospital who will die without donor hearts. These are the only hearts available, and the brain is aware of this. If the railman on the left side of the track lives, he, too, will kill five men – in fact, the same five that the railman on the right would kill. However, Leftie will kill the five as an unintended consequence of saving ten men: he will inadvertently kill the five men as he rushes the ten hearts to the local hospital for transplantation. A further result of Leftie's act is that the busload of orphans will be spared. Among the five men killed by Leftie is the man responsible for putting the brain at the controls of the trolley. If the ten hearts and Leftie are killed by the trolley, the ten prospective heart-transplant patients will die and their kidneys will be used to save the lives of twenty kidney transplant patients, one of whom will grow up to cure cancer and one of whom will grow up to be Hitler. There are other kidneys and dialysis machines available, but the brain does not know this.

Assume that the brain's choice, whatever it turns out to be, will serve as an example to other brains in vats, and thus the effects of its decision will be amplified. Also assume that if the brain chooses the right side of the fork, an unjust war free of war crimes will ensue, whereas if the brain chooses the left fork, a just war fraught with war crimes will result. Furthermore, there is an intermittently active Cartesian demon deceiving the brain in such a way that the brain is never sure that it is being deceived.

Question: Ethically speaking, what should the brain do?"[80]

We cannot act in *two ways* at *one time* – cannot move forwards and backwards, cannot stop and go, simultaneously. When faced with stimuli, whose meaning is indeterminate, we are therefore placed in *conflict*. Such conflict must be resolved, before adaptive action may take place. We can actually only do one thing, at one time – although we may be motivated by confusing, threatening, dangerous or unpredictable circumstances to attempt many incommensurate things simultaneously.

2.2.2. Unexplored Territory: Phenomenology and Neuropsychology

The dilemma of contradictory simultaneous meanings can only be *solved* in one of two related ways (although it can be avoided in many others). We can *alter our behaviors*, in the difficult situation, so that those behaviors no longer produce consequences we do not desire or cannot interpret. Alternatively, *we can reframe our contexts of evaluation* (our goals and our interpretations of the present), so that they no longer produce paradoxical implications, with regards to the significance of a given situation. These processes of behavioral modification and reframing constitute *acts of effortful revaluation*, which means thorough, exploratory reconsideration of what has been judged previously to be appropriate or important.

Things or situations with indeterminate meanings therefore challenge our adaptive competence; force us to revaluate our present circumstances, and alter our ongoing behaviors. Such circumstances arise when something we have under control, from one perspective, is troublesome or otherwise out of control from another. "Out of control" means, most basically, unpredictable: something is *beyond us* when our interactions with it produce phenomena whose properties could not be determined, beforehand. *Unexpected* or *novel* occurrences, which emerge when our plans do not turn out the way we hope they would, therefore constitute an important – perhaps the most important – subset of the broader class of *stimuli of indeterminate meaning*. Something unexpected, or novel, necessarily occurs in relationship to what is

known – is always identified and evaluated with respect to our currently operative plan [which is to say that a "familiar" thing, in an unexpected place (or at an unexpected time) is actually something *unfamiliar*]. The wife of an adulterous husband, for example, is familiar to him, perhaps, when she is at home. The fact of her, and her behavior, constitutes *explored territory*, so to speak. She is an entirely different sort of phenomenon, however, from the perspective of affect (and implication for behavioral output), if she makes an unexpected appearance at his favorite motel room, in the midst of a tryst. What will the husband do, in his wife's presence, when she surprises him? First, he will be taken aback, in all likelihood – then he will concoct a story, that makes sense of his behavior (if he can manage it, on such short notice). He has to think up something new; has to *do something he has never done before*. He has to manage his wife, who he thinks he has fooled – his wife, whose mere unexpected presence at the motel is proof of her endless residual mystery. Our habitual patterns of action only suffice for things and situations of determinate significance – by definition: we only know how to act in the presence of the familiar. The appearance of the unexpected pops us out of "unconscious," axiomatic complacency, and forces us (painfully) to *think*.

The implications of novel or unpredictable occurrences are unknown, by definition. This observation carries within it the seeds of a difficult and useful question: what, is the significance of the unknown? It might seem logical to assume that the answer is none – something unexplored cannot have meaning, because none has yet been attributed to it. The truth, however, is precisely opposite. Those things we do not understand nonetheless signify. If you can't tell what something means, because you don't know what it is, what then does it mean? It is not nothing – we are in fact frequently and predictably upset by the unexpected. Rather, it could be anything – and that is precisely the crux of the problem. Unpredictable things are not irrelevant, prior to the determination of their specific meaning. Things we have not yet explored have significance, prior to our adaptation to them, prior to our classification of their relevance, prior to our determination of their implication for behavior. Things not predicted, not desired, that occur while we are carrying out our carefully designed plans – such things *come loaded, a priori, with meaning, both positive and negative*. The appearance of unexpected things or situations indicates, at least, that our plans are in error, at some stage of their design – in some trivial way, if we are lucky; in some manner that might be devastating to our hopes and wishes, to our self-regard, if we are not.

Unexpected or unpredictable things – novel things, more exactly (the class of novel things, most particularly) – have a potentially infinite, unbounded range of significance. What does something that might be anything mean? In the extremes, it means – *the worst that could be* (or, at least, the worst you can imagine) and, conversely, *the best that could be* (or the best you can conceive of). Something new might present possibility for unbearable suffering, followed by meaningless death – might present threat virtually unbounded in significance. That new and apparently minor but nonetheless strange and worrisome ache you noticed this morning, for example, while you were exercising – might just signify the onset of the cancer that will slowly and painfully kill you. Alternatively, something unexpected might signify inconceivable opportunity for expansion of general competence and well-being. Your old, boring, but secure job unexpectedly disappears. A year later, you are doing what you really want to do, and your life is incomparably better.

An unexpected thing, or situation, appearing in the course of goal-directed behavior, constitutes a stimulus that is intrinsically problematic: novel occurrences are, simultaneously, cues for punishment (threats) and cues for satisfaction (promises).[81] This paradoxical *a priori* status is represented schematically in ***Figure 5: The Ambivalent Nature of Novelty***. Unpredictable things, which have a paradoxical character, accordingly activate two antithetical emotional systems, whose mutually inhibitory activities provide basic motivation for abstract cognition, whose cooperative endeavor is critical to the establishment of permanent memory, and whose physical substrates constitute universal elements of the human nervous system. The most rapidly activated[82] of these two systems governs inhibition of ongoing behavior, cessation of currently goal-directed activity;[83] the second, equally powerful, but somewhat more conservative,[84] underlies exploration, general behavioral activation,[85] and forward locomotion.[86] Operation of the former appears associated with anxiety, with fear and apprehension, with negative affect – universal subjective reactions to the threatening and unexpected.[87] Operation of the latter, by contrast, appears associated with hope, with curiosity and interest, with positive affect – subjective responses to the promising and unexpected.[88] The process of exploring the emergent unknown is therefore guided by the interplay between the emotions of curiosity/hope/excitement, on the one hand, and anxiety, on the other – or, to describe the phenomena from

another viewpoint – between the different motor systems responsible for approach (forward locomotion) and inhibition of ongoing behavior.

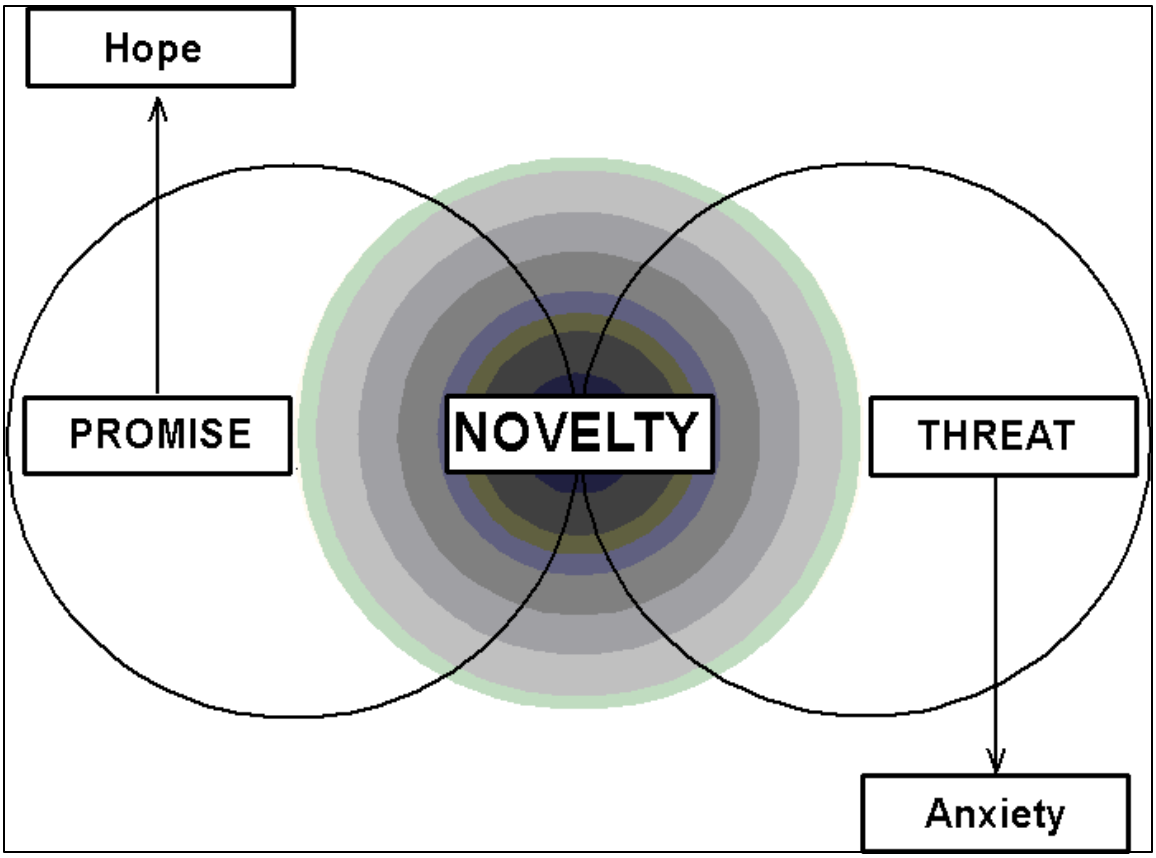

Figure 5: The Ambivalent Nature of Novelty

The "ambivalent unknown" – that is, novelty – comes in two "forms," so to speak (as alluded to earlier). "Normal" novelty emerges within the "territory" circumscribed by the choice of a particular end-point or goal (which is to say, after getting to specific point "b" has been deemed the most important possible activity, *at this time and in this place*). Something "normally" novel constitutes an occurrence which leaves the current departure point and goal intact, but that indicates that the *means* of achieving that goal have to be modified. Let us say, for example, that you are in your office. You are accustomed to walking down an unobstructed hallway, to get to the elevator. You are so used to performing this activity, that you can do it "automatically" – so you often read while walking. One day, while reading, you stumble over a chair someone left in the middle of the hallway. This is "normal" novelty. You don't have to alter your current goal, except in a temporary and trivial manner; you are not likely to get too upset by the unexpected obstacle. Getting to the elevator is still a real possibility, even within the desired time-frame; all you have to do is walk around the chair (or move it somewhere else, if you are feeling particularly altruistic). ***Figure 6: Emergence of Normal Novelty in the Course of Goal-Directed Behavior*** provides an abstracted representation of this process of trivial adaptation.

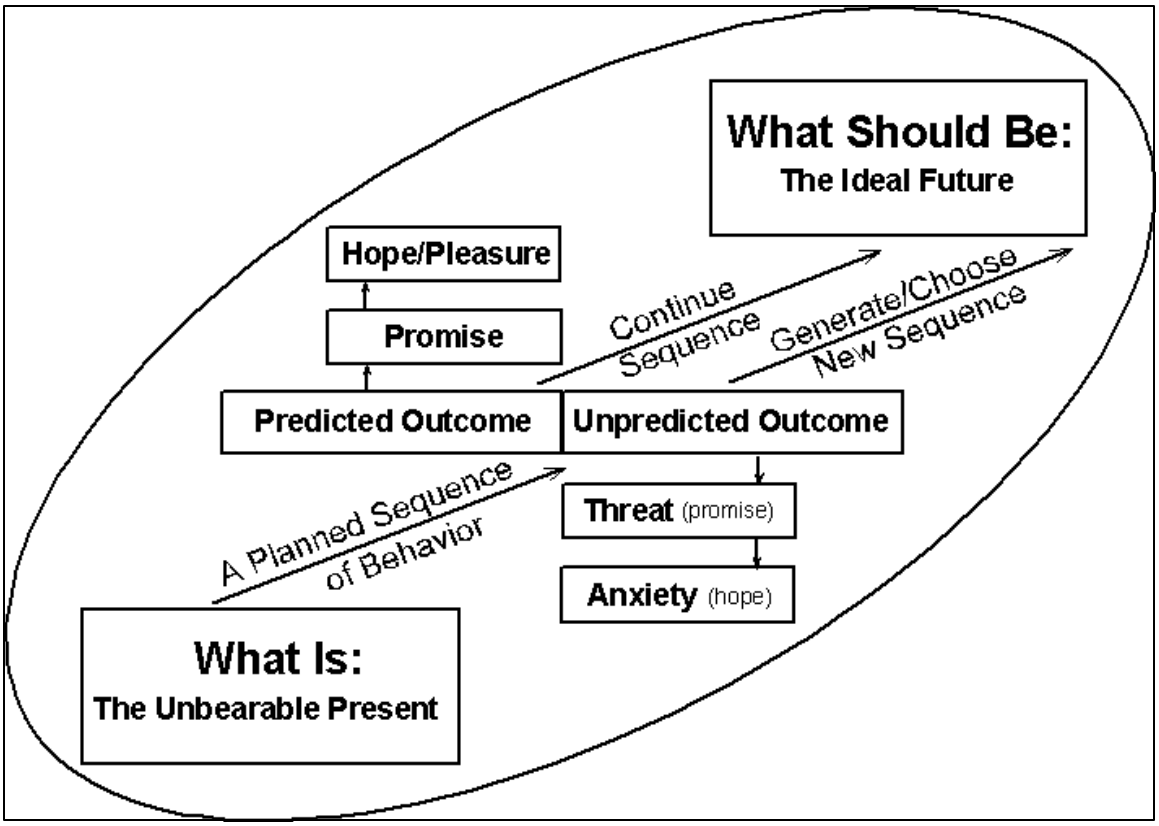

Figure 6: Emergence of Normal Novelty in the Course of Goal-Directed Behavior

"Revolutionary novelty" is, by contrast, something altogether different. Sometimes the sudden appearance of the unexpected means taking path "b" to grandma's house, instead of path "a." Sometimes that appearance means emergent doubt about the very existence of grandma. Here is an example: I am sitting alone in my office, in a high-rise building, alone at night. I suddenly fantasize: "I am going to take the elevator down three floors and get something to eat" (more accurately, hunger suddenly grips my imagination, and uses it for its own purposes). This "fantasy" constitutes a spatially and temporally bounded image of the ideal future – an "actual" possible future, carved out as a discriminable (and thus usable) object, from the infinite domain of "potential" possible futures. I use this definite image to evaluate the events and processes that constitute the interpreted present, as it unfolds around me, as I walk towards the elevator (on my way to the cafeteria). I *want* to make "reality" match my fantasy – to subdue my motivation (to please the gods, so to speak). If the unexpected occurs – say, the elevator is not operating – the mismatch temporarily stops me. I replace my current plan with an alternative behavioral strategy, designed to obtain the same end. This means that I do not reconfigure the temporally and spatially bounded "map" that I am using to evaluate my circumstances – that I am using to "regulate" my emotions. All I have to do is change *strategy*.

I decide to take the stairs to the cafeteria. If the stairs are blocked by construction, I am in more serious trouble. My original fantasy – "go down to the cafeteria and eat" – was predicated on an implicit presumption: *I can get downstairs*. This presumption, which I wasn't really even aware of (which might be regarded as *axiomatic*, for the purposes of the current operation), has been violated. The story "go downstairs to eat" only retained its function in an environment characterized by valid means of between-floor transportation. The existence of these means constituted a given – I had used the elevator or the stairs so often that their very presence took on the aspect of a justifiably-ignored constant. Once I had mastered

the stairs, or the elevator – once I had learned their location, position, and mechanisms – I could take them for granted, and presume their irrelevance. Predictable phenomena (read "thoroughly explored, and therefore adapted to") do not attract attention – do not require "consciousness." No new behavioral strategies or frameworks of reference must be generated, in their presence.

Anyway: the elevators are broken; the stairs are blocked. The map I was using to evaluate my environment has been invalidated: my *ends* are no longer tenable. In consequence, necessarily, the means to those ends (my plans to go to the cafeteria) have been rendered utterly irrelevant. I no longer know what to do. This means, in a non-trivial sense, that I no longer know *where I am.* I presumed I was in a place I was familiar with – indeed, many familiar things (the fact of the floor, for example) have not changed. Nonetheless, something fundamental has been altered – and I don't know *how* fundamental. I am now in a place I cannot easily leave. I am faced with a number of new problems, in addition to my unresolved hunger – at least in potential (will I get home, tonight? Do I have to get someone to "rescue" me? Who *could* rescue me? Who do I telephone, to ask for help? What if there was a fire?). My old "plan" – my old "story" ("I am going downstairs to get something to eat") – has vanished, and I do not know how to evaluate my current circumstances. My emotions – previously constrained by the existence of a temporarily valid plan – re-emerge, in a confused jumble. I am anxious ("what will I do? What if there <u>was</u> a fire?"), frustrated ("I'm certainly not going to get any more work done tonight, under these conditions!") angry ("who could have been stupid enough to block all the exits?"), and curious ("just what the hell is going on around here, anyway?") Something unknown has occurred, and blown all my plans. An emissary of chaos – to speak metaphorically – has disrupted my emotional stability. ***Figure 7: Emergence of "Revolutionary Novelty" in the Course of Goal-Directed Behavior*** graphically presents this state of affairs.

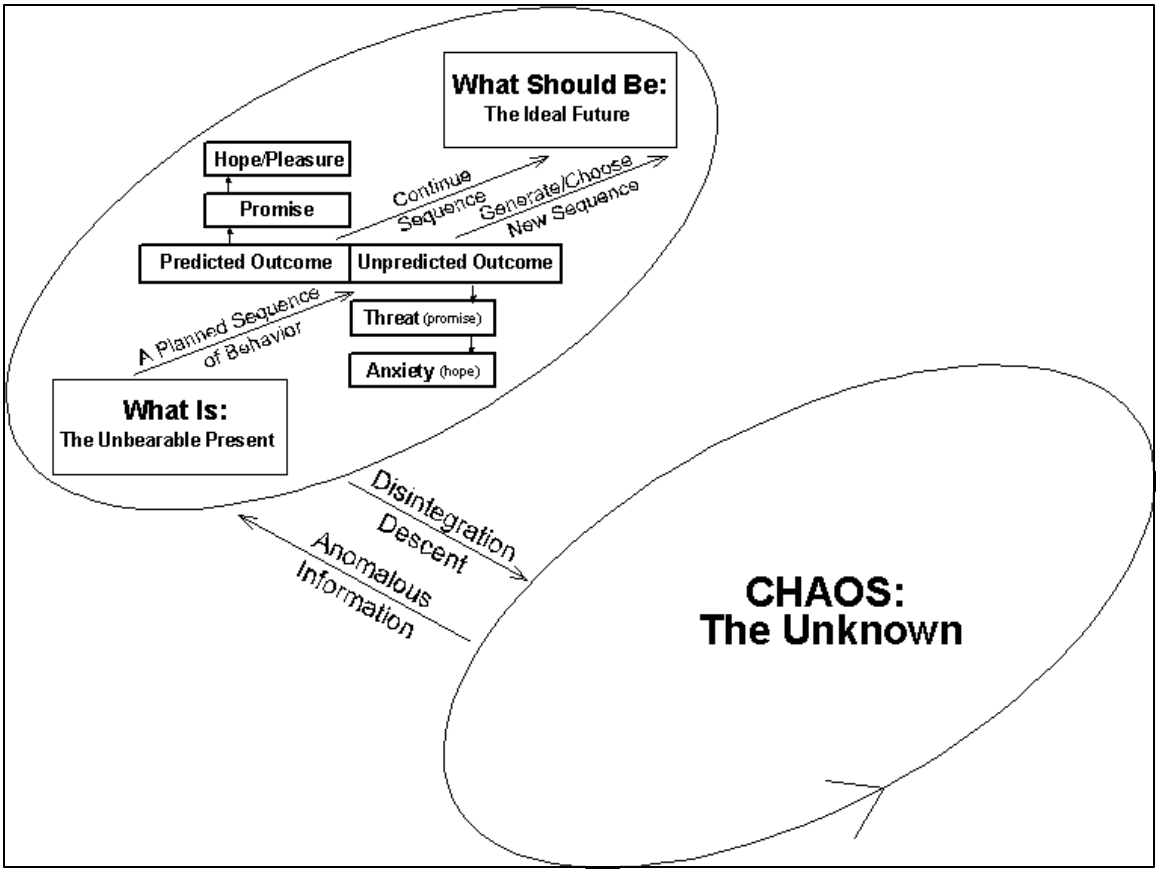

Figure 7: Emergence of "Revolutionary Novelty" in the Course of Goal-Directed Behavior

The plans we formulate are mechanisms designed to bring the envisioned perfect future into being. Once formulated, plans govern our behavior – *until we make a mistake.* A mistake, which is the appearance of a thing or situation not envisioned, provides evidence for the incomplete nature of our plans – indicates that those plans, and the presumptions upon which they are erected, are in error, and must be updated (or, heaven forbid, abandoned). As long as everything is proceeding according to plan, we remain on familiar ground – but when we err, *we enter unexplored territory*.

What is known, and what unknown, is always relative, in a manner of speaking, because what is unexpected depends entirely upon what we expect (desire) – on what we had previously *planned and presumed*. The unexpected constantly occurs because it is impossible, in the absence of omniscience, to formulate an entirely accurate model of what actually is happening, or of what should happen; because it is impossible to determine what results ongoing behavior will finally produce. Errors in representation of the unbearable present and the ideal, desired future are inevitable, in consequence, as are errors in implementation *and* representation of the means by which the former can be transformed into the latter. The infinite human capacity for error *means that encounter with the unknown is inevitable*, in the course of human experience; means that the likelihood of such encounter is as certain, regardless of place and time of individual existence, as death and taxation. The (variable) existence of the unknown, paradoxically enough, *can therefore be regarded as an environmental constant*. Adaptation to the "existence" of this domain must occur, therefore, in every culture, and in every historical period – regardless of the particulars of any given social or biological circumstance.

Deviations from desired outcome constitute (relatively) novel events, indicative of errors in presumption, either at the level of analysis of current state, process, or ideal future. Such mismatches – unpredictable, nonredundant, or novel occurrences – *constantly comprise the most intrinsically meaningful, interesting elements of the human experiential field*. This interest and meaning signifies the presence of new information, and constitutes a prepotent stimulus for human (and animal) action.[89] It is where the unpredictable emerges that the possibility for all new and useful information exists. It is during the process of exploration of the unpredictable or unexpected that all knowledge and wisdom is generated, all boundaries of adaptive competence extended, all foreign territory explored, mapped and mastered. The eternally extant domain of the unknown therefore constitutes the *matrix* from which all conditional knowledge emerges. Everything presently known to each, everything rendered predictable, was at one time unknown to all, and had to be rendered predictable – beneficial at best, irrelevant at worst – as a consequence of active exploration-driven adaptation. The matrix is of indeterminable breadth: despite our great storehouse of culture, despite the wisdom bequeathed to us by our ancestors, we are still fundamentally ignorant, and will remain so, no matter how much we learn. The domain of the unknown surrounds us, like an ocean surrounds an island. We can increase the area of the island, but we never take away much from the sea.

2.2.3. Exploration: Phenomenology and Neuropsychology

The unfamiliar exists, as an invariant feature of experience, no less than the familiar. We remain ignorant, and act while surrounded by uncertainty. Just as fundamentally, however, we always know something, no matter who we are, or when we live. We tend to view the "environment" as something "objective," but one of its most basic features – familiarity, or lack thereof – is something virtually defined by the subjective. This environmental subjectivity is non-trivial, as well: it is certainly the case that mere "interpretation" of a "phenomenon" can determine whether we thrive or sicken, live or die. It appears, indeed, that the categorization or characterization of the environment as unknown/known (nature/culture, foreign/familiar) might be regarded as more "fundamental" than any objective characterization – if we make the presumption that what we have adapted to is, by definition, reality. For it is the case that the human brain – and higher nervous systems, in general – have specialized for operation in "the domain of order," and "in the domain of chaos." And it is impossible to understand the fact of this specialization, unless those domains are regarded as more than mere metaphor.

We normally use our conceptions of cognitive processes to illuminate the working of the brain (normally use our models of thought to determine "what must be the case" physiologically). However,

neuropsychological investigation has advanced to the point where the reverse procedure is equally useful. What is known about brain function can be used to illuminate our conceptions of cognition – indeed, of "reality" itself) – can be used to provide those conceptions with suitable "objective constraints." Enlightenment thought strove to separate "reason" and "emotion"; empirical investigations into the structure and function of the brain – given great initial impetus by the consequences of that separation – have demonstrated instead that the two phenomena are mutually interdependent, and essentially integral.[90] We live in a universe characterized by the constant interplay of *yang* and *yin*, chaos and order: "emotion" provides us with an initial guide, when we don't know what we are doing, when reason alone will not suffice.[91] "Cognition," by contrast, allows us to construct and maintain our ordered environments, and keep chaos – and affect – in check.

The brain may be usefully regarded as composed of three primary units – motor, sensory, and affective – or as constituting a matched pair of hemispheres, right and left. Each manner of conceptual subdivision has its theoretical advantages; furthermore, the two are not mutually exclusive. We will attend to the description of the "units," portrayed schematically in ***Figure 8: The Motor and Sensory Units of the Brain***, first.

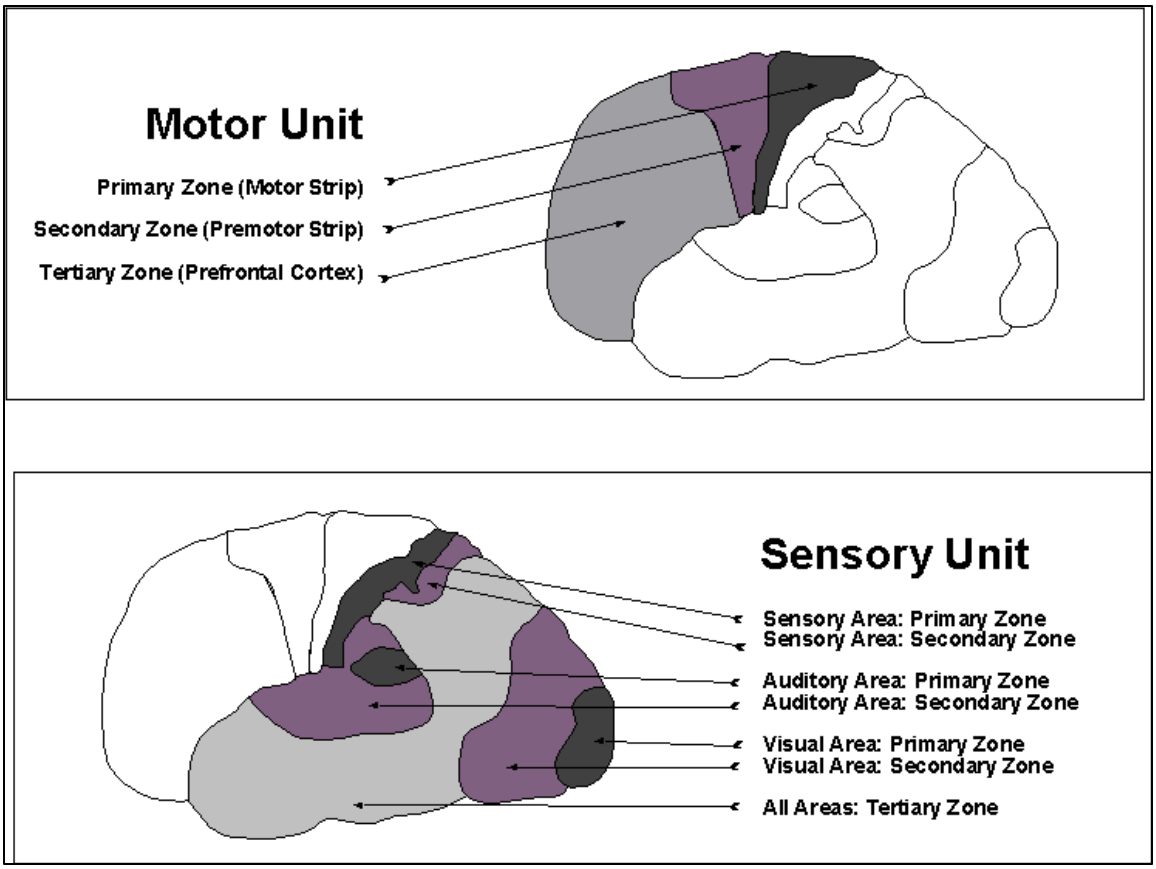

Figure 8: The Motor and Sensory Units of the Brain

Most neocortical (and many subcortical) structures have attained their largest and most complex level of development in *homo sapiens*. This is true, in particular, of the motor unit,[92] which comprises the anterior or forward half of the comparatively newer neocortex (and which is composed of the motor, premotor and prefrontal lobes). This level of heightened development accounts in part for increased human intelligence, behavioral versatility and breadth of experience, both actual and potential, and underlies our capacity to formulate plans and intentions, organize them into programs of action, and regulate their execution.[93]

The sensory unit,[94] which comprises the posterior half of the neocortex (and which is composed of the parietal, occipital, and temporal lobes), is responsible for the construction of the separate worlds of our sensory systems (primarily sight, hearing and touch) – and for their integration into the unified perceptual field that constitutes our conscious experience.[95] The sensory unit processes the information generated in the course of the actions planned by the motor unit, and builds the world of the recognizable and familiar out of that information.

The "limbic unit," finally – phylogenetically ancient, tucked under the folds of the neocortex – compares[96] the nature of behavioral consequences, as they occur, with a dynamic model, extant in fantasy, of what was *supposed to occur* – of what was *desired to happen*. It is therefore signalling of *motivational significance*, or *affective importance*, that constitutes what is perhaps the major responsibility of the limbic system – that, and the (integrally related) inculcation and renewal of memory ["integrally related," as it is *significant* events that transform knowledge, that are "stored" in memory (more accurately, that *alter* memory)]. This process of signalling necessarily involves comparison of the undesirable present, as currently understood, with the ideal future, as currently imagined. The capacity to generate such a contrast appears dependent upon operations undertaken deep within the comparatively ancient central portion of the brain – particularly in the tightly-integrated structures known as the hippocampus[97] and amygdala.[98] The nature of this comparative process can perhaps best be understood, in introduction, through consideration of a phenomenon known as the *event-related cortical potential*.

The brain constantly produces a shifting pattern of electrical activity in the course of its operations. The electroencephalogram (the EEG) provides a rough picture of that pattern. The individual undergoing EEG examination has electrodes placed in an array on his scalp. These electrodes allow the patterns of electrical activity, generated in the course of neurological activity, to be detected, monitored and, to some degree, localized. (The brain produces enough electrical activity to be detected through the skull and tissue surrounding it, although the interference produced by that surrounding tissue makes evaluation of the EEG difficult). The rather limited capacities of EEG technology have been greatly extended by the analytic capacities of the computer. The *cortical event-related potential* is a measure of brain activity derived by computer from EEG recordings averaged at different delays after the subject being evaluated has been presented with some sort of "stimulus." The nature of this stimulus may vary. In the simplest case, it is merely something sensory, like a tone presented repeatedly through stereo headphones. In more complex cases the event-related potential is monitored following presentation of a stimulus with affective valence – which means following something that must be "discriminated, recognized, or otherwise evaluated."[99] Perhaps the simplest way to produce an event of this sort is to randomly and rarely insert a tone that differs in frequency into a repetitious sequence of otherwise predictable tones (although the stimulus might just as easily be visual or tactile). These "odd-ball" events are characterized by (relative) novelty (novelty is always relative) and evoke a pattern of cortical electrical activity that differs from that produced by the predictable tones. Any event that has specific or known implications for alteration in ongoing behavior will also produce a potential like the "odd-ball."

The averaged cortical event-related potential produced by infrequent or otherwise meaningful events is a waveform with a characteristic time-course and shape. Most attention has been paid to elements of this waveform that occur within the first half-second (500 milliseconds) post-stimulus occurrence. As the first half-second passes, the polarity of the waveform shifts. Peaks and valleys occur at different, more-or-less standard times (and in essentially predictable "locations") and have therefore been identified and named. Event-related potentials (ERPs) are negative (N) or positive (P) depending on polarity, and numbered according to their occurrence in time. The earliest aspects of the ERP (<200 msec) vary with change in the purely sensory quality of an event. The waveforms named N200 (negative 200 msec) and P300 (positive 300 msec), by contrast, vary with the *affective significance and magnitude* of the stimulus, and can even be evoked by the absence of an event that was expected, but that did not appear. The psychophysiologist Eric Halgren states:

> "One may summarize the cognitive conditions that evoke the N2/P3 as being the presentation of stimuli that are novel or that are signals for behavioral tasks, and thus need to be attended to, and processed. These evoking conditions and functional consequences are identical to those that have been found for the orienting reflex."[100]

Halgren considers the N2/P3 and the autonomic orienting reflex "different parts of an overall organismic reaction complex evoked by stimuli that merit further evaluation,"[101] and terms this overall response pattern the orienting *complex*. A substantial body of evidence suggests that the amygdalic and hippocampal systems are critically involved in production of the N2/P3 waveforms, although other brain systems also participate. (It is also of great interest to note that an additional waveform, the N4, is produced when human experimental subjects are exposed to abstracted symbols with integral significance, such as written, spoken or signed words and faces, in a meaningful context.[102] In such a context, the N4 occurs after the N2 but before the P3, and increases in magnitude as a function of the difficulty of integrating the word with the context in which it appears. The amygdala and hippocampus are also directly responsible for the production of this waveform – and, therefore, for contextual synthesis, which is a vital aspect of the derivation of meaning, which is significance for behavior, given the desire to attain a particular goal.)

The processes that reveal themselves behaviorally in the orienting complex and electrophysiologically in the N2/N4/P3 waveform appear to play a central part in the manifold processes we experience (and understand) as *consciousness*. Another psychophysiologist, Arne Ohman,[103] has posited that orienting initiates a sequence of "controlled processing," which is difficult, slow, accompanied by awareness, sequential and generative (and which is referred to as *exploratory behavior* in this document), contrasted with "automatic processing," which is habitual, "unconscious" and immediate (and which occurs in "explored territory"). The orienting complex is apparently only manifested when a given experimental subject becomes "aware" of some relationship between sensory input and motor action. Likewise, the N2/P3 waveform appears only when the experimental stimulus utilized "has captured the subject's attention and reached his or her awareness."[104] Consciousness (affiliated tightly with orienting, for the purposes of the present argument) therefore appears as a *phenomenon critically involved in and vital to the evaluation of novelty* – appears vital to placement of the unpredictable into a defined and determinate context, as a consequence of behavioral modification, undertaken in the territory of the unknown. This means that consciousness plays a centrally important role in the *generation of the predictable and comprehended world from the domain of the unexpected*. Such response, placement and generation remains forever mediated by the twin forces of hope/curiosity and anxiety – forces produced, non-coincidentally, by the same structures that govern "reflexive" orientation and exploratory motor output.

The constant and universal presence of the incomprehensible in the "world" has "forced" adaptive response from us – has elicited such response from all creatures like us, with highly developed nervous systems. We have evolved to operate successfully in a world eternally composed of the predictable, in paradoxical juxtaposition with the unpredictable. The combination of *what we have explored and what we have still to evaluate* actually comprises our environment, insofar as its nature can be broadly specified – and it is to that environment that our physiological structure has become matched. One set of the systems that comprise our brain and mind governs activity, when we are guided by our plans – when we are in the domain of the *known*. Another appears to operate when we face something unexpected – when we have entered the realm of the *unknown*.[105]

The "limbic unit" generates the orienting reflex, among its other tasks. It is the orienting reflex, which manifests itself in emotion, thought and behavior, *that is at the core of the fundamental human response to the novel or unknown*. This reflex takes a biologically-determined course, ancient in nature, primordial as hunger or thirst, basic as sexuality, extant similarly in the animal kingdom, far down the chain of organic being. The orienting reflex is the general instinctual reaction to the strange category of *all occurrences which have not yet been categorized* – is response to the unexpected, novel or unknown *per se*, and not to any discriminated aspect of experience, any specifically definable situation or thing. The orienting reflex is at the core of the process that generates (conditional) knowledge of sensory phenomena *and* motivational relevance or valence. Such knowledge is *most fundamentally* how to behave, and what to expect as a consequence, in a particular situation, defined by culturally-modified external environmental circumstance and equally-modified internal motivational state. It is also information about what *is*, from the objective perspective – is the record of that sensory experience occurring in the course of ongoing behavior.

The orienting reflex *substitutes for particular learned responses* when the incomprehensible suddenly makes its appearance. The occurrence of the unpredictable, the unknown, the source of fear and hope, creates a seizure of ongoing specifically goal-directed behavior. Emergence of the unexpected constitutes evidence for the incomplete nature of the story currently guiding such behavior – comprises evidence for

error at the level of working description of current state, representation of desired future state, or conception of the means to transform the former into the latter. Appearance of the unknown motivates curious, hopeful exploratory behavior, regulated by fear, as means to update the memory-predicated working model of reality (to update the *known*, so to speak, which is defined or familiar territory). The simultaneous production of two antithetical emotional states, such as those of hope and fear, means conflict – and the unexpected produces intrapsychic conflict like nothing else. The magnitude and potential intensity of this conflict cannot be appreciated under normal circumstances, because under normal circumstances – in defined territory – things are going according to plan. It is only when our goals have been destroyed that the true significance of the decontextualized object or experience is revealed – and such revelation makes itself known first in the form of fear.[106] We are protected from such conflict – from subjugation to instinctive terror – by the historical compilation of adaptive information generated in the course of previous novelty-driven exploration. We are protected from unpredictability by our culturally-determined beliefs, by the stories we share with those who are like us. These stories tell us how to presume and how to act, to maintain the determinate, shared and restricted values that compose our familiar worlds.

The orienting reflex – the involuntary gravitation of attention to novelty – lays the groundwork for the emergence of (voluntarily-controlled) exploratory behavior.[107] Exploratory behavior allows for classification of the general and (*a priori*) motivationally-significant unexpected into specified and determinate domains of motivational relevance. In the case of something with actual (post-investigation) significance, relevance means context-specific punishment or satisfaction, or their putatively "second-order" equivalents: threat or promise (as something threatening implies punishment, as something promising implies satisfaction). This is categorization, it should be noted, in accordance with implication for motor output, or behavior, rather than with regards to sensory (or, formalized, objective) property.[108] We have generally presumed that the purpose of exploration is production of a picture of the objective qualities of the territory explored. This is evidently – but only partially – true. However, the reasons we produce such pictures (are motivated to produce such pictures) are not usually given sufficient consideration. Every explorable sub-territory, so to speak, has its sensory aspect, but it is the emotional or motivational relevance of the new domain that is truly important. We only need to know that something is hard and glowing red as a means of keeping track of the fact that it is hot, and therefore dangerous – that it is punishing, if contacted. We need to know the feel and look of objects so that we can keep track of what can be eaten, and what might eat us.

When we explore a new domain, we are mapping the motivational or affective significance of the things or situations that are characteristic of our goal-directed interactions within that domain, and we use the sensory information we encounter, to identify what is important. It is the determination of *specific* meaning, or emotional significance, in previously unexplored territory – not identification of the objective features – that allows us to inhibit the novelty-induced terror and curiosity emergence of that territory otherwise automatically elicits. We feel comfortable somewhere new, once we have discovered that nothing exists there that will threaten or hurt us (more particularly, when we have adjusted our behavior and schemas of representation so that nothing there is likely to or able to threaten or hurt us). The consequence of exploration that allows for emotional regulation (that generates security, essentially) is not objective description – as the scientist might have it – but categorization of the implications of an unexpected occurrence for specification of means and ends. Such categorization is what an object "is," from the perspective of archaic affect and subjective experience. It is of course also the case that the orienting reflex, and the exploratory behavior that follows its manifestation, allows for the differentiation of the unknown into the familiar categories of objective reality. However, this ability is a late development, historically speaking – emerging only four hundred years ago[109] – and cannot therefore be considered basic to "thinking" or "evaluation." Specification of the collectively apprehensible sensory qualities of something – generally considered, in the modern world, as the essential aspect of the description of reality – merely serves, to state it once again, as an aid to the more fundamental process of *evaluation*; merely serves to determine the precise nature of *relevant* or *potentially relevant* phenomena.

When things are going according to plan – that is, when our actions fulfill our desires – we feel secure, even happy. When nothing is going wrong, the cortical systems expressly responsible for the organization and implementation of goal-directed behavior remain firmly in control. When cortically-generated plans and fantasies go up in smoke, however, this control vanishes. The comparatively ancient "limbic"

hippocampal and amygdalic systems leap into action, modifying affect, interpretation, and behavior. The hippocampus appears particularly specialized for comparing the (interpreted) reality of the present, as it manifests itself in the subjective sphere, with the fantasies of the ideal future constructed by the pre-motor unit (acting in turn as the higher-order mediator – the king, so to speak – of all the specialized subsystems that compose the more fundamental or primary components of the brain). These desire-driven fantasies might be regarded as motivated hypotheses about the relatively likelihood of events produced in the course of ongoing goal-directed activity. What you *expect* to happen – really, what you *want* to happen, at least in most situations – is a model you generate, using what you already know, in combination with what you are learning while you act. The hippocampal comparator[110] constantly and "unconsciously" checks what is "actually" happening against what is supposed to happen. This means, that the comparator contrasts the "unbearable present," *insofar as it is comprehended* (because it is a model, too), against the ideal future, as it is imagined; means that it compares the interpreted outcome of active behavior with an image, in imagination, of the intended consequences of that behavior. Past experience – skill and representation of the outcome of skill; memory, as it is applied – governs behavior, until error is committed. When something occurs that is not intended – when the actual outcome, as interpreted, does not match the desired outcome, as posited – the hippocampus shifts mode, and prepares to update cortical memory storage. Behavioral control shifts from the cortex, to the limbic system – apparently, to the amygdala, which governs the provisional determination of the affective significance of unpredictable events, and has powerful output to centers of motor control.[111] This shift of control allows the activation of structures governing orienting, heightened intensity of sensory processing, and exploration.

The "higher" cortex controls behavior until the unknown emerges – until it makes a mistake in judgment; until memory no longer serves – until the activity it governs produces a mismatch between what is desired, and what actually occurs. When such a mismatch occurs, appropriate affect (fear and curiosity) emerges. But how can situation-relevant emotion attach itself *to what has by definition not yet been encountered*? Traditionally, significance is attached to previously irrelevant things or situations as a consequence of learning – which is to say that things mean *nothing* until their meaning is learned. But no learning has yet taken place, in the face of the unknown – and yet, emotion reveals itself, in the presence of error. It appears, therefore, that the kind of emotion that the unpredictable arouses is *not learned* – which is to say that the novel or unexpected comes preloaded with affect. Things are *not irrelevant*, as a matter of course. They are *rendered irrelevant*, as a consequence of (successful) exploratory behavior. When they are first encountered, however, *they are meaningful*. It is the amygdala, at bottom, that appears responsible for the (disinhibited) generation of this *a priori* meaning – terror and curiosity.

The amygdala appears to automatically respond to all things or situations, *unless told not to*. It is told not to – is functionally inhibited – when ongoing goal-directed behaviors produce the desired (intended) results.[112] When an error occurs, however – indicating that current memory-guided motivated plans and goals are insufficient – the amygdala is released from inhibition, and labels the unpredictable occurrence with meaning. Anything unknown is dangerous and promising, simultaneously: evokes anxiety, curiosity, excitement and hope *automatically* and *prior to what we would normally regard as exploration or as (more context-specific) classification*. The operations of the amygdala are responsible *for ensuring that the unknown is regarded with respect, as the default decision*. The amygdala says, in effect – "if you don't know what it signifies, you bloody well better pay attention to it." Attention constitutes the initial stage of exploratory behavior, motivated by amygdalic operation – composed of the interplay between anxiety,[113] which impels caution in the face of novelty-threat, and hope, which compels approach to novelty-promise.[114] Caution-regulated approach allows for the update of memory, in the form of skill and representation. Exploration-updated memory inhibits the production of *a priori* affect. On familiar ground – in explored territory – we feel no fear (and comparatively little curiosity).

The desired output of behavior (what should be) is initially posited; if the current strategy fails, the approach and exploration system is activated,[115] although it remains under the governance of anxiety. The approach system (and its equivalent, in abstraction) generates (1) alternative sequences of behavior, whose goal is the production of a solution to the present dilemma; (2) alternative conceptualizations of the desired goal; or (3) re-evaluation of the motivational significance of current state. This means (1) that a new strategy for attaining the desired goal might be invented, or (2) that a replacement goal, serving the same function, might be chosen; or (3) that the behavioral strategy might be abandoned, due to the cost of its

implementation. In the latter case, the whole notion of what constitutes "reality" – *at least with regards to the story or frame of reference currently in use* – might have to be reconstructed. This most troublesome state of affairs is schematically presented – in its successful form – in ***Figure 9: The Regeneration of Stability from the Domain of Chaos.*** [116]

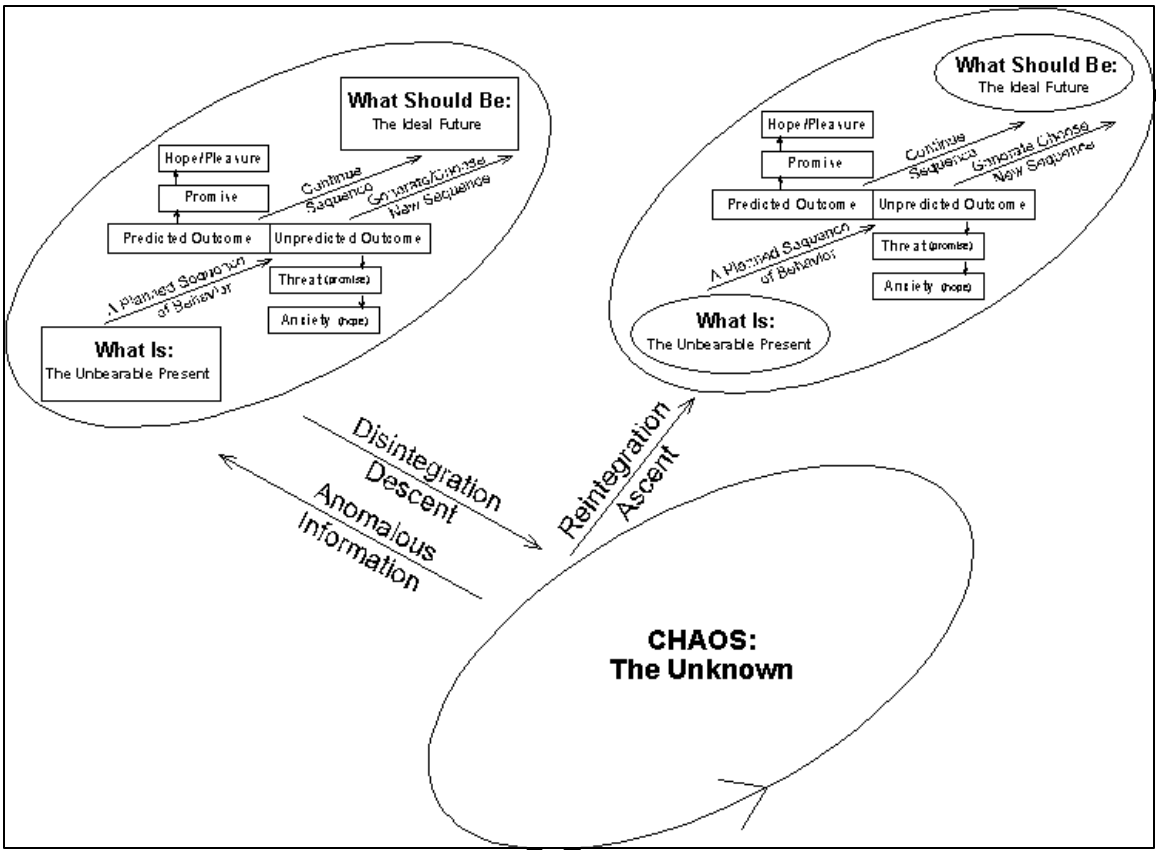

Figure 9: The Regeneration of Stability from the Domain of Chaos

Exploratory activity culminates "normally" in restriction, expansion, or transformation of the behavioral repertoire. In exceptional, non-normal circumstances – that is, when a "major error" has been committed – such activity culminates in "revolution": *in modification of the entire story guiding affective evaluation and behavioral programming*. Such revolutionary modification means update of modeled reality, past, present and future, through incorporation of information generated during exploratory behavior. Successful exploration transforms the unknown into the expected, desired and predictable; establishes appropriate behavioral measures (and expectations of those measures) for next contact. Unsuccessful exploration, by contrast – avoidance or escape – *leaves the novel object firmly entrenched in its initial, "natural," anxiety-provoking category*. This observation sets the stage for a fundamental realization: *human beings do not learn to fear new objects or situations, or even really "learn" to fear something that previously appeared safe, when it manifests a dangerous property*. Fear is *the a priori position*, the natural response to everything for which no structure of behavioral adaptation has been designed and inculcated. Fear is the *innate* reaction to everything that has not been rendered predictable, as a consequence of successful, creative exploratory behavior undertaken in its presence, at some time in the past. LeDoux states:

> "It is well established that emotionally neutral stimuli can acquire the capacity to evoke striking emotional reaction following temporal pairing with an aversive event. Conditioning does not create new emotional responses but instead simply allows new stimuli to serve as triggers capable of activating

existing, often hard-wired, species-specific emotional reactions. In the rat, for example, a pure tone previously paired with footshock evokes a conditioned fear reaction consisting of freezing behavior accompanied by a host of autonomic adjustments, including increases in arterial pressure and heart rate.[117] Similar responses are expressed when laboratory rats are exposed to a cat for the first time, but following amygdala lesions such responses are no longer present,[118] suggesting that the responses are genetically specified (since they appear when the rat sees a cat, a natural predator, for the first time) and involve the amygdala. The fact that electrical stimulation of the amygdala is capable of eliciting the similar response patterns[119] further supports the notion that the responses are hard-wired."[120]

Fear is not conditioned; security is unlearned, in the presence of particular things ("stimuli") or contexts, as a consequence of violation of explicit or implicit presupposition. Classical behavioral psychology is wrong – in the same manner our folk presumptions are wrong: fear is not secondary, not learned – security is secondary, learned. Everything not explored is tainted, *a priori*, with apprehension. Any thing or situation that undermines the foundations of the familiar and secure is therefore to be feared.[121]

It is difficult for us to formulate a clear picture of the subjective effects of the systems that dominate our initial response to the truly unpredictable, *because we strive with all our might to ensure that everything around us remains normal*. Under "normal" conditions, therefore, these primordial systems never operate, with their full force. It might be said, with a certain amount of justification, that we devote our entire lives to making sure that we never have to face anything unknown, in the revolutionary sense – *at least not accidentally*. Our success in doing so deludes us, so to speak, about the true nature, power, and intensity of our potential emotional responses. As civilized people, we are secure. We can predict the behaviors of others, around us (that is, if they share our stories); furthermore, we can control our environments well enough to ensure that our subjection to threat and punishment remains at a minimum. It is the cumulative consequences of our adaptive struggle – our cultures – which enable this prediction and control. The existence of our cultures, however, blinds us to the nature of our true (emotional) natures – at least to the range of that nature, and to the consequences of its emergence.

Experimental examinations of the orienting reflex have not shed much light on our true potential for emotional response, in the past, because they generally took place under exceptionally controlled circumstances. Subjects evaluated for their responses to "novelty" are generally presented with stimuli that are only novel in the most trivial – the most "normal" – of manners. A tone, for example, which differs unpredictably from another tone (or which appears at a relatively unpredictable time) is still a tone, something experienced, more-or-less, a thousand times before, and something experienced in a lab, in a hospital or university, under the jurisdiction of trustworthy personnel, devoted to minimizing the anxiety-provoking nature of the experimental procedure. The controlled circumstances of the experiment (which are, in fact, the implicit and therefore invisible theoretical presumptions of the experiment) have led us to minimize the importance of the orienting reflex, and to misunderstand the nature of its disappearance.

Orienting signifies "attention," not terror, in the standard lab situation, and its gradual elimination with repeated stimulus presentation is regarded as "habituation" – as something boring, akin to automatic acclimation, adjustment, or desensitization. "Habituation" is not a *passive process*, however – at least at higher cortical levels of processing. It just looks passive, *when observed under relatively trivial circumstances*. It is in reality always the consequence of active exploration and subsequent modification of behavior, or interpretive schema. The (relatively) novel target laboratory tone, for example, is investigated for its underlying structure by the cortical systems involved in audition. These systems actively analyze the component elements of every sound.[122] The subject is lead to "expect" or predict one sort of sound, and gets another. The unexpected other has indeterminate significance, in that particular context, and is therefore regarded as (comparatively) meaningful – threatening and promising. The unexpected tone is presented repeatedly. The exploratory subject notes that the repetitions signify nothing, in the context that defines the experimental situation (nothing punishing, satisfying, threatening or promising), and ceases to react. He has not merely "habituated" to the stimuli. He has mapped its context-dependent significance, which is zero. This process appears *trivial because the experimental situation makes it so*. In real life, it is anything but boring.

Classical work conducted on animal "emotion" and motivation has taken place under circumstances reminiscent of the artificially constrained situations that define most work on human orienting. Animals,

usually rats, are trained to be "afraid" – or to inhibit their behavior – in the presence of a "neutral stimulus" paired repeatedly with a punishment [a stimulus whose motivational valence is negative, in the supposed absence of learning (or, at least, in the absence of interpretation)]. The rat is placed in the experimental "environment," and is allowed to familiarize himself with his surroundings. The "neutral stimulus" he is faced with might be a light; the "unconditioned" stimulus, an electric shock. The light goes on; the floor of the rat's cage is briefly electrified. This sequence occurs repeatedly. Soon the rat "freezes" as soon as the light appears. He has developed a "conditioned response," manifesting behavioral inhibition (and fear, theoretically) to something that was previously neutral. Procedures of this sort effectively *produce* fear. Their implicit contextual constraints or axioms of these procedures, however, lead researchers to draw odd conclusions about the nature of the "acquisition" of fear.

Such experiments first imply that fear in a given situation is necessarily something learned. Second, they imply that fear exists, as a consequence of exposure to punishment, and only because of that exposure. The problem with this interpretation is that the rat was inevitably "afraid" as soon as he was placed in the new experimental environment – even though nothing terrible had yet happened there. After he is allowed to explore, he "calms down." It is only then that he is regarded as "normal." The experimenter then jars the rat out of his "acquired normalcy" by presenting him with something unexpected, and painful – the "unconditioned stimulus," in conjunction with the "neutral stimulus." He then "learns" to be afraid. Really what has happened is that the unexpected occurrence forces the rat to re-attain the state he was in (or that same state, in an exaggerated manner) when he first entered the cage. The fact of the electric shock, in conjunction with the light, indicates to the rat (reminds the rat) that he is, once again, in unexplored territory. His fear, in unexplored territory, is just as "normal" as his complacency in environments he has mapped, and which hold no danger. We regard the calm rat as the "real" rat because we project our misinterpretations of our own "habitual" nature, onto our experimental animals. It is as D.O. Hebb states:

> "[The urbanity characterizing ourselves,]… the civilized, amiable, and admirable part of mankind, well brought up and not constantly in a state of fear… depends as much on our successfully avoiding disturbing stimulation as on a lowered sensitivity [to fear-producing stimuli]…. [T]he capacity for emotional breakdown may [well] be self-concealing, leading [animals and human beings] to find or create an environment in which the stimuli to excessive emotional response are at a minimum. So effective is our society in this regard that its members – especially the well-to-do and educated ones – may not even guess at some of their own potentialities. One usually thinks of education, in the broad sense, as producing a resourceful, emotionally stable adult, without respect to the environment in which these traits are to appear. To some extent this may be true. But education can be seen as being also the means of establishing a protective social environment in which emotional stability is possible. Perhaps it strengthens the individual against unreasonable fears and rages, but it certainly produces a uniformity of appearance and behavior which reduces the frequency with which the individual member of the society encounters the causes of such emotion. On this view, the susceptibility to emotional disturbance may not be decreased. It may in fact be increased. The protective cocoon of uniformity, in personal appearance, manners, and social activity generally, will make small deviations from custom appear increasingly strange and thus (if the general thesis is sound) increasingly intolerable. The inevitable small deviations from custom will bulk increasingly large, and the members of the society, finding themselves tolerating trivial deviations well, will continue to think of themselves as socially adaptable."[123]

Our emotional regulation depends as much (or more) on the stability and predictability of the social environment (on the maintenance of our cultures) as on "interior" processes, classically related to the strength of the ego or the personality. Social order is a necessary precondition for psychological stability: it is our companions, and their actions (or inactions) that primarily stabilize – or destabilize – our emotions.

A rat (a person) is a complacent creature, when it is in explored territory. When it is in unexplored territory, however, it is anything but calm. A rat moved from its home cage to a new and unknown environment – a new cage, for example – will first freeze (even though it has never been punished, in the new situation). If nothing terrible happens to it (nothing punishing, threatening, or additionally unpredictable) it will begin to sniff, to look around, to move its head, to gather new information about the intrinsically frightening place it now inhabits. Gradually, it starts to move about. It will explore the whole

cage, with increasing confidence. It is mapping the new environment for affective valence. It "wants" to find out – is there anything here that will kill me? Anything here I can eat? Anyone else here – someone hostile, or friendly; a potential mate? The rat is interested in determining whether the new place contains anything of determinate interest to a rat, and it explores, to the best of its capacity, to make that judgment. It is not primarily interested in the "objective" nature of the new circumstances – a rat cannot actually determine what is objective, and what is merely "personal opinion." Nor does it care. It just wants to know what it should do.

What happens if an animal encounters something truly unexpected – something that should just not be, according to its current "frame of reference" or "system of belief"? The answer to this question sheds substantial light on the nature of the orienting reflex, in its full manifestation. Modern experimental psychologists have begun to examine the response of animals to natural sources of mystery, and threat. They allow the animals to set up their own environments, realistic environments, and then expose them to the kinds of surprising circumstances they might encounter, in "real life." The appearance of a predator, in previously "safe" space (space previously explored, that is, and mapped as useful or irrelevant) constitutes one type of realistic surprise. Blanchard and colleagues describe the naturalistic behavior of rats, under such conditions:

> "When a cat is presented to established mixed-sex groups of laboratory rats living in a visible burrow system, the behaviors of the subjects change dramatically, in many cases for 24 hours or more.[124] The initial active defensive behavior, flight to the tunnel/chamber system, is followed by a period of immobility during which the rats make 22 kHz ultrasonic vocalizations, which apparently serve as alarm cries, at a high rate.[125] As freezing breaks up, proxemic avoidance of the open area gradually gives way to a pattern of "risk assessment" of the area where the cat was encountered. Subjects poke their heads out of the tunnel openings to scan the open area where the cat was presented, for minutes or hours before emerging, and when they do emerge, their locomotory patterns are characterized by [behaviors that theoretically reduce their visibility and vulnerability to predators] and very short "corner runs" into and out of the open area. These risk assessment activities appear to involve active gathering of information about the possible danger source,[126] providing a basis for a gradual return to nondefensive behaviors.[127] Active risk assessment is not seen during early post-cat exposure, when freezing and avoidance of the open area are the dominant behaviors, but rises to a peak about 7-10 hours later, and then gradually declines. Nondefensive behaviors such as eating, drinking and sexual and aggressive activity tend to be reduced over the same period.[128,129]

The unexpected appearance of a predator, *where nothing but defined territory previously existed*, terrifies the rats – badly enough so that they "scream" about it, persistently, for a long period of time. Once this initial terror abates – which only occurs if nothing else horrible or punishing happens – curiosity is disinhibited, and the rats return to the scene of the crime. The space "renovelized" by the fact of the cat has to be transformed once again into explored territory – *as a consequence of active modification of behavior (and representational schema), not by passive desensitization to the unexpected*. The rats run across the territory "contaminated" by the presence of the cat, to find out if anything dangerous (to running rats) still lurks there. If the answer is "no," then the space is defined, once again, as home territory (which is that place where commonplace behaviors produce desired ends). The rats transform the dangerous unknown into familiar territory, as a consequence of voluntary exploration. In the absence of such exploration, terror reigns unchecked.

It is just as illuminating to consider the responses of rats to their kin – who constitute "explored territory" – in contrast to their attitude towards "strangers," whose behavior is not predictable. Rats are highly social animals, perfectly capable of living with their familiar compatriots in peace. They do not like members of other kin groups, however; will hunt them down and kill them. Accidental or purposeful intruders are dealt with in the same manner. Rats identify one another by smell. If an experimenter removes a well-loved rat from its familial surroundings, scrubs it down, provides it with a new odor, and returns it to its peers – it will be promptly dispatched, by those who once loved it. The "new" rat constitutes "unexplored territory;" his presence is regarded as a threat (not unreasonably) to everything currently secure.[130] Chimpanzees – perfectly capable of killing "foreign devils" (even those who were once familiar) – act in much the same manner.[131]

2.2.4. Explored Territory: Phenomenology and Neuropsychology

When we explore, we transform the indeterminate status and meaning of the unknown thing that we are exploring into something determinate – in the worst case, rendering it non-threatening, non-punishing; in the best, manipulating and/or categorizing it so that it is useful. Animals perform this transformation in the course of actual action, which is to say that they construct their worlds by shifting their positions and changing their actions in the face of the unknown, and by mapping the consequences of those shifts and changes in terms of their affective or motivational valence. When an animal encounters an unexpected situation, such as a new object placed in its cage, it first freezes, watching the object. If nothing terrible happens, while it is immobile – nothing punishing, or additionally threatening – it moves, slowly and at a distance, monitoring the thing for its reactions to these cautious exploratory activities. Perhaps the animal sniffs at the thing, or scratches at it – trying to determine what it might be good (or bad) for. It maps the utility and valence of the object, conceived in relationship to its ongoing activity (and, perhaps, to possible patterns of activity in the future). The animal builds its world of significances from the information generated in the course of – as a consequence of – ongoing exploratory behavior. The application of experimental search programs, drawn primarily from the reservoir of learned (imitated) and instinctual behavior, or manifested as trial and error, involves behavioral alteration (exploration, play) and subsequent transformation of sensory and affective input. When an animal actively explores something new, it changes the sensory quality and motivational significance of that aspect of its experience, as a consequence of its exploratory strategy. This means that the animal exhibits a variety of behaviors in a given mysterious situation and monitors the results. It is the organized interpretation of these results, and the behaviors that produce them, *that constitute the world*, past, present and future, of the animal (in conjunction with the unknown, of course – which constantly supersedes the capacity for representation).

It is not too much to say that the animal elicits the properties of the object, sensory and affective, (or even brings them into being) through its capacity for creative investigation.[132] Animals that are relatively simple – compared, say, to higher-order primates, including man – are limited in the behaviors they manifest by the structure of their physiology. A rat cannot pick anything up, for example, to examine it in detail – and does not in addition have the visual capacity to focus intensely on the kinds of tiny features we can perceive. Higher-order nonhuman primates have a more developed grip, however, which enables more detailed exploration, and, in addition, have a relatively sophisticated prefrontal cortex. This means that such primates can evoke more features from the world, directly, and that they are increasingly capable of modelling and acting. The prefrontal cortex is the newest part of the motor unit, and "grew" out of the direct motor control centers, in the course of cortical evolution.[133] More sophistication in development of the prefrontal centers means – in part – heightened capability for *abstract* exploration, which means investigation in the absence of actual movement, which means the capacity to learn from the observation of others and through consideration of potential actions before they emerge in behavior. This means increasing capability for *thought* – considered as abstracted action and representation.[134] Action and thought produce phenomena. Novel acts and thoughts produce new phenomena. Creative exploration, concrete and abstract, is therefore linked in a direct sense to being. Increased capacity for exploration means existence in a qualitatively different – even new – world. This entire argument implies, of course, that more complex and behaviorally flexible animals inhabit ("construct," if you will[135]) a more complex universe.

Humans possess cortical development – prefrontal and otherwise – that is unique in terms of its great mass and, more importantly, in terms of its structure. Various indices of development have been used to signify the nature of the relationship between the brain and intelligence. Sheer mass is one measure, degree of surface convolution another. The former measure is contaminated by size of animal. Larger animals tend to have more absolutely massive brains. This does not necessarily make them smarter. Brain mass corrected for body size constitutes the encephalization quotient, a common rough measure of animal intelligence.[136] Degree of surface convolution constitutes an additionally useful measure. The grey matter of the brain – which theoretically does much of the work associated with intelligence – occupies the brain's surface, which has been dramatically increased in area by folding. Some representatives of the *cetacean* family (dolphins and whales) have encephalization quotients similar to and brain surfaces more convoluted than

man's[137] – although the thickness of the cetacean neocortex is about half that of the human.[138] Consideration of this high level of nervous development has led to speculation about the potential superhuman range of cetacean ability.[139] However, it is structure and organization of cortex, not simply mass, or even relative mass, or even surface area, that most clearly defines the nature and reach of a species' experience and competence. More particularly, it is embodiment of the brain that matters. Brain structure necessarily reflects embodiment – despite the archaic presumption of the independence of spirit and matter (or soul and body, or mind and body) – because the body is, in a primary sense, the environment to which the brain has adapted.

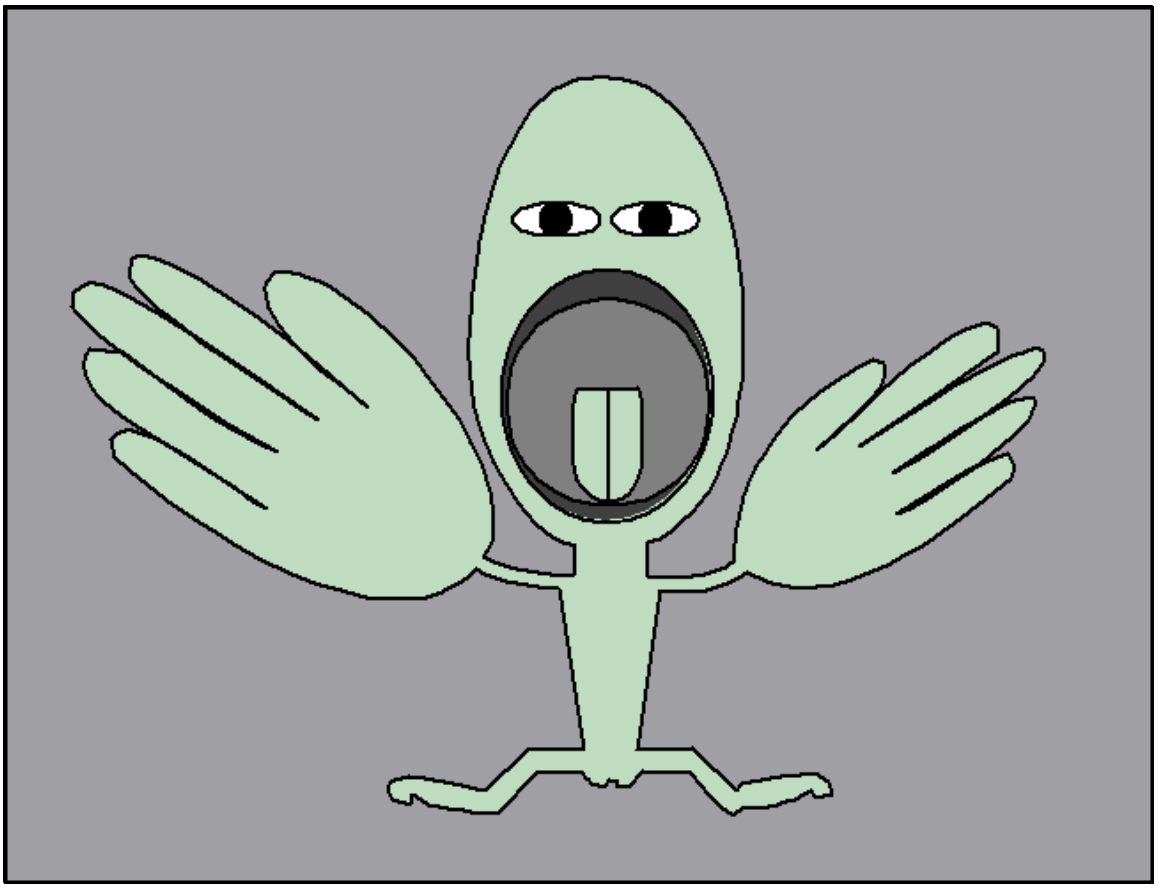

Figure 10: The Motor Homunculus

The body is specifically represented in the neocortex. This representation is often given schematic form as the *homunculus*, or "little man." The homunculus was "discovered" by Wilder Penfield,[140] who mapped the surface of the cortices of his neurosurgical patients, by stimulating them electrically, painstakingly, point after point. He did this to find out what different sections of the brain were doing, so that he could do the least damage possible, when attempting to surgically treat epilepsy or cancer or other forms of brain abnormality. He would probe the surface of the brain of one of his (awake) patients with an electrode (patients undergoing neurosurgery are frequently awake, as the brain feels no pain) and monitor the results, either directly, or by asking the patient what he or she experienced. Sometimes such stimulation would produce visions, sometimes elicit memories – other times, produce movement or sensations. Penfield determined, in this manner, how the body was mapped onto the central nervous system – how it was incarnated, so to speak, in intrapsychic representation. He established, for example, that homunculi come in

two forms, motor and sensory – the former associated with the primary zone of the motor unit; the latter associated with the primary zone of the sensory area of the sensory unit. It is the motor form – represented schematically in ***Figure 10: The Motor Homunculus*** – which is of most interest to us, because our discussion centers on motor output. The motor homunculus is a very odd little "creature." Its face (particularly mouth and tongue) and hands (particularly thumbs) are grossly disproportionate to the rest of its "body." This is because comparatively large areas of the motor (and sensory, for that matter) cortex are given over to control of the face and hands, which are capable of an immense number of complex and sophisticated operations. The motor homunculus is an interesting figure. It might be regarded as the body, insofar as the body has anything to do with the brain. It is useful to consider the structure of the homunculus, because it is in some profound way representative of our essential nature, as it finds expression in emotion and behavior.

It is the most outstanding characteristic of the motor homunculus, for example – the hand, with its opposable thumb – that is simultaneously the defining feature of the human being. The ability to manipulate and explore characteristics of objects, large and small – restricted as a general capacity to the highest of primates – sets the stage for elicitation of an increased range of their properties, for their utilization as tools (for more comprehensive transformation of their infinite potential into definable actuality). The hand, used additionally to duplicate the action and function of objects, also allows first for imitation (and pointing), and then for full-blown linguistic representation.[141] Used for written language, the hand additionally enables long-distance (temporal and spatial) transfer of its ability to another (and for the elaboration and extension of exploration, during the process of writing, which is hand-mediated thinking). Even development of spoken language, the ultimate analytic motor skill, might reasonably be considered an abstract extension of the human ability to take things apart, and then to reassemble them, in an original manner. Interplay between hand and brain has literally enabled the individual to change the structure of the world. Consideration of the structure and function of the brain must take this primary fact into account. A dolphin or whale has a large, complex brain – a highly developed nervous system – but it cannot shape its world. It is trapped, so to speak, in its streamlined test-tube like form, specialized for oceanic life. It cannot directly alter the shape of its material environment in any complex manner. Its brain, therefore, is not likely prepared to perform any traditionally "creative" function (indeed – as one would suspect – lacks the sophisticated structuring characteristic of primate brains[142]).

It is not just the hand, however, that makes the crucial human difference, although it is the most obvious, and perhaps the most important, single factor. It is more a style or melody of adaptation that characterizes the individual human being. This style is adaptation for exploration of the unknown, within a social context – for the (speech-mediated) creation, elaboration, remembrance, description and subsequent communication of new behavioral patterns, and for the representation of the (frequently novel) consequences of those patterns. The hand itself was rendered more useful by the development of vertical stance, which extended visual range, and freed the upper body from the demands of locomotion. The fine musculature of the face, lips, and tongue – over-represented, once again, in the motor homunculus – helped render subtle communication possible. Development of explicit language extended the power of such communication immensely. Increasingly detailed exchange of information enabled the resources of all to become the resources of each, and vice versa. That process of feedback greatly extended the reach and utility of the hand – in fact provided every hand with the ability, at least in potential, of every other hand, extant currently or previously. Evolution of the restricted central field of the eye, which has input expanded 10,000 times in the primary visual area, and is additionally represented, interhemispherically, at several higher-order cortical sites,[143] was of vital importance to development of visual language, and enabled close observation, made gathering of detailed information simpler. Combination of hand and eye enabled *homo sapiens* to manipulate things, to a degree qualitatively different from that of any other animal. The individual can discover what things are like, under various, voluntarily produced or accidentally encountered (yet considered) conditions – upside down, flying through the air, hit against other things, broken into pieces, heated in fire, and so on. The combination of hand and eye allowed human beings to experience and analyze the (emergent) nature of things. This ability, revolutionary as it was, was dramatically extended by application of hand-mediated, spoken (and written) language.

The human style of adaptation extends from the evidently physical to the more subtly psychological, as well. The phenomenon of consciousness, for example – arguably the defining feature of man – appears

related in some unknown fashion to breadth of cellular activation in the neocortex. Bodily features with large areas of cortical representation are also therefore more thoroughly represented in consciousness (at least in potential). This can be made immediately evident to subjective awareness merely by contrasting the capacity for control and monitoring of the hand, for example, with the much-less-represented expanse of the back. Consciousness also evidently expands or sharpens during the course of activities designed to enhance or expand adaptive competence – during the course of creative exploration. Processing of novel or otherwise interesting sensory information, associated with the orienting complex, heightened awareness and focused concentration, activates large areas of neocortex. Similarly, increased cortical mobilization takes place during the practice phase of skill acquisition, when awareness appears required for development of control. The area of such engagement or mobilization shrinks in size as movement becomes habitual and unconscious, or when sensory information loses interest or novelty.[144] Finally – as we have noted before – intrinsic pleasure of an intense nature appears to accompany activation of the cortical systems activated during psychomotor exploratory activity, undertaken in the face of the unknown. The operation of these systems appears mediated in part by the neurotransmitter dopamine[145] – involved in producing subjective and behavioral response to cues of reward, in the form of hope, curiosity and active approach.

Human beings enjoy capacity for investigation, classification and consequent communication, which is qualitatively different from that characterizing any other animal. The material structure of *Homo sapiens* is ideal for exploration, and for the dissemination of the results thereof; spiritually – psychologically – man is characterized by the innate capacity to take true pleasure in such activity. Our physical attributes – what we are (the abilities of the hand, in combination with the other physiological specializations of man) – define who we are, and enable us to endlessly elicit new properties from previously stable and predictable elements of experience. The object – any object – serves us as a source of limitless possibility (or, at least, possibility limited only by the capacity for exploratory genius exhibited at any particular moment). Simple animals perform simple operations, and inhabit a world whose properties are equally constrained (a world where most "information" remains "latent"). Human beings can manipulate – take apart and put together – with far more facility than any other creature. Furthermore, our capacity for communication – both verbal and nonverbal – has meant almost unbelievable facilitation of exploration, and subsequent diversity of adaptation.

Thinking might in many cases be regarded as the abstracted form of exploration – as the capacity to investigate, without the necessity of direct motoric action. Abstract analysis (verbal and nonverbal) of the unexpected or novel plays a much greater role for humans than for animals[146] – a role that generally takes primacy over action. It is only when this system fails partially or completely in humans – or when it plays a paradoxical role (amplifying the significance or potential danger of the unknown through definitive but "false" negative labelling) – that active exploration (or active avoidance), with its limitations and dangers, becomes necessary. Replacement of potentially dangerous exploratory action with increasingly flexible and abstracted thought means the possibility for growth of knowledge without direct exposure to danger – and constitutes one major advantage of the development of intelligence. The abstract intelligence characteristic of the human being developed in parallel with rapid evolution of the brain – rapid shift in quantity and quality. We can communicate the results and interpretations of our manipulations (and the nature of the procedures that constitute that manipulation) to each other, across immense spatial and temporal barriers. This capacity for exploration, verbal elaboration and communication of such in turn dramatically heightens our capacity for exploration (as we have access to all communicated strategies and interpretive schemas, accumulated over time, generated in the course of the creative activity of others). In terms of normal parlance, this would mean merely that we have been able to "discover" more aspects of the world. It seems to me more accurate, however, to recognize the limitations of this perspective, and to make room for the realization that new procedures and modes of interpretation literally produce new phenomena. The *word* enables differentiated thought, and dramatically heightens the capacity for exploratory maneuvering. The world of human experience is constantly transformed and renewed as a consequence of such exploration. In this manner, the word constantly engenders new creation.

The capacity to create novel behaviors and categories of interpretation in response to the emergence of the unknown might be regarded as the primary hallmark of human consciousness – indeed, of human being. Our engagement in this process literally allows us to carve the world out of the undifferentiated mass of unobserved and unencountered "existence" – a form of existence which exists only hypothetically, as a

necessary fiction; a form about which nothing can be experienced, and less accurately stated. We "carve" out the world as a consequence of our direct interactions with the unknown – most notably, with our hands, which enable us to manipulate things, to change their sensory aspects and, most importantly, to change their importance to us, to give them new, more desirable *value*. The capacity for dextrous manipulation is particularly human, and has enabled us to radically alter the nature of our experience. Equally particular, however, is our capacity for abstract exploration, which is thought about action (and its consequences), in the absence of action (and its consequences). The manner in which we conduct our abstracted exploration appears as tightly linked to the physiological structures of our brains as the manner in which we move, while exploring. In novel circumstances, our behavioral output is mediated by the systems that govern fear, and appropriate inhibition, and hope, and appropriate activation. The same things happen when we think abstractly – even when we think about how others think.[147]

Animal exploration is primarily motor in nature. An animal must move around an unfamiliar thing or situation to come to any understanding of it – to determine its affective relevance and sensory nature. This process of moving around experimentally appears as a consequence of the interaction between the mutually regulatory or inhibitory evaluative systems whose responsibilities are identification of potential danger, or threat, and potential satisfaction, or promise. In the human case, each of these systems apparently comes, in the course of normal development, to dominate one of our twinned cortical hemispheres: the *right* governs response to threat (and to punishment), while the *left* controls response to promise and, perhaps (although much less clearly) to satisfaction.[148] This basically means that the right hemisphere governs our initial responses to the unknown, while the left is more suited for actions undertaken while we know what we are doing. This is in part because everything thoroughly explored has in fact been rendered either promising or satisfying (or, at least, irrelevant). If threat or punishment still lurks somewhere – that is, somewhere we must be – our behavioral adaptation is, by definition, insufficient (and the unexpected has not been vanquished). We have been unable to modify our actions to elicit from the "environment" – really, from the "unknown" – those consequences we wish to produce.

Richard Davidson and his colleagues have been investigating the relationship between different patterns of cortical electrical activity and mood states, in adults and children. Davidson et al. have concluded that the twin hemispheres of the human brain are differentially specialized for affect – at least with regards to their frontal regions. Signs of positive affect (like genuine smiling in infants) are accompanied by heightened comparative activation of the left frontal cortex. Negative states of affect (like those occuring in chronic depression), by contrast, are accompanied by heightened activation of the right frontal hemisphere.[149] Substantial additional evidence exists to support this general claim. To put it most fundamentally: it appears that the twin hemispheres of the brain are differentially specialized (1) for operation in unexplored territory, where the nature and valence of things remains indeterminate, and (2) for operation in explored territory, where things have been rendered either irrelevant or positive, as a consequence of previous exploration. Our brains contain two emotional systems, so to speak – one functions when we do not know what to do, and initiates the (exploratory) process that creates secure territory; the other functions when we are in fact secure. The fact of the presence of these two subsystems, but not their "locale," has been known for a good while; Maier and Schnierla[150] and Schnierla[151] hypothesized more than five decades ago that mechanisms of "withdrawal" and "approach" (characteristic of animals at virtually all levels of the evolutionary scale) provided the foundation for motivation, as such. The nature of these two systems can best be understood by relating emotional state to motor activity, as we have done previously.

Each hemisphere, right and left, appears to have what might be described as a *family* of related functions, portrayed in ***Figure 11: The Twin Cerebral Hemispheres and their Functions***. The right hemisphere, less language-fluent than its generally more dominant twin, appears specialized for the inhibition and extinction of behavior (and, therefore, for the production of negative emotion), for generation and manipulation of complex visual (and auditory) images, for coordination of gross motor actions, and for rapid and global recognition of patterns.[152] The right hemisphere appears to come "on-line" when a particular situation is rife with uncertainty – appears particularly good at governing behavior when what *is*, and *what to do*, has not yet been clearly specified.[153] It might be posited, in consequence, *that this hemisphere is still under limbic control* – since the limbic system is responsible for detecting novelty and initiating exploratory behavior. This archaic control mechanism would then "drive" the processes of

imagistic "hypothesis" generation that constitute the processes of abstract exploration – fantasy – we use to give determinate (and oft-bizarre) form to the unknown.

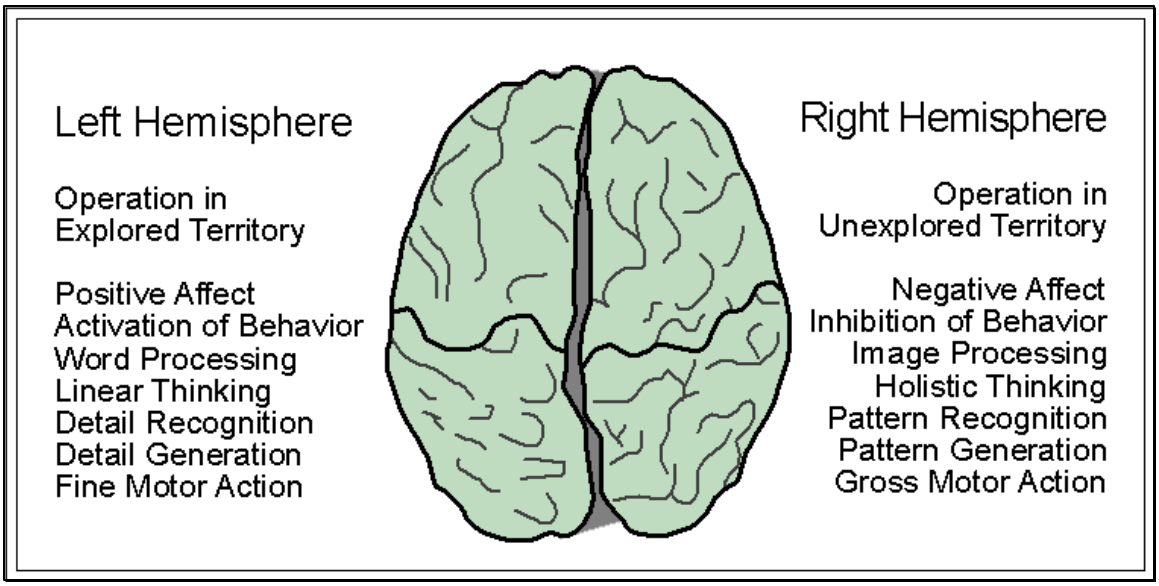

Figure 11: The Twin Cerebral Hemispheres and their Functions

The left hemisphere, by contrast, appears particularly skilled at linguistic processing and communication, at detailed, linear thinking, at fine motor skill, and at the comprehension of wholes in terms of their constituent elements.[154] The left hemisphere – particularly its frontal or motor (sub)unit – also governs approach behavior,[155] in the presence of cues of satisfaction, is integrally involved in the production of positive affect, and appears particularly good at carrying out practiced activities, at applying familiar modes of apprehension. The left seems at its best when what *is* and *what should be done* are no longer questions; when tradition governs behavior, and the nature and meaning of things has been fixed. The dual specialization of the left – for what has been practiced, and for what is positive – can be understood, in part, in the following manner: positive affect rules in known territory, by definition: a thing or situation has been explored most optimally (and is therefore most well known) if it has been transformed by behavioral adaptations manifested in its presence into something of determinate use (or satisfaction) or into potential for such (into promise).

The right hemisphere, in contrast to the left, appears to have remained in direct contact with – appears specialized for encounter with – the *unknown* and its terrors, which are apperceived in the domain of instinct, motivation, and affect, long before they can be classified or comprehended intellectually. The right hemisphere's capacity for inhibition and extinction of behavior (for inducing caution during exploration, for governing flight, for producing negative affect) ensures that due respect is granted the inexplicable (and therefore dangerous) when it makes its appearance. The right's aptitude for global pattern recognition (which appears as a consequence of its basic neurophysiological structure[156]) *helps ensure that a provisional notion (a fantastic representation) of the unknown event (what it is like, how action should be conducted in its presence, what other things or situations it brings to mind) might be rapidly formulated*. The right hemisphere appears integrally involved in the initial stages of analysis of the unexpected or novel – and its *a priori* hypothesis is always this: *this (unknown) place, this unfamiliar space, this unexplored territory is* dangerous*, and therefore partakes in the properties of all other known dangerous places and territories, and all those that remain unknown, as well*. This form of information-processing – "a" is "b" – is metaphor; generation of metaphor (key to the construction of narratives – dreams, dramas, stories and

myth) might well be regarded as the first stage of hypothesis construction. As situation-specific adaptive behaviors are generated, as a consequence of exploration, this provisional labelling or hypothesis (or fantasy) might well undergo modification (assuming nothing actually punishing or determinately threatening occurs); such modification constitutes further and more detailed learning. Anxiety recedes, in the absence of punishment or further threat (including novelty); hope occupies the affective forefront, accompanied by the desire to move forward, and to explore (under the governance of the left hemisphere).

The right hemisphere appears capable of dealing with less determinate information; can use forms of cognition that are more diffuse, more global,[157] and more encompassing to come to terms initially with what cannot yet be understood, but which undeniably exists. It uses its capacity for massive generalization and comprehension of imagery to place the novel stimulus in an initially meaningful context, which is the *a priori* manner of appropriate categorization. This context is defined by the motivational significance of the novel thing, which is revealed first by the mere fact of novelty (which makes it both threatening and promising) and then in the course of its detailed exploration – and not by its objective sensory qualities (at least not primarily). The right hemisphere remains concerned with answering the questions: "what is this new thing like?" and this means – "what should be done in the presence of this unexpected occurrence?" not "what is this thing objectively?" "What is the new thing like?" (which is a question about its fundamental nature) means "is it dangerous, or threatening (first and foremost), satisfying or promising?' [although each of these basic categories of affective value can be subdivided more particularly (can it be eaten? can it eat me? will it serve as mate?)]. Categorization according to valence means that the thing is what it signifies for behavior.

The chaos that constitutes the unknown is rendered predictable – is turned into the "world" – by the generation of adaptive behaviors and modes of representation. It is the process of novelty-driven exploration that, in the individual case, produces such behaviors and strategies of classification. However, we are not only individuals; we exist in a very complex social environment – an environment characterized by the constant exchange of information, regarding the means and ends of "proper" adaptation. The human capacity for the generation of self-regulatory behavior and representation has been expanded immensely – expanded in some ways, beyond our own comprehension – by our capacity for verbal and non-verbal (primarily mimetic[158]) communication. We can mimic – and learn from – everyone who surrounds us, and who we can directly contact. In addition, we can obtain information from everyone who can write – assuming we are literate – or who could write, when they were alive. But there is more – we can also learn from everyone who can act, in the natural course of things, or dramatically, and we can also store the behaviors of individuals we come into contact with (directly, by copying them; or indirectly, through the intermediation of narrative and dramatic art forms). Furthermore, our capacity for copying – for mimesis – means that we are capable of doing things that we do not necessarily "understand" (that is, cannot describe explicitly). It is for that reason, in part, that we need a "psychology."

Patterns of behavioral and representational adaptation are generated in the course of active exploration and "contact with the unknown." These patterns do not necessarily remain stable, however, once generated. They are modified and shaped – improved and made efficient – as a consequence of their communicative exchange. Individual "a" produces a new behavior; "b" modifies it, "c" modifies that, "d" radically changes "c's" modification – and so on, *ad infinitum*. The same process applies to representations (metaphors, say, or explicit concepts). This means that our exploratory assimilative and accomodative processes actually extend over vast periods of time and space (as anyone who has had a document-mediated "conversation" with a great figure of the past is sure to appreciate). Some of this "extension" – perhaps the most obvious part – is mediated by literacy. An equally complex and subtle element, however, is mediated by mimesis.

Patterns of behavioral adaptation and schemas of classification or representation can be derived from the observation of others (and, for that matter, from the observation of oneself). How we act in the presence of things, in their constantly shifting and generally social context, is what those things mean (or even what they are), before what they mean (or what they are) can be more abstractly (or "objectively") categorized. What a thing is, therefore, might be determined (in the absence of more useful information) by examination of how action is conducted in its presence – which is to say that if someone runs from something it is safe to presume that the thing is dangerous (the action in fact defines that presumption). The observation of action patterns undertaken by the members of any given social community – including those of the observing subject – therefore necessarily allows for the derivation and classification of provisional value

schema. If you watch someone (even yourself) approach something then you can assume that the approached thing is good, at least in some determinate context – even if you don't know anything else about it. Knowing what to do, after all, is classification, before it is abstracted: classification in terms of motivational relevance, with the sensory aspects of the phenomena serving merely as a cue to recall of that motivational relevance.[159]

It is certainly the case that many of our skills – and our automatized strategies of classification – are "opaque" to explicit consciousness. The fact of our multiple memory systems, and their qualitatively different modes of representation – described later – ensures that such is the case. This opaqueness means, essentially, that we "understand" more than we "know"; it is for this reason that psychologists continue to depend on notions of the "unconscious" to provide explanations for behavior. This unconsciousness – the psychoanalytic god – is our capacity for the implicit storage of information about the nature and valence of things. This information is generated in the course of active exploration, and modified – often unrecognizably – by constant, multigenerational, interpersonal communication. We live in social groups; most of our interactions are social in nature. We spend most of our time around others and, when we are alone, we still wish to understand, predict and control our personal behaviors. Our maps of the "understood part of the world" are therefore in large part *maps of patterns of actions* – of *behaviors* established as a consequence of creative exploration, and modified in the course of endless social interactions. We watch ourselves act; from this action, we draw inferences about the nature of the world (including *those acts that are part of the world*).

We know that the right hemisphere – at least its frontal portion – is specialized for response to punishment and threat. We also know that damage to the right hemisphere impairs our ability to detect patterns and to understand the meaning of stories.[160] Is it too much to suggest that the emotional, imagistic and narrative capabilities of the right hemisphere play a key role in the initial stages in the process of transforming something novel and complex – such as the behaviors of others (or ourselves) and the valence of new things – into something thoroughly understood? When we encounter something new, after all, we generate fantasies (imagistic, verbal) about its potential nature. This means we attempt to determine how the unexpected thing might relate to something we have already mastered – or, at least, to other things that we have not yet mastered. To say "this unsolved problem appears to be like this other problem we haven't yet solved" is a step on the way to solution. To say, "here is how these (still essentially mysterious) phenomena appear to hang together" is an intuition, of the sort that precedes detailed knowledge – is the capacity to see the forest, though not yet differentiating between the types of trees. Before we truly master something novel (which means, before we can effectively limit its indeterminate significance to something predictable, even irrelevant) we *imagine* what it might be. Our imaginative representations actually constitute our initial adaptations – constitute part of the structure that we use to inhibit our responses to the *a priori* significance of the unknown – even as they precede the generation of more detailed and concrete information. There is no reason to presuppose that we have been able to explicitly comprehend this capacity – in part because it actually seems to *underly (to serve as a necessary or axiomatic precondition for) our ability to understand, explicitly*.

It appears that the pattern-recognition and spatial capacities of the right hemisphere appear to allow it to derive from repeated observations of behavior *images of action patterns* that the verbal left can arrange, with increasingly logic and detail, into *stories*. A story is a map of meaning, a "strategy" for emotional regulation and behavioral output – a description of how to act in a circumstance, to ensure that the circumstance retains its positive motivational salience (or at least has its negative qualities reduced to the greatest possible degree). The story appears generated, in its initial stages, by the capacity for imagery and pattern recognition characteristic of the right hemisphere, which is integrally involved in narrative cognition,[161] and in processes that aid or are analogous to such cognition: the ability to decode the nonverbal and melodic aspects of speech, to empathize (or to engage, more generally, in interpersonal relationships), and the capacity to comprehend imagery, metaphor, and analogy.[162] The left-hemisphere "linguistic" systems "finish" the story: adding logic, proper temporal order, internal consistency, verbal representation, and possibility for rapid abstract explicit communication. In this way, our explicit knowledge of value is expanded, through the analysis of our own "dreams." Interpretations that "work" – that is, that improve our capacity to regulate our own emotions (to turn the current world into the desired

world, to say it differently) *qualify as valid*. It is in this manner that we verify the accuracy of our increasingly abstracted presumptions.

The process of creative exploration – the function of the *knower*, so to speak, who generates explored territory – has as its apparent purpose increase in the breadth of motoric repertoire (skill) and alteration of representational schema. Each of these two purposes appears served by the construction of a specific form of knowledge, and its subsequent storage in permanent memory. The first form has been described as *knowing how*. The motor unit, charged with origination of new behavioral strategies when old strategies fail (when they produce undesired results), produces alternate action patterns, experimentally applied, to bring about the desired result. Permanent instantiation of the new behavior, undertaken if the behavior is successful, might be considered development of new *skill*. *Knowing how* is skill. The second type of knowing, which is representational (which is an *image or model of something*, rather than the thing itself) has been described as *knowing that*[163] – I prefer *knowing what*. Exploration of a novel circumstance, event, or thing, produces new sensory and affective input, during active or abstracted interaction of the exploring subject and the object in question. This new sensory input constitutes grounds for the construction, elaboration and update of a permanent but modifiable four-dimensional (spatial and temporal) representational model of the experiential field, in its present and potential future manifestations. This model, I would propose, is a story.

It is the hippocampal system – which, as we have seen, is an integral part of the regulation of anxiety – that is critically involved in the transfer of information from observation of ongoing activity to permanent memory,[164] and that provides the physiological basis (in concert with the higher cortical structures) for the development and elaboration of this mnestic representation. It is the right hemisphere, which is activated by the unknown, and which can generate patterns rapidly, that provides the initial imagery – the contents of fantasy – for the story. It is the left hemisphere that gives these patterns structure and communicability (as it does, for example, when it interprets a painting, a novel, a drama, a conversation – or a dream). The hippocampus notes mismatch; this disinhibits the amygdala (perhaps not directly). Such disinhibition "releases" anxiety and curiosity, driving exploration. The right hemisphere, under these conditions of motivation, derives patterns relevant to encapsulation of the emergent unknown, from the information at its disposal. Much of this information can be extracted from the social environment, and the behavioral interactions and strategies of representation – emergent properties of exploration and communication –that are "embedded" in the social structure. Much of this "information" is still implicit – that is, coded in behavioral *pattern*. It is still *knowing how*, before it has been abstracted and made explicit as knowing what. The left-hemisphere gets increasingly involved, as translation "up the hierarchy of abstraction" occurs.

Knowing-how infovmation, described alternatively as *procedural*, habitual, dispositional, or skilled, and *knowing-what* information, described alternatively as *declarative*, episodic, factual, autobiographical, or representational, appear physiologically distinct in their material basis, and separable in course of phylo- and ontogenetic development.[165] Procedural knowledge develops long before declarative knowledge, in evolution and individual development, and appears represented in "unconscious" form, expressible purely in performance. Declarative knowledge, by contrast – knowledge of what – simultaneously constitutes consciously accessible and communicable episodic imagination (the world in fantasy) and subsumes even more recently developed semantic (linguistic) knowledge, whose operations, in large part, allow for abstract representation of the contents of the imagination, and communication thereof. Squire and Zola-Morgan[166] have represented the relationship between these memory forms according to the schematic of ***Figure 12: The Multiple Structure of Memory***.[167] The neuroanatomical basis of *knowing how* remains relatively unspecified. Skill generation appears in part as the domain of the cortical pre/motor unit; "storage" appears to involve the cerebellum. Knowing *what*, by contrast, appears dependent for its existence on the intact function of the cortical sensory unit, in interplay with the hippocampal system.[168] Much of our knowing *what*, however – our description of the world – *is about knowing how*, which is behavioral knowledge – wisdom. Much of our descriptive knowledge – representational knowledge – is representation of what constitutes wisdom (without being that wisdom, itself). We have gained our description of wisdom by *watching how we act, in our culturally-governed social interactions, and by representing those actions.*

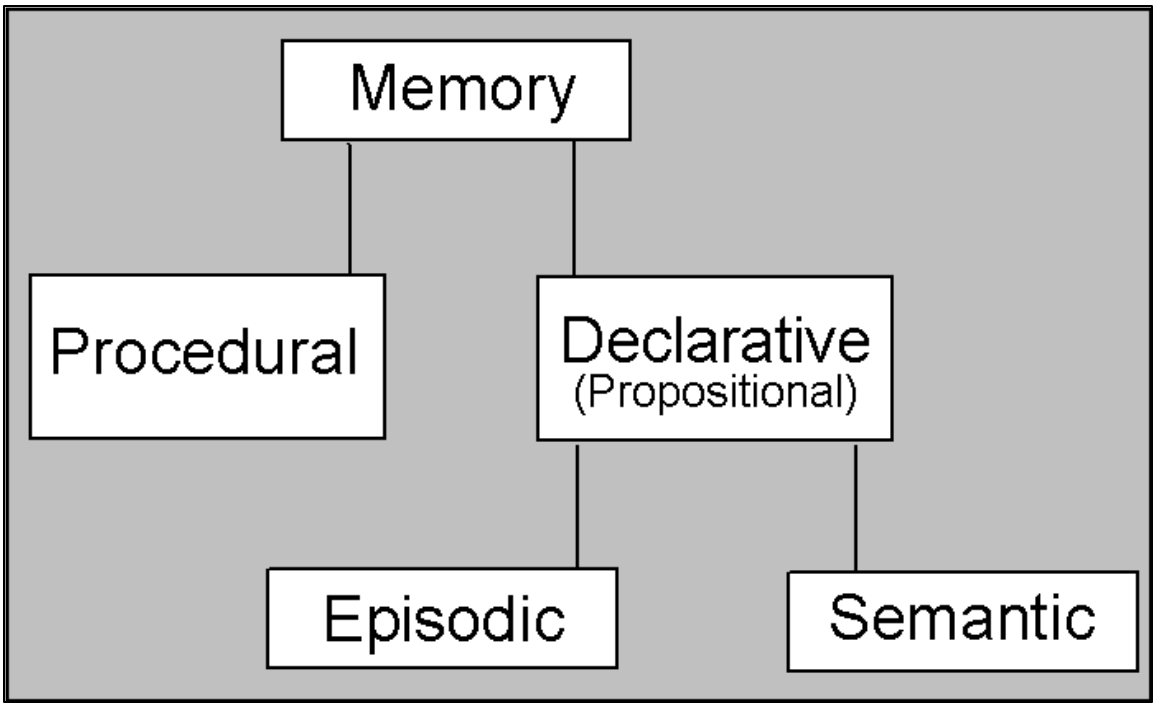

Figure 12: The Multiple Structure of Memory

We know *how*, which means how to act to transform the mysterious and ever-threatening world of the present into what we desire, long before we *know how* we know how, or *why* we know how. This is to say, for example, that a child learns to *act* appropriately (assuming it does) long before it can provide abstracted explanations for or descriptions of its behavior.[169] A child can be "good," without being a moral philosopher. This idea echoes the developmental psychologist Jean Piaget's notion, with regards to child development, that adaptation at the sensorimotor level occurs prior to – and lays the groundwork for – the more abstracted forms of adaptation that characterize adulthood. Piaget regarded *imagistic representation* as an intermediary between sensorimotor intelligence and the (highest or most abstract) stage of "formal operations"; furthermore, he believed that imitation – the "acting out" of an object – served as a necessary prerequisite to such imagistic representation (portrayal in image or word, instead of behavior). The process of *play* appears as a higher-order, or more abstract form of imitation, from this perspective. Piaget presents two main theses:

> "The first is that in the field of play and imitation it is possible to trace the transition from sensory-motor assimilation and accomodation to the mental assimilation and accomodation which characterize the beginnings of representation.... [The second is that] the various forms of representation interact. There is representation when an absent model is imitated. There is representation in symbolic play, in imagination and even in dreams, the systems of concepts and logical relations, both in their intuitive and operational forms, implies representation."[170]

Piaget believed that imitation could be described in terms of accomodation: "... if there is primacy of accomodation (matching of behavior) over assimilation (altering of schemas)... the activity tends to become imitation."[171] This implies that the imitating child in fact *embodies* more information than he "understands" (represents). He continues: "representation... can be seen to be a kind of interiorized imitation, and therefore a continuation of accomodation."[172] [With regards to the three-memory-system model (which Piaget is of course not directly referring to): "... even if there were justification for relating the various stages of mental development to well-defined neurological levels, the fact remains that, in spite of the

relative discontinuity of the structures, there is a certain functional continuity, each structure preparing for its successors while utilizing its predecessors."[173]]

What can be said of children appears true, more or less, phylogenetically: our cultures (which we absorb as children, through the processes of imitation) consist primarily of patterns of activity, undertaken in a social context. As parents are to children, cultures are to adults: we do not know how the patterns we act out (or the concepts we utilize) originated, or what precise "purposes" (what long term "goals") they currently serve – these patterns are in fact *"emergent properties" of long-term social interactions*. Furthermore, we cannot describe such patterns well, abstractly (explicitly, semantically) – even though we duplicate them accurately (and unconsciously) in our behavior (and can represent them, episodically, in our literary endeavors). We do not know *why* we do what we do – or, to say the same thing, what it is that we are (all ideological theories to the contrary). We watch ourselves, and wonder; our wonder takes the shape of the story or, more fundamentally, the *myth*. Myths describing the *known*, explored territory, constitute *what we know about our knowing how*, before we can state, explicitly, what it is that we know how. Myth is, in part, the image of our adaptive action, as formulated by imagination, before its explicit containment in abstract language; myth is the intermediary between action, and abstract linguistic representation of that action. Myth is the distilled essence of the stories we tell ourselves about the patterns of our own behavior – and about the inevitable consequences of those patterns, as they play themselves out in the social and impersonal worlds of experience. We learn the story, *which we do not understand* (which is to say, cannot make explicit), by watching. We represent the action patterns we encounter in action – that is, in ritual – and in image, and word: we act, then represent our behavior, ever more abstractly (ever more explicitly, "consciously").

The central features of our (socially-determined) behavior thus become key elements – characters – in our stories (just like the procedural elements of the emergent games of interacting children become explicit "rules" later in development). The generation and constant refinement of these stories, told and retold over centuries, allows us to determine ever more clearly just what it is that proper (and improper) behavior consists of, in an environment *permanently characterized by the interplay between security and unpredictability*. We are extremely (uncontrollably) imitative, appallingly social, and interminably exploratory. These characteristics allow us to generate and communicate represented images, and, simultaneously, serve as the focal point of inquiry for those images. Our capacity for creative action frees us, constantly, from the ever-shifting demands of the "environment." The ability to represent creative action – to duplicate observed creativity in our own actions, and to represent that creativity in detail and essence – allows everyone to benefit from the creative action of everyone else (at least everyone with whom communication might conceivably take place). The fact of our sociability ensures that our adaptive behaviors are structured with the social community in mind – at least in the long run – and increases our chances of exposure to creative intelligence. We observe others acting, in a manner we find admirable, and duplicate their actions. In this manner, we obtain the skills of others. Our capacity for abstraction allows us to take our facility for imitation one step farther, however: we can learn to imitate not only the precise behaviors that constitute adaptation, *but the process by which those behaviors were generated*. This means – we can learn not only skill, but meta-skill (can learn to mimic the pattern of behavior that generates new skills). It is the encapsulation of meta-skill in a story that makes that story great.

Our imitative proclivity, expressed in behavior, appears to find its more abstracted counterpart in the ability to admire, which is a permanent, innate or easily acquired constituent element of our intraspsychic state. This capability for awe, this desire to copy, often serves to impel further psychological and cognitive development. The worshipful attitude that small boys adopt towards their heroes, for example, constitutes the outward expression of the force that propels them towards embodying, or incarnating (or even inventing) oft ill-defined heroic qualities themselves. The capacity for imitation surfaces in more abstract guise in the human tendency to act "as-if"[174]– to identify with another – to become another, in fantasy (which means, to ritually identify with or unconsciously adopt the story of another). (This means – the ability to adopt someone else's goal, as if it were yours.[175]) The capacity to act "as if" expresses itself in admiration (ranging in intensity from the simple respect accorded a competent other, to abject worship) and, even more abstractly, in ideological possession. No independent "instinct" necessarily needs to be postulated, to account for this mimetic ability (although one may well exist): all that may be necessary is the capacity to observe that another has obtained a goal that is also valued by the observer (that observation

provides the necessary motivation), and the skill to duplicate the procedures observed to lead to such fulfillment.

Mimetic propensity, expressed in imitative action, provides for tremendous expansion of behavioral competence[176]; allows the *ability* of each to become the *capability* of all. Precise duplicative facility, however, still retains pronounced limitations. Specific behaviors retain their adaptive significance only within particular, restricted environments (only within bounded frames of reference). If environmental contingencies shift (for whatever reason), the utility of strategies designed for the original circumstance (and transmitted through imitation) may become dramatically restricted, or even reversed. *The capacity for abstraction of imitation* – which is, in the initial stages, capability for dramatic play – overcomes the specific restrictions of exact imitation, elaborating reproduction of particular acts, removing the behavior to be copied from its initial specific context, establishing its first-level declarative representation and generalization. *Play* allows for the permanent extension of competence and confidence through *pretence*, which means through metaphoric and symbolic action (which is semantic use of episodic representation), and for natural expansion of behavioral range from safe, predictable, self-defined contexts, out towards the unknown world of experience. Play creates a world in "rule-governed" fantasy – in episodic or imagistic representation – in which behavior can be rehearsed and mastered, prior to its expression in the real world, with real-world consequences. Play is another form of "as-if" behavior, that allows for experimentation with fictional narratives: pretended descriptions of the current and desired future states of the world, with plans of action appended, designed to change the former into the latter. To *play* means to set – or to fictionally transform – "fictional" goals. Such fictional goals give valence to phenomena that would, in other contexts, remain meaningless (but valence that is informative, without being *serious*). Play allows us to experiment with means and ends themselves, without subjecting ourselves to the actual consequences of "real" behavior – and to benefit emotionally, in the process. The goals of play are fictional; the incentive rewards, however, that accompany movement to a fictitious goal – these are *real* (although bounded, like game-induced anxieties). The bounded reality of such affect accounts, at least in part, for motivation to play – for the intrinsic interest that accompanies play (or immersion in any dramatic activity).

Play transcends imitation, in that it is less context-bound; it allows for *the abstraction of essential principles from specific (admirable) instances of behavior* – allows for the initial establishment of a more general model of what constitutes allowable (or ideal) behavior. Elaboration of dramatic play into formal drama likewise *ritualizes* play, abstracting its key elements one level more, and further distills the vitally interesting aspects of behavior – which are representative (by no mere chance) of that active heroic/social (exploratory and communicative) pattern upon which all adaptation is necessarily predicated. Theatrical ritual dramatically represents the individual and social consequences of stylized, distilled behavioral patterns, based in their expression upon different assumptions of value and expectations of outcome. Formal drama clothes potent ideas in personality, exploring different paths of directed or motivated action, playing out conflict, cathartically, offering ritual models for emulation or rejection. Dramatic *personae* embody the behavioral wisdom of history. In an analogous fashion, in a less abstract, less ritualized manner, the continuing behavior of parents dramatizes cumulative mimetic history for children.

Emergence of narrative – which, paradoxically, contains much more information than it explicitly presents – further disembodies the knowledge extant latently in behavioral pattern. Narrative presents semantic representation of play, or drama – of essentially abstracted episodic representations of social interaction and individual endeavor – and allows behavioral patterns contained entirely in linguistic representation to incarnate themselves in dramatic form on the private stage of individual imagination. Much of the information derived from a story is actually already *contained in episodic memory*. In a sense, it could be said that the words of the story merely act as a retrieval cue for information already in the mnestic system (of the listener), although perhaps not yet transformed into a form capable either of explicit (semantic) communication, or alteration of procedure.[177] [178] It is for this reason that Shakespeare might be viewed as a precursor to Freud (think of Hamlet): Shakespeare "knew" what Freud later "discovered" – but he knew it more implicitly, more imagistically, more procedurally. (This is not say that Shakespeare was any less brilliant – just that his level of abstraction was different.) Ideas, after all, come from somewhere – they do not arise, spontaneously, from the void. Every complex psychological theory has a lengthy period of historical development – development that might not be evidently linked to the final emergence of the theory.

Interpretation of the reason for dramatic consequences, portrayed in narrative – generally left to the imagination of the audience – constitutes analysis of the *moral* of the story. Transmission of that moral – that rule for behavior, or representation – is the *purpose* of narrative, just as fascination, involuntary seizure of interest, is its (biologically-predetermined) means. With development of the story, mere description of critically important (and therefore compelling) behavioral/representational patterns becomes able to promote active imitation. At this point the semantic system, activating images in episodic memory, sets the stage for the alteration of procedure itself. This means establishment of a "feedback loop," wherein information can cycle up and down "levels of consciousness" – with the social environment as necessary intermediary – transforming itself and expanding as it moves. Development of narrative means verbal abstraction of knowledge disembodied in episodic memory and embodied in behavior; means capability to disseminate such knowledge widely and rapidly throughout a communicating population, with minimal expenditure of time and energy; means intact preservation of such knowledge, simply and accurately, for generations to come. Narrative description of archetypal behavioral patterns and representational schemas – *myth* – appears as an essential precondition for social construction and subsequent regulation of complexly civilized individual presumption, action and desire.

It is only after behavioral (procedural) wisdom has become "represented" in episodic memory, and portrayed in drama and narrative, that it becomes accessible to "conscious" verbal formulation (procedural knowledge is not representational, in its basic form) and to (potential) modification, in abstraction. Knowing how information, generated in the course of exploratory activity, can nonetheless be *transferred* from individual to individual, in the social community, through means of imitation. Piaget points out, for example, that children first act upon objects, and determine object- "properties" in accordance with these actions, and then almost immediately imitate themselves, turning their own initial spontaneous actions into something to be represented and ritualized.[179] The same process occurs in interpersonal interaction, where the other person's action rapidly becomes something to be imitated, and then ritualized (and then abstracted and codified further). A shared rite, where each person's behavior is modified by the other, can therefore emerge in the absence of "consciousness" of the structure of the rite; however, once the social ritual is established, its structure can rapidly become described and codified (presuming sufficient cognitive ability and level of maturation). This process can in fact be observed during the spontaneous construction (and then codification) of children's games.[180] It is the organization of such "games" – and their elaboration, through repeated communication – that constitutes the basis for the construction of culture itself.

Behavior is imitated, then abstracted into play, formalized into drama and story, crystallized into myth and codified religion – and only then criticized in philosophy, and provided, *post-hoc*, with rational underpinnings. Explicit philosophical statements regarding the grounds for and nature of ethical behavior, stated in a verbally comprehensible manner, were not established through rational endeavor – their framing as such is (clearly) a secondary endeavor, as Nietzsche recognized:

> "What the scholars called a 'rational foundation for morality' and tried to supply was, seen in the right light, merely a scholarly expression of the common faith in the prevalent morality; a new means of expression for this faith."[181]

Explicit (moral) philosophy arises from the mythos of culture, grounded in procedure, rendered progressively more abstract and episodic through ritual action, and observation of that action. The process of increasing abstraction has allowed the *knowing what* "system" to generate a representation, in imagination, of the "implicit predicates" of behavior governed by the *knowing how* "system." Generation of such information was necessary to simultaneously insure accurate prediction of the behavior of others (and of the self), and to program predictable social behavior through exchange of abstracted moral (procedural) information. Nietzsche states, further:

> "That individual philosophical concepts are not anything capricious or autonomously evolving, but grow up in connection and relationship with each other; that, however suddenly and arbitrarily they seem to appear in the history of thought, they nevertheless belong just as much to a system as all the members of the fauna of a continent – is betrayed in the end also by the fact that the most diverse philosophers keep filling in a definite fundamental scheme of possible philosophies. Under an invisible spell, they always revolve once more in the same orbit; however independent of each other they may feel themselves with

> their critical or systematic wills, something within them leads them, something impels them in a definite order, one after the other – to wit, the innate systematic structure and relationship of their concepts. Their thinking is, in fact, far less a discovery than a recognition, a remembering, a return and a homecoming to a remote, primordial, and inclusive household of the soul, out of which those concepts grew originally: philosophizing is to this extent a kind of atavism of the highest order."[182]

The knowing what system, declarative (episodic and semantic), has developed a description of knowing how activity – procedure – through a complex, lengthy process of abstraction. Action and imitation of action developmentally predates explicit description or discovery of the rules governing action. Adaptation through play and drama preceded development of linguistic thought, and provided the ground from which it emerged. Each developmental "stage" – action, imitation, play, ritual, drama, narrative, myth, religion, philosophy, rationality – offers an increasingly abstracted, generalized and detailed representation of the behavioral wisdom embedded in and established during the previous stage. The introduction of semantic representation to the human realm of behavior allowed for continuance and ever-increasing extension of the cognitive process originating in action, imitation, play, and drama. Language turned drama into mythic narrative, narrative into formal religion, and religion into critical philosophy, providing for exponential expansion of adaptive ability. Consider Nietzsche's words, yet again:

> "Gradually it has become clear to me what every great philosophy so far has been: namely, the personal confession of its author and a kind of involuntary and unconscious memoir; also that the moral (or immoral) intentions in every philosophy constituted the real germ of life from which the whole plant had grown."[183]

The procedural system provides (constitutes?) memory for behavior. Such memory includes imitative representation of behaviors generated spontaneously in the course of creative individual action, whose precise circumstance of origins have been lost in the mists of history, but which have been integrated into a consistent behavioral pattern, over time – integrated into culturally-determined *character*. Integration means active balance of competing subjectively-grounded motivational demands within the context of the social environment; means internalization of socially-regulated behavioral expression of subjective desire. Such internalization constitutes construction of a value (dominance) hierarchy – determination of the relative contextual propriety (morality) of imitated or otherwise incorporated patterns of action. Such construction inevitably "precedes" episodic or semantic representation of the basis of the construction, *although such second-order representation, once established, becomes capable (indirectly) of modifying procedure itself (as what is imagined can then be acted out)*. This is the loop that feeds the development of explicit "consciousness" itself: procedure is established, then represented, then altered in abstraction, then practiced; the procedure changes, as a consequence of the abstracted and practiced modification; this change in turn produces an alteration in its representation, and so on, and so on, from individual to individual, down the chain of generations. This process can occur "externally," as a consequence of social interaction, or "internally," as a consequence of word and image-mediated abstract exploratory activity ("thought"). This interactive loop – and its putative relationship to underlying cognitive/memory structures – is represented schematically in ***Figure 13: Abstraction of Wisdom, and the Relationship of Such Abstraction to Memory***. (Only a few of the interactions between the "stages" of knowledge are indicated, for the sake of schematic simplicity.)

Behavioral knowledge is generated during the process of creative exploration. The consequences of such exploration – the adaptive behavioral patterns generated – are imitated, and represented more abstractly. Play allows for the generalization of imitated knowledge, and for the integration of behaviors garnered from different sources (one "good thing to do" may conflict in a given situation with another; "good things to do" therefore have to be ranked in terms of their context-dependent value, importance or *dominance*). Each succeeding stage of abstraction modifies all others, as our ability to speak, for example, has expanded our capacity to play. As the process of abstraction continues – and information vital for survival is represented evermore simply and efficiently – what is represented transforms from the particulars of any given adaptive actions to the most general and broadly appropriate pattern of adaptation – that of creative exploration itself. This is to say: individual acts of "heroism," so to speak (that is, *acts of voluntary and successful encounter with the unknown*) might be broadly imitated; might elicit spontaneous imitation. *But*

some more essential ("prototypical"[184]) feature(s) characterize all acts of heroism. With increasing abstraction and breadth of representation, the essential features comes to dominate the particular. As Eliade[185] points out: traditional (that is, nonliterate) cultures have a historical memory that may be only three generations long – that is, as long as the oldest surviving individual is old. Events that occurred previous to this are telescoped into something akin to the aboriginal Australian's "dreamtime": into the "trans-historical" period when ancestral heroes walked the earth, and established the behavioral patterns that constitute the present mode of being. This telescoping is the "mythologization" of history – and is very useful, from the perspective of *efficient storage*. We learn to imitate (and to remember) not individual heroes – not the "objective" historical figures of the past – but what those heroes represented: *the pattern of action that made them heroes*. That pattern is – to say it once again – the act of voluntary and successful encounter with the unknown: *the generation of wisdom through exploration*. (I am not trying to imply, either, that the semantic or episodic memory systems can directly modify procedure; it is more that the operations of the semantic/episodic systems alter the world, and world-alterations alter procedure. The effect of language and image on behavior is generally secondary – mediated through the environment – but is no less profound for that).

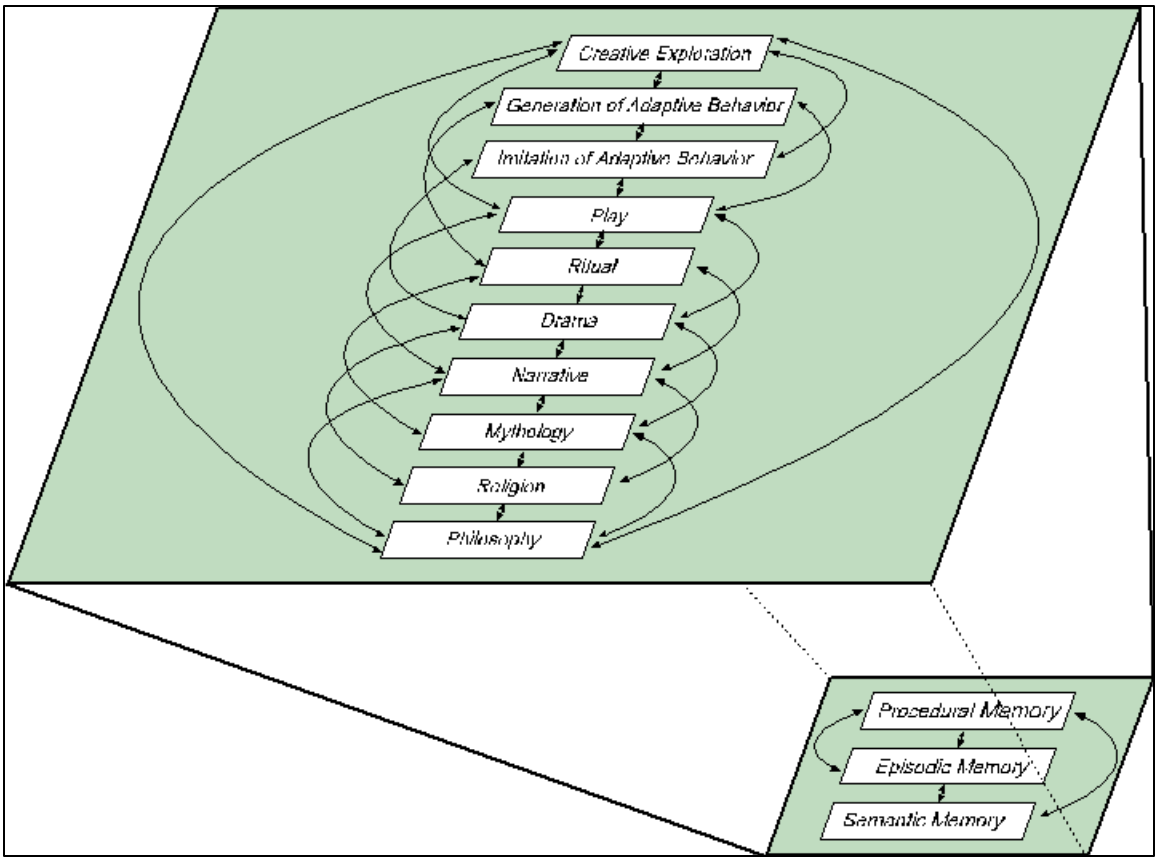

Figure 13: Abstraction of Wisdom, and the Relationship of Such Abstraction to Memory

The fact that the many "stories" we live by can be coded and transmitted at different levels of "abstraction," ranging from the purely motoric or procedural (transmitted through imitation) to the more purely semantic (transmitted through the medium of explicit ethical philosophy, say) makes comprehension of their structure and inter-relationships conceptually difficult. This difficulty is compounded by the fact that different stories have different spatial-temporal "resolutions," – that is, that we may be governed at one

moment by short-term, simple considerations and at the next by longer-term, more complex considerations. Someone married might think, for example, "I find my friend's spouse particularly attractive; I would like to make love to him or her," – evaluating that individual, positively – and then, immediately, correct: "My friend's spouse flirts too much for his or her own good, and looks like a lot of trouble." Perhaps both these viewpoints are valid. It is certainly not uncommon for the same "stimulus" to possess competing valences. Otherwise – as I said before – we would never have to think.

Every apprehensible phenomenon has a multitude of potential uses and significances. It is for this reason that it is possible for each of us to drown in possibility. Even something as simple as a piece of paper is not simple at all – except insofar as implicit contextual determinants make it appear so. Wittgenstein asks:

> "Point to a piece of paper. – And now point to its shape – now to its colour – now to its number (that sounds queer). – How did you do it? – You will say that you 'meant' a different thing each time you pointed. And if I ask how that is done, you will say you concentrated your attention on the colour, the shape, etc. But I ask again: how is *that* done?"[186]

A kitchen knife, for example: is it something to cut up vegetables, at dinner? Something to draw, for a still life? Something to cut up vegetables, at dinner? A toy, for mumblety-peg? A screwdriver, to fix a shelf? Or, perhaps – an implement of murder? In the first four cases, it "possesses" a positive valence. In the last case, it is negative – unless you are experiencing a frenzy of rage. How is its essential functional and affective multiplicity reduced to something singular and, therefore, useful? You can't fix the shelf and make dinner at the same time, and in the same place. You may need to do both, at some point, however – and this means that you must maintain the multiple uses and valences as possibilities (whatever that implies). This means that you must (1) decide on one course of action, and eliminate all the rest, yet (2) retain the others, for "future consideration" – to ensure that your range of possible actions remains as broad as possible.

How is this ever-present competition to be ameliorated? How might the process of amelioration be considered, with regard to the additional complicating fact of the multi-level embodiment and abstraction of stories? So far we have considered the "ends" and the "means" of a given framework of reference (a story) as qualitatively different phenomena – echoing a dilemma that pervades ethics, as a field of study. The "end" or goal of a given planned sequence of behavior constitutes an image of the desired future, which serves as point of contrast, for the "unbearable" present. The "means" by which this end might be attained comprises the actual behavioral steps that might be undertaken, in pursuit of such desirable change. This seems a very reasonable perspective, in that at any given moment "means" and "ends" might be usefully distinguished. *Where we are going* is evidently different than *how we will get there*. This conceptual utility is only provisional, however – and the fact of the "means/end" distinction actually obscures more detailed and comprehensive description. "Means" and "ends" – plans and goals – are not qualitatively different, in any final sense, and can be transformed, one into the other, at any moment. Such transformation occurs, in fact, whenever a problem arises: whenever the unknown manifests itself, in the course of our ongoing behavior. It is in this manner that we switch spatial-temporal resolution (change "set" or shift our "frames of reference"), in order to re-evaluate our actions, and re-consider the propriety of our wishes.

Our stories – our frames of reference – appear to have a "nested" or "hierarchical" structure. At any given moment, our "attention" only occupies one level of that structure. This "capacity for restricted attention" gives us the capability to make provisional but necessary judgments about the valence and utility of phenomena. However, we can also "shift levels of abstraction" – which means, *can voluntarily focus our attention, when necessary, on stories that map out larger or smaller areas of space-time* (excuse the Einsteinian reference, but it is in fact accurate in this case, as our stories have a duration, as well as an area). "When necessary" means *depending on the status of our current operations.* For example: you are in the kitchen; you want to read a book in your study. An image of you reading a book – in your favorite chair – thus occupies the "ends" or "desired future" pole of your currently operational story (contrasted with the still-too-illiterate you of the present time). This "story" might have a conceived duration of, say, ten minutes; in addition, it "occupies" a universe defined by the presence of a half-dozen relevant "objects" (a reading lamp, a chair, the floor you have to walk on to get to your chair, the book itself, your reading

glasses) and the limited space they occupy. You make it to your chair. Your book is at hand. You reach up to turn on the reading light – flash! – the bulb burns out. The unknown – that is, the unexpected, in this context – has just manifested itself. You switch "set." Now your goal – still nested within the "reading a book" story – is "fix the reading lamp." You adjust your plans, find a new bulb, and place it in the lamp. Flash! It burns out again. This time you smell burnt wire. This is worrisome. The book is now forgotten – irrelevant, given the current state of affairs. Is there something wrong with the lamp (and, therefore – at a slightly more general level – with all future plans, that depend on that lamp)? You explore. The lamp doesn't smell. It's the electrical outlet, in the wall! The plate covering the outlets is hot! What does that mean? You shift your apprehension up several levels of spatial-temporal resolution. Maybe there is something wrong with the wiring of the house, itself! The lamp is now forgotten. Ensuring that your house does not burn down has suddenly taken priority. How does this shift in attention occur?

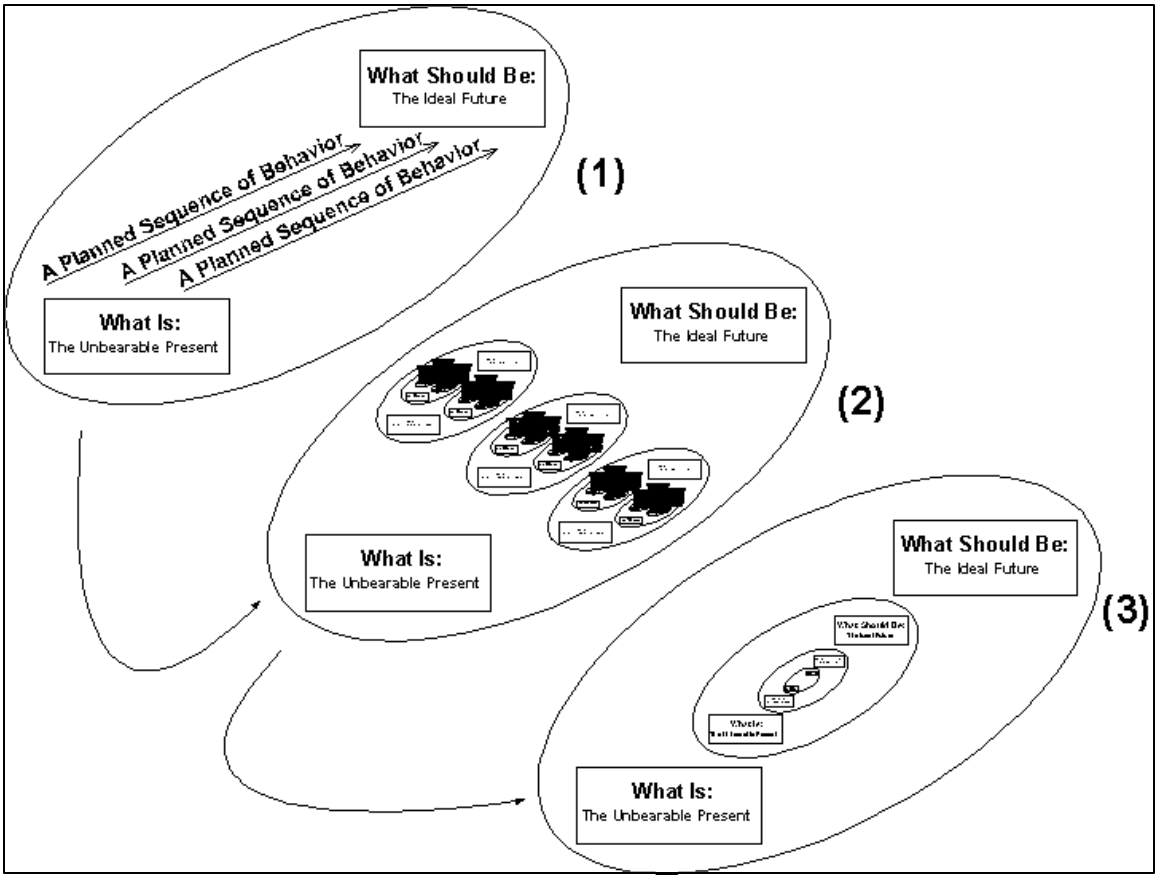

Figure 14: Conceptual Transformation of the Means/Ends Relationship from Static to Dynamic

Figure 14: Conceptual Transformation of the Means/Ends Relationship from Static to Dynamic presents a tripartite schematic, designed to take us from the state where we conceptualize means and ends as distinct, to the state where we see them as isomorphic elements, given distinct status only on a provisional basis. Subdiagram (1) is familiar, and represents the "normal" story, composed of present state, desired future state, and three of the various means that might be utilized, in order to transform the former into the latter. This subdiagram is predicated on the presumption that many means might be used to get from point "a" to point "b"; in truth, however, only one means (the "most efficient" or otherwise desirable) will be employed at any one time. (We only have one motor output system, after all – and, therefore, one "consciousness"?) Subdiagram (2) is a transformed version of (1), showing that the "plans" of (1) can

better be conceptualized as "stories," in and of themselves – showing that a "big" story (one that occupies a large spatial-temporal domain) is actually composed of nested "little" stories. Subdiagram (2) is still predicated on the presumption that a number of smaller stories might be used as means for a larger end. If your company is failing, you might fire half your employees, branch out into a new product line, or cut the salaries of your upper management. Each of these approaches – all designed for the same purpose – are clearly different (and complex) in their internal structure. You might do more than one thing – but – if two of these multiple things conflict, one will have to be made subordinate to the other. Plans (and ends) are granted comparative importance, and organized accordingly (in a structure that, by the way, is very much like a dominance hierarchy). This state of affairs – where the relative importance of (potentially competing) plans has been fixed – is represented, in subdiagram (3), which will be our representation of choice, for the remainder of this discussion.[187]

At any given place and time, we are considering only a fixed number of "variables," as means and ends. This is absolutely necessary, as action requires exclusion, as much (or more) as inclusion.[188] However, those things we consider as "relevant variables" (and their status as relevant, or not) have to be mutable. We have to decide, yet retain the capacity to alter our decisions. Our prefrontal cortex – critical to goal-directed action[189] – appears to allow us this freedom: it does so, by "temporally sequencing" events and actions,[190] by considering "contextual information" and using that consideration to govern behavior,[191] and by "shifting set."[192] It performs this multiplicity of operations, I submit, by considering one thing, then another, as the currently-operative "consummatory reward" – as the goal towards which behavior is to be devoted, as the "desired future" against which the "unbearable present," in the form of emergent experience, is to be compared and evaluated. The structure in Figure 14, subdiagram (3), is a multilevel, nested structure, composed of interdependent goals and plans – interdependent goals and plans that, in totality, comprise the "life-story." This conceptualization helps explain the idea of a "step along the way" (a stairway or ladder to Heaven, metaphorically speaking).[193]

Each step – each substory – has the "same" *structure* (but not the same *content*) as all those stories "above" and "below." This means that all the elements of a "good" story might be expected to mirror, in some profound manner, all the other elements: that a story, like the world itself, might be read (and read correctly) at multiple and multiply informative "levels of analysis." This gives "good" stories their *polysemous* quality. It is for this reason that Frye can state:

> "One of the commonest experiences in reading is the sense of further discoveries to be made within the same structure of words. The feeling is approximately 'there is more to be got out of this,' or we may say, of something we particularly admire, that every time we read it we get something new out of it."[194]

A phenomenon that constitutes a goal at one "level" might be regarded as an incentive reward at the next, since the attainment of subsidiary goals are preconditions for the attainment of higher-level goals (this implies that most consummatory rewards will simultaneously possess an incentive aspect). The cognitive operations dependent upon the intact prefrontal cortex can move up and down these levels, so to speak, fixating at one, and allowing for determinate action, when that is deemed most appropriate (making the others "implicit" at that place and time); "reorganizing" and "reconstituting" the levels and their respective "statuses," when that becomes necessary. ***Figure 15: Bounded Revolution*** sheds light on this process and, simultaneously, on the conundrum of relative novelty. How can a thing be *radically new*, *somewhat new*, *somewhat familiar*, or *completely familiar*? The simple answer is – a given phenomenon (a "thing" or "situation") can have its utility and/or meaning transformed at one level of analysis, but not at another. This means that novelty can be "bounded"; that something can be new in one manner, but remain familiar at another. This upper "familiar" level provides "walls" of security; provides the stable structure within which necessary change can occur, without catastrophe.

Here is an exemplary "story": I am an undergraduate. I want to be a doctor. I am not sure exactly why, but that question has never become relevant (which is to say, my desire is an implicit presumption – an axiom of my behavior). I did well in high school. I have good marks in university, as a pre-med student. I take the MCAT. I fail: twentieth percentile. Suddenly – and unexpectedly – I am not going to be a doctor. The walls come tumbling down. My emotions, which were held in check by the determinate valences my ongoing story gave to experiential phenomena, now (re)emerge, viciously – in chaos. I am a depressed and anxious wreck. As I recover, I re-evaluate my life. I am discplined and have good academic skills. I like

university; I like working with people. Many of the upper-level stories necessary upon which the doctor story was implicitly predicated are still intact, and do not need modification. *Farther up the hierarchy, then*! – maybe, for the first time. We do not question a story, when it is working! If it produces the desired results, it is *correct*! Why did I want to be a doctor? For monetary security. Because it was expected of me (for reasons of tradition – my father was a doctor). For reasons of status. Because I could appease the suffering of others, and be a good person. So – hierarchical organization [this takes (or even is) thought]: (1) I want to help people; (2) I need some monetary security; (3) I would like to stay in the health profession; (4) perhaps status is not as important as I thought (and might therefore be "sacrificed," to appease the angry gods, and restore order to the cosmos). I will become a *medical technician*; or maybe even a *nurse*. I can still be a "good person," even if I'm not a doctor – and, perhaps, that is the most important thing of all. Reorganization completed. Utility of experiential phenomena re-established. Emotional integrity and stability re-attained. Good thing I didn't do myself in!

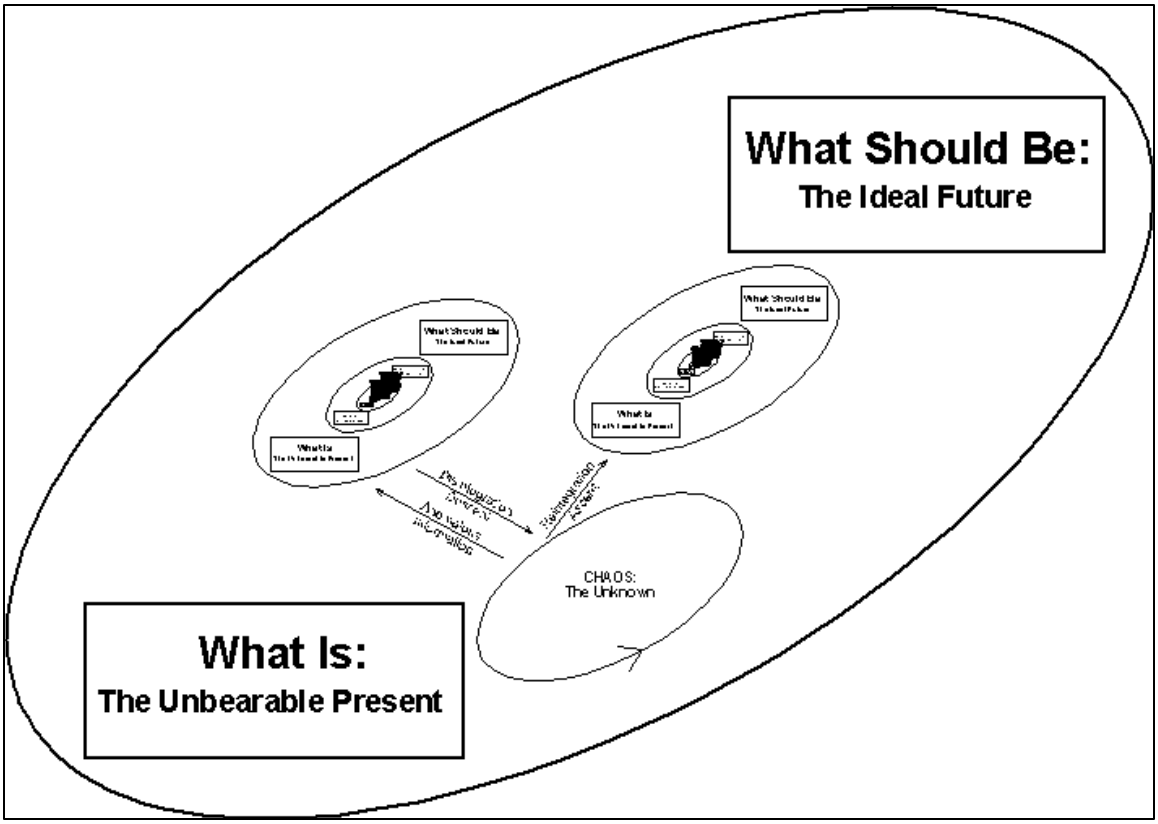

Figure 15: Bounded Revolution

It is interesting – and instructive – to consider Eastern representations of reality (that is, of the "cosmos") in light of this conceptualization. Reality is made up of nested interpretations, that give determinate form to "objects" (as implements) and to the valence of those objects. Every interpretation, however, is subject to transformation, at every level. This constant (and necessary) transformation, in conjunction with the fact of at least transient (and necessary) stability, makes up the "world." Mircea Eliade describes the Indian version of the doctrine of the "eternal return" – the endlessly nested, cyclical nature of the "universe" (conceived of as the totality of experience, and not as "objective reality"):

> "A complete cycle, a *mahayuga*, comprises 12,000 years. It ends with a dissolution, a *pralaya*, which is repeated more drastically (*mahapralaya*, the Great Dissolution) at the end of the thousandth cycle. For the paradigmatic schema "creation-destruction-creation-etc." is reproduced *ad infinitum*. The 12,000 years of a *mahayuga* were regarded as divine years, each with a duration of 360 years, which gives a total of 4,320,000 years for a single cosmic cycle. A thousand such *mahayugas* make up a *kalpa* (form); *14 kalpas* make up a *manvantara* (so named because each *manvantara* is supposed to be ruled by Manu, the mythical Ancestor-King). A *kalpa* is equivalent to a day in the life of Brahma; a second *kalpa* to a night. One hundred of these "years" of Brahma, in other words 311,000 milliards of human years, constitute the life of Brahma. But even this duration of the god's life does not exhaust time, for the gods are not eternal and the cosmic creations and destructions succeed one another forever."[195]

Every novelty-inspired, exploration-driven "learning experience" has a revolutionary element; it is just that those reconstructions that involve stories with very limited "sizes" (that is, spatial-temporal areas) only release a proportionate amount of emotion. The "normal/ revolutionary" *dichotomy* is, therefore, not valid – it is always a matter of degree. Small scale irritations require minor life-story modifications. Large-scale catastrophes, by contrast, undermine everything. The "biggest disasters" occur when the largest stories that we play out are threatened with dissolution, as a consequence of radical "environmental" transformation. Such transformation may occur in the natural course of things, when an earthquake or similar "act of God" takes place; may be generated internally, as a consequence of heretic action; or may emerge when the "foreign devils" – emissaries of chaos – threaten our explored territories (our nested stories, our cultural stability). In the latter case, we may well turn to war – as an alternative deemed emotionally desirable, in comparison to the overwhelming existential threat posed by the (potential) destruction of our large-scale stories.

Our stories are nested (one thing leads to another) and hierarchically arranged [pursuit "a" is superordinate to pursuit "b" (love is more important than money)]. Within this nested hierarchy, our "consciousness" – our apperception – appears to have a "natural" level of resolution, or categorization. This "default resolution" is reflected in the fact, as alluded to previously, of the "basic object level." We "see" some things *naturally*; that is, in Roger Brown's terminology, at a level that gives us "maximal information with minimal cognitive effort [196]." I don't know what drives the mechanism that determines the appropriate level of analysis. Elements of probability and predictability must play a role. It is, after all, increasingly useless to speculate over increasingly large spatial-temporal areas, as the number of variables that must be considered increases rapidly, even exponentially (and the probability of accurate prediction, therefore, decreases). Perhaps the answer is something along the lines of "the simplest solution that does not generate additional evident problems wins" – which I suppose is a variant of Occam's razor. So the simplest cognitive/exploratory maneuver that renders an unpredictable occurrence *conditionally* predictable or familiar is most likely to be adopted. This is another example of proof through utility – if a solution "works," (serves to further progress towards a given goal) – then it is "right." Perhaps it is the frontal cortex that determines what might be the most parsimonious possible context, within which a given novel occurrence might be evaluated. So the notion would be that a novel occurrence initiates an exploratory procedure, part of which is devoted to determining the level of analysis most appropriate for conducting an evaluation. This would involve the shifting of stories. Also: a given "stimulus" is obviously not evaluated at all possible levels of analysis, simultaneously. This would constitute an impossible cognitive burden. It seems that the cortex must temporarily "fixate" at a chosen level, and then act "as if" that is the only relevant level. Though this maneuver, the valence of something can appear similarly fixed. It is only this "arbitrary" restriction of "data" that makes understanding – and action – possible.

We are adapted, as biological organisms, to construe our environment as a domain with particular temporal and spatial "borders" – that is, as a place of a certain size, with a fixed duration. Within that "environment," conceived of as that certain size and duration, certain phenomena "leap out at us," and "cry out to be named."[197] Whenever those "natural categories" of interpretation and their associated schemas of action fail us, however, we have to look up and down the scale of spatial-temporal resolution. We do this by looking at the "big picture," when we have to, or by "focusing in" on "details" that may have previously escaped us. Both the "details" and the "big picture" may be considered as dwindling or trailing off into, first, the "unconscious" (where they exist as "potential objects of cognition") and then, the "unknown"

(where they exist as "latent information" or as "undiscovered facts"). The "unconscious" may then be considered as the mediator between the unknown, which surrounds us constantly, and the domain that is so familiar to us that its contents have been rendered explicit. This mediator, I would suggest, is "nothing but" those metaphoric, imagistic processes, dependent upon limbic-motivated right-hemispheric activity, that help us initially formulate our stories. ***Figure 16: Nested Stories, Processes of Generation, and Multiple Memory Systems*** helps explain the idea of this "unconscious" – the broadest span stories, which are determined by complex social interactions, are episodic (imagistic) or even procedural (only manifested in socially-modified behavior) in nature. There is a very narrow window of expressible "frames of reference" – conscious stories. Just ask any young child – or unsophisticated adult – to describe the "rationale" for their behaviors.

Every level of analysis – that is, every definable categorization system and schema for action (every determinate story) – has been constructed, interpersonally, in the course of exploratory behavior and communication of the strategies and results thereof. Our "natural levels of apprehension" – that is to say, the stories that most easily or by default occupy our attention – have contents that are relatively accessible to "consciousness" – that is, to explicit verbal/semantic formulation and communication. The "higher-level" stories – that cover a broader expanse of spatial-temporal territory – are increasingly complex and, therefore, cannot be as simply formulated. Myth steps in to fill the breach.

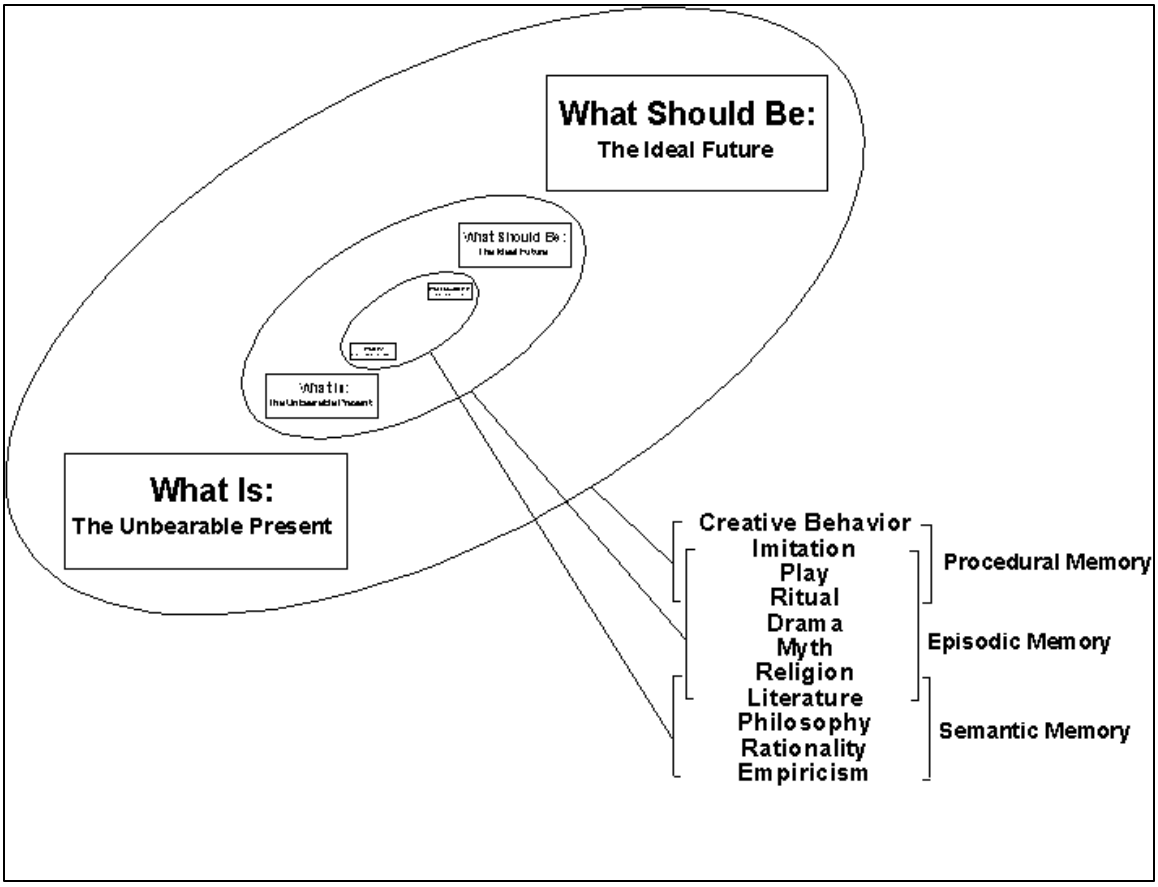

Figure 16: Nested Stories, Processes of Generation, and Multiple Memory Systems