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AFFECT AS A SIGN SYSTEM

INTRODUCTION

After long decades of being ignored by cognitive and neural sciences, the phenomenon of affect has recently become the object of intense study. Exciting work has been published in the last few years, attempting to bring affect studies up to par with those of cognition, motivation, behavior, and memory. The study of affect parallels the also recent interest in consciousness, and in fact it is becoming clear that consciousness and affect are evolutionarily intertwined. (Panksepp, 1998; Damasio, 1999).

The very first issue of this journal was devoted to affect. Solms and Nersessian's review of the psychoanalytic theory of affect, Panksepp's discussion and presentation of his research on affect, plus the other commentaries in that issue, brought the subject up to date, and presented some of the cutting edge theories and current controversies in one impressive volume. The complexity of the subject is nearly overwhelming, possibly one reason that affect, like consciousness, has been neglected by neuroscientists until recent decades. In this current explosion of affect research, several major books have been published, among them Damasio (1999), LeDoux (1996), Panksepp (1998), Rolls (), Ekman (1994), and many others. The books themselves are complex, and there is disagreement among authors on many issues. Further research will no doubt help bring some of these theories into an integrated picture.

In this paper I will try to illuminate the concept of affect by viewing it from the perspective of biological semiotic systems. Semiotics, the study of signs, addresses the communication system itself, and by so doing we learn about the phenomena that are communicated. An analogy might be to the study of linguistics as way to help understand narrative. My general purpose is to see if bringing a different *point of view* to bear on affect will explicate the subject in a novel way. I will explore ideas that might clarify certain controversies in current theorizing, with the hope that as a heuristic model it may open up other questions and generate other hypotheses.

The basic model here is one of information processing. Signs carry information, and they do so by the "standing-for relationship." That relationship "brings to mind" a thing, a thought, an idea; or we may say it draws attention to, and brings to consciousness. In addition to the basic semiotic model describing the standing-for relationship, Charles Sanders Peirce, a nineteenth century American philosopher, developed a more nuanced, trichotomous model of semiotic that denotes three major categories of sign, the index, the icon, and the symbol. These categories help understand the different *ways* in which one thing can stand for another.

In this paper, I will briefly explicate the semiotic model as an alternative, heuristic point of view, capable of providing a different perspective on affect theory. I will then try to relate it to current biological models of affect. Finally, I will bring in the tripartite semiotic model, focussing on the functions of the different types of signs with respect to affect. I will use the model as a way to explore four issues relevant to psychoanalysis: 1. The question of the time course of an affect. 2. The issue of drives

and affects, 3. The three manifestations of affect and their dissociation, and 4. The different functions of the three types of signs with respect to affect.

THE SEMIOTIC MODEL

Let me first summarize the semiotic model that I have used elsewhere in trying to understand the informational function of the brain. I have previously explicated semiotic models in some detail (Olds, 1990, 2000, 2002)). Semiotics, in the thinking of de Saussure, Peirce, and the Indiana semiotician, Thomas Sebeok, is the study of signs. The notion of a sign goes back at least to the Stoic philosophers, but the articulation most often cited is St. Augustine's De Doctrina Christiana. Saint Augustine's definition of a sign is still probably the best one around: "A sign is something that, on being perceived, brings something other than itself into awareness."

What is the need to use semiotics for this purpose? In the previous paper I used the model to look at life processes including the mind-brain relationship from a different perspective. There have been contributions from psychoanalysis and the cognitive sciences to this relationship. The cognitive sciences have been forging ahead in recent decades to a vast explanatory theory of mind and brain. In the process both these disciplines have begun to consult with each other about mind-brain function at the highest functional levels. We begin to see the possibility of a unified theory of mind and brain. But there are some unanswered questions remaining because of (1) complexity in certain areas where simple linear models do not work,

and (2) the necessary dualism in a world where there are irreducible dichotomies such as those between the animate and the inanimate, and the mind and the brain. The semiotic model approaches the second of these questions, while complexity theories such as connectionist, neural-network, and non-linear systems theories address the first.

In the previous paper I outlined the way the model helps explain the dualism inherent in the crucial difference between the living as opposed to the inanimate world. The foundation of the theory is that in living beings things can *stand for* other things in a system. This phenomenon can help in modeling the processes of reproduction and genetic transfer, protein synthesis, neurotransmitter function, and brain function with respect to mental processes including thought, affect, memory, language and culture. The semiotic model is based on the notion of information transfer. Within a system, information can be conveyed by a sign, which stands for information in one part of the system, and transfers it to another part of the system. The advantage of the model is that we have a bridging concept, the *sign*, which has the capacity to represent, at different levels in the biological hierarchy. At each level the mode of representing may be quite different, but there is the common feature that one thing stands for another.¹

¹ In discussing semiotics there are several terms that can lead to misunderstandings and disagreements requiring volumes of argument. Particularly troublesome are “information” and “meaning.” I will give brief accounts of them, hoping to pursue my argument without getting sidetracked into the many confusions about their use.

Information is basically a pattern or sequence; in the present context, a sign can convey that pattern to another part of a system. Thus RNA carries the code of the DNA and the pattern leads to the construction of a protein. Or Morse code carries a pattern of sounds that code for letters and can be read out as words. It is often the case that the process goes from one medium to another, as with the

The present paper will expand on the semiotics of *affect* with the same goal mentioned above: to provide a different perspective on affect, a theoretical viewpoint that may fill in some gaps in current theory. If the semiotic model is valid and useful it will not contradict other viewpoints including the neurobiological; it should provide a meaningful augmentation.

THE SEMIOTIC MODEL AS A POINT OF VIEW

One thing to make clear in presenting the semiotic model is that it is a *point of view*. It could be considered to be on the level of the metapsychological points of view. In his theoretical work, Freud (1915) described the metapsychological points of view, the "dynamic, topographical and economic aspects." (p.181) Subsequent writers (Hartmann et al, 1946, and Rapaport & Gill, 1959) have added two others, the *genetic* and the *adaptive* points of view. These viewpoints allow explanation from deep, underlying principles, these principles not susceptible to translation into each other. For instance, the topographical point of view describes the mind insofar as it is internally structured with differentiated global functionings, whereas the economic point of view describes the effects of the flow and counterflow of energy; these are not incompatible but they are different. In the current environment it may be useful to add the *neurobiological* point of view, (Olds, 1990)

sounds in code standing for letters in language. But this is not always so; when DNA replicates, it produces another identical DNA.

Meaning may be even more difficult. For the present argument, we might say that the meaning includes the information carried by a sign, but it is more inclusive. A peacock's display is a sign of sexual readiness, and will lead to mating. The meaning of the sign may relate more to broader issues of context and subjectivity. The meaning for the peahen may be different than for a human observer. As we develop the idea of affect as a sign, we will see that meaning may be variable depending on subjectivity and context. In this paper I will avoid the word because of the many

and now the *semiotic* point of view. This aspectual approach allows for a model to be heuristic without forcing it to antagonize or refute other models. The heuristic value of each is that phenomena at a certain level of conceptualization may be considered as a system providing information and possible hypothesis generation within its domain.

The semiotic point of view would be one which, to paraphrase Rapaport, would *include propositions concerning the workings of signs in the transfer of information*. From this viewpoint, we follow the flow of information; we attend to patterns and structures that are transformed as information travels in living organisms.

An example might be the following: First a model in a rat, then a more psychoanalytic model in a human. A rat sees food and is hungry for it; it has learned that when it crosses the barrier between it and the food it gets a shock. *Dynamic*: the vector forces are such that the need to avoid the shock is greater than that to get to the food, and the rat does not move. Later when the hunger vector has increased the balance could shift and the rat would brave the shock and get the food. The *genetic* viewpoint would be that the rat is constitutionally wired to learn the association of certain behaviors and painful shock, and it has been subjected to such learning. The *neurobiological* viewpoint would explain this via learning paradigms in which neural networks in causal chains would lead to first the inhibition and then the action. The *semiotic* point of view would have a rat receiving two different signs, one a sign representing the body's need for food and another representing an evaluation of the situation in which a behavior is associated with shock, namely fear. There is an

confusions it can cause.

approach-avoidance dilemma produced by two opposing evaluations. As the hunger increases, the evaluation begins to place the importance of getting the food higher than that of avoiding the shock.

In the human example we might see in psychoanalytic terms the following: a person is ambitious for success but feels afraid that success will lead to punishment or retaliation. *Dynamic*: the vector forces are such that the need to avoid the punishment is greater than that to advance in his career; the result is an inconsistent or self-sabotaging performance that leads nowhere. The *genetic* point of view would relate inborn constitution and childhood experience leading to a constellation of attempts at success marred by recurrent self-sabotage. The *neurobiological* viewpoint would explain this via learning paradigms in which neural networks in causal chains would lead first to adaptive action and then to inhibition and self-interference. The *semiotic* point of view would have the man receiving two opposing evaluative signs, one that success is good and leads to increased self esteem, and the other that success precedes disaster or punishment, in fact is a sign of disaster, and therefore must be avoided. There may be fantasies of being killed, beaten or humiliated, which act as signs that success is dangerous. With the dynamic viewpoint, we emphasize the force vector aspects, with the genetic we emphasize constitutional and historical aspects, with the neurobiological we emphasize the neuronal structures, with the semiotic we attend to the sign systems. They all end up contributing to an understanding of one and the same phenomenon.

The heuristic value of this is that it leads us to inquire about the mind-brain

connection, and mind/brain products such as affect, as being in this category of *standing-for* relationships. It should lead research investigators to look for ways in which mental phenomena behave as semiotic entities. In the present enterprise, I am turning this particular lens onto the phenomenon of affect with the hope of revealing something about affect in its communicative and meaning-producing aspect. As we shall see, it leads us to think more about the semiotic aspect of affect rather than the direct physiological effect of affect, without in any way undermining theories of neurobiology or physiology.

As organisms proceed up the evolutionary ladder, affects become more complex. There are central aspects, which may be mediated by neurons, but we have even more need to consider the system as a semiotic one in which the responses indicate value judgments, with physiological, expressive, subjective and motor aspects. The physiological-neurological package, considered from this point of view, is part of a sign system. In mammals, the system is very complex and our theories, and even our descriptions of affects, are still unsettled. In fact, there is disagreement about the definitions of “emotion,” “affect” and “feeling.” Major researchers in the field have different tallies of what are the basic emotions. For instance Ekman has 17 basic emotions², while Panksepp has three categories of emotion-like phenomena in one of which reside the four “blue ribbon basic emotions” – *seeking, fear, separation*

² Ekman (1994) proposes these basic emotions: “amusement, anger, awe, contempt, contentment, disgust, embarrassment, excitement, fear, guilt, interest, pride in achievement, relief, sadness, satisfaction, sensory pleasure, and shame.” (p.18) He has identified distinctive universal signals for only four: anger, fear, disgust and sadness, with the possible additions of contempt and embarrassment.

*panic and rage.*³

THE ROOTS OF AFFECT IN UNMEDIATED APPROACH-AVOIDANCE

With this simplified description of semiotics in mind, my thesis is that the affects make up a semiotic system, one that has evolved since the first one-celled animals. In those simple creatures we believe that affect constituted a simple positive-negative sign system. Even in this simple state, one can see that the affect system is an evaluation device, and in semiotic parlance it uses signs which stand for the evaluation; this evaluation leads to approach or withdrawal. For instance a one-celled organism would approach increasing nutrient concentration, but avoid heat or too much acidity.

As an example of one of the more simple and primitive approach-avoidance systems, Hofer (1997) describes a bacterium that, when it encounters a nutrient gradient, its flagellae move in synchrony, directing it upstream toward increasing concentration. When there is no such obvious stream to follow, the flagellae go out of phase and the organism simply rotates in place, not going anywhere. In higher organisms there are many reflex systems that operate this way; the motor response is an automatic result of the perception.

In multicellular creatures with more complex perceptual systems, chemoreceptors persist as early forms of smell and taste, and other systems such as the visual, auditory and sensory systems evolve. With these, in organisms such as fish

³ In Panksepp's view the basic emotions arise from, and can be defined by, distributed and neuroanatomically distinguishable brain circuits, a model worked out in great detail in *Affective*

and reptiles, simple stimuli, such as a color or a shape, may still be hard-wired to certain responses. For instance, a frog may reflexly attack and swallow any dark small fly-sized object as if it were a fly; and it will avoid any looming object. Eventually other objects will be recognized as conspecifics or non-specifics, rivals, or adversaries, or food. At this level comes object recognition, where qualia must be assembled to form object representations. Already the criteria for approach and avoidance have become more complex. At this level of organism - the level of fish and reptiles - we may suggest that approach may be for the purpose of conglomeration as in schools of fish, or for mating; it may also be for the purpose of fighting, and defense of territory, or for that of eating, devouring prey. Avoidance now may be for self-protection, escaping from a predator or a more powerful rival, or it may be for genetically evolved requirements for space and population distribution. But clearly, at this evolutionary level, we have more than a simple model of approach-avoidance or pleasure-unpleasure. We have to have different evaluations as part of the adaptive response. A fish defending territory will not try to eat the object, and termination will occur when the object backs away; but if the object is food, the fish will pursue and devour, but only when hungry. Here the nature of the object perceived triggers the response, which has a behavioral and often a display aspect. The display may be different for feeding, fighting and sex. We can postulate that at this level, all there is to the affect is the display and the behavior; we have no idea what the subjective aspect may be. We believe from observing and experimenting

Neuroscience (1998). In my view, each of these complexes would constitute a semiotic system.

that there is little freedom of response, that there is no mentalizing and evaluating between the perception and the response. We think of the response as “reflex,” or “unmediated.”

MEDIATED AFFECT SYSTEMS

As we work up the evolutionary ladder, the dichotomy persists - the distinction between the useful or pleasurable, on one hand, and painful, damaging or dangerous on the other. At the same time the complexity increases, so that (1.) There are more differentiated affects, and (2.) There are much more complicated chains of mediation, clusters of signs between input and output, between stimulus and response. With lower mammals such as rats things are already more complicated; there are the positive evaluations, including those towards certain pleasures, or necessities, of eating, mating, exploring and playing, as well as the negative ones of fear, rage and depression. All five senses are used to recognize and evaluate current environment and experience. There is always the basic polarity between the positive and negative; and this polarity means affects are sometimes in opposition as in the laboratory rat or the success-phobic man mentioned above.

At the approach-avoidance level of affect, we have a basic circuit – the connection between the percept and the action is automatic. At more complex levels, however, there are inner (central) responses to the percept, which themselves are signs of what to do next. These signs evoke autonomic arousals within the organism, which are the analogs to the behavior of the simple organism. In other words, instead of automatically moving, the organism gets an internal message, manifested as the

activation of arousal or inhibitory systems. That activation itself becomes a sign as it is interpreted by the organism. Due to this intermediary system an organism has a second chance; its behavior is less tightly determined, and it can decide if it really wants to follow the indication of the arousal system. With more corticalization, as in primates and humans, that subjective response becomes more elaborate, and mediated in the social milieu. In higher animals, there is the physiological response including a tendency or urge to act, but the act may be inhibited as the urge conflicts with a competing urge. One might be angry and wish to challenge the silverback, but also be afraid to do it, and hold back. Or one might be frightened to give a public speech, but in certain conditions one might do it anyway. The fear seems to be an appropriate response to the situation, but one might over-ride it for other purposes.

THE BRAINSTEM CENTERS OF AFFECT

The work of Damasio, Panksepp, and others suggests that there is at the base of the evaluation system an integration of affect and arousal. The roots of affect depend on brainstem nuclei – including the *periaqueductal gray* and the *parabrachial nucleus*. These areas make up the lowest point in what is being called the ERTAS system, or Extended Reticulo-thalamic Activating System. An elaboration of this system is beyond my competence and the limits of this paper, but it seems that at this point there is an initial division into positive and negative evaluations, leading both to activation and arousal, and also to approach or avoidance. Thus at this level the mechanism of affect and the mechanism of arousal may be essentially

indistinguishable. Arousal begins with a value judgment, and levels of arousal determine levels of affect. The sign system involved has a distinguishable circuit for each of the major affects (Panksepp, 1998). Each circuit is distributed through the neuraxis and includes these brainstem areas, in addition to specific areas in the limbic system such as nuclei in the amygdala, hypothalamus and cingulate cortex. Each of them is essentially a sign system using complexes of neurotransmitters to conduct information about value to the cortex and motor systems; these guide motivation, thought and behavior.

Recent work by Damasio et al (2000) supports the idea that each affect activates a cluster of brain areas, “structures that regulate the organism’s current state, by executing specific actions via the musculoskeletal, ranging from facial and postural expressions to complex behaviors, and by producing chemical and neural responses aimed at the internal milieu, viscera and telencephalic neural circuits.” (P. 1049). In their experiment they induced subjects to recall certain memories which evoked four basic emotions – happiness, sadness, anger and fear. They performed PET scans on the subjects as they were experiencing the emotion and compared it to a situation where they were in a “neutral” emotional state. They conclude that “these varied patterns provide distinctive ‘perceptual landscapes’ of the organism’s internal state and that the differences among those landscapes constitute the critical reason why each emotion feels different.” (p. 1051) An example of such a pattern for happiness is “the positive peak in the right posterior cingulate, the negative peak in the anterior third of the left cingulate, the positive peak in the left insula, and the

positive peak in the right SII” (secondary sensory cortex). For the present argument this suggests a correlation between the subjective awareness of a certain emotion and the unique, reproducible cluster of brain activations. It is not clear if these activations are part of the mechanism of becoming aware, or *perceiving* the emotional state of the body, or are they being measured in the act of *producing* the emotional state, or both. But the point is that this complex of neurological phenomena, correlates with the affect and represents the evaluation, in this case of the memory being evoked for the experimental purpose.

AN EVALUATIVE QUALE?

Each affect is a sign system, and the sign is made up of a set of neurological responses. This may be parallel to that for a complex visual sign, which includes *qualia*⁴, or sensed qualities, of shape, location, color, texture, size, etc, each of which requires a modular brain system. Or it may be like taste, which is a blend of four different taste qualities, from four different systems. An affect may be a similar complex of responses, including arousal mechanisms, autonomic changes, motor responses of approach and avoidance, as well as physiologic responses to expected pleasure or harm. Could the affect sign be a quale, functioning like any other sensed quality of an object? Panksepp (2000b) suggests something very similar in his notion of “equale” referring to an *evolutionary quale*.

⁴ For the moment I will accept the notion of a quale as a sensory bit or minimal unit of sensory information such as color, shape, and not join the argument about whether qualia even exist, issues raised by Dennett (1991), and recently by Crick and Koch (2000).

The kind of sign we are dealing with is unusual. It isn't a simple token or object that "stands for" something. It is a complex set of physiological responses standing for an *evaluation*. Thus there is no "object" that it stands for, only a value, an abstraction. The affect starts with the awareness of a state of affairs, via perception, but also the connection of the perception with one's history, sense of self, and current contexts. So it may be that there are different entry points for an affective experience, e.g. the stimulus, the perception, the natural reflex response, the learning history, and higher level evaluation generated by the cortex. If someone accidentally steps on my toe, I'll react with immediate withdrawal, and quick anger. As the experience is worked over by way of higher cortical centers, and I hear the person's apologies and obvious contrition, I will see it was not a deliberate attack, it was an accident, unintentional. The pain may remain but the anger may dissipate because of the top-down (cortical) modulation.

Let us try to correlate certain trains of perception, again focussing on the visual system. As described in a previous paper (Olds, 2000) the brain has evolved to provide different sign systems for certain interpretive clusterings of sensations according to certain functional categories, denoting the *identity*, the *location* and the *value* of the percept. The identity is iconic in that it depicts the visual characteristics needed to identify or recognize the object; this is done mainly in the temporal cortex. The location is the indexical relationship, conveying information about where the object is in relation to the self. The value is a third functional category, the evaluation of the object, using the affect system.

A simplified version of the process would be this: A light stimulus enters the eye and a “retinotopic” icon of the object is formed. Optic neurons carry this image to the thalamus and then to the occipital cortex.⁵ Experiments have shown that the image maps onto the cortex in an iconic way. (A stimulus such as an “X” sign will generate a neural firing pattern in V1 – in the primary visual cortex - that has the shape of an “X.”) Tootell () As the activation spreads to secondary cortices, the stimulus can be compared to memory traces and, in the *temporal* cortex, identified as what it is. As it spreads to the *parietal* cortex, its image is much less detailed, and the information is generated as to the distance and direction from the self. Third, as it goes to the systems generating affect, it will be interpreted in terms of its value to the self.

Thus, the semiotic approach suggests that the brain uses three major systems to process these practically different aspects of an object. The affect may be attached faster than we can be aware of but still it is temporally secondary to the other two; it is not just another quale like the color or shape. The affect represents the object's value, and is not an inherent property of the object. In most cases affects are attributed as a result of experiential learning, usually in the form of classical conditioning. The attribution has a history in previous experience. In simple neurological terms it takes time to put together an image and an object in the visual system, and then even more time to communicate with another set of brain systems to recreate the association to the affect. We might call the affect a “secondary quale.”

⁵ This description relates to the corticalized brains of higher primates, particularly the human. For a reptile with very little cortex the thalamus does the work. This is LeDoux’s rapid circuit, in which response is automatic and minimally mediated.

The affect, being an appraisal, necessarily follows the perception; there must be something to appraise. However, because of the fast, early limbic circuit, and the relatively slow pace of consciousness, the percept and affect usually appear to be simultaneous.⁶ For this third step the brain has to choose which affect to connect with the stimulus. This has been learned by prior experience: mother's approaching footsteps evoke an expectation that relief is immanent. Mother's more rapid staccato footsteps may mean "watch out."

But how did the percept and affect get connected in the first place? There seem to be pre-wired connections for certain sensations indicating wetness, cold, hunger, separation, etc. with certain affect responses. In other words, how does an infant know that a pinprick is "painful" and a light caress "pleasurable?" Those connections must be prestructured. Many percept-affect connections are learned in the well-known behavioral paradigm. In this, the stimulus may be paired in time with a set of sensations, and thereby the association is made. But, also, it is generally accepted that some stimuli are pre-wired to affective response. Some species seem to have innate avoidance responses to snakes and looming objects. A chick will fall silent when any shadow passes overhead, despite no prior experience of shadows. Mouse pups with no previous experience of cats, in the middle of "rough and tumble play," will stop playing the instant some cat fur is placed in the cage (Panksepp, 1998).

⁶ In fact, in laboratory experiments with word presentation, there is a delay in conscious recognition of conflict laden words such as "cancer" or "swastika," suggesting that even with symbols there is an initial quick appraisal prior to awareness.(Anscombe, 1986) In such instances it may be that the sound

The expression of affect, the signs of emotion to be conveyed to others, precedes language by a long time. And much of mammalian evolution has included an increasing complexity of affects and of their expression. The driving force for this complexity seems to have been the degree of sociality that a species develops. Going a long way back in evolution are the expressions of mating-readiness, and of aggression in the establishment of social dominance hierarchies. These may have evolved in social animals such as monkeys and primates, leading to "social" emotions such as shame or triumph. With pre-linguistic hominids, the expression via gesture, facial expression, and tones of voice became highly elaborated. As language developed in archaic Homo sapiens, we think that affects became nameable like everything else.

THE SEMIOTIC CATEGORIES OF AFFECT

For the present argument, we must try to clarify just what kind of a sign an affect is. It is an extremely complex sign, and we may use Peirce's categories to define some subtypes of signs.⁷

Loosely following Peirce's classification, we may consider three major types of signs, each having different properties useful for conveying particular kinds of information within and among living organisms. To briefly review these categories of signs, we can take for example the much-used object, the writing pen. If there is a pen

pattern itself has a pre-symbolic effect, like a scream or a dog's growl, via Ledoux's rapid circuit, stimulating anxiety before its symbolic reference is appreciated. This would be interesting to research.

⁷ I should point out that this is not a paper about Peirce with affect intended as an exemplification of his theories. My hope is to write about affect, using Peirce's ideas as a starting point and seeing if they can add to a dialogue with current neuroscience theories.

lying on the table, there are three main ways you can bring it to mind: you can point to it, thus locating it in space and drawing attention to it - in Peirce's terminology this is an "index;" you can draw a recognizable picture of it, otherwise known as an "icon;" or you can name it or "symbolize" it. A crucial distinction among these three ways is that the non-symbolic signs (indices and icons) are in some way *constrained* by their objects; if you use an index to represent the pen you have to point at the pen, you can not just point anywhere you please. And if you use an icon, a drawing or a diagram, it must resemble the pen; otherwise you won't recognize it. However, with a *symbol*, there is no necessary connection to the object; just about any set of phonemes can be used to represent anything, the ones you choose will depend on what language you are speaking. This so-called "semiotic freedom" gives the symbol incredible power, which has made it one of the major engines of human evolution.

Affects as signs.

How do we classify an affect as a sign? An affect has aspects of all three kinds of signs:

Indexical: location is important in determining what affect will be elicited. First of all, the phenomena of approach and avoidance are the clearest examples of the index that there are. *Proximity* and *distance* are among the fundamental categories relevant to survival. Basic issues of pleasure and unpleasure indicate whether one should approach or avoid. In addition indexical values determine many specific responses. A coiled rattler three feet away will provoke one affect and response; the same snake 30 feet away will occasion a different reaction. An affect display may

include indexical aspects such as *withdrawal* gestures and postures or gestures of *drawing near* and embracing. And within the body the subjective aspect of emotion may include a location, the “heart” or the “guts.” The metaphors often associated with affect have indexical aspects; my mood is up or down, I’m feeling “distant,” or “inside myself.” In infancy, but also throughout life, the *whereness* of important objects is highly affectively salient. For an infant the whereabouts of the mother is of constant concern, proximity being possibly the most important factor in the survival of an infant of any species.

Iconic: an affect may have natural constraints including that the affect be appropriate to the situation. Increased heart and breathing rate are appropriate to situations of danger, where fighting or fleeing may be necessary. Ekman’s () research has supported the notion that some affect displays are uniform across cultures. Thus we can say that the sign of affect is constrained by the affect; this suggests it is non-symbolic, better characterized as an icon. But if it is an icon, how does it resemble anything? We can say that the physiology of each affect relates in a non-accidental way with the situation causing it. For instance the emergency emotions of fear and anger include sympathetic arousal and a body prepared for action. This is iconic in the sense that it is appropriate for fighting or fleeing. Sadness or joy arouses different physiological responses. It is likely that the iconic aspect of affect plays a large part in the “attunement” experience between mothers and infants described by Stern (1985). In that interaction there is much passing back and forth of affective displays, including both “categorical” emotions, the ones we have been speaking of, and the

“vitality” affects, representing changes in intensity, tension and energy. Infant-research tapes have shown iconicity in the cross modal expressions of rhythm, for instance when a mother’s vocal rhythm matches the infant’s banging of a rattle.

To pursue the iconicity issue further, we must say that it is important that I recognize the affect that you have. Empathy, imitation, other forms of internalization produce an iconic likeness of your affect in me. This may occur by several routes, as yet not fully understood. If we think of the iconic representation of the visual image that arises in the visual cortex, is there an analogy in the world of affect? As mentioned above we learn to associate an affect with a percept (say loud noises with fear) and we communicate our affects to others. The communication function is of major importance. By the analogy of vision, my perception of your affect may have an iconic representation in me; this would have to mean it would induce in me at least a mild version of your affect. (If you are sad I’ll be sad; if you are angry I’ll know it by having “trace anger;” then I will be angry or afraid of you, depending on the context.) There are intriguing possibilities for research. One such possibility is the phenomenon of “mirror cells.” Experiments with the motor system in monkeys has shown that, when a monkey makes a motor act such as putting food in its mouth certain motor cells can be recorded. Then when the monkey sees the experimenter making the same motion of arm and hand, the same cells fire *in the monkey*. This direct mirroring of the others actions in one’s own brain may be important in imitation and the learning of skills, possibly in all mammals. It may be that such mirroring allows for internal simulation of another’s affect. As far as I know, research

in the mirror cells in the receptive areas or the affective-motor areas of the brain has not been done.

Symbolic: affects are expressed non-verbally and verbally. The verbal expression is obviously symbolic by our definition of language. At first consideration the non-verbal affect expression, via body posture, gesture and facial display, is not culturally determined and therefore does not fit the definition of symbol. However, it may be *evolutionarily* determined, in a way that is not dissimilar to the cultural mode. Affect displays have evolved over the millennia. It may not be clear how each affect evolved its repertoire of physiological responses, and there may be some manifestations that now seem arbitrary, although they may have once been constrained by adaptive purpose. For instance it makes sense that the expression of shame might include a sagging posture, derived as it may be from the dominance-submission systems in primate evolution, or that rage might be indicated by aggressive expressions of baring teeth and making frightening noises, iconic for a fighting posture. But it may be somewhat accidental that the brow furrows with worry or the eyebrows go up with surprise. This could be similar to the evolution of birdsong; each species has the inherited apparatus to produce a series of notes that is unique to the species, a kind of language whereby members of the species can communicate and be recognized. But there is no inherent constraint producing any particular series of notes. As with all forms of communication there must be a shared

understanding of the meaning of the sign, so that the singing bird and listening bird have evolved to make use of the same song.⁸

An interesting sidelight here is that affective expressions have to some extent been preserved through the evolution of species. A dog and a human can easily detect anger or fear in the each other. This is different in bird-song and other displays related to mating. A dog will respond appropriately when a peacock gets angry, but will be quite indifferent to the peacock's mating display.

Also because of the vagaries of both disposition and learning there is some indeterminacy in the particular relation between an affect and its inducer. One person might evaluate a mouse running across the floor as cute or amusing, while another might react with terror. But the particular affect is expressed to the self and to others in pretty uniform ways.

It is striking that the iconic and indexical aspects of affect expressions have themselves generated much symbolism. As Lakoff and Johnson (1996) have pointed out, much of our language derives from metaphors derived from body feelings appropriate to affects: "hot under the collar" relating to anger, "down in the dumps" relating to low mood or sadness. In other words the signs of the physiology and display of affect are translated into the symbols of linguistic emotion expression. This

⁸ Could some of the expressive aspects of affect that are not necessary parts of the physiologic arousal, such as the raised eyebrows or the sneer, be co-evolved in a more accidental way, and as mentioned above behave like symbols? Could we follow Panksepp and call them "esymbols?"

is interesting in that the symbolism here is directed by the iconic and indexical aspects of the non-verbal aspects of affects.⁹

A DIFFERENCE THAT MAKES A DIFFERENCE?

One might wonder how this redescription via semiotic theory could make any difference other than the philosophical issue of the difference between non-life and life, or the generally interesting notion that we live in a sea of signs.¹⁰

There are several issues we might open up to semiotic examination to see if the model is of some heuristic value. 1. The issue of the time course of an affect. 2. The issue of drives and affects, 3. The three functions of affect and their dissociation, and 4. The different functions of the three types of signs with respect to affect.

The time course of affect.

There has been considerable struggle between at least two models of the time course of an affect. One is a traditional perception-first model. In this the subject first senses and identifies an object, then attaches an affect, and then has a physiological and motor response. Affects have been associated with objects through previous

⁹ Here is an example of the fact that there are almost no signs that are “pure.” And many symbols have some iconic and indexical aspects, which we can see especially when we follow their etymology in a language. For instance the word “sanguine” associates a ruddy countenance with optimism and good humor, an iconic aspect. (A. Chiozza, personal communication.)

¹⁰ Two other important bodies of work address similar issues and may be complementary to the present essay. One is that of Bucci (1997) who has derived the concepts of sub-symbolic, non-verbal symbolic, and symbolic forms of communication. Another is that of Lane and Schwartz (1987, 1990), who have developed a hierarchy of expressions of affect, which has an epigenetic unfolding similar to that of Piaget in his series of cognitive stages.

conditioning; and subsequently when one comes upon something dangerous or previously associated with harm or pain, one sees it, recognizes it and then responds with *fear* and jumps away. An alternative is the classical James-Lange model of affect proposed in the late nineteenth century. In this model the generation of affect is pre-conscious, mediated by somatic, physiological reactions. In the classic statement of the theory, one knows one is afraid when one realizes one is running away. The physiologic response of fear, anger or pleasure is made instantly and pre-consciously, and one learns of one's emotion by becoming aware of such a response. Although the semiotic model can not prove either of these alternatives, it might help resolve the controversy. If we take LeDoux's model of fear in which there is a "short circuit" whereby a percept is immediately routed to subcortical structures - in the case of fear, to the amygdala - and a long circuit by way of the cortex. The short circuit is very fast but imprecise visually so that anything that looks like a snake triggers an immediate reflex jumping away. This circuit would correspond to the interpretation-first view of affect. When the cortex is used to evaluate the stimulus and conclude that the object is only a curved stick, this aspect would correspond to the James-Lange view because it is at this level that we become conscious of the experience, it's most salient and possibly first-arriving feature being the fact that I am jumping away. Each of the two steps represents a semiotic system, one for rough and ready survival, one for more deliberate judgment. It is probably even more complicated than that. Panksepp proposes a more elaborate model where there are multiple levels in the neurological and mental response, with two-way feedback in *concurrent* complex

processes. (1998, pp. 35-45) The semiotic analysis finds a contradiction in the model that suggests we attach the affect before knowing what the object is. Signs do not flow backward; by this I mean that a sign exists in time *after* the thing, phenomenon, or event that it stands for. The sign of evaluation must have something to evaluate, and therefore must *follow* it. The LeDoux short circuit provides the answer to the apparent paradox.

Drives and affects.

The place of drives and affects in psychoanalytic theory has had a tumultuous course. In the neuroscientific realm there may be similar uncertainty, although it seems to be a less passionately debated issue there. Damasio seems to conflate drives and affects as in the same category - homeostatic regulatory mechanisms. Panksepp does not discuss drives much in his *Affective Neuroscience*. But interestingly, in his tri-level listing of affects his level 1. seems to be really about drive like phenomena – the hungers, etc.

A paper that addresses this issue squarely is Shevrin's (1995). He points out that psychoanalytic theory has, in its flight from libido theory, taken a sharp turn toward "affect-first theory." He reviews Lichtenberg's and Kernberg's models as ones in which drives are downgraded, and almost discarded. For Lichtenberg the things considered in the past to be drives are now limited to signals, which derive all their force from associated affects. The informational model has taken over, so that even the "drives" are informational signals that initiate affective processes that lead to action. Where there seems to be no escaping the energy aspect, there are terms like

“affective cathexis” which slip energy back in without much notice. Could semiotics help us here?

Let us go back to the earlier mentioned hard-wired affects represented by approach-avoidance, say toward nutrients or away from looming objects. I described them as “unmediated” affect systems, reflex and with no central intermediate phases. Or with a hunger, one gets hungry and eats. One can do that without much affect. In Freud’s model the affect of unpleasure was associated with the increasing drive, say hunger, and pleasure with the satisfaction and reduction of the excitatory pressure. Thus drive and affect were intimately related. But it may be that a drive is more about the state of the body and its homeostasis, and an affect is more about the state of the world, of the environment confronting the organism. Shevrin points out that the semantics differentiate drive from affect. You can *frustrate* or *gratify* a drive, or a “craving”, but not an affect. You can *experience*, *express* or *suppress* a feeling but not a drive. You can *want* (drive) something without *liking* (affect) it, and you can like something without wanting it. Drives have force and affects have evaluative content. Pleasure and unpleasure are the basic affect vectors; satisfaction or frustration are basic drive vectors. Of course there is frequent overlap; one can become angry or sad when a hunger or craving is unsatisfied. A feeling of happiness can lead to increase in sexual or creative drive. Anxiety can lead to reducing of both those drives. Shevrin describes a craving in very young children as diffuse and non specific. The baby is dysphoric, it cries, the mother tries to satisfy it with the small repertoire of ministrations - feeding, burping, changing, rocking or cuddling. Later

the drives become more differentiated as desires; the baby, and soon the mother, through signs, “know” the baby is hungry, or wet or tired, etc.

From our point of view, we could suggest that the difference is in the nature of the sign. For a drive we have a kind of unmediated urge; the sign - conscious or otherwise - is not a value, it is directly a hunger, a wanting. The sign is a physiological sign, a sign of homeostatic imbalance. It can be conscious as with hunger, or non-conscious as with electrolyte imbalance. The body normally automatically rights the imbalance without a lot of affect. Blood sugar goes down to a certain threshold, that is a sign to various brain areas leading to physiological responses and feelings, light-headedness, stomach feelings, etc. As Panksepp points out we have evolved so that we have this experience long before we are near starvation; there is a healthy lead-time built in so that hunger begins well before there is an emergency. The subjective sign is the representative of the drive, it is a physiological set similar to that for an affect, but it is not an evaluation as such. A value may be added, but not inevitably; if I’m hungry, I could be angry or anxious that I don’t know where my next meal is coming from, or I could be pleased because I want to have a good appetite for the excellent restaurant I’m heading for.

This may help in understanding Panksepp’s categories of affects. In his description there are three categories. Category 1. includes “low level emotive responses that are almost reflexive, such as startle, disgust, and the various hungers...” Category 2. are the “blue ribbon grade-A emotions’.” These are “expectancy” or “seeking,” “rage,” “fear,” and “separation-distress.” Category 3. are

more subtle, socially determined affects, usually studied in humans. Category 1. tends to the drive and craving model. Category 2 and 3 phenomena are more evaluative as described above and less drive-like. They are more informational and less energetic, the obverse of the situation with drives.

In summary, the difference lies in the nature of the sign. With a drive the sign is the physiological imbalance itself, and the correction is normally done automatically, with or without awareness. With an affect there is a secondary evaluative sign. It is less peremptory and possibly more complex and with more mediating steps than the drive. We might say simplistically that an affect has, or is, an extra sign that a drive does not have. A secondary feature we can note here is that an affect, value sign, is usually a quale attached to a percept or a remembered image. In other words the affect sign is about the world and the organism within the world; an affect turns outward. A drive arises from within; the sign is of a state of homeostatic disequilibrium. Another difference may be that affects are less about current states and imbalances than are drives, but are more predictive, they are evaluations, which lead to predictions as to the organism's welfare given the current circumstances. Thus, the signs that represent the drive represent the imbalance itself – with hunger: the stomach pangs, the fatigue, the light-headedness. With affect, the signs represent the evaluation, not any particular drive-related metabolic imbalance. Another way of describing the difference is this: a drive is a semiotic system representing a departure from homeostasis necessary for survival of the organism. An affect creates a departure from homeostasis that acts as a sign to motivate the organism with respect

to its environment according to values. The affect seems to have more of a top-down aspect, more room for a high level evaluation of the state of affairs, which then enhances or reduces the immediate physiological response.

Three aspects of affect and their possible dissociations.

We can abstract three major manifestations of the affect system. One is the *physiological response* involving multiple brain centers and the autonomic nervous system indicated in research such as Damasio et al's experiment. A second is the *display* aspect, and the third is the *subjective* aspect. Psychoanalysts have long been aware that these three are often dissociated, possibly the most common and striking feature of our patients' presentations. In a sense each aspect can be put out of commission, temporarily or long-term. One may have the physiological and the display aspects but be unaware. One may for instance be red in the face, with knuckle white fists, and show the cardiovascular phenomena attributable to the anger response, and still say, "Who me, angry? No way!" This dissociation may be quite habitual in some people, a facet of the "repressor style" to which I'll return later.

One may have both the subjective and the physiological aspects, but not the display, as in a dissembler or "poker faced" negotiator. Here the display aspect can be sharply reduced, but such a person may fail a lie detector test, which measures the physiology. Or alternatively one may fake display, as in feigned anger in order to intimidate, or feigned friendliness to a hated rival.

Or one may have only the physiology but no display and no subjective awareness. Examples of this may be the “alexithymic” and possibly the “avoidant” child to whom I will also return later. It seems that of the three we have *very little* control over the physiologic response (with the possible exceptions of certain trance states and Yogic practices), *some* conscious and unconscious control over the display, and *much* unconscious control, mostly by way of defense mechanisms, over the awareness.

Krause (2000) points out that affect research beginning with Freud has underestimated the importance of the expressive aspect of affect. One could argue that the expressive purpose of affect is particularly important as mammals became more social. It could be that the ability to dissociate display from basic physiological response had its own evolutionary trajectory. Just as the anger and the fear clusters may have evolved as separate systems, the expressive aspects could have evolved as separate systems as well. The ability to dissemble and fake affect expressions seems to be a high-level function, well known to humans and possibly present in chimpanzees. Also some species may find some flexibility in affect expression to be advantageous. A lion preparing to struggle with a rival in a power dispute will use a dramatic threatening display. The same animal about to attack a wildebeest, may have a similar physiological cluster of excitations, but it can well do without the display. If these two aspects - physiology and display - have evolved separately and differentially in different species, they could more easily be seen to develop separately, and at times idiosyncratically, in humans. Krause points out that certain

kinds of psychopathology exhibit mixes of incompatible affect displays, such as anger and pleasure, or anxiety and pleasure. Then there are ethnic differences, such that affect display in general is more or less acceptable and uninhibited, and other areas where expression of certain affects may be curtailed. For instance in one culture the display of contempt might be important in preserving social hierarchy, while in another culture contempt would have little value and would be considered bad manners unacceptable in a leader.

For the present discussion the most obvious semiotic dimension of affect is the outward expression. Yet the physiology and the display have an inward semiotic aspect, so that the subjective awareness of affect includes both an awareness of the physiology of preparedness and of proprioceptive sensations resulting from the display. Curiously, we can use each manifestation as a sign to generate the other two. I can think *sadly* as in Damasio's experiment and generate the physiology and expression; I can have the physiology stimulated by drugs or electrodes, or I can imitate the expression as in some of Ekman's (1994) work, and the other two phenomena follow.

This phenomenon of dissociation may be an example of the heuristic value of the semiotic approach. We sometimes speak of "carving nature at the joints." Semiotics may show us some of the joints, in this case the knife is dissociation which suggests that an affect is made up of three semiotic systems that have co-evolved. In fact, this affect-system dissociation is the bread and butter of psychoanalysis. It has not been as much studied by neural scientists, as have other aspects of affect.

An extraordinary experiment by Heller (1996) may be an example of the kind of dissociation I've described. In an attempt to understand "the semiology of suicide" they observed videotapes of the facial expressions of a psychiatrist interviewing patients within three days of a suicide attempt. Following the interview, the patient and doctor filled in questionnaires aimed at evaluating the emotional quality of the interaction. The doctor wrote down his diagnosis and his *prediction* of the patient's making another suicide attempt. The interview was structured, with a set series of questions. Video tapes were made of the doctor's face and the patient's. Only after doing these things did the doctor consult the patient's previous record. The first interviews included 59 suicide attempters. A year later they found that ten of the patients had made another suicide attempt, none fatal. The video tapes were coded using a facial expression coding system devised by Ekman and Friesen (1978). In brief, the doctor predicted the risk of another attempt, using his conscious impression with an accuracy of 29%; however, the coding of the doctor's face during one minute of tape allowed the investigators to predict with 81% accuracy. One major difference was that the doctor *frowned* more and was more emotionally expressive and active with the future re-attempters than with a matched sample of patients who did not make another attempt.

This experiment was done with one doctor interviewing 59 patients. Although there are many reasons to question the results - the small n, the unique personality of the doctor, even the possibility that his frowning had a negative therapeutic effect. But the fact that his facial expression pattern was a more accurate indicator of his

reaction to the patient's presentation than his own conscious evaluation is striking. He revealed an iconicity with the patient that even he did not realize. This is a nice example of dissociation between the display aspect and the subjective aspect. It would be interesting to have had the doctor wired for physiological measures.

The symbol in relation to the other types of signs.

Let's take another look at the role of the symbol. Affects themselves, both in their internal and external expressions, are inborn and universal, and therefore in general would not be considered symbolic. As mentioned above however, in humans, the furrowed brow and the raised eyebrows may not be physiological requirements related to the affects involved. As with birdsongs and the barks and whines of mammals, the mutual evolution of signs, and receivers of those signs, produced a communication system. However, in human language symbols can be used to represent affects, thus standing for affects in a more arbitrary way. With human language, there may be some influence from iconic and indexical aspects as mentioned above. But the fact that a symbol is chosen arbitrarily and is different in each language makes its relationship to its referent always more distant and provisional. Symbols can be verbal (language), or non-verbal, for instance a gesture, a national flag, or an advertising logo.

This distance and provisional nature provide the symbol with the properties of flexibility and the power to help in adaptation in a complex social world. Boysen, et al (1996) describe an experiment with chimpanzees, that makes a dramatic point. If

you present one hungry chimp with two plates of food, one much bigger than the other, it will always choose the larger by pointing to it. If you ask the animal to choose one, which will go to another chimp, potentially giving the other one the smaller portion, the subject chimp will not be able to make the self-serving choice. When asked to select by pointing to the food plate to be given to the other animal, it will always point to the larger and then be quite angry when this goes to the other. Children before age two have the same problem; they can not point to the smaller - to be given away - in order to end up receiving the larger. However, in the world of primate research, there are now some chimps that have learned to count and use numbers as symbols. When the same experiment is done with such a chimp, for instance with one treat in the small portion, and four in the large one, and you ask, "Which one do you want to be given away, '1' or '4'?", it can soon learn to sign "1" and then triumphantly enjoy the big portion. In other words when the animal has to use an index, namely point to the desired dish, it doesn't have the kind of flexibility needed. When symbols are applied, it can somehow play the game at a different level.

This experiment is enlightening with respect to symbol systems. They provide a separate world, the world of the symbolic, manipulated in the brain. Symbols, in this case numbers, have such a loose connection to their referents that they can be manipulated with great freedom, a freedom Lacan refers to as "glissance," a kind of sliding or slippage. Symbols relate more intensely to *other symbols* than to the objects in the world.

Now it appears that the symbolization of affects can be beneficial. Research suggests that affects of which one is unaware, and/or unsymbolized, are less in our control. We have a less flexible way of dealing with them, and we are unable to learn whether they are appropriate or not. A repressed person finds himself in transference situations with an authority figure, finds himself behaving in damaging ways and has no awareness of why. Like the chimp who is unable to make the adaptive choice with respect to the two plates of food, the transference reaction is out of the person's control. Teaching the chimp to use symbols apparently allows for an adaptive flexibility. Teaching an analytic patient to symbolize affects may allow for similar adaptability.

If we look at this possibility in semiotic terms we can imagine the following. Semiotic theory leads us to focus on the repetition compulsion as fundamental to much repetitive behavior, some, but not all of which, is maladaptive and out of a person's control. The repetition structures transference responses and many behavioral complexes we term characterologic. A repetition is by definition *iconic*. A structure of experience is repeated as a habit, also called a procedure, or procedural learning. For instance in a patient who has intense conflicts in dealing with authority figures, the person has generalized an affective response derived in early experience with a parent or caretaker, to all those in a position of power or influence over the self. The ensuing response to such a person, involving fear and withdrawal, compulsive rebelliousness, anger and resentment, or passive-aggressive negativity, will result from the affects habitually associated with the authority figure. The affect

has become an implicit quale in this situation, and the person has little choice beyond his habitual response. The iconicity implies that the experience is a *package* deemed similar, there is no freedom to parse out aspects of the experience that would break down the conviction of similarity.

In a transference reaction the affective icon is linked to a category of person. When we introduce the symbolic, by talking about a patient's experiences with authority figures, we can introduce some flexibility into the transference system. When we do this, each element of the complex can be separated out and can be named and dealt with discretely by its name. The affect involved can be named, and the parts that might differentiate the current object from the transference object can be named. This naming allows the individual elements to be peeled away from the affect. One might have the freedom to conclude, 'Yes indeed my boss is harsh and critical, but he is not the same person as my father, and the various meanings of his behavior are different for a grown man than for a little boy.' That is of course not the end of it. The working through requires many repetitions and re-experiencings of this insight that has been shared through naming - in the analytic situation. But the naming and the differentiating at the symbolic level, allied with the new patterns experienced in relation to the analyst, seem to allow for change. The symbolic order takes events and things into a virtual world, mediated by the human cortex and the social world. The virtual world can be manipulated by trial actions, imagined events and people, by re-arrangements of reality. The hard wired affective connection, leading to phobia, inhibition, compulsion, perversion or repetition-compulsion

becomes an object in the symbolic world, and the connection can be seen to be provisional. Other possibilities emerge, and one can work through to change. Affects too can become objects when they become named and become the referents of symbols. Thus the person who can symbolize has this great advantage: feelings can be named and thus opened to question.

Lest we focus too much on the negative aspects of the iconic repetition, we must remember that the positive transference is also iconic. We enter the therapeutic relationship with hope for the repetition of the positive aspects of our childhood and the beneficent role of our caretakers. The iconic aspects we use profoundly, and for those for whom there was little good in their childhood, there may be little positive transference to count on. And we know that the separations and reunions of the present, the analyst's vacations and returns, are among the most dramatic and important repetitions that we encounter; they are iconic experiences, which generate iconic responses. Again, verbalization helps in managing these responses. It may take years to be able to verbalize what is good in the relationship, what one misses by absence and gains by presence. That too involves the symbolization of what was indexical and iconic.

There is much recent work showing more of the power of symbolization, particularly of language. Eagle (1998) reviews the growing literature showing the disadvantages of the "repressive style" and the advantages of verbal expression - the lifting of thing presentations to word presentations. He quotes Freud from 1937 saying "It sometimes turns out that the ego has paid too high a price for the services

the defense mechanisms render it. The dynamic expenditure necessary for maintaining them, and the restrictions of the ego which they almost invariably entail, prove a heavy burden on the psychological economy." There are numerous lines of research on people with a repressive style, a general style that avoids consciousness of negative affects and the thoughts or memories that could trigger such affects. They may have the advantage of a more sanguine conscious mood; but they more often have a decreased immune response under stress, heightened systolic blood pressure and increased cortisol levels; they may also have heightened susceptibility to somatic conditions including ulcers, allergies, and other medical problems. Jensen found that repressor cancer patients generally had a more positive affect; but their medical history at follow up was much worse than for non-repressors. A related example is the "avoidant" child described in the literature on attachment; although unaware or and unexpressive of an emotional reaction, the toddler is manifesting many of the autonomic arousal signs appropriate to separation anxiety. Does this child become a "repressor?"

On the other side of this coin there are shown to be advantages to making use of the symbolic realm. Pennebaker and colleagues have shown that students suffering from various kinds of trauma, who are asked to write about the trauma, make fewer visits to the student health service, and have shown improved immune function. In another example Esterling et al (1990) have shown that writing about traumatic events seems to modulate latent Epstein-Barr virus activity.

Summary and review

To review the arguments:

1. The semiotic model provides a *point of view* of biology and brain function that allows for a smooth crossing of the mind-brain barrier; in fact, there *is* no mind-brain barrier. From this viewpoint, brain phenomena and mind phenomena are all semiotic; they are all forms of information processes at different levels of conception.
2. The model works particularly well when the functions of interest are themselves basically informational systems, such as the central nervous system and its many communicative manifestations - for instance neuro-peptide systems, hormone systems, and the neural-network systems, that generate perception, memory, affect and consciousness - as well as interpersonal systems including gesture, language and social structure.
3. We have encountered three trichotomies. There are three major categories of signs, the icon, the index and the symbol. There are three major systems for distinguishing percepts, namely identity, location and evaluation (affect), with major brain systems devoted to these distinctions. And, the affect system itself has three major manifestations including a physiological response, an expressive display, and a subjective awareness.
4. We have noted the importance of the dissociation of these different manifestations of affect, and we may suspect that such dissociation plays a part in some

psychopathology; and, the undoing of such dissociations may play a part in psychotherapy.

5. When we consider different types of signs - icon, index and symbol - we see that each type plays a part in affect systems. An understanding of the functions of the different types may be heuristic in suggesting paths of research. And, this understanding can shed some light on questions about the time course of affect, the nature of drives and affects, dissociations of the manifestations of affect, and the functions of the different kinds of signs in affect systems.

In summary, I suggest that the point of view espoused by the semiotic model has heuristic value in the scientific study of affect, at different levels of discourse.

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