

Chapter 5

Metaphors of Motivation

A Learning Experience

In every age, and in every discipline, there is an accepted metaphorical framework that describes how the world works. When tools and methodologies are created that pose questions that cannot be answered within the framework of that discipline, new theories and procedures arise that overturn otherwise unchallenged and intellectually sacred ideas. For the concept of meditation, it is easy to believe meditation isn't rest if you didn't have the tools and procedures to conceptualize what rest is. But the problem extends beyond that to the incorrect metaphors that inform both common and academic sensibilities as to the rudimentary principles that drive our minds and behavior.

How do people behave? Common sense would seem to provide a key. But common sense is a moving target. What seems absurd today was universal truth in a previous age. Yet witch burning, blood letting, flat earths, and various other fictions disappeared not when they were separately refuted, but when better metaphors were introduced that explained our biological and physical worlds.

But language seems almost without words when it comes to that dull convoluted pudding that makes us be, our brains. Look from outside, and you see a skein of neurons clustered in interacting organelles, awash in chemicals, and connected to our bodies in a recurring loop. Look from inside, and its reality is embodied in feelings, emotions, and a consciousness that is linguistically reiterated by a dance of metaphors. Recognizing the vaunting complexity of these first two perspectives, a third view is to employ pragmatism, and simply look at the behavior of brain and body in 'action', and form the metaphorical language that can most completely and parsimoniously describe the causes and effects of everyday behavior. That is, a better route to understanding may be to simply describe what we are doing rather than what we are.

This third perspective represents a description of how experience shapes behavior. Yet, for much of our behavior, experience plays no role whatsoever, and behavior occurs no matter what happens. Respiration, sleeping, digestion, and the daily biological upkeep functions that keep us alive occur automatically, no experience required. These 'homeostatic' behaviors keep the body in a state of regulation, and bring it back into regulation if time or circumstances takes it out of balance. Homeostatic behaviors, although indirectly influenced by experience, nonetheless do not need experience to occur. For example, although singing a song to a child induces or enables sleep, it does not *cause* sleep. Sleep would occur pretty much on its own without lullabies.

On the other hand, many internal responses also occur indirectly from experience, and although they also enable behavior, they could not otherwise occur without that behavior. These *allostatic* behaviors represent stability through change, or in other words, allow us to sustain altered behavior patterns by changing our internal regulatory behavior. For example, running fast occurs because of information or 'demand', yet the changes in the autonomic nervous system such as rapid heart beat, hormonal changes, etc. enable one to keep running. But these changes would not otherwise occur without an instigating or indirect cause that we in fact control.

Outside of the S-R responses of homeostatic and allostatic behavior, we are left with those responses that are emitted due to information we consciously or nonconsciously derive from our environment. This information can be codified by many metaphors, from 'demand' to what-if expectancies to the behavioristic language of contingency. These response event-stimulus outcome or R-S metaphors attribute behavior to events that are projected to occur in the future, and derive from processes of memory that represent behavior virtually in physical and temporal dimensions. That is, static experience or memory is dynamically translated into four dimensional projections that correlate with or cause behavior.

Ultimately, a systematic description of how behavior changes due to variations in information or demand must include a description of the feedback and feed forward processes that integrate allostatic and homeostatic behavior with processes of thought. In other words, to adequately describe behavior, S-R and R-S processes must be combined. This integrated conception of biology and behavior represents a *bio-behavioral theory of learning*. Unfortunately, in spite of the compelling argument for a science of learning that integrates the biological with the behavioral, the surface or consciously appraised 'facts' of behavior speak otherwise. Because demand or the information that comprises demand is often non obvious or subtle, information may be encoded in highly abstract characteristics of our environment that are difficult to capture with language, hence an S-R-S conceptualization of many so-called reflexive or S-R behaviors is inconceivable because it

is *unconceivable*. Because of this, behavior has historically been divided into two separate subject matters. Thus whereas we can describe the means-ends expectancies that drive rational or voluntary behavior, non-rational or involuntary behaviors are something we never 'expect', and we have consigned them to indivisible stimuli that elicit behavior as if it were no more than a reflex.

This is particularly the case for muscular tension and relaxation, which are universally regarded as allostatic behaviors that respectively result from the 'demand' of threat or focus. But this emotional demand is barely informative, and reflects a point like stimulus that involves no deliberation, no thought, and no contingency. Thus, a stimulus like event (S) elicits the response (R) of tension that in turn elicits the allostatic behavior (heart rate increase, etc.) that sustains it. These allostatic events also follow a mechanistic cause and effect mechanics, therefore allowing the entire behavior sequence to be described as a chain of S-R responses. This is in contrast to events that are dependent upon abstract patterns of information, or means-end expectancies. Therefore we may grasp an object, walk, talk or think because of information that we perceive as response event-stimulus outcome (R-S) expectancies. Although allostatic behavior also occurs pursuant to this behavior, it is generally considered to have little or no influence on that behavior, and gives rise to the conception that voluntary behavior is primarily dependent upon rational or informative causes without the affective input of internal bodily states, or is disembodied.

For stress, this has led to the widely held dichotomy that the feelings of pain or pleasure deriving from the musculature and its accompanying physiology are different in kind from behavior that stems from purely informative sources. This split between emotion and reason and the behaviors they engender is built not only into the conceptual framework of everyday life, but until the last few decades was established as a scientific principle. The convergence of this common sense and academic view finds its technical counterpoint in the concepts of *operant* and *respondent* behavior. These behaviors were different in kind, different in terms of their causal mechanisms, different in terms of the methodologies that revealed them, and different in terms of the two psychologists who almost literally made them be.

An S-R Story

..classical and operant conditioning are not two different 'kinds' of learning, but two procedures that are reliably present when (behavioral) selection occurs.

-James Donahoe and Robert Palmer (1993)

It all started with Ivan Pavlov (xxxx-1936). A physiologist by training, Pavlov was first interested in the process of digestion, and he soon recognized that measures of digestion, namely salivary responses or secretions in the animals gut were often occurred prior to the ingestion of food, and represented 'psychic' causes that depended upon the specific pairing or contingency between stimulus and response. The taste of food would elicit an unconditioned response of salivation, but salivation in turn could be elicited or conditioned to occur after the introduction of neutral stimuli (e.g. a bell) that were paired earlier with the food. The bell would be a conditioned stimulus (CS) leading to the conditioned reaction (CR) of food. This process of learning, or *respondent or classical conditioning*, was based on data derived from a particular methodology. These data were in turn described using a 'data' language derived from the metaphor of stimulus- response. Because certain types of behavior, namely emotional or other covert responses seemed most amenable to the investigative methodology of classical conditioning, the assumption soon followed that emotional behavior was under the specific province of the S-R principles that underscored classical conditioning.

The Pavlovian metaphor of stimulus-response found contrast with a complementary metaphor that represented overt or voluntary behavior. Identified with the work of psychologist B. F. Skinner, voluntary behaviors represented responses that were not elicited by stimuli, but rather were *emitted* and subsequently reinforced by stimulus events or reinforcers. This R-S (response-stimulus) or operant behavior also was derived from the use of a specific methodology and data language. And like classical conditioning, operant conditioning seemed to apply best to voluntary behaviors, thus providing the second half of a neat dichotomy that separated S-R or respondent behavior from R-S or operant behavior.

These S-R and R-S metaphors in turn extended in turn to a *physiological* metaphor that localized S-R processes in separate structures or organelles of the brain. Thus, S-R or Pavlovian processes were localized in midbrain structures that operated in an analogical manner, and R-S or Skinnerian processes were localized in cortical processes that operated in an logical or computational manner. These processes acted independently of one another. Finally, S-R and R-S metaphors provided a *taxonomy* where certain modalities of behavior were classified. Thus, operant behaviors encompassed the conscious control of the striated musculature and all voluntary and overt behavior, whereas respondent behavior reflected the nonconscious control of the smooth musculature and all involuntary or covert behavior (e.g. emotions). These behaviors not only were different in kind, but operated separately from each other.

The problem with this metaphorical scheme is that a purely S-R interpretation of respondent conditioning conflicts with the metaphor of conditioning, forming an implied definition of learning that is a contradiction in terms. The term 'conditioning' denotes experience, which is represented neurologically as memory, and represented topologically as expectancy or contingency. That is, experience consists not just of stimuli, but the contingent or correlational relationship between stimuli that occurs in three spatial dimensions and the dimension of time. To conceive or picture events, they must therefore occur in time, or involve contingency. Conditioning always introduces contingency, and couples S-R processes with R-S processes. For example, a salivary response is elicited as an 'unconditioned' reflex when food is introduced into the mouth of a naive subject. Pair the onset of food with a neutral stimulus such as a bell tone, and the subsequent occurrence of the sound of the bell will act as a 'conditioned' stimulus and elicit salivation when the food is not at hand. Yet, the bell elicits salivation not because it has taken on the properties of food, but because it predicts the occurrence of food. After successive trials in which food does not follow the stimulus, salivation decreases or extinguishes as the predictive power of the bell wanes. Indeed, expectancy or contingency can be used to describe the results of any respondent experiment because both metaphorically represent the relationship of behavior and events in time.

A second problem with the distinction between operant and respondent conditioning is that it does not fit the facts of behavior. In the case of stress, if the activity of the striated musculature is primarily an operant, why is muscular contraction in stress considered a respondent? In addition, respondent behaviors such as gastric motility rate and salivation can also be conditioned by operant methods. This is confirmed by our own experience, as we know this from psychosomatic behavior, wherein a stomach ache can be very useful in avoiding school or work. Moreover, operant (R-S) and respondent (S-R) are interdependent, and cannot occur separately. As in the case of the movement of the striated musculature, respondent events such as hormonal release, heart rate and other autonomic activity always follow and permit voluntary behavior to occur, thus forcing operant and respondent behavior to be understood not as separate entities, but through their interdependencies, or a S-R-S model.

This is underscored by the fact that mapping the general classes of operant and respondent conditioned behaviors to specific neural processes is purely inferential, and is not grounded in the realities of actual neural processes. There is no purely S-R mechanics behind salivation just as there is no purely R-S mechanics behind walking and talking. Ultimately, the mind is composed of recurring loops between 'higher' and 'lower' neurological processes, neither of which has clear dominance. Thus, the logical or thinking part (cerebral cortex) 'bosses' and is 'bossed' by lower level neural structures (limbic system, midbrain) that are analogical or reflexive in nature. The higher level R-S or thinking components are

explained by rules, and are generally depicted as logical or computational, but the lower level S-R processes are rule independent, and are driven by analogical processes that are not computational. It is this strange interdependence that makes for behavior. Putting it more poetically, the heart has reasons that the head cannot understand. But what the poet accepts, the philosopher may surely not, as the mythology of learning attests to this present day.

The interrelationship between S-R and R-S behavior is a continuously recursive loop. The relationship is not only complex, it is subtle, and we are most often unaware not only of the reiterative processes that permit behavior, but extend this ignorance to how we classify behavior. Thus, an appreciation of the complexity of this relationship requires at least a rudimentary understanding of the complex feedback mechanisms of brain and body that give affective meaning to behavior, and an appreciation of the subtlety of this relationship means we must clarify the nonconscious events that escape conscious appraisal. This requires an entirely new perspective of behavior that demonstrates the constant and remarkable influence of embodied and nonconscious events. Nonetheless, in the course of philosophical thought over millennia, the origins of behavior has been viewed as disembodied and conscious, creating a new mythology for learning that is mismatched to the realities of behavior.

The Mythology of Learning

If behavior was derived solely from grey matter, or the cerebral cortex, then the psychology of learning would be simple, and be quite in accord with principles found in almost every philosophy. If this thinking part of the brain acted independently, then behavior and learning must be *conscious and disembodied*. Our behavior is such because we are aware of what we do, do what we do because of logical reasons, and continue to do it because of disembodied or extraneous events that follow or 'reinforce' behavior.

But this rationale falls away with a simple consideration of the affective processes of brain and body that are integrated with everything we do. First would be the feedback from regulatory or *homeostatic* events that occur regardless of our behavior. Thirst, hunger, and sleep are the non behavioral events that occur through specific S-R mechanisms in the brain. When they occur, we respond with R-S behavior such as buying a drink, searching for food, or going to bed. In other words, because of the discomfort caused by hunger, thirst and sleep 'drives', we associate through learning the proper courses of action to satisfy or reduce them. Secondly would be the feed back from *allostatic* events that occur

pursuant to behavioral (R-S) contingencies. For example, running fast produces narcotic substances or endorphins that mute the pain of running, or engaging in behavior that has unpredictable outcomes (e.g. playing a slot machine) creates a state of euphoria due to the release of the neuromodulator dopamine. Thus we run fast or gamble because of these subsequent embodied neurological events. If these events have an inordinate control over behavior that causes us to ignore rational priorities, we call them addictive. Third, we experience feedback from the allostatic events that occur not pursuant to but are intrinsic with conscious or nonconscious behavior. For example, running hard causes our muscles to ache, and relaxing them causes us to feel comfortable, and we moderate our behavior according to this affective muscular feedback. Similarly, we become tense when confronted with difficult decisions, and behavior is equally moderated or changed by the discomfort that attends tension.

As the S-R component to the S-R-S model for behavior, homeostatic and allostatic events comprise outcomes to behavior and indirectly change behavior. We therefore reduce the hunger or thirst drive by eating or drinking, or continue running because it makes us feel good. Homeostatic events do not occur because of behavior, but instigate behavior once they occur. Thus we don't go to sleep until we are tired, or eat unless we are hungry. On the other hand, allostatic events occur *because* of behavior, and their occurrence or non occurrence will reinforce the likelihood that that behavior will be repeated. Therefore we will avoid engaging in behaviors that make us uncomfortable, and engage in behaviors that make us feel good.

The ability to approach and avoid behaviors that are associated with good or bad affective states is ultimately dependent upon our conscious awareness of the correlation of those behaviors with specific somatic or affective states. But many affective states are not available to consciousness, or when they reach awareness are temporally removed from the circumstances that directly caused them. In a similar fashion, we are unaware of effects of bad diet or other maladaptive behaviors because their impact occurs cumulatively over time. Tension is no different, as we do not recognize the events that make us tense because tension occurs nonconsciously, is elicited by near imperceptible stimuli or contingencies, and is only recognized as the culmination of a day in which tension imperceptibly 'builds'.

This occurs whether tension occurs because as a direct result of stimulation (S-R), or cognition (S-R-S). For example, jostling on the road leaves us tired, yet we attribute this to boredom, road hypnosis, or excessive attention to navigating traffic. But even if we are entertained by music, diverted by scenery, or unbothered by bad drivers or heavy traffic, we still end up as exhausted after a long drive as if we had spent the day in constant exertion. As an example of the Cinderella Effect, the involuntary activation of the musculature due to the stimulation resulting from having to continually adjust to a

vibrating seat can continually activate the musculature not only at the place of stimulation but also muscles more distant from the vibration side. Similarly, tension occurs because of cognitive events that signal tension. Thus tension may build as we are confronted with a succession of small but irreconcilable choices that are the typical content of a working day.

Unawareness of the non-conscious perceptions that drive behavior is remedied by knowledge and by training. Knowledge allows us to change our general environments so as to preclude the occurrence of behavior, and training allows us to better access the proprioceptive stimuli that moves heretofore 'involuntary' behavior to behaviors that are under our 'voluntary' control. For example, an awareness of how vibration causes fatigue while driving gives force to the argument to take breaks from driving (or being a passenger for that matter) at different times even when we are not otherwise feeling fatigued. Similarly, and as I discuss at length in coming chapters, reducing or deferring the number of minor 'difficult' decisions we make daily will also reduce or eliminate muscular tension.

Secondly, the ability to achieve relaxation through the avoidance of the contingencies which imperceptibly control tension allows us become thoroughly relaxed, and in time more cognizant of and capable of being relaxed. The fact that the involuntary response of relaxation can be made 'voluntary' with familiarity demonstrates how so called reflexive or respondent behaviors such as relaxation can be voluntarily controlled. Indeed, the voluntary/involuntary distinction that seems to separate operant and respondent behavior does not reflect separate processes, but our relative conscious access to *singular* learning processes that is dependent on training or learning. Thus, with the proper training (as stage performers and method actors can attest), many so called reflexive behaviors from tears to anger can be called forth 'at will'.

The fact that psychologists have generally ignored the overwhelming evidence that behavior is embodied and is generally controlled by nonconsciously perceived information has meant that learning based explanations for complex behavior has been 'left off the table' in favor of simple and simplistic S-R explanations that posit reflexive processes that possess metaphorical credibility but neural unreality. This is the case not only for stress, but for many other behaviors that have been explained by humanistic, evolutionary, and psychoanalytic psychologists who eschew learning in favor of inbuilt reflexive mechanisms. Ultimately, to understand stress, we must understand the subtlety and complexity of how we process information, and the interrelationship between information and our perception or 'feeling' of bodily states.

Thus, to summarize:

Learning is Non Conscious

Consciousness entails awareness, and in the case of mankind, the exercise of language to describe and parse our behavior, its causes and effects. But the metaphorical appraisal of language cannot begin to encompass the complex information processing algorithms that occur near concurrently with the capture of sensory information. Although learning is rule based, we may not be aware of those rules not because they are repressed or ignored, but because they are subtly complex, and have abstract and continuously fluid properties that are not available for introspection. The cause of stress is a case in point, as the subjectively encoded meanings of an onrushing train is shortened to the indivisible point of a 'stimulus event', with the result that complex perceptual contingencies are reduced to the simple metaphor of reflex.

Response contingencies are normally the ones that we have access to verbally, but they do not include the innumerable contingencies that are complex, numerous, subtle, and nonconscious. These contingencies influence not only overt behavior, but covert behavior such as tension that indirectly influences overt behavior because it is painful, or in the case of relaxation, pleasurable. These nonconsciously perceived contingencies are not reflexive nor are they different in kind from the contingencies we consciously perceive. But because they are contingencies, they underscore the far greater role information rather than instinct plays in the generation of behavior.

Learning is Embodied

Embodiment means that behavior is dependent upon feedback and feed forward mechanisms of brain and body. Reason is dependent upon feeling, and vice versa, and information is influenced by pain and pleasure. Outside of green blooded Vulcans, for human kind reason and emotion, information and affect are inseparable. Indeed, even our very language is informed by affect, as we map affect through metaphor to give sensory meaning to the act of thinking itself.

Although most embodied events such as hunger, thirst and respiration are homeostatic and have no eliciting cause, other embodied events such as tension and attentive arousal are allostatic in nature, occur because of response contingencies, and signal other allostatic responses (e.g. accelerated heart rate, increase hormonal activity) that in sum influence

behavior.

In terms of our nascent description of the causes and cures of stress, this new perspective presents two challenges. First, the complexity of an S-R-S model means that behavior is always influenced by analogical processes that reach awareness through our 'feeling' of them, or through affect. The question is, how does affect influence the tensions we encounter daily? Secondly, the subtlety of an S-R-S model means that we may not be able to easily differentiate between analogical and computational processes. Where does reason start and affect begin, where do they neurologically reside, and how are they interrelated?