

# Taking the *Project* Seriously

## The Unconscious in Neuroscience Perspective

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One hundred years ago, Dr. Sigmund Freud, a Viennese neurologist and investigative neuropathologist and neuropsychologist, outlined a conceptual nervous system to accommodate some psychological concepts that he had developed in order to explain some perplexing ways in which people think and act. His design granted access of information from the outside world in parallel both to an area for conscious experience and to an area for unconscious mental processes. It was the first brain model to feature parallel processing (now so widely accepted). It was also pioneering in its application of the neurophysiological concept of inhibition to higher mental functions. Freud did not intend his *Project for a Scientific Psychology* to be published because he could not defend it in terms of the contemporary late nineteenth-century neurology. Has advancing neuroscience in the interim caught up with the *Project* and borne it out or rendered it moot? I discuss these alternatives with respect to three propositions inherent in the *Project*:

1. Most mental work is unconscious.
2. Consciousness, a mere spectator, glimpses fragments only of unconscious mental work.
3. Conscious and unconscious processes are separately represented in the brain.

Before Freud it had seemed obvious that the mind is synonymous with whatever a person is conscious of. This outdated though intuitively appealing misconception persists to this day. Freud revolutionized our understanding of mental processes by attributing them in large part to neural events not represented in consciousness. The person is conscious only of some sparse and fragmentary products of this massive incessant unconscious mental activity. Freud may be construed as implying that consciousness follows the unconscious like its shadow. And like a shadow, consciousness renders the mental work only in the roughest outline.

Freud arrived at these insights by observing, more closely than those who preceded him, how much of what they think and do people cannot explain, and indeed is not readily explicable. He concluded that mental states, and in particular, motives, were driven by long forgotten experiences. He conjectured that some of these could be recovered. Freud's skepticism about the unity and integrity of the Conscious is in style today—witness such trendy extravagances as multiple personality disorder, recovered memories of prenatal and neonatal events, previous life experiences, and memories of alien abductions. Can today's neuroscience validate unconscious mental processes and their separate representation in the brain?

Unconscious mental processes are high-profile events nowadays. We have learnt that much information that the brain acquires, and that influences its subsequent

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decision-making, is only fleetingly if at all represented in consciousness. Priming, the biasing of responses by previous experience, is the most popular field of study in current cognitive psychology. Priming effects are being modeled in connectionistic networks that take account of at least some of the properties of real neurons. Key properties resemble those that Freud proposed. These are neuron-to-neuron communication by evanescent trans-synaptic activity (adaptive to the current state of affairs), and cumulative tuning of neurons (cathexis) that systematically modifies their readiness to discharge (embodying the enduring effects of experience in itself not necessarily recollected).

Freud's emphasis on the Unconscious, to the detriment of the Conscious, now seems even more well founded than he knew. Awareness of an external change lags several hundred milliseconds behind the stimulus onset, and substantially behind the cortical processing that establishes the nature and significance of the external change (Velmans, 1991). Moreover, by the time the individual, that is, the brain, is conscious of the input, decisions for corresponding action, if any, have already been made. Again, some hundreds of milliseconds elapse before the brain is aware of the decision-making already in progress. Our brains, these self-organizing, self-stabilizing adaptive devices, both analyze the situation and select adaptive action before they (i.e., we) are aware of any of this. Once we realize that the business of the brain is essentially conducted pre-consciously, we can be more open to the idea that what is conscious is substantially pre-determined and biased unconsciously.

Human thinking and behavior are driven by a manifold of determinants. The most archaic ones are evolutionary. Our drives for reproduction, and for survival during the reproductive period, are determined by the blind selection pressure that emanates from the "selfish gene" (Dawkins, 1976). These influences are well outside of awareness. We do not mate, and do not struggle to survive, with the well-being of our gene pool firmly in mind. We are not in the least swayed in our impulses by knowing that sexual intercourse with contraception defeats its evolved purpose, and that survival beyond our fertile stage is irrelevant to the selfish genes. We act out our predetermined motives regardless. Awareness encompasses the motives and opportunities of the present (viewed through a lens distorted by the past). Individual differences in motives and preferences, Freud discovered, are determined by events early in life that are long forgotten, and of the potential significance of which we were certainly not aware at the time.

Our experiences, both as a species and as individuals, bias the approach/withdrawal cost-accounting that precedes all but automatic decision-making. It is the exception rather than the rule for this cost-accounting to be conscious. As Freud perceived, awareness would not affect the decision anyway. However, suppose a decision-making rule proves to be maladaptive—psychopathological, phobic, paranoid, self-defeating. Then it becomes expedient, in Orwellian fashion, to rewrite history, to revise the allocation of valences by "remembering" suitable scenarios, that frame the matter so as to be, in the therapist's judgment, adaptive to present needs. Whether that scenario really did occur is unknowable and moot. A mental detoxification has taken place.

Freud placed the conscious and the unconscious in opposition to each other, allocating them to separate domains of the mind and brain. In doing so, he followed Cartesian tradition. Initially, Cartesian dualism was formulated in terms of duality between the material brain and the spiritual mind. Philosophers almost without exception now abjure such dualistic beliefs and profess themselves materialist: mind is an attribute of brain and nothing else. However, the dualistic habits of thought persist; the soul has, as it were, been drawn into the brain and offered a privileged location therein. The distinction between the conscious self and (the rest of) its brain seems as natural as the distinction between the person and his or her world.

This dichotomizing generates intractable philosophic problems. The temptation

seems irresistible, to classify as the I, the conscious self, what one is conscious of. What then becomes of free will? Is not the conscious self then helplessly constrained by busy unconscious brain processes that do the real mental work? This is reason enough to subject Freud's second postulate—that the conscious and the unconscious are separate organs of brain—to trial by cognitive neuropsychiatry. Are there patients whose “conscious awareness system” is largely or totally inactivated by focal disease, but whose unconscious performs their mental work anyway? And, reciprocally, are there other patients whose unconscious is out of commission, liberating their conscious mental processes from the priming and tuning of the years of their premorbid existence? If not, we have achieved a “nonexistence proof” that compels us to seek a different design for the human brain.

No known pattern of psychopathology is compatible with either of these hypothesized abnormal cases. No focal lesion turns people into the zombies beloved of philosophers of mind. Nor does any lesion strip away the implicit influence of early experience. Only global impairment, as in Alzheimer's disease, succeeds in abolishing priming effects, and it diminishes awareness and conscious remembering in parallel.

But what about the intriguing syndromes of selective unawareness (agnosia for faces, unilateral neglect of space and person) in which priming is still demonstrable, or in which telltale psychophysiological changes signal “recognition” at some preconscious level? Farah, O'Reilly, and Vecera (1993) have argued that less activation of cell assemblies is needed for such residual effects than for full awareness. I have summarized evidence for the need for a critical level of activation of cell assemblies in order for them to be included in the dominant focus of consciousness (Kinsbourne, 1988, 1997). I have cited unilateral neglect as evidence for unawareness as a consequence of hemisphere underactivation (Kinsbourne, 1977, 1987). Underactivated zones of cerebral cortex are at a disadvantage in contributing their representations' contents to the dominant pattern of activation of the global network.

If we take seriously the overwhelming evidence that there is no privileged part of the brain, no hidden observer for whose purposes information is displayed (and on whose analysis the brain relies), nor any hidden intender, who commands the brain and body accordingly, then we arrive at a counterintuitive conclusion. Conscious mental processes must be widespread in, if not coextensive with, forebrain function, and the same must be said of unconscious mental processes. Their substrates being the same, the conscious and the unconscious must represent different functional states of that same substrate. For instance, unconscious processes could reflect the network in its modular aspect—loops of action and reaction in relatively isolated progress. Conscious processes would be the same processes in some form of coordination (I have suggested one way in which this might work, the integrated cerebral field model [Kinsbourne, 1988]). The heuristic roles of this uncentered brain model for psychopathology are clear: Those many and perplexing psychopathologies that violate the ostensible unity of the self-schizoid states, dissociative disorders, and multiple personality disorders can be studied as failures of integration or coordination of the widespread circuitry that in its entirety energizes the fluctuating awareness of the phenomenal self.

For a centered model of consciousness, anomalies of the self are perplexing. By what mechanism can multiple selves be based in the same brain, coexisting or alternating? How can the conscious-awareness system be denied access to some of the available information and not experience the fact that access is precluded? The brain is the Self, and consciousness reflects particular states of integrated activation of parts of the brain. These differ from moment to moment, an ever-changing kaleidoscope of forming and dissolving patterns of neuronal firing. As a self-organizing and self-regulating neural network, the brain has autonomy, only some of which it acts out in awareness.

Freud's conceptual anatomy, in concert with the neuropsychology of his time, dealt

with hypothetical material-specific stores. Thus conceived, as a simmering cauldron of desires and fantasized satisfactions, the Unconscious has no place in today's neuroscience. But replaced by current notions of differential tuning of neural networks, again both species—specific and based on individual experience, the unconscious can still do much of its work as conceived in psychoanalytic theory. Specifically, our understanding of memory processes is quite consistent with the overlaying of event memory by rule acquisition, including rules that turn out to be adaptively detrimental.

Dennett and Kinsbourne (1992) have analogized the variable encoding of a given event over time to a writer's preparation of multiple drafts. An experience is coded consistent with the observer's knowledge base and affective state. In terms of network theory, variable attractor states are achieved at different times, depending on influences emanating from elsewhere in the network. As instances multiply, either of comparable events, or of multiple reactivation/revision of the same event memory, the event becomes reformulated into a rule, and either its memory becomes stereotyped or it is forgotten altogether. Its effect on behavior, however, is preserved in the form of revised response predispositions. The origin of these predispositions may be irretrievably lost.

It is apparent that this revised blueprint for a brain offers opportunities for a cognitive neuropsychiatry that bridges the illusory divide between subjectivity and circuitry. Conceptual boundaries between cognition and the brain dissolve in a mind/brain identity concept. The network has subjective access to some of its states. Experience is what it is like for neural networks to be in certain functional states. Psychopathology, that is, failures in adaptive behavior, can be referred back to deviations in mental processes, which can in turn be referred back to deviations in the integrative functioning of the nervous system. Mind as brain and psychopathology as dynamic neuropathology are not reductions in the pejorative sense, but complementary descriptions of different aspects of the same reality.

Having endorsed, from our contemporary viewpoint, the first two of the three propositions from the *Project* that we began with, we can now revisit the problem of free will. Can we (i.e., the Conscious) be free when "our" brain makes all the observations and arrives at all the decisions (unconsciously) while "we" look on, and rationalize a series of *faits accomplis*? It seems to our consciousness that we perceive, then act. This impression is inevitable, based on the incomplete information that is available to awareness. First in awareness is the percept, then the thought, then the act. Temporal succession, reliably repeated across innumerable instances, generates a powerful intuition of causation. If we conceive ourselves narrowly as our consciousnesses, we can indeed not escape the straitjacket of antecedent neural processing. But it is the agenda of science to overthrow intuition, and replace it by something less pragmatic and less bound to surface appearances—that is, by *knowledge*. The more powerful and persuasive the intuition, the longer it takes for it to be undermined. But the great discoveries in the physical sciences are well known to be counterintuitive, and they are accepted as knowledge nonetheless. The brain sciences follow close behind; if the self is both the conscious and the unconscious agency of the brain, free will is reinstated. The brain (self), a self-regulating and self-stabilizing device, makes its own decisions.

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