Neuroscientists are finding that their biological descriptions of the brain may fit together best when integrated by psychological theories Freud sketched a century ago.
the ideas of Sigmund Freud dominated explanations of how the human mind works. His basic proposition was that our motivations remain largely hidden in our unconscious minds. Moreover, they are actively withheld from consciousness by a repressive force. The executive apparatus of the mind (the ego) rejects any unconscious drives (the id) that might prompt behavior that would be incompatible with our civilized conception of ourselves. This repression is necessary because the drives express themselves in unconstrained passions, childish fantasies, and sexual and aggressive urges.

Mental illness, Freud said until his death in 1939, results when repression fails. Phobias, panic attacks and obsessions are caused by intrusions of the hidden drives into voluntary behavior. The aim of psychotherapy, then, was to trace neurotic symptoms back to their unconscious roots and expose these roots to mature, rational judgment, thereby depriving them of their compulsive power.

As mind and brain research grew more sophisticated from the 1950s onward, however, it became apparent that the evidence Freud had provided for his theories was rather tenuous. His principal method of investigation was not controlled experimentation but simple observations of patients in clinical settings, interwoven with theoretical inferences. Drug treatments gained ground, and biological approaches to mental illness gradually overshadowed psychoanalysis. Had Freud lived, he might even have welcomed this turn of events. A highly regarded neuroscientist in his day, he frequently made remarks such as “the deficiencies in our description would presumably vanish if we were already in a position to replace the psychological terms by physiological and chemical ones.” But Freud did not have the science or technology to know how the brain of a normal or neurotic personality was organized.

By the 1980s the notions of ego and id were considered hopelessly antiquated, even in some psychoanalytical circles. Freud was history. In the new psychology, the updated thinking went, depressed people do not feel so wretched because something has undermined their earliest attachments in infancy—rather their brain chemicals are unbalanced. Psychopharmacology, however, did not deliver an alternative grand theory of personality, emotion and motivation—a new conception of “what makes us tick.” Without this model, neuroscientists focused their work narrowly and left the big picture alone.

Today that picture is coming back into focus, and the surprise is this: it is not unlike the one that Freud outlined a century ago. We are still far from a consensus, but an increasing number of diverse neuroscientists are reaching the same conclusion drawn by Eric R. Kandel of Columbia University, the 2000 Nobel laureate in physiology or medicine: that psychoanalysis is “still the most coherent and intellectually satisfying view of the mind.”

Freud is back, and not just in theory. Interdisciplinary work groups unifying the previously divided and often antagonistic fields of neuroscience and psychoanalysis have been formed in almost every major city of the world. These networks, in turn, have come together as the International Neuro-Psychoanalysis Society, which organizes an annual congress and publishes the successful journal Neuro-Psychoanalysis. Testament to the renewed respect for Freud’s ideas is the journal’s editorial advisory board, populated by a who’s who of experts in contemporary behavioral neuroscience, including Antonio R. Damasio, Kandel, Joseph E. LeDoux, Benjamin Libet, Jaak Panksepp, Vilayanur S. Ramachandran, Daniel L. Schacter and Wolf Singer.

Together these researchers are forging what Kandel calls a “new intellectual framework for psychiatry.” Within this framework, it appears that Freud’s broad brushstroke organization of the mind is destined to play a role similar to the one Darwin’s theory of evolution.
served for molecular genetics—a template on which emerging details can be coherently arranged. At the same time, neuroscientists are uncovering proof for some of Freud’s theories and are teasing out the mechanisms behind the mental processes he described.

**Unconscious Motivation**

When Freud introduced the central notion that most mental processes that determine our everyday thoughts, feelings and volitions occur unconsciously, his contemporaries rejected it as impossible. But today’s findings are confirming the existence and pivotal role of unconscious mental processing. For example, the behavior of patients who are unable to consciously remember events that occurred after damage to certain memory-encoding structures of their brains is clearly influenced by the “forgotten” events. Cognitive neuroscientists make sense of such cases by delineating different memory systems that process information “explicitly” (consciously) and “implicitly” (unconsciously). Freud split memory along just these lines.

Neuroscientists have also identified unconscious memory systems that mediate emotional learning. In 1996 at New York University, LeDoux demonstrated the existence under the conscious cortex of a neuronal pathway that connects perceptual information with the primitive brain structures responsible for generating fear responses. Because this pathway bypasses the hippocampus—which generates conscious memories—current events routinely trigger unconscious remembrances of emotionally important past events, causing conscious feelings that seem irrational, such as “Men with beards make me uneasy.”

Neuroscience has shown that the major brain structures essential for forming conscious (explicit) memories are not functional during the first two years of life, providing an elegant explanation of what Freud called infantile amnesia. As Freud surmised, it is not that we forget our earliest memories; we simply cannot recall them to consciousness. But this inability does not preclude them from affecting adult feelings and behavior. One would be hard-pressed to find a developmental neurobiologist who does not agree that early experiences, especially between mother and infant, influence the pattern of brain connections in ways that fundamentally shape our future personality and mental health. Yet none of these experiences can be consciously remembered. It is becoming increasingly clear that a good deal of our mental activity is unconsciously motivated.

Repression Vindicated

Even if we are mostly driven by unconscious thoughts, this does not prove anything about Freud’s claim that we actively repress unpalatable information. But case studies supporting that notion are beginning to accumulate. The most famous one comes from a 1994 study of “anosognosic” patients by behavioral neurologist Ramachandran of the University of California at San Diego. Damage to the right parietal region of these people’s brains makes them unaware of gross physical defects, such as paralysis of a limb. After artificially activating the right hemisphere of one such patient, Ramachandran observed that she suddenly became aware that her left arm was paralyzed—and that it had been paralyzed continuously since she had suffered a stroke eight days before. This showed that she was capable of recog-
nizing her deficits and that she had unconsciously registered these deficits for the previous eight days, despite her conscious denials during that time that there was any problem.

Significantly, after the effects of the stimulation wore off, the woman not only reverted to the belief that her arm was normal, she also forgot the part of the interview in which she had acknowledged that the arm was paralyzed, even though she remembered every other detail about the interview. Ramachandran concluded: “The remarkable theoretical implication of these observations is that memories can indeed be selectively repressed. ... Seeing [this patient] convinced me, for the first time, of the reality of the repression phenomena that form the cornerstone of classical psychoanalytical theory.”

Like “split-brain” patients, whose hemispheres become unlinked—made famous in studies by the late Nobel laureate Roger W. Sperry of the California Institute of Technology in the 1960s and 1970s—anosognosic patients typically rationalize away unwelcome facts, giving plausible but invented explanations of their unconsciously motivated actions. In this way, Ramachandran says, the left hemisphere manifestly employs Freudian “mechanisms of defense.”

Durham neuropsychologist Aikaterini Fotopoulou recently studied a patient of this type in my laboratory. The man failed to recall, in each 50-minute session held in my office on 12 consecutive days, that he had ever met me before or that he had undergone an operation to remove a tumor in his frontal lobes that caused his amnesia. As far as he was concerned, there was nothing wrong with him. When asked about the scar on his head, he confabulated wholly implausible explanations: he had undergone dental surgery or a coronary bypass operation. In reality, he had indeed experienced these procedures—years before—and unlike his brain operation, they had successful outcomes.

Similarly, when asked who I was and what he was doing in my lab, he variously said that I was a colleague, a drinking partner, a client consulting him about his area of professional expertise, a teammate in a sport that he had not participated in since he was in college decades earlier, or a mechanic repairing one of his numerous sports cars (which he did not possess). His behavior was consistent with these false beliefs, too: he would look around the room for his beer or out the window for his car.

What strikes the casual observer is the wishful quality of these false notions, an impression that Fotopoulou confirmed objectively through quantitative analysis of a consecutive series of 155 of his confabulations. The patient’s false beliefs were not random noise—they were generated by the “pleasure principle” that Freud maintained was central to unconscious thought. The man simply recast reality as he wanted it to be. Similar observations have been reported by others, such as Martin Conway of Durham and Oliver Turnbull of the University of Wales. These investigators are cognitive neuroscientists, not psychoanalysts, yet they interpret their findings in Freudian
terms, claiming in essence that damage to the frontal limbic region that produces confabulations impairs cognitive control mechanisms that underpin normal reality monitoring and releases from inhibition the implicit wishful influences on perception, memory and judgment.

Animal Within

Freud argued that the pleasure principle gave expression to primitive, animal drives. To his Victorian contemporaries, the implication that human behavior was at bottom governed by urges that served no higher purpose than carnal self-fulfillment was downright scandalous. The moral outrage waned during subsequent decades, but Freud’s concept of man-as-animal was pretty much sidelined by cognitive scientists.

Now it has returned. Neuroscientists such as Donald W. Pfaff of the Rockefeller University and Jaak Panksepp of Bowling Green State University believe that the instinctual mechanisms that govern human motivation are even more primitive than Freud imagined. We share basic emotional-control systems with our primate relatives and with all mammals. At the deep level of mental organization that Freud called the id, the functional anatomy and chemistry of our brains is not much different from that of our favorite barnyard animals and household pets.

Modern neuroscientists do not accept Freud’s classification of human instinctual life as a simple dichotomy between sexuality and aggression, however. Instead, through studies of lesions and the effects of drugs and artificial stimulation on the brain, they have identified at least four basic mammalian instinctual circuits, some of which overlap. They are the “seeking” or “reward” system (which motivates the pursuit of pleasure); the “anger-rage” system (which governs angry aggression but not predatory aggression); the “fear-anxiety” system; and the “panic” system (which includes complex instincts such as those that govern social bonding). Whether other instinctual forces exist, such as a rough-and-tumble “play” system, is also being investigated. All these brain systems are modulated by specific neurotransmitters, chemicals that carry messages between the brain’s neurons.

The seeking system, regulated by the neurotransmitter dopamine, bears a remarkable resemblance to the Freudian “libido.” According to Freud, the libidinal or sexual drive is a pleasure-seeking system that energizes most of our goal-directed interactions with the world. Modern research shows that its neural equivalent is heavily implicated in almost all forms of craving and addiction. It is interesting to note that Freud’s early experiments with cocaine—mainly on himself—convinced him that the libido must have a specific neurochemical foundation. Unlike his successors, Freud saw no reason for antagonism between psychoanalysis and psychopharmacology. He enthusiastically anticipated the day when “id energies” would be controlled directly by “particular chemical substances.”

Today treatments that integrate psychotherapy with psychoactive medications are widely recognized as the best approach for many disorders. And brain imaging shows that talk therapy affects brain function in complex ways.

Dreams Have Meaning

Freud’s ideas are also reawakening in sleep and dream science. His dream theory—that nighttime visions are partial glimpses of unconscious wishes—was discredited when rapid-eye-movement (REM) sleep and its strong correlation with dreaming were discovered in the 1950s. Freud’s view appeared to lose all credibility when investigators in the 1970s showed that the dream cycle was regulated by the pervasive brain chemi-
cal acetylcholine, produced in a “mindless” part of the brain stem. REM sleep occurred automatically, every 90 minutes or so, and was driven by brain chemicals and structures that had nothing to do with emotion or motivation. This discovery implied that dreams had no meaning; they were simply stories concocted by the higher brain to try to reflect the random cortical activity caused by REM.

But more recent work has revealed with impunity—that dream content has no primary emotional mechanism.

**Finishing the Job**

**NOT EVERYONE IS** enthusiastic about the reappearance of Freudian concepts in the mainstream of mental science. It is not easy for the older generation of psychoanalysts, for example, to accept that their junior colleagues and students now can and must subject conventional wisdom to critical acetylcholine, produced in a “mindless” part of the brain stem. REM sleep occurred automatically, every 90 minutes or so, and was driven by brain chemicals and structures that had nothing to do with emotion or motivation. This discovery implied that dreams had no meaning; they were simply stories concocted by the higher brain to try to reflect the random cortical activity caused by REM.

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**Dreaming and REM Sleep Are Controlled by Different Brain Mechanisms.** Mark Solms in *Behavioral and Brain Sciences,* Vol. 23, No. 6, pages 843–850; December 2000.


**The Brain and the Inner World.** Mark Solms and Oliver Turnbull. Other Press, 2002.

**The International Neuro-Psychoanalysis Society and the journal Neuro-Psychoanalysis:** www.neuro-PSA.org

If scientists can reconcile neurology and psychology, then patients could receive more integrated treatment.

If scientists can reconcile neurology and psychology, then patients could receive more integrated treatment.
Sigmund Freud’s views on the meaning of dreams formed the core of his theory of mental functioning. Mark Solms and others assert that brain imaging and lesion studies are now validating Freud’s conception of the mind. But similar scientific investigations show that major aspects of Freud’s thinking are probably erroneous.

For Freud, the bizarre nature of dreams resulted from an elaborate effort of the mind to conceal, by symbolic disguise and censorship, the unacceptable instinctual wishes welling up from the unconscious when the ego relaxes its prohibition of the id in sleep. But most neurobiological evidence supports the alternative view that dream bizarreness stems from normal changes in brain state. Chemical mechanisms in the brain stem, which shift the activation of various regions of the cortex, generate these changes. Many studies have indicated that the chemical changes determine the quality and quantity of dream visions, emotions and thoughts. Freud’s disguise-and-censorship notion must be discarded; no one believes that the ego-id struggle, if it exists, controls brain chemistry. Most psychoanalysts no longer hold that the disguise-censorship theory is valid.

Without disguise and censorship, what is left of Freud’s dream theory? Not much—all that instinctual drives could impel dream formation. Evidence does indicate that activating the parts of the limbic system that produce anxiety, anger and elation shapes dreams. But these influences are not “wishes.” Dream analyses show that the emotions in dreams are as often negative as they are positive, which would mean that half our “wishes” for ourselves are negative. And as all dreamers know, the emotions in dreams are hardly disguised. They enter into dream plots clearly, frequently bringing unpleasant effects such as nightmares. Freud was never able to account for why so many dream emotions are negative.

Another pillar of Freud’s model is that because the true meaning of dreams is hidden, the emotions they reflect can be revealed only through his wild-goose-chase method of free association, in which the subject relates anything and everything that comes to mind in hopes of stumbling across a crucial connection. But this effort is unnecessary, because no such concealment occurs. In dreams, during non-REM sleep, but nothing in the chemical activation model precludes this case; the frequency of dreams is simply exponentially higher during REM sleep.

Psychoanalysis is in big trouble, and no amount of neurobiological tinkering can fix it. So radical an overhaul is necessary that many neuroscientists would prefer to start over and create a neurocognitive model of the mind. Psychoanalytic theory is indeed comprehensive, but if it is terribly in error, then its comprehensiveness is hardly a virtue. The scientists who share this view stump for more biologically based models of dreams, of mental illness, and of normal conscious experience than those offered by psychoanalysis.

J. Allan Hobson, professor of psychiatry at Harvard Medical School, has written extensively on the brain basis of the mind and its implications for psychiatry. For more, see Hobson’s book Dreaming: An Introduction to the Science of Sleep (Oxford University Press, 2003).