

(FREUD at 150)

## Original Ideas

# Neurotic about Neurons

Scientists today are using the latest imaging technologies to investigate Sigmund Freud's most fundamental tenets: that dreams represent unfulfilled wishes, that the three parts of the psyche—the ego, id and superego—have neuronal bases, and that “talk therapy” changes the physical networks of neurons in the brain. The fact that such work is happening at all represents an apparent comeback for psychoanalysis [see “Freud Returns,” by Mark Solms, on page 28]. No one would be happier than Freud himself. Although his followers like to think of his work as pure psychology, the young Freud built his theories on his own detailed investigation of animal and human brains. To him, every mental illness stemmed from a physical defect in the brain.

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→ Freud's theories sprang directly from neuroscience, until he began interrogating sexually frustrated women

By Steve Ayan

His point of view changed, however, when he began treating women who were diagnosed as being “hysterical.” They suffered from what appeared to be suppressed sexual desires. These cases and others prompted him to discard his own model of the brain as a kind of neuronal machine and replace it with a model of the mind as an entity driven by secret desires. Freud constructed his fantastic theories of dreaming, repression, and ego and id based on years of listening to troubled patients tell of their woes while lying on his office couch—a career move from the brain lab motivated primarily by Freud’s need to make enough money to support his rapidly expanding family. And yet in his final writings, he acknowledged his own repressed hope that one day science would recast his maxims in neurology.

### Rooted in Biology

Sigmund Schlomo Freud came into the world on May 6, 1856, as the first of eight children. He was born in Freiberg in the Austro-Hungarian Empire—today the town of Pribor in the Czech Republic. Four years later his mother and father, a wool dealer, moved the family to Vienna for good. The wool business never went well, and like most Eastern European Jewish immigrants the family struggled against anti-Semitism and poverty. Yet the Freuds set great hopes on their firstborn and nurtured his ambitions.

Young Freud, called Sigmund for short, enrolled as a medical student at the University of Vienna in 1873. The place had some of the finest minds in medical education. Among Freud’s teachers was Ernst Brücke, a prominent physiologist, and at age 20 Freud entered his lab as an assistant, dedicated to studying the nervous systems of lower animals. His early publications included titles such as “On the Origin of the Posterior Nerve Roots in the Spinal Cord of *Ammocoetes*.”

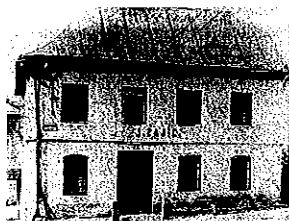
Neurophysiological research was a new but rising discipline. Brücke was a member of the Berlin Physical Society, whose motto was, “We have pledged ourselves to make this truth known: that within the organism no other forces are at work beyond normal physical-chemical ones.” Freud, armed with a dissection knife and a microscope, strived to inform this strictly biological model.

In the summer of 1882—a year after receiving his degree—Freud was engaged to Martha Bernays, who came from a prominent family. The gifted but penniless physician now urgently needed money and status before he could marry Bernays, five years his junior. He wanted to continue in research but saw no prospects for rapid promotion in the university. So that same year he took a position at Vienna General Hospital, where over the next three years he would make rounds in all the important departments, including surgery, internal medicine and psychiatry.

# Freud's Journey from Neurology to Psychology

1856

On May 6 Sigmund Schlomo Freud is born in Freiberg, Moravia (today Příbor). In 1860 the family moves to Vienna



Freud's birth house



The 16-year-old with his mother

1867

Karl Marx's *Das Kapital* is published

1875

Wilhelm Wundt begins teaching at the University of Leipzig in Germany, where four years later he will establish the first psychological institute in the world

1873

In the fall the young Freud begins his medical studies at the University of Vienna in Austria. After an unusually long time—eight years as a student—he receives his medical degree, at the age of 25

The psychiatry department was headed by Theodor Meynert, a world-renowned brain researcher and a proponent of the idea of cerebral localization. This school of thought, much in vogue at the time, held that every psychopathological symptom—whether a speech defect, hallucination or mental illness—originated from a physical defect in the brain. An investigator's most important task was to locate such defects during autopsies. Meynert was convinced that psychiatric illness could be traced back to neuronal sources. He was suspicious of any patient's complaint that lacked a recognizable, organic cause; without such evidence, a patient's claim must simply spring from imagination or even be deliberately feigned.

## Talk Therapy Begins

During his years with Meynert, Freud became an expert in cerebral localization. But soon his career would take a completely different path. Thanks to a traveling fellowship from his department, he left Vienna in 1885 to spend six months at the Salpêtrière hospital in Paris, where psychiatrist Jean-Martin Charcot was searching for a therapy for a disorder common among women: so-called hysteria.

The victims of hysteria suffered from sudden attacks of paralysis and aphasia (inability to comprehend speech). Some of them babbled as if delirious or became highly aroused sexually. The cause of this odd disorder was obscure, and the usual treatments—hydrotherapy or massage—seldom helped. So the charismatic Charcot hypnotized his patients and suggested to them that

they were, right then and there, experiencing the symptoms. Often the patients acted "hysterical," but once they were awakened from hypnosis they reported feeling improved. Freud was so caught up in Charcot's enthusiasm that he would later name his first son after the French doctor.

As soon as Freud returned to Vienna, he married Bernays, and the couple had six children in rapid succession. To earn enough to feed his growing family, Freud gave up research to become a neurologist in private practice. In 1891 the clan moved to larger quarters in Vienna—a house big enough to accommodate a room to treat patients. They stayed there for almost 50 years, until they had to flee the Nazis in 1938.

Soon after the move Freud furthered his relationship with Joseph Breuer, a physician who was experimenting with hypnosis as treatment for various mental ills. In 1895 the two jointly published *Studies on Hysteria*. This classic book of case studies marked the birth of psychoanalysis. The two doctors explained that hysterical women suffered, above all, from "reminiscences"—fragmentary memories of traumatic events such as sexual abuse—that broke into their conscious minds in the form of anxiety fantasies. This experiential, unconscious process contradicted the then dominant localization theory that every mental illness was traceable to a physical origin.

Freud developed the technique of "free association" as a means to gain access to the repressed memories of hysterical people and of those who exhibited compulsive behavior. Because the content of these memories was generally "hidden" in the unconscious and repressed from breaking

BETTMANN CORBIS (Charcot); MARY EVANS PICTURE LIBRARY/SIGMUND FREUD COPYRIGHTS (Martha); © FREUD MUSEUM, LONDON, U.K./BRIDGEMAN ART LIBRARY (couch); MARY EVANS PICTURE LIBRARY/SIGMUND FREUD COPYRIGHTS (book)



A contemporary painting shows Jean-Martin Charcot hypnotizing a young woman



The famous couch, now a museum exhibit

1899  
In November, Freud's now famous *The Interpretation of Dreams* appears. The title page shows the date as 1900 to emphasize its historical significance



1885  
At the Salpêtrière hospital in Paris, Freud gets to know Jean-Martin Charcot, the French psychiatrist. Charcot's hypnosis of frantic female patients awakens Freud's interest in hysteria and ways to treat it



The bride, Martha

1886  
Freud marries Martha Bernays. Over the next 10 years she will bear six children

1891  
Freud moves his family to a larger home in Vienna, at street address Berggasse 19. Freud lives and works there for 47 years, until he and his family flee the Nazis

1895  
Together with Joseph Breuer, Freud publishes *Studies on Hysteria*. The case studies in this collection form the cornerstone of psychoanalysis as a treatment method for mental ills

1879  
Albert Einstein is born in Ulm, Germany

1879

1885 1886

1891

1895

1899

through to the patients' conscious awareness, Freud told his patients to relax on his couch and challenged them to tell him whatever came into their heads. The analyst noted everyday experiences, dreams and feelings. Even his patients' jokes and casual remarks were sources that could unveil the dramas of the unconscious mind. Freud's postulate was that bringing a neurotic disturbance into conscious discussion through therapy would cause the troubling notion to dissolve, by way of a mechanism he called the "cathartic" effect of psychoanalysis.

Freud's heart was not in treating patients, however. The tedious therapy sessions served above all as a laboratory for the refinement of his theories. Freud readily took the knowledge he obtained and applied it to people in general. As he wrote: "What analytic research originally had in mind was no more than finding the causes of a few pathological mental conditions, but in achieving this we were able to discover relationships of fundamental significance, and thus create a new psychology."

In 1899 Freud laid the foundations of psychoanalytic theory in his book *The Interpretation of Dreams*. The script presented a set of ideas that has influenced modern thought just as strongly as has Darwin's theory of evolution or Einstein's theory of relativity. In later decades Freud would revise, expand and even discard individual ideas within the theory; after World War I he postulated a second source of psychic energy—in addition to the libido—that he called Thanatos, or the "death instinct." The division of the psyche into three interactive parts—the driven id, the

moralistic superego and the ego that negotiated between the two—was chiefly delineated in the 1920s. But psychoanalysis persevered.

*Dreams* marked a complete turn away from neurology, treading purely in psychology. In it, Freud wrote, "We shall wholly ignore the fact that the psychic apparatus concerned is known to us also as an anatomical preparation, and we shall carefully avoid the temptation to determine the psychic locality in any anatomical sense. We shall remain on psychological ground." This position affected not just therapy but research methodology. The interpretation of reported dreams, for instance, had nothing in common with the search for brain injuries or arousal of the central nervous system.

Nevertheless, when it came to the "psychic apparatus," Freud continued, as before, to see both psychological and biological principles at work. This conundrum led him to the heart of the ancient mind-body problem—whether the mind is purely the outcome of neurons firing throughout the nervous system or whether it arises as a higher state. Freud had already imagined resolving it in 1895, when he drafted a report called *Project for a Scientific Psychology*. "The intention," he wrote, "is to furnish a psychology that shall be a natural science: that is, to represent psychic processes as quantitatively determinate states of specifiable material particles, thus making

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The secret "Committee," which set itself the goal of maintaining a pure doctrine of psychology unencumbered by physical brain considerations. From left: Otto

Rank, Freud, Karl Abraham, Max Eitington, Sándor Ferenczi, Ernest Jones and Hanns Sachs



C. G. Jung, circa 1904

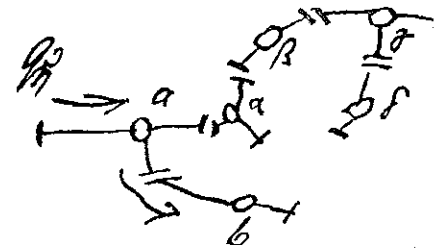


Diagram penned by Freud shows how he thought neurons repressed the flow of memories

**1902**

The first regular meetings of the Wednesday Psychoanalytic Society begin in Freud's home on Berggasse. From this circle of students, the Vienna Psychoanalytic Society arose in 1908. The first president of the International Psychoanalytic Association, founded in 1910, was C. G. Jung, a doctor from Zurich

**1909**

Together with Jung and Ferenczi, Freud travels to the U.S., where his talks about psychoanalysis arouse great interest

**1913**

Freud breaks ranks with Jung, his one-time "crown prince"

**1914**

World War I begins after the assassination of Archduke Franz Ferdinand, heir to the Austro-Hungarian throne, in Sarajevo

**1923**

Freud publishes *The Ego and the Id*. The ego mediates between the primal, driven id and the moralistic superego

1902

1909

1913-1914

1923

those processes perspicuous and free from contradiction." The "material particles" were most likely neurons, which were in contact with one another via synapses. What Freud meant by "quantities" was the level of psychic energy flowing through the neurons. The energy arose from arousal either by a sensory organ or—far more important—by the body's own drives. Discharging this energy—in the sex act, for instance—creates pleasure for the individual, whereas blocking its discharge creates displeasure.

Even this terse description makes it clear that Freud's metaphor for the organ of the mind was an electric motor. His psychodynamic model resembles an internal relay station that directs constantly flowing "current" into a complex, highly branched system. Occasionally, in some unknown way, this current quantity was transformed into quality—conscious experience. "Every psychic act begins as an unconscious one," Freud declared in his draft report.

**Conflicted**

Despite seemingly certain statements, Freud struggled mightily with whether to place his faith in biology or psychology. While working on *Project for a Scientific Psychology* in October 1895, he wrote to his friend Wilhelm Fliess in Berlin: "Everything fell into place, the cogs meshed, and the thing really seemed to be a machine which in a moment would run of itself." Yet just five weeks later he admitted his disappointment: "I no longer understand the state of mind in which I concocted this psychology." At the end, Freud discarded his plan for a neuronal machine, and the unfinished

*Project* manuscript disappeared into a drawer.

Freud failed to reconcile the brain and mind because he saw no possibility of finding a neurological basis for distinguishing between conscious and unconscious processes—the magical hub around which his entire psychology revolved. The dead end is not surprising, given that research into brain function was still primitive. No one knew how the brain worked. Wilhelm Waldeyer had just introduced the concept of the neuron in 1891. The big question was whether the dense tissue of the brain was a single, spongelike mass, as Italian physician Camillo Golgi believed, or whether it was made of many tiny units, the concept favored by Spanish histologist Santiago Ramón y Cajal. Golgi developed a staining method that allowed scientists to study thin sections of brain under a microscope. Using it, Ramón y Cajal was able to identify narrow gaps between neuron cell bodies, leading him to the image of a myriad of intercommunicating units in the brain. This advancement brought Golgi and Ramón y Cajal the Nobel Prize in Physiology or Medicine in 1906.

Scientists were also largely in the dark about anatomical brain function. It had been 20 years since losses in certain regions of the mysterious gray organ had been linked to specific pathological symptoms. Paul Broca, a French neuroanatomist, investigated an aphasic who had unusual speech problems. The patient understood most of what was said to him yet could not produce a single intelligible sentence. After the patient died, Broca autopsied his brain and discovered lesions in a part of the left frontal lobe, known today as Broca's area; the ability to produce speech is lo-



Many Austrians hail the union with Nazi Germany in 1938



On the train to Paris, with daughter Anna, in 1938



Freud's burial urn in London

1930

Freud receives the Goethe Prize, the highest literary award of the Weimar Republic, for his life's work. His mother, Amalia, dies the same year

1933

The National Socialists take power in Germany

1938

In March the Wehrmacht marches into Vienna. In June the Freuds flee the city to London via Paris

1939

Assisted suicide: Freud dies on September 23 of an overdose of morphine, injected by his physician Max Schur at Freud's request. Freud had suffered for many years from exceptionally painful cancer of the jaw

1930

1933

1938 1939

cated there. Broca's German colleague, Carl Wernicke, discovered the neurological seat of speech understanding—a part of the frontal lobe far above Broca's area; a patient with damage there cannot understand even the simplest speech but can still produce grammatically correct, though often meaningless, sentences.

Few other anatomical associations had been found by 1895, however. Physicians hoped every one of the gyri and sulci—the characteristic hills and valleys of the cerebral cortex—might be charted according to its function, but Freud was skeptical. What would that say about the psychic events taking place within them? His answer: Nothing. "We know two things concerning what we call our psyche or mental life: firstly, its bodily organ and scene of action, the brain (or nervous system) and secondly, our acts of consciousness, which are immediate data and cannot be more fully explained by any kind of description. Everything that lies between these terminal points is unknown to us, and, so far as we are aware, there is no direct relation between them. If it existed, it would at the most afford an exact localization of the processes of consciousness and would give us no help toward understanding them."

These words are found in the opening of *An Outline of Psychoanalysis*, Freud's last work, which he began shortly before his death in 1939. Here again Freud collected the most important points of his psychology. "The phenomena with which we have had to deal do not belong to psychology alone; they have an organic and biological side as well.... We have adopted the hypothesis of a psychic apparatus extended in space, appro-

priately constructed, developed by the exigencies of life, which gives rise to the phenomena of consciousness only at one particular point and under certain conditions. This hypothesis has put us in a position to establish psychology on foundations similar to those of any other science."

Was Freud's flirtation with biology no more than a "self-misunderstanding," as philosopher Jürgen Habermas wrote? Or did it merely serve as a pretext he used to endow his teachings with the prestige of science? There is a great deal of evidence that Freud did believe that psychoanalysis would, one day, have empirical foundations.

Some experts today are indeed attempting to lay the groundwork of "neuropsychology." Modern neuroscience, they claim, possesses the necessary methods and findings to support Freud's assumptions. Yet Freud himself realized that the converse might be true: "Biology is truly a land of unlimited possibilities. We may expect it to give us the most surprising information, and we cannot guess what answers it will return in a few dozen years to the questions we have put to it. They may be of a kind that will blow away the whole of our artificial structure of hypothesis." M

### (Further Reading)

- ◆ **Freud, Biologist of the Mind: Beyond the Psychoanalytic Legend.** Frank J. Sulloway. Harvard University Press, 1992.
- ◆ **Freud's Requiem: Mourning, Memory, and the Invisible History of a Summer Walk.** Matthew Von Unwerth. Riverhead, 2005.
- ◆ **Complete Bibliography of Psychoanalysis and Neuroscience (1895–1999).** International Neuro-Psychoanalysis Society. Available for download at [www.neuro-psa.org.uk/npsa/index.php?module=pagemaster&PAGE\\_user\\_op=view\\_page&PAGE\\_id=7](http://www.neuro-psa.org.uk/npsa/index.php?module=pagemaster&PAGE_user_op=view_page&PAGE_id=7)

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