PSYCHODYNAMIC PSYCHOTHERAPY AND NEUROBIOLOGY: CONFLUENCE OR CONFLICT

"The intention is to furnish a psychology that shall be a natural science: that is, to represent psychical processes as quantitatively determinant states of specifiable material particles, thus making those processes perspicuous and free from contradiction."

Could this be a quote from the mission statement of the APA's Steering Committee on Practice Guidelines? Or from Steve Hyman, describing new research initiatives for NIMH? In fact, this is the opening line from the introduction of the "Project for a Scientific Psychology," written by Sigmund Freud in 1895.

"The Project" was one of Freud's many attempts to explain psychological phenomena in physical science terms. Though the limited knowledge of the day thwarted these efforts, to the end of his life Freud retained the deep conviction that new knowledge would bring the integration of physical science and psychological phenomena.

Because the development of psychoanalysis overshadowed his earlier career, it is often forgotten that Freud began his work as a research neurobiologist. Working under the renowned Viennese physiologist, Ernst Brucke, in the famed "Helmholtz School of Medicine," Freud published a number of papers on neuroanatomical research, including three papers on the structure of the medulla oblongata, and others on new techniques for staining nerve tracts and for tracing embryological nerve fiber origins. In addition to his daring, as well as controversial, studies on the medicinal properties of cocaine, his published lecture on the "Structure of the Elements of the Nervous System" has been considered by many to contain a clear anticipation of the later neuron theory.

His writings established him as a specialist on the subject of cerebral paralyses in children, and his 1891 monograph, "On Aphasia," is still considered a classic today. Freud's roots as a distinguished biological and neuroanatomical research scientist are enumerated in detail in Frank Sulloway's *Freud, Biologist of the Mind.* Sulloway points out that Freud began his psychoanalytic work relatively late in life and after 15 years of biological research. In fact, "it was only when Brucke himself, in 1882, sensibly pointed out to Freud the inevitable financial difficulties that the latter would have to face if he were to continue with a research career in biology that he finally – and reluctantly – turned to the practice of medicine." Sulloway notes "the later Freudian theories derived their roots from this work not only in fundamentals but also in detail. The impact of these intensive…years can not be overemphasized….In many respects Freud seems to have undergone a profound re-orientation as he turned from being a neuroanatomical researcher to a clinical neurologist who experimented with psychotherapy, finally becoming the first psychoanalyst."

True to his scientific training, Freud based his psychoanalytic theories squarely upon careful and detailed clinical observation. In contrast to some of his followers, Freud never hesitated to discard and replace formulations in the light of new clinical data. He considered himself a scientific "conquistador," developing revolutionary and effective treatment methods for conditions that had proved impervious to known approaches. This new "humanitarian" psychoanalytic discipline quickly replaced the existing Kraepelian descriptive psychiatry, which seemed rigid and unresponsive by comparison.

Psychoanalysis and psychodynamic therapy within a relatively few years became the "gold standard" by which all other treatments were measured. The success of these treatment techniques in dealing with "battle fatigue" in both World War I and World War II further validated psychoanalysis and psychodynamic therapy as an essential clinical approach, as well as a general theory of mind. The years following World War II were the halcyon days of psychoanalysis in this country, with virtually unlimited numbers of candidates wishing to be trained and psychoanalytic ideas being fully integrated into the culture. Psychoanalysts were regularly the heads of major departments and training programs in medical schools and universities. Ironically, that very success may have contributed to the sense that psychoanalysis could afford to be a field unto itself. Ties to the community and other professional groups such as the APA and the AMA languished. What can be described only as a certain sense of hubris on our part may have played a major role in our later difficulties.

The object lesson here is to some degree the nature of science; especially to the point, however, is how the perception of science is distorted through the lens of organizational and group culture. Inevitably the seeming objectivity of science is altered and shaped by the underlying value system of the group. What is considered to be "scientific" is exceedingly changeable and often constitutes a rationalized and self-serving mechanism for group protection.

This was certainly the case for American psychoanalysis. The isolation occurred for what seemed to be sound scientific and clinical reasons. The view of transference and countertransference, which evolved after Freud, dictated that treatment could take place only under carefully controlled conditions, free from external influence. In fact, it is clear in retrospect that these convictions were determined by the sense of threat experienced by analytic institutes. The subsequent reaction of trying to protect psychoanalysis by "circling the wagons," albeit for "scientific" reasons, proved highly destructive.

In the last nine years, the American Psychoanalytic Association has undergone a dramatic renaissance. A serious and searching self-assessment has led to profound change. Open and vigorous explorations about a variety of treatment approaches have led to a healthy clinical flexibility. We have launched major initiatives in the funding of scientific research. Determined outreach efforts have re-engaged us with our professional and public communities. The numbers of members and trainees, as well as analytic groups, are increasing. Our public information effort has led to numerous articles in major newspapers. Our political advocacy initiatives are increasingly effective on Capital Hill. Our 88th annual meeting this past year in Washington, DC was attended by more people than any spring meeting in the history of our Association. We feel that we are on our way.

I thought it might be useful to go into some detail about the vicissitudes of our own organizational struggles as a case study and caveat. It is surprisingly easy for any professional group to develop a kind of cultural xenophobia which is antithetical to sound scientific thinking. To this end it is instructive to read recent articles by Eric Kandel ("A New Intellectual Framework for Psychiatry," *Am J Psychiatry,* April 1998) and Glen Gabbard ("A Neurobiologically Informed Perspective of Psychotherapy," *British J Psychiatry,* 2000). Both authors, from their differing perspectives, express concerns about reductionism and polarization in the field of psychiatry. They speak to the split between mind and brain and the failure of neurobiologists and psychodynamic

psychiatrists to work in concert. I was especially interested in Kandel's criticism of the tendency of previous generations of psychoanalysts to turn away from critical scientific thinking. I must admit I got a rueful chuckle out of Kandel's description of the teaching of Elvin Semrad, a phenomenally charismatic psychoanalyst who influenced generations of psychotherapists at Mass. Mental Health Center, then one of the preeminent residency programs in the country. To give you a sense of the prevailing sentiment of the times, 21 out of the 22 residents in my group intended to pursue psychoanalytic training. The lone holdout, for a time at least, was me.

Kandel points out "they made a point of encouraging us not to read" To quote Semrad on the treatment of schizophrenic patients by psychotherapy: "Loving the patient as he is, in his state of decompensation, is the therapist's primary concern in approaching the patient."

I can thoroughly empathize and identify with Kandel's frustration, as I experienced the same reaction. What he left out, however, was Semrad's teachings about the use of medication. Semrad was quite clear that the use of medication was done "to treat the therapist and not the patient." I did not engender much love from Dr. Semrad himself however after sending his long-term schizophrenic patient back to another hospital for treatment with phenothiazines when prolonged psychotherapy did not seem to be producing any change.

As Kandel puts it "many social scientists have a deep and enduring antipathy toward the biological sciences because they equated biological thinking with a view of human nature that they found simplistic, misguided, and socially and ethically dangerous."

As much as I agree with Kandel's criticism of the then prevailing value system, I think he is still fighting a battle of the last generation. I also think he overlooks the fact that there is a danger of similar reductionism in neurobiology now that the pendulum has swung so far in the opposite direction. Just as psychoanalysts of that era viewed neurobiology as something that you did if you could not be a real psychoanalyst, many neurobiologists at the present time view psychoanalysis and psychodynamic therapy as some archaic manifestation of a bygone era, disregarding the fact that three thousand years of medical tradition has held that the doctor-patient relationship itself has always been understood to be(until the advent of managed care) at the very center of the healing process.

Similiarly, clinical chauvinism is just as much of a danger to the neurobiologically oriented physician as it is to the psychodynamic one. For example, a patient consulted me because of severe panic attacks. Despite many attempts, she could not tolerate medication, because of side effects and non-compliance. After a few months of regular psychotherapy, her symptoms subsided entirely, and did not reappear. However, at the beginning of her illness, she had called a well-known psychopharmacologist who was a specialist in treating panic attacks. When his office called with an appointment after nearly a year, she was so angry she decided to see him to tell him she was doing very well, no thanks to him. He replied that he was pleased that she was doing well, but what she needed to understand was that she had a biological illness, and she should be on prophylactic medicine, or she would surely have a recurrence. For the next several days, she experienced her first panic attacks in nearly a year.

Kandel also comments on the declining interest in the number of medical students choosing psychiatry as a career, and points out Freud's emphasis that psychotherapy can be carried out effectively by non-medical specialists. This will continue to be true, he argues, if we do not rediscover the biological underpinnings to our profession. I agree with that, but I would also argue the opposite side. I believe that a major reason for the decreased number of medical students choosing to be trained in psychiatry is because of the almost complete elimination from psychiatric residencies of training in psychodynamic therapy. A statistic you might find interesting is that 35% of the Harvard Medical School class of 1962 (my class) went into psychiatry. The plain fact of the matter is that many people are attracted to the field of psychiatry because of their humanistic interest. If the practice of psychiatry is reduced to molecules and medications, it flatly becomes boring and non-involving to many people.

Certainly one major factor in the resurgence of numbers of people wishing to be trained in psychoanalysis and psychodynamic psychotherapy in psychoanalytic institutes is that such training is no longer available in most residency programs. As an example the membership in the American Psychiatric Association is declining by an alarming five percent per year, while the membership in the American Psychoanalytic Association has risen in the last several years by ten percent. The establishment of psychotherapy training programs has been the salvation of many of our analytic institutes. Must it be so difficult, for the future of our profession, to design an integrated training program which includes <u>both</u> mind and brain?

Gabbard says "psychiatry is at risk of becoming a house divided against itself, with psychosocial specialists in one camp and neuroscientists in another. While we <u>know</u> that mind and brain are inseparable, our literature and our practice do not always reflect that." He deplores the "Cartesian dualism that splits people into a mind and a brain. While the two constructs represent domains that have their own languages and can be separated for purposes of discussion, they are always integrated." What Gabbard is referring to is the model proposed by Decartes, in which the universe is divided into "matter", and some other kind of substance he defined as "spirit" or "mind". He described this latter as an "extracorporeal entity that was expressed though the pineal gland".

Two major areas of discovery now make the integration of mind and brain seem within reach. The first is the understanding of the brain not as a static organ, as we were once taught, with a fixed number of neurons at birth which gradually decline throughout life. Instead it has become clear that the brain is enormously plastic and vital both in terms of the capability to produce new neurons virtually though out life, with an almost infinite capacity to develop, activate, and deactivate neural networks in response to various kinds of stimuli. The second factor is an increasing sophistication in the understanding of genetic function. Study of the human genome has recently revealed that the body contains only 30,000 genes, about one third as many as had been predicted, and only about twice as many as fruitflies have. We share the vast majority of our genes with other creatures, particularly early mammals. This makes it clear that something far more sophisticated than some sort of static idea of "genetic determinism" is going on. As it turns out genes are highly versatile in their function.

Kandel's criticism continues: "The unease of social sciences arise in part from two misapprehensions (not unique to social sciences): first, that biologists think that biological processes are strictly determined by genes, and second, that the sole function of genes is the inexorable transmission of hereditary information from one generation to

another….In this view, social forces as such have little influence on human behavior. They are powerless in the predetermined relentless actions of the genes."

Kandel notes that this is a fundamental misperception of how genes work and points out that "the key concept of importance is that genes have dual functions." The first gene function is that of template which can replicate reliably. The only changes that can occur in succeeding generations of gene replication are through mutation. The template, a transmission function of the gene, is beyond individual or social control.

However, the second function of the gene, its transcriptional function, determines which proteins will be manufactured by that cell. The important point here is that the transcriptional function is in fact variable, plastic, and highly responsive to environmental factors. This means that variations of gene expression appear to be the mode through which new learning is incorporated into the brain and cultural evolution takes place. While this new learning can not be transmitted genetically as in the Lamarckian sense, learning can be transmitted culturally from one generation to another. Indeed, Gabbard suggests that "different forms of expression and incomplete penetrance are typical of the major (mental) disorders, suggesting that environmental and developmental factors must interact with genes to produce psychiatric illness. Indeed the study of the plasticity of the brain has shown that once genes are activated by cellular developmental processes, the rate at which those genes are expressed is highly regulated by environmental signals throughout life."

Citing twin studies Kandel notes "if schizophrenia were caused entirely by genetic abnormalities the concordance rate for monozygotic twins who share almost all of each other's genes, would be nearly one hundred percent. The fact that the rate is forty-five percent clearly indicates that genetic factors are not the only cause."

Kandel goes on to point out that "development, stress, social experience are all factors that can alter gene expression….Animal studies of alterations of gene expression indicate that one major consequence of such alterations in gene activation is the growth of synapic connections." This was first delineated in studies such as the snail "Aplysia." Animals who underwent controlled learning developed two or three times as many long-term memory pre-synapic terminals as untrained animals. Kandel goes on to postulate that the different environment in which each of us is brought up cause our brains to develop in different ways, which along with a "unique genetic make-up, constitutes the biological basis for individuality."

Kandel, Medina, and others have described the long-term storage of memories in mammals through a process called "long-term potentiation" or LTP. Medina points that repeated reinforcement of stimuli is necessary for LTP to occur but once the synaptic strengths between two neurons occur it is as though a neural channel is created and only a small amount of stimulus from the first neuron is required to create rapid firing in the second. Once this kind of bond is established the effect may be quite long lasting. As Medina puts it, "individual neurons are using a form of language to talk to each other. It is a language of tiny off and on switches, seemingly binary in form, that are deeply involved in collective neural functioning."

Edelman has also written extensively about the effect of the environment on the brain. He describes the cortex as an "interconnected 6 layered sheet of about 10 billion neurons with about a million billion connections". Though what he terms

”neural Darwinism”, neural groupings develop which create a highly specialized ability within the brain for “categorization”, on which learning and memory depend. In Edelman’s view, memory is a dynamic property of neuronal groups, and the physiologic basis for memory is synaptic change. “Alterations in the synaptic strengths of groups in a global mapping provide the biochemical basis for memory”. It should be mentioned that Dr. Edelman received an honorary membership from our Association in 1997, and continues to work closely with a number of psychoanalysts.

Similarly, Fischbach comments on the developing brain: “once the advancing tips of the axons arrive in the approximate regions, the choice of particular targets are influenced by nerve impulses originating or stimulated by events within the world itself”.

The importance of environmental effects on the developing brain is further reinforced by animal studies, such as those done by Suomi on Rhesus monkeys. When infant monkeys were separated from their mothers at an early stage they developed symptoms that suggested a kind of social anxiety. Infants raised by their own mothers were compared with those raised by peers and the latter had higher levels of cortisol and adrenocorticotropic hormone. Some twenty percent of infants in the monkey colonies who were reared by their own mothers nevertheless appeared to be genetically vulnerable to depressive reaction and anxiety. However when they were placed with highly nurturing mothers, “the inborn vulnerability to separation anxiety disappeared. These monkeys ultimately rose to the top of the social hierarchy in the monkey colony.”

Combining these studies with infant observation studies, it requires no great leap to begin to understand, or to at least make a reasonable hypothesis, about the neurobiological bases for the psychodynamic concepts of attachment, internalization, identification, and transference. Consonant with Freud hypotheses, the early experiences of the infant appear to activate particular combinations of genetic expression, which becomes encoded through long-term potentiation as long-term memory in what Amini (Amini et al, 1996) refers to as procedural (or unconscious) memory. The psychoanalytic method rests in large measure on the assumption that in the psychoanalytic situation, the patient will re-create in the relationship with the analyst the problematic relationship with early important objects. The internalized memories of these early important relationships are often largely unconscious, particularly in their problematic aspects, and repeat themselves over and over throughout the patient’s life in a “repetition compulsion.” What this means is that, uninterrupted, the patient will endlessly pursue and repeat these unhappy patterns. Each time this occurs the patient is unconsciously repeating the early relationships with their associated painful, but comfortingly familiar, affects.

<u>Some additional evidence on the impact of the environment on influencing brain function</u>

Wong and Chevrin have recently uncovered neurobiological evidence for unconscious anticipation of an unpleasant event, that is a shock delivered in the past as a negative stimulus. According to Wong “it does seem like, if there is an event that happened in the past, and a similar occurrence occurs in the present, then the brain is anticipating the same kind of thing will happen that happened in the past.” They believe that what they have been studying is what Freud called “signal anxiety” – anticipation of danger.

Martin Teicher at McLean Hospital in Belmont, Massachusetts has recently conducted a series of experiments which suggest that childhood physical abuse creates changes that damage the brain in a number of demonstrable ways, i.e. the temporal lobes, the corpus collosum, the left hemisphere (more specifically the left hippocanthus), and the cerebellar vermis. According to Teicher, "if childhood maltreatment exerts enduring negative effects on the developing brain, fundamentally altering one's mental capacity and personality, it may be possible to compensate for these abnormalities – to succeed in spite of them – but it is doubtful they can actually be reversed in adulthood."

What Teicher seems to be suggesting that there may be a special biological vulnerability of the developing brain in childhood. While he is specifically studying physical trauma, many other studies have suggested that psychological trauma can also alter cortical development. Experiences of neglect and deprivation early in life can produce demonstrable deficits in limbic, brain stem, and mid-brain responses to fear and danger.

Bremner et al (1997) came to a similar conclusion, showing that the left hippocampal volume in adults with post-traumatic stress disorder was dramatically less than that of controls. A similar conclusion was reached in the tragic case of "Genie," a 13 year old girl who had been tied to a chair and not allowed to speak for her entire childhood. When she was discovered and taken into custodial care, an immense amount of remedial treatment was made available to her. As it turned out she was only able to develop the most rudimentary patterns of speech, apparently having missed the developmental window essential for the development of speech.

A number of researchers in post-traumatic stress disorder have come to the same conclusion. I became aware of this myself during my work as a psychiatrist during Vietnam from 1967-1969. I was working with post-combat Marines and was struck by the fact that there was a markedly different ability in different individuals to recover from roughly similar traumatic combat experiences. The single common denominator of those who either did not recover or recovered slowly was the existence of a deprived or traumatic childhood.

These studies would appear to corroborate many of Freud's ideas about early infant development. He hypothesized that there were developmental phases that unfolded in a specific and orderly sequence, and with particular developmental tasks appropriate to that phase. If these tasks were not accomplished in a timely fashion, a "fixation" point would occur. Although the maturation of the individual might continue in other ways, a deficit would be left, to which the adult, under stress might regress. Some of these deficits might be remediable, though therapy or other means, and some might not be repairable. To put it in light of some of our recent knowledge about the neurobiological basis of learning, it would appear that some early learning deficits can be corrected and augmented, as in the repeated experiences of long term therapy, and some cannot.

Dreams

Probably there is no area that is more of a flashpoint in the battle of mind and brain, than that of the nature and purpose of dreaming. The point-counterpoint between researchers Alan Hobson and Mark Solms illustrates this issue. Hobson's early work pointed to the primitive, automatic, entirely non-mental mechanisms in the brainstem as the origin of REM sleep, and therefore, dreaming. There seemed to be little compatibility between this view and Freudian dream theory. More recent work suggests a much more complex model, with the higher cortical centers for memory, emotion, and motivation

involved. Some of this work, especially the Solms observations that if the instinctual motivational part of the brain is damaged (as for example, in patients subjected to surgical leucotomy, or as it was commonly called, pre-frontal lobotomy), dreaming stops altogether, is much closer to the analytic view of dreams.

Dreaming is such a distinctive characteristic of the mammalian brain, it is hard to imagine that it does not have some important adaptive physiological and psychological function which we have yet to fully understand. Dreams remain an important and fruitful aspect of psychodynamic work. My own view of dreams is that they represent a way of processing issues and concerns, rather than being a strict wish-fulfillment, as Freud postulated. This is also a view put forward by Reiser, in the March issue of the Green Journal. In that article, Reiser also points out that the dream is the perfect vehicle for collaborative mind-brain research.

Dreams can give all sorts of important information about what is going on within an individual. For example, a patient of mine had recurrent vivid dreams about being shot in the chest. I suggested that he should have a physical examination, which revealed advanced, but heretofore asymptomatic and unsuspected sarcoidosis.

The Effect of Psychotherapy on the Brain

Freud called his final and most sophisticated hypothesis for understanding the workings of the mind, significantly, the "structural model." Although this was strictly a psychological construct, he nevertheless couched nearly all of his theories in physical science terms. He further held that goal of psychoanalysis was to produce lasting "structural change" in the mind. Interestingly, recent work suggests that this is precisely what happens as a result of psychotherapy and psychoanalysis. As Kandel puts it "It is intriguing to suggest that insofar as psychotherapy is successful about bringing about substantive changes in behavior, it does so by producing alterations in gene expression that produce new structural changes in the brain….When a therapist speaks to a patient and the patient listens, the therapist is not only making eye contact and voice contact, but the action of neuronal machinery in the therapist's brain is having an indirect and, one hopes, long lasting effect on the neuronal machinery in the patient's brain; and quite likely, vice versa. Insofar as our words produces changes in our patient's mind, it is likely that psychotherapeutic interventions produce changes in the patient's brain. From this perspective, the biological and sociopsychological approaches are joined."

Gabbard notes that the phenomenon of LTP supports Freud's notion that early experiences are critical to the development of representations of one's self and body. "Moreover the dynamic plasticity and malleability of self and other representations are paralleled by the strong evidence that…the brain is a dynamic structure capable of being modified by experience. Indeed a basic premise of psychotherapeutic method is that the patient's view of self and other is modified by experiences in the relationship of the psychotherapist."

What this means in effect is that the learning which takes place in psychotherapy, especially long-term psychotherapy and psychoanalysis, is capable of modifying the early internalized structures and replacing them with the experience of the psychotherapeutic relationship both as an affective emotional experience and as a body of new learning. Interestingly, as Gabbard notes, patients seen years after a successful psychotherapy seldom remember the specifics of psychotherapeutic interventions but

instead remember some affect-laden interaction or emotional connection between themselves and the therapist.

To illustrate the point, I had a particularly moving experience with a young woman patient whose psychotherapy was quite literally life-saving. When I began to see her, she was having periodic hallucinations and at one point tried to commit suicide by driving a nail through her head, and partially succeeded. She went on to become a wife and mother, with a good solid family and a successful career. I saw her briefly many years later, and asked her what she thought had made the difference. To my chagrin, she said she could not remember any of the "brilliant" interpretations I had made. She remembered instead the look of genuine concern on my face when I had visited her in the hospital after her suicide attempt. Suddenly, in that moment, she had realized that I really was concerned about her. As she put it, "I really couldn't remember much of anything that you actually said. I only remember two things, love and relentlessness. There were some things you were absolutely relentless about. You just wouldn't let me get away with kidding myself."

Kandel and others have especially criticized psychoanalysis and long-term psychodynamic therapy for failure to develop a "scientific" basis for our field. In particular, the relative absence of clinical outcome studies have been cited. This has been a major issue in the "practise guidelines" being developed by the APA, which tends to include "data-based" studies, but not "experience-based" studies. Kandel may well have been correct to some degree 20 years ago in charging us with an "anti-science" bias, but certainly no longer. In fact, there is an increasingly large body of psychoanalytic research which has been developed in recent years.

The plain fact of the matter is that it is much more difficult to design research protocols for long term therapy, than for the shorter term treatments, such as medication or cognitive behavioral therapy. What is tremendously exciting at this point, however, is that new technologies are making it possible to produce objective data for changes produced by the "talking therapies". For the first time,

New research techniques have tremendously advanced our ability to understand what takes place in psychotherapy. With new brain imaging techniques, it is beginning to be possible to literally "see" change occurring. Allan Schore writes, "The mobilization of fundamental modes of development that occurs in psychotherapy reflects the organization of structural alterations in limbic circuitries that neurobiologically mediate the emergence of adaptive capacities." Basch asserts that psychotherapy can facilitate the alteration and re-working of the patterns in the patient's nervous system that govern how he or she processes socioemotional information. In fact it is now thought that cortical and sensorilimbic connections are re-worked in long-term dynamic psychotherapy.

Watt speculates that the connections of right frontolimbic cortex, a neurobiological structure involved in the regulation of primitive affects, are specifically re-organized by the psychoanalytic experience. Most intriguingly these hypotheses about the nature of the internal structural system that is altered in psychotherapy has recently been corroborated in a PET imaging study that demonstrates that patients show significant changes in the metabolic activity in the right orbitofrontal cortex and its sub-cortical connections as a result of successful psychological treatment."

Researchers in Finland have demonstrated that psychodynamic therapy may have a significant impact on serotonin metabolism. Single photon emission computer tomography (SPECT) demonstrated that a man who had had one year of dynamic therapy had regained a normal serotonin uptake while a control patient had not. Gabbard reports that recent research on cancer patients suggests also that psychotherapy and meaningful supportive relationships can influence brain functioning. Cancer patients who were randomly assigned to group psychotherapy or a control group lived an average of 18 months longer than the controls.

Lessons from Freud

We truly live in a remarkable time. We are standing on the threshold of an exciting frontier, that of truly developing a unified theory of mind and brain, what E.O Wilson calls "a consilience". For the first time we have the technical tools for research becoming available to us to achieve this true integration of a biopsychosocial understanding and a unified mind-brain theory. It is incumbent upon all of us, neurobiologists and psychodynamic therapists alike, to think beyond our particular training and point of view to work together toward this goal. It is no stretch to compare it in importance and complexity to the human genome project.

As Fischbach describes the challenge before us, this 3 or 4 pound phenomenon, the human brain, "is sometimes hailed, with good reason, as the most complex object in the universe. It comprises a trillion cells, 100 billion of them linked in networks that give rise to intelligence, creativity, emotion, consciousness, and memory". No one has put it more poetically than Ramon y Cahal, the father of modern brain science. Speaking of the great diversity of nerve cells, he describes them as "the mysterious butterflies of the soul, the beating of whose wings may some day-who knows-clarify the secret of mental life".

The true legacy of Freud is not embodied in a particular theory, but in his unflinching, honest and open search for the unvarnished truth. The message for us to carry into the future is that deviating from this principle makes for bad science and unhealthy professional organizations. Freud saved psychiatry from a rigid, mechanistic model by emphasizing the healing power of the doctor-patient relationship. However, the pendulum eventually swung too far. Currently, we are in imminent danger of returning to that equally one-sided model. If we can regain our intellectual and scientific balance, and overcome our mutual prejudices, we have the unprecedented opportunity of realizing Freud's dream of understanding how mind and brain operate as one. This is where the spirit and vision of Freud can carry us into the 21st century.

What about Freud in the 21st century? There is little question that psychoanalysis and psychodynamic therapy as clinical disciplines are not only surviving, but also beginning to flourish again. As for Freud's ideas, his dream of a true integration between mind and brain, of a psychology thoroughly grounded in neurobiology is his challenge to us for the 21st century. In Freud's day, lack of knowledge made his noble attempt in "The Project" impossible. Now, due to advances in both neurobiology and psychology, we have the historic opportunity to achieve a true biopsychosocial understanding of the human mind. All we need is the courage and the breadth of vision.

And Freud? I think he would say it's about time.

BIBLIOGRAPHY

Boldrini, M., Placidi, G.P.A., & Marazziti, D. (1998) Applications of Chaos Theories to Psychiatry: A Review and Future Perspectives, *CNS Spectrums*, 3(1):22-29.

Edelman, G. (1992) *Bright Air, Brilliant Fire – On the Matter of the Mind*. New York: Basic Books.

Fichbach, G.D. (1992) Mind and Brain, *Scientific American*, September: pp 48-57.

Gabbard, G.O. (1994) Mind and Brain in Psychiatric Treatment, *Menninger Clinic Bulletin*, 58(4):427-446.

_____ (2000) A Neurobiologically Informed Perspective on Psychotherapy, *British J Psychiatry*, 177:117-122.

Galderisi, S. & Mucci, A. (2000) Emotions, Brain Development and Psychopathologic Vulnerability, *CNS Spectrums*, 5(8):44-48.

Gedo, G.E. (1991) *The Biology of Clinical Encounters – Psychoanalysis as A Science of Mind.* Hillsdale, NJ: The Analytic Press.

Gorman, J.M., Kent, J.M., Sullivan, G.M., & Copeland, J.D. (2000) Neuroanatomical Hypothesis of Panic Disorder, revised, *Am. J. Psychiatry*, 157(4):493-505.

Kandel, E.R. (1998) A New Intellectual Framework for Psychiatry, *Am J Psychiatry*, 155(4):457-469.

Medina, J. (2001a) A New Way of Looking at Depression, *Psychiatric Times* January, pp. 13-14.

_____ (2001b) Neural Architecture at the Molecular Level, *Psychiatric Times*, March, pp. 21 & 24.

Reiser, M.F. (2001) The Dream in Contemporary Psychiatry, *Am J Psychiatry*, 158(3): 351-359.

Rymer, R. (1992) A Silent Childhood, 1 & 2, *The New Yorker*, 4/13/92, 4/20/92.

Schore, A. N. Neurobiological Changes in Psychotherapy, *Psychotherapy Book News,* pp. 32-33.

Victoroff, J. (1999) Brainotherapy, *Psychiatric Times*, July, pp, 76-77.