

# UC Berkeley

## Essays and Articles

### Title

Neurological Humanism: The Divided Brain and the Unification of Two Cultures

### Permalink

<https://escholarship.org/uc/item/9vr8x5tb>

### Author

Dolan, Brian

### Publication Date

2006-04-24

## Neurological Humanism: The Divided Brain and the Unification of Two Cultures

Brian Dolan

In the late 1930s, the British mathematician Godfrey Hardy posed a question to his friend C.P. Snow. “Have you noticed how the word ‘intellectual’ is used nowadays?”, he asked. “There seems to be a new definition which certainly doesn’t include Rutherford or Edington or Dirac or Adrian or me. It does seem rather odd, don’t y’ know.”

Hardy was soon to publish a book called *A Mathematician’s Apology* (1940) on the aesthetics of mathematical thought written for a lay audience, the forward to which was written by Snow. Also in 1940, Snow, a Cambridge don and physicist, would publish his first of a series of political novels that would make him a minor celebrity amongst the British literati. However, what Hardy had said to him provoked reflections on contemporary society that Snow later articulated in a public lecture at Cambridge in 1959 and which was published under a title that would make him far more famous: “The Two Cultures and the Scientific Revolution.”

The new way that the term “intellectual” was being used was apparently dismissive of natural scientists’ mental endeavors. Intellectual came to mean “literary intellectual”, those who were non-scientists and who, according to Snow, thought that scientists were “unaware of man’s condition,” whereas, in response, scientists considered literary types to be introspective and “lacking in foresight.”

The immediate popularity of Snow’s book on both sides of the Atlantic proved that it hit a nerve that was exposed in the mid-twentieth century. Debating what defined an “intellectual” was related to an associated identity crisis about what constituted a “professional” in modern managerial society and what professionals were thought to be concerned about: namely, whether they cared about humanity.

The 1960s and ‘70s, in both Britain and America, saw a surge in public critiques of professionalism, which according to a number of sociologists became equated with elitism and a tyrannical control over knowledge. It was a period of disenchantment with science, and medicine, as a profession, did not escape charges of turning into a dehumanizing practice. These debates set the stage for my talk tonight. I draw on rather unique perspectives from neuroscience, and to a lesser degree neurosurgery, to reexamine philosophical positions about the divide between the arts and sciences in Western culture, of scientific investigations into meaning of human nature, about mind and brain dualism, and brain as the seat of the soul. I’m going to focus briefly on the work of Roger Sperry, of split-brain fame, and his neurosurgical colleagues Joseph Bogen and Philip Vogel, to talk about Sperry’s vision of how science relates to the study of human values. I conclude by making tentative connections between neurological concepts of the divided brain, cerebral localization, and the idea that the fields of neuroscience and neurosurgery might unify the two cultures referred to by Snow by redefining humanity.

So I return to the crisis: medicine, especially medical science, was apparently losing its grip on humanitarian concerns. Criticisms against scientific knowledge earlier in the twentieth century had bundled the organization of scientific research and the deployment of its results by “technologists” together under the rubric of industrial bureaucratization. Post World War I attitudes that shaped the scientific climate and its technological centrality further heightened the tension between a machine-like routinization of scientific and medical skill and the sensitivity of humanity affected by its actions. The French army surgeon and author Georges Duhamel, who was conscripted to an ambulant unit in World War I, worried about an imminent factory-oriented Taylorism being imposed on medicine. “The machine is within us,” wrote Duhamel, “automatism is within us, inside our soul and inside our body: we have made the automaton not in our image, but in the image of a part of ourselves.” That “part” was motor-skill. The necessity of treating wounded soldiers rapidly and almost simultaneously turned military doctors into “a machine without a soul, heated to the right temperature, calibrated to run for

ages and do lots of work.” Duhamel envisioned a future where the efficiency of machine-medicine would perilously strip humanity from medical practice.

In the second half of the twentieth century, individual specialties showed an awareness about how the public might be perceiving their emergent professional identities and what affect this had on their connection to human values. In a 1980 Presidential address to the Neurosurgical Society of America, Dr. William Hunt chose the topic of “professionalism” and discussed what it meant to his colleagues. He too acknowledged a disparity between lay and expert knowledge, where “the public today is very uneasy about all the professions.” He noted a tendency among political liberals to speak in condemnation of “the ‘health industry’ delivering its ‘product’ without regard to the financial or geographic situation of the ‘consumer’.”

Dr. Hunt realized that, owing to the years of focused training and “monopoly-like” control over their practice that specialized physicians had, the medical professionals and the general public would be caught in the semantic traps that divide the arts and sciences. He also knew it was worth considering how to reintegrate human values to a professional image so as to regain the trust of the patients.

In 1983, two years after Hunt’s presidential address, the renowned medical ethicist Dr. Edmund Pellegrino was invited to give the Harvey Cushing oration to the society of neurosurgeons and he too discussed the ideal of professional identity. “No idea has been more debased than the idea of a profession”, he said. “Today, anyone who undertakes any activity full-time, for pay, or with high skill, anyone with special competence or knowledge, anyone with a college degree or credential, anyone who provides some needed advice can call himself a ‘professional’.” However, invoking Cushing’s notion of a “common devotion” to humane learning as much as to scientific medicine, Pellegrino underscored the message that all physicians, whether neurosurgeons or internists (such as himself), “separated though we may be by differences in skill, knowledge, and temperament, are nevertheless bound together by the example of our illustrious predecessors, Harvey Cushing and William Osler.” Both

left legacies of promoting “philanthropia” and “philotechnia”—the love of humanity and the love of the art—as the heart of medicine’s moral duty. Pellegrino’s point was that medicine has a long history of humanities within it, not least exemplified by the individual efforts of Osler and Cushing, to say nothing of Chauncey Leake, John Saunders, William Welch or Henry Sigerist who helped found the discipline of the history of medicine.

What puzzled C.P. Snow some twenty years earlier was why one would want to isolate themselves by replacing intellectualism with professionalism. Weren’t the fundamental questions of science, not just physical science but medical and social science as well, of fundamental importance to humanity?

Well, concerns over the de-humanization of medicine through mechanization and technological intervention ultimately led to the development of institutions seeking to bridge the cultural divide, to reintegrate humanity into scientific practice. In 1969, for instance, funds provided by the National Endowment for the Humanities and the Russell Sage Foundation led to the establishment of the Society for Health and Human Values (now the American Society for Bioethics and Humanities). An offspring of this Society was the Institute on Human Values in Medicine, and Dr. Edmund Pellegrino was appointed the chairman of its first Board of Directors.

In a book he co-authored with the late Dr. David Thomasma published in 1981 called *A Philosophical Basis of Medical Practice*, the authors proposed a number of ways society can reevaluate the fundamental linkages between science and humane studies. “Medicine”, they wrote, “because it bridges both [the] scientific study of man and deeply rooted human values, offers a field for a resolution of tension between abstract and concrete, science and humanities, the search for knowledge and the search for well being.” The clinical encounter provided a unique moment that combined medical theory and practice. “No simplistic neo-Cartesian reduction of medicine to sciences of mind, arithmetically added to science of the body and tied together with a ribbon of moral science, is adequate to explain this synthesis,” they wrote.

It is not surprising that the mind/body problem would emerge as a philosophical bromide to embrace questions of science and humanity. Phenomenology and existentialism, religion, and psychiatry were now all brought into dialectic play with the neurological sciences. They wrote that “The findings of neuropathology, neurosurgery, and the physiology and pharmacology of the nervous system are essential to any serious deliberation on the philosophy of mind and psyche.” This would become an essential core, if not essential tension, to the proposed philosophy of medicine, whether approached from Cartesian dualism or monistic materialism. Medical science was returning to address fundamental questions of human values such as the constitution of the mind and of “self”. But the moral sciences had yet to engage. “Philosophy is still far from drawing fully on the large base of neurophysiological, neuropsychiatric, and neuroendocrinological data medicine has collected”, stated Pellegrino and Thomasma.

It is an ironic allegation that the field of humanities was slow to take up the findings of science to extend a theory of humanness. However, the many associations being made in this period about the “two cultures” debate, between humanistic and scientific knowledge, and the problem of “fragmenting” experience also caught the attention of the professor of psychobiology at CalTech, Roger Sperry.

Sperry gained notoriety in the 1950s for his experiments to surgically divide the corpus colosum of cats and rhesus monkeys so that the connection between the left and right hemispheres of the brain were severed, whereby he made novel observations during subsequent tests on the animal’s unilateral learning capacity. It appeared that dividing the brain resulted in “two independent minds” becoming manifest within a single skull. In the 1960s, he teamed up with California neurosurgeons Joseph Bogen and Philip Vogel to perform similar procedures on patients suffering from intractable epilepsy. While patients at first appeared normal, when special testing was done, a wide variety of disconnection deficits could be elicited, indicating lack of inter-hemispheric transfer and hemispheric specialization effects. It is the long line of research that started in the 1950s on cerebral organization and behavior that eventually earned Sperry his

share of the Nobel Prize in 1981 “for his discoveries concerning the functional specialization of the cerebral hemispheres.”

Interest in the “divided brain”, or “double brain” as it is sometimes called, has a long history with roots in theological investigations into the “seat of the soul”, Cartesian dualism, and a largely nineteenth-century history of neuroanatomical investigations by Franz Gall, Paul Broca, Carl Wernicke, and others. At the turn of the nineteenth century, double brain theories were embraced in different ways by an emergent psychiatric field concerned with “diseases of the mind” and neurology, which was interested in “diseases of the brain.” In 1868, John Hughlings Jackson introduced the concept of cerebral dominance and investigators such as Wernicke began to realize that problems of language function corresponded with damage to the left hemisphere. One result of learning about this form of cerebral localization was that the left hemisphere became associated with possessing significant cognitive functioning, while the right hemisphere, or “right brain”, was considered inactive and mute, maybe even vestigial. The cultural impact of these theories created a left-brain chauvinism, celebrating its linear, logical, and linguistic reasoning while the characteristics of the right brain, the realm of emotions and aesthetics, were muted.

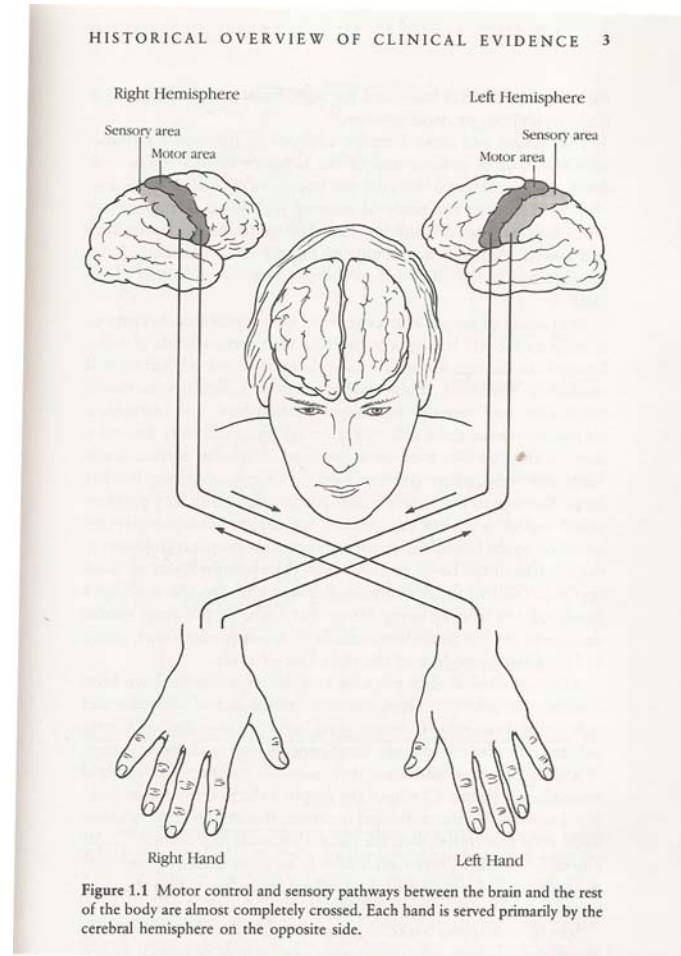
Roger Sperry noted that this imbalanced “dualism” allowed materialist philosophy to prevail. Of no relevance to neuroscientific research were intangible things like mind and spirit, “mental images, sensations, thoughts and feelings, hopes, ideals, and all the other subjective phenomena that comprise the world of inner experience.” One disturbing consequence of the left brain bias was that it was affecting human socialization; the educational system discriminates against half of the brain with a curriculum that ignores all nonverbal and nonmathematical forms of reasoning, which Sperry’s research had discovered did exist in the right hemisphere.

Owing to Bogen’s and Vogel’s surgical work and Sperry’s tests, the right hemisphere of split brain patients was shown to be “a second conscious entity that is characteristically human and runs along in parallel with the more dominant stream of consciousness in the major hemisphere.” This was no superfluous spare part; these

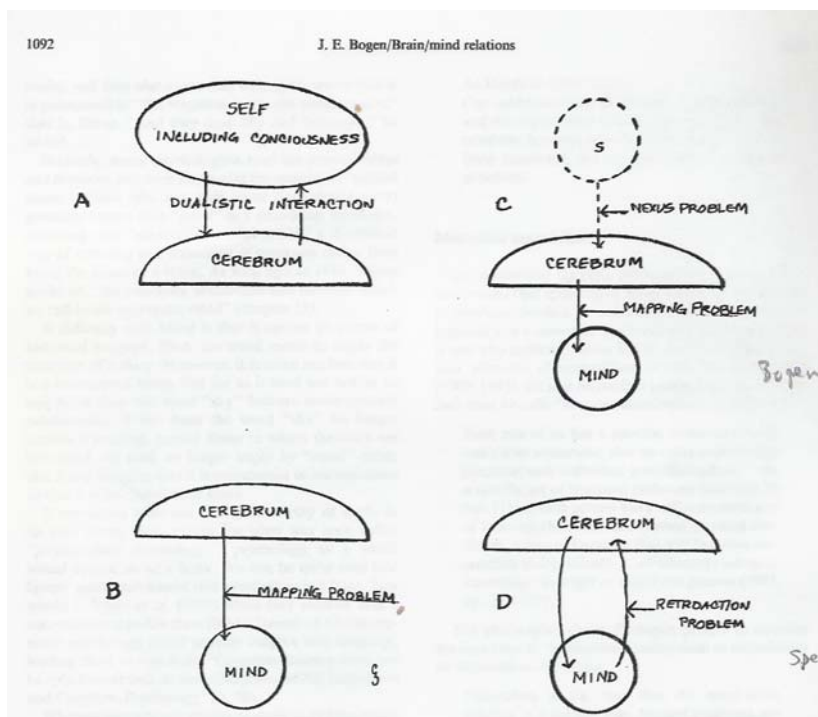
studies suggested a commissural cross-connectedness—a “partner” hemisphere. “We must think of the two hemispheres as normally functioning together as an integral unit”, wrote Sperry. “The classic neurologic doctrine of one-sided dominance, with a major and a minor hemisphere, is replaced by the idea of a bilateral complementary specialization.”

Sperry had two major revelations from this research. The first was that the two sides of the brain function normally in mental collaboration. The second was that the “revitalization” of the right hemisphere opened the pathway to a new science of consciousness. His early writings on this identify what he called “the central issue”. “If the prevailing view in neuroscience is correct,” he wrote, “that consciousness and mental forces in general must be excluded from any objective model [of the brain]—then we write off all that inner subjective world from science and come out with materialism and all its implications.” This he vehemently resisted. He was scornful of what he identified as “today’s prevailing objective, mechanistic, materialistic, behavioristic, reductionistic, fatalistic view of the nature of mind and psyche.” The tendency to see the brain as a network of complex electrochemical communications governed by scientific laws of biophysics dispenses with the conscious mind as well as “other spiritual components in human nature.” However, he proposed a way to reintegrate it.

Sperry had spun the belief that mental forces have no place in a theory of brain function on its head, so to speak. Up to this point, “Mind” was a four letter word, according to Joseph Bogen. But Sperry had waged a protest, if not his own war, against mechanistic physico-chemical explanations of life and the emergence of mind. For Sperry, this amounted to the idea that “conscious phenomena ... [are] properties of brain processing ... [and they cause] cerebral excitation.” To put it more bluntly, “Mind moves matter in the brain”. Sperry said that his was a scheme that “would put mind back into the brain of objective science and in a position of top command.”



I don't want to be very confusing here, but I wanted to show you this diagram drawn by Dr. Bogen which is his schematic of different views about brain/mind relations. "A" is traditional dualism, where the brain and the self exist separately but they can interact. "B" is more materialist, where 'mind' is entirely dependent on brain—it is not separate. "C" represents Bogen's own belief, which he called Agnostic Physicism. He separates the Soul from Mind, allowing the mind to be studied materially, while leaving the input of the soul to metaphysics. "D" is Sperry's belief: the mind is a subset of cerebral states—it is a property of, but also influences brain function. He materialized consciousness. I'm not going to quiz you on this, I offer it because Bogen took the time to draw it.



So why was it so important for Sperry to rescue consciousness? Because, I believe, that when scientists were seen to ignore human consciousness they were by default dismissing the foundation of the value system that would solve the world's problems. As Sperry portentously declared, "The human brain is today the dominant control force on our planet; what moves and directs the brain of man will, in turn, largely determine the future." This formula was meant to underscore the importance of the new findings in neuroscience that would end the reign of Pavlovian and Watsonian plasticity and Skinnerian behavioralism. Sperry called his theory of consciousness a "science of the self", the "new holist-mentalist paradigm." As early as 1965 he presented his ideas for a Watson Lecture at CalTech and, in his words, "it went over like a lead balloon." Sperry complained that he was surrounded molecularists plugging away without any interest in "the big problems of society."

In his 1981 Nobel Lecture, Sperry once again made reference to this paradigm and how his integration of the right brain with left brain served a higher function. "Basic revisions in concepts of causality are involved in which the whole, besides being 'different from and greater than the sum of the parts', also causally determines the fate of the parts." (This reference to holism resonates with holistic theories in neurology that became popular in Germany in the 1920s and '30s, and is found in the work of Kurt Goldstein, who moved to America in 1935 and is known for his work on aphasia among other things.)

The point I want to make is that Sperry believed that he was offering, "an objective, explanatory model of brain function [that] affirms age old humanist values" while at the same time opening current moral values to "the free winds of scientific skepticism and inquiry." His version of "cognitivism", he said, "bridges the chasm between what the writer C.P. Snow has called the 'two cultures' – the widening gap between the world view of the scientist and the humanist."

While I began this talk by citing Snow's apparent concern about intellectual identity and the humanitarian concerns of "profes-

sionals”, few people know or remember the fact that his original conception of “two cultures” was not primarily a reference to the division between science and the humanities, or literary intellectuals and physical scientists. He intended his talk to be about the growing gap between the two cultures of the rich and the poor—between Western culture’s wealth and the “Rest’s” poverty. He was referring to geopolitical cultures. Snow was musing about the formation of post-industrial society, and about how a scientific revolution on a global-scale could happen that would extend industrial wealth to poor countries.

Writing amidst growing cold war tensions, he talked about how the US and the USSR—about how philosophers and politicians on the right and on the left, on one side of the globe and on the other side of the globe—need to learn to work together. The people who needed to be recruited for this global collaborative endeavor, he said, “need to be trained not only in scientific but in human terms.” The many divides that Snow referred to, literally and metaphorically, needed to be unified in a global effort to connect with humanity.

The way that a line of research in neuroscience developed in the decades after Snow’s lecture, the way that it interacted with attitudes about the disenchantment with science, a new philosophy of medicine, and a cognitive model to reintegrate science and human values, goes to the heart of what Snow’s deeper point was. Yes, science and humanities need to unite, but for no less a reason than to solve the world’s problems. Sperry thought that his brain research provided a way to accomplish this. The problems of the “global condition”, said Sperry, “pollution, poverty, aggression, overpopulation, and so on”, could be tackled once human values were reintegrated with scientific inquiry. Reuniting the two sides of the brain was literally, for him, a way of reuniting the two cultures because now consciousness—the seat of human values—was shown to be open to scientific analysis. How exactly one was supposed to control the mind and shape human values so that the world’s problems would be solved is unclear. I do not think he was suggesting an engagement with psychosurgery. I wish I knew more about Bogen’s work and ideas on this. He said that Sperry’s work on the split brain “was for

me the most influential scientific experiment that I have ever seen or know about. It set the course of my life.”

Last year when I read his obituary I was intrigued to learn that he had been searching for the site in the brain where consciousness is located. He apparently concluded that the location was the intralaminar nucleus of the thalamus gland and was preparing a book about his findings when he died. If anyone knows what happened to that manuscript I’d like to hear from you.

C.P. Snow said that he would one day be asked if he actually thought there was a one in ten chance that the two cultures would unite and tackle the world’s problems. “I can only reply”, he said, “that I do not know.” He was, after all, only a writer. And apparently those who did not know Sperry very well simply assumed “he’s gone religious like so many old folks.” So what are we left with today? Has unification occurred?

I have suggested that one basis for trying to unify the arts and sciences in America stemmed from a crisis of professional identity and charges that there was diminishing humanity in the materialist, reductionist, technologist trends in biomedicine in the mid twentieth century. It seems to me that at the beginning of the new century our culture engages with science and medicine on so many different levels that it belies the notion of unification in different ways of thinking. Isn’t the idea of diversification more suited to the dynamics of Western culture anyway? The cultural anthropologist Richard Shweder wrote a critical response to E.O. Wilson’s concept of *Consilience: The Unity of Knowledge*: “There is no universally binding reason to privilege that particular ideal of knowledge; and that idea, while perhaps serviceable in some contexts, may actually get in the way of many valuable forms of systematic inquiry in the human sciences, and perhaps even in the non-human sciences as well.” At a meeting on the “convergence of natural and human science” held at the New York Academy of Sciences in 2000, Harvard ant expert and inaugurator of sociobiology debates Edward O. Wilson reminded his audience of the historic origins of their topic, asking “Are the scientific and literary cultures, as defined by C.P. Snow in his famous 1959 Rede Lecture, permanent?”

He personally saw these spheres coming together, maybe one being absorbed into the other through a sort of osmosis. To him, science was beginning to solve the deep mysteries of life. Just as the mysteries of heredity were reduced to DNA, he said, so human nature seems definable by technological intervention. He said: “Only recently have doubts about the accessibility of the physical basis of mind ... faded before the advance of sophisticated imaging techniques.”

Where technology was once the reason for increased hostility and attacks on medicine for its dehumanizing effects, it now seems as if technology has turned into a process of understanding humanness. It has evolved beyond the common causal influences that excite the cellular elements of the brain that were discussed mid-century with terms like ion flow, chemical transmitters, pre-synaptic and post-synaptic potentials. As Roger Sperry stated in 1966, “The inner sensations, feelings, percepts, concepts, mental images, and the like cannot be weighed or measured, photographed, spectrographed, or chromatographed, or otherwise recorded or dealt with objectively by any known scientific methodology.” In short, one was technologically limited to investigate “consciousness.” However, as Wilson indicated in 2000, with the advent of PET, CT and MRI scans, now pictures can apparently tell us the “whole” story.

It is unlikely that any divide has been bridged, but rather that the court of public opinion is beginning to favor the languages and images of science as a way of gleaning information about human nature. There is no bridge between two land masses, but rather people are jumping from one side to the other, resulting in one field that seems to be getting larger than the other. Where this leaves debates about the space in-between is uncertain. It is like the joke about post-1991 Russia. “Comrades”, said the statesman to the people, “for years we have been at the edge of a great abyss. Now we have taken a great step forward.”

More and more, investigations traditionally in the domain of the humanities seem to be undertaken through the lens of the sciences. Interest in what constitutes the self, “personhood”, is now pursued by looking at pictures. Inquiring minds are captivated by the

workings of \$2 million magnets which perform functional MRI. Academics, journalists, and popular science writers want to go beyond the identification of media-hyped “centers” of the brain that are linked in some way to certain traits—the “speech center” or “jealousy center”, for instance—to see if neuroscience can help one understand something more fundamental about human nature. As Steven Johnson asked in his book *Mind Wide Open* (2004), “Could tools that measure the minute-by-minute levels of those substances in your body and brain teach you something about your own emotional toolbox?”

I suppose it is up to the individual to decide if looking at the way the brain lights up on a computer monitor really gives them insight about themselves. I’m not sure, however, if we know what shade of grey the soul is. It seems unlikely that knowing how to color-code one’s brain commands will be of great comfort to any patient who suffers from any number of diseases that are also identified through imaging techniques. Learning where a particular emotion lives in one’s head doesn’t make one understand the emotion any more clearly.

No one could probably know better than brain surgeons that something extends beyond the world of physical ontology and into the abyss of consciousness, or spirituality, or the realm of the soul of a person. An historical review of the practices of psychosurgery by Dr. Herbert Vaughan in 1975 is illustrative of the unease of crossing sacred boundaries. “Although the force of the conceptual dichotomy between mind and brain has been substantially reduced by evidence demonstrating the dependence of mental processes upon brain mechanisms, willful alteration of the personality of a human being through the slash of a knife or a stereotaxic lesion represents to many an intrusion upon the most private aspects of the self—essentially, an assault upon the soul.”

In 1994, the then President of the Congress of Neurological Surgeons, Dr. Arthur Day, reflected on a related concern in his presidential address. He commented that since the 1970s, neurosurgery had become phenomenally successful primarily because of technological developments in imaging, surgical microscopy, and



stereotactic biopsy among others. However, each technique introduced a risk of displacing more conventional clinical patient histories and neurological examinations, representing a shift away from seeing the whole person. “To defeat our enemies”, he said, referring to malignant glioma, ruptured aneurysms and the like, “we must invoke the best part of our art and science to resist the practice of a mechanical body-parts medicine and utilize our technological resources wisely. ... [We must have] an awareness that the mind and body are connected but separate, and that many physical ailments are expressions of mental conflict that no amount of high-tech physical correction will heal.” He was moved to reflect on a recent personal experience he had when operating on a woman with a “large, deep seated arteriovenous malformation in her corpus callosum.” During the operation, he said, “I became intensely aware that somewhere in that marvelous organ that lay open before me dwelt the connection with her spirit, and that I had been entrusted with maintaining her connection with the physical world.” Remarkably, to me, he managed to keep his nerve after this thought and finished a successful operation. The moral of the story was a reiteration of William Osler’s sage remark that “happiness lies in the absorption in some vocation which satisfies the soul ... that we are here to add what we can to, not get what we can from, life.”

The art and science of neurosurgery thus not only work in a unified manner to identify and treat disease, but to extend the life, the soul, of humanity and its connection to the physical world. The unification of the humanities and sciences occurs when individuals realize the limitations of their professional knowledge. It comes with learning to understand and cope with lay expectations and frustrations, while putting the patient’s interests above all others. As the neurosurgeon Dr. Edward Laws commented in his presidential address to the society of neurosurgeons in 1985, “We are among the most fortunate of men; we have our craft, we have our science, we have our traditions to guide us, we have our humanity with which to care for our patients.” Perhaps the two cultures have always been united in one skull.