The Paradox of Medical Practice and Medical Education

The 1969 Cushing Oration*

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First, may I express my very deep appreciation for the privilege of delivering the Cushing Oration on this most important occasion. When the invitation was first extended, I hesitated, for at least a moment, as to whether I might properly accept it, much as I wished to. I have always had the feeling that there is a basic impropriety in an address by a layman to a group of physicians on a medical subject or on one which is in the mainstream of the interest to the profession. However, I overcame my scruples very rapidly for three reasons.

First, I have been a most fortunate person, for in my life as a university president I have had the privilege of working very closely with two faculties of medicine made up of very distinguished people who were extremely kind to me, and who became my teachers in the hope that I might come to understand something of medical education and of medical practice. Second, through the good offices of the American Medical Association, of some of its constituent societies, and of the Association of American Medical Colleges, I have been given opportunities to observe, study, consider, learn, and to write about some of the aspects of medical education. The third reason that I felt I might properly accept a very welcome invitation is because this is the centennial year of the birth of Harvey Cushing. He was a Cleveland and was deeply attached to the Western Reserve, a region and institution in which I have some proprietary interest.

I would remind you that Harvey Cushing, born 100 years ago in this city, came from a long and distinguished line of physicians whose lifetimes and practices spanned the early history of this interesting region of our nation. His great grandfather, Dr. David Cushing, Jr., his grandfather, Dr. Erastus Cushing, and his father, Dr. Henry Kirk Cushing, were all distinguished practitioners and medical educators of this city and of the Western Reserve. Though Harvey Cushing left Cleveland after his graduation from Central High School to go to Yale, nevertheless his interest in and his affection for Cleveland, for the Western Reserve, and the Western Reserve Medical School persisted throughout his life.

In preparation for this afternoon's address, I had the good fortune of being able to browse throughout the Cleveland Medical Library and the Dietrich Museum to see what has been written about Harvey Cushing but, more interestingly, what Harvey Cushing wrote and said. One thing that particularly attracted my attention and which would seem to be peculiarly prophetic to those of us who have lived and worked in this community and particularly in this university, were the words which he spoke in October, 1924, when he was the honored guest at the dedication of what was then called the "new medical school building." I quote from his address since I think it is as valid and interesting today as it was 45 years ago.

"Time and experience have shown that few institutions erected by men are more enduring than universities. Governments may come and go but an institution endures so long as there is any vigor in the race. Moreover, to endure, it must show growth, and so a university becomes a natural magnet which may at times appear to repel but in the long run must serve ultimately to attract unto itself bodies which temporarily labor under the impression that their own orbits are independent ones. In all such affairs the process of amalgamation is a slow one, but inevitable. It takes imagination, courage, time, and sacrifice, and necessitates a surrender of autonomy of certain personal or vested interests for the common good. The day will

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come, I foresee, when under the banner of the Western Reserve, a term which represents an historical episode not to be lightly laid aside and forgotten, there will be a fusion of many institutions which, though retaining their name and individuality and purpose as separate schools and institutions, can only become great when thus affiliated with an ever greater university."

To those of us who have been engaged over the last two decades in the creation of what we call the University Circle Concept and the Greater University now called Case Western Reserve University, these words have a remarkable and prophetic ring.

I take my text (since I am, Mr. Chairman, a licensed lay preacher and always prefer to have a text) from an address given by Dr. Cushing in November of 1928 at Dartmouth College. At that institution there is a Department of Biography and an endowed lectureship which each year brings to the campus very distinguished members of the several professions to speak to the students about their lives and respective professions. Dr. Cushing, in that year, was the representative of the profession of medicine. His paper was entitled, "The Ideals, Opportunities, and Difficulties of the Medical Profession." He spoke eloquently of the unchanging tradition of the medical profession since its very earliest times in these words:

"So, while the professional ideals are not essentially different from what they were to our predecessors of antiquity, its opportunities are becoming these later years amazingly increased on account of the many-sidedness of the doctor's vocation which the subdivisions of medicine have made possible. For, in spite of its continuity of tradition, the medical profession has succeeded in effectually shaking off the shackles of dogma and a precedent, which still appear to hamper the progress of divinity and of law."

When I read these words, at first I had a negative reaction for I was a bit annoyed that Dr. Cushing had failed to include in his list of the ancient and learned professions my profession, that of teaching. He mentioned only the Church, Medicine, and Law. I wondered why he omitted teaching, but this was not a very interesting or profitable speculation. My mind then ran to the question of how Dr. Cushing would have placed teaching had he thought to include it in his list of learned professions. Would he have put it as having the characteristic of medicine, that of adaptability, or would he have placed it in the category of divinity and law—two professions which do not exhibit adaptability to a marked degree? I realized that if I were to speak his thoughts today, I would reiterate Harvey Cushing's words. I would speak of the capacity of the medical profession to follow its long-established tradition but not to be hampered by the shackles of dogma and a precedent, which do appear to still hamper the progress of divinity, law, and teaching. This observation about teaching brings me to the title of my remarks this afternoon, which is, "The Paradox of Medical Practice and of Medical Education."

The paradox to me seems to be quite clear, for medical practice has certainly, over this century, proven its capacity time and time again to adapt rapidly to new knowledge and to changing circumstances. In my observation and in sharp contrast, medical education has shown little capacity to adapt to new knowledge and to altered circumstances. Therefore, it seems to me, we do have a paradox wherein medical practice is adaptable, creative, inventive; and whereas medical education lacks these characteristics.

To make my point, I shall cite four aspects of, and the consequences of, the scientific revolution which have been recognized in medical practice but which are not now recognized philosophically or in fact in medical education. The four are: the knowledge explosion; the disappearing time lag between the two worlds of science and of art; the reversed order of precedence of science and of art; and the requirement for institutionalization and organization.

First, the knowledge explosion—a matter wholly familiar to this distinguished audience—but may I remind you of two less familiar aspects of it. It is not an ordinary explosion in the sense of gunpowder or TNT; it is an explosion in the mode of an atomic explosion—it is a chain reaction. It is a constantly accelerating phenomenon, and the graph which represents it is, of course, an exponential curve. What we have seen in our lifetime, even the lifetime of the youngest
man in this room, will be nothing as compared to what we shall see even for as short a term as the next decade.

Another aspect of the knowledge explosion is one of which I think we too rarely are conscious. It is a multi-directional explosion, multi-directional in the sense that the envelope of the forces released is a sphere. Just exactly as when one detonates an atomic blast, there is a great mushroom cloud rising upward and a great cavern excavated in the ground. There is a blast to the north, to the south, to the east, and to the west. Likewise, new knowledge in the area of physics not only multiplies our understanding of physics, but immediately adds knowledge to other fields, such as, chemistry, biology, geology, and astronomy. We see, therefore, the birth of new fields of knowledge with hybrid names, such as biophysics, astrophysics, geophysics, and magnetogeology.

What are the requirements for adjustment to these aspects of the knowledge explosion in the area of medical education? The first and most obvious, and one which many people are thinking about, is an articulation of medical education with education before and after the formal period in the medical school. We are wasting the time of our students who are unnecessarily repeating a good deal of instruction because of our failure to articulate with the vastly-improved science instruction in both our secondary schools and our colleges. Second, it means that we must concentrate not upon details, but upon principles in a way that I think most teachers have failed to do in the past. Third, and to me the most important, is the realization that what should happen in the medical school is not the teaching of the art of medicine, but the teaching of the art of learning medicine, because the physician must continue to learn throughout his entire life. He will have to learn more rapidly as a practitioner at the age of 50 than he does as a student at the age of 25. The true art which we should be teaching is the art of learning medicine and not the art of medicine alone. This means that our teaching techniques need re-examination in order to facilitate learning rather than the mastery of detail. It requires, in my judgment, a re-evaluation of the role of research as a means of learning. Research is the most efficient, the most effective, and frequently the only possible method of learning for the mature scholar.

My second point was the vanishing time lag between the two worlds of science and art. If one looks at the intellectual history of the world or at the development of civilization, one is struck by the fact that for literally thousands of years science and art have lived in two worlds separated by a time lag of roughly one human generation. You can supply many illustrations of this in the fields of biology and medicine. I can provide many from the fields of physics and engineering. However, our basic misapprehension has been our belief that the separation between science and art was one of place and activity. One world we called the “Ivory Tower,” where one was concerned only with knowledge. The other world we called the “Marketplace,” where one was concerned only with the use of knowledge as applied in a skill, that is, in an art. But the generational time lag which persisted over the centuries has disappeared within the last two to three decades, for it happened during World War II with the development of the powerful weapons of that time in our history. No longer is there a generational time lag between knowledge as such and its utilization in a skill or in an art; rather, the application of new knowledge is virtually immediate. We are in a time when no longer can we speak of two worlds—a world of science, that is, the world of knowing; and a world of art, that is, the world of doing. Rather, these two worlds have become one. This fact requires a major adjustment in medical education, for our system is obviously built on the assumption that there are two separate worlds. For years we have had the preclinical years and the clinical years and cared not that the twain should never meet. The medical student takes two years in the laboratory then burns his notes and sells his textbooks to the unsuspecting freshman and moves into the hospital where life is real and medicine really exists. Structurally, the curriculum is a horizontal system like a dry wall—a wall of independent units known as secondary school, pre-medicine and college, pre-clinical, clinical, internship, and residency. We have built stone upon stone without any vertical reinforcement and
with very little vertical connection. What is needed, in my judgment, is the realization that there are not two worlds of knowing and doing independently; these are simply the two aspects of the intellectual process. Therefore, our educational system should and must have a vertical organization where both knowing and doing are ever-present, are immediately related, and the continuing theme is the interface through which knowledge becomes skill—through which science becomes art. This is a personal interface for it must occur within each individual.

My third point was the reversal of the precedence of science and of art. Historically, art ("doing") has always preceded science ("knowing"). Man could do things long before he knew why or how he succeeded. The cave man learned early that it was easier to roll a stone than it was to drag it, but he knew nothing about the laws of sliding and rolling friction. Man discovered early that a person recovered most rapidly from a faint when placed in a horizontal position though nothing was known about the circulation of the blood or the relation of oxygen in the brain to consciousness. Art has always come first and science has always come second. The long and painful process by which mankind has advanced both his science and his art is by the pragmatic way of trying things and finding what works and what does not. Intellectual curiosity has then driven men to the laboratory and to reflection in order to find out "why." Having developed some science or knowledge, they apply it to the skill in order to enhance the art. This process has been repeated time and time again, cycle after cycle. The motivation to that necessary ingredient of intellectual life, research, has been the question "why?". Research has arisen because man has had skill and has wanted to improve it, has known he could improve it, and has learned that development of new knowledge will make a better art possible. This time order is reflected in the way in which we use these words. Have you ever heard of a university "faculty of sciences and arts"? It is always written the "faculty of arts and sciences." This is a deeply imbedded word usage and reflects the historical facts upon which I have been dwelling. My point is that we have arrived at a most revolutionary epoch in human intellectual history. It is no longer true that art must always precede science, and that the word order shall always be "the arts and the sciences." We are now at a point where perhaps we shall have to speak of "the sciences and the arts," for we have a power which no man has ever had before, that is, the capacity to create an art de novo. If you, ladies and gentlemen, were watching your television sets at Christmas time as Apollo IX appeared from behind the moon exactly on schedule and saw it come back into earth orbit exactly as planned, you may have realized that for the first time we had demonstrated in this incredibly spectacular way that man has created the art of space travel purely out of knowledge and without any prior art or pragmatic experience.

What does this mean to medicine? It means that we have a great new power, the power to create new medical art directly from all kinds of new knowledge. First, it means that the science input into the education of physicians must be continuous and not discontinuous. The senior medical student, the intern, the resident, the seasoned and successful practitioner will need as much science input in his educational experience as does the beginning undergraduate medical student. Second, and perhaps even more important, this concept opens up a whole new area for the satisfaction of man's insatiable intellectual curiosity through the art of research. Now we can conceive research to answer the question "how?" rather than only to answer the question of "why?". Can we take the knowledge of molecular physics, of molecular biology, of the behavioral sciences, of the several technologies, and create out of this knowledge a new medical art? We have done just this in space travel; why not in medicine? Third, it seems to me that a radical change in our concepts of continuing and post-graduate education is required. We need an education emphasizing science perhaps even more than art.

The fourth aspect of the scientific revolution to which medical education has not as yet adapted is the requirement for institutionalization and organization. It seems to me that we have a simple irrefutable and inescapable logic before us, which I state this way: the knowledge explosion demands of each one of us a choice of field in which he shall attain competence. This we call special-
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ization. There is no alternative; we are not going to breed supermen who can comprehend all of biology, or all of physics, or all of medicine, or all of surgery. The next step in my logical sequence is that specialization immediately leads to the division of labor. One man does one thing, another man does another. But as soon as you divide labor, you face the necessity of organization and of institutionalization. I care not whether we talk about an industry, a university, a hospital, or a government; this is true, and it creates one of our knottiest problems. I will phrase this problem as a question: What form of human organization will meet simultaneously two separate and often antithetical requirements: first, a one-to-one relationship of physician to patient; second, the division of labor without loss of efficiency and productivity? There is no human organization that I know of which has as yet met both of these requirements. In the industrial field we have provided for the division of labor without loss of efficiency and productivity, in fact, with a marked gain. But it is not a system that provides for a one-to-one relationship of two individuals, the artisan and the buyer. We are not doing it in education. Pick up your newspaper or turn on your television set and see what is happening on the college campuses today. I simply say that the desired form of organization is not yet known. We have here a problem which requires the most highly creative, the most boldly inventive minds, and the widest experience that we can bring to bear on the problem. We must find that form of organization which will release the great benefits of specialization, permit us to use all of the knowledge and skill that we have, preserve the relationship of physician to patient, and do so with increased efficiency and productivity and, therefore, with some control of the economic cost.

What does this fact demand of medical education? Two things: first, the opening of a second front of research, that is, research in the delivery of medical care, a field which has gone far too long unrecognized and uncultivated; second, that our medical curricula recognize the fact that medical care is delivered in a system even though we call it a non-system—and it may very well be that. The future practitioner must understand and accept the fact that the fruits of knowledge and skill are delivered in a system.

In conclusion, I reiterate my statement that there is a paradox, a paradox between medical practice on the one hand and medical education on the other. Medical practice is highly adaptive and medical education is highly resistive to change. Further, I would observe that we must do something about this paradox. The “we” includes you as professionals, it includes me as a responsible university officer, and all of us as teachers. I believe that were Harvey Cushing here today, he would give a strong endorsement to this observation. Lastly, I would leave this thought with you. Medicine (and particularly that branch known as Surgery) has a history of responsive adaptation in practice and has frequently led in innovation in medical education. Medicine ought to be the profession to place education on the same side of Cushing’s contrast as medical practice, rather than allowing it to continue to be grouped with his list of the unadaptive learned professions.