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PRESIDENTIAL ADDRESS

The making of a cardiothoracic surgeon: An Appolonian quest

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"I have never let my schooling interfere with my education." Mark Twain

The intent of this **address** is to present to you some of my thoughts about education, in the broadest sense, and also about the training of cardiothoracic surgeons. I shall briefly discuss views concerning (1) the virtues of an organized humanistic background, (2) related ethical concerns, (3) high school, college, and medical school education, (4) cardiothoracic residency training, and (5) an alternative option of governance for a combined cardiothoracic training environment.

NEED FOR BACKGROUND IN THE HUMANITIES

Apollo, according to mythology, was the god of the intellect, the arts, and healing. The term Apollonian also implies harmony, balance, rationality, loyalty, and discipline—all desirable characteristics for cardiothoracic surgeons. Clearly our specialty is not merely an applied science and a technical discipline. It also includes an important aesthetic component, juxtaposing art and science, and demanding, in addition, honesty, courage, judgment, vision, erudition, compassion, and a consuming commitment to the pursuit of excellence and of high ethical standards. Surgery is an eminently moral act, and, by living with human suffering, we learn to appreciate man's moral nature. I have no doubt that we are all well trained in clinical and scientific matters. I am less certain that we are educated well enough to fulfill what I shall call, in lieu of a better term, the humanistic demands of our profession. The very nobility of our mission renders this shortcoming all the more regrettable. There is an unresolved paradox in which we often find ourselves: our Hippocratic obligation to immerse ourselves in and, at the same time, the need to distance ourselves emotionally from the struggle of human survival. We all share in this dilemma, which enriches us and which, hopefully, makes us better people and better surgeons. The privilege to participate in

preserving and improving life provides us with our purest professional satisfaction. But are we sufficiently cultured and do we have the necessary background in the humanities to achieve this professional harmony? Unfortunately, the widening gulf between science and the humanities, so accurately portrayed by C. P. Snow, persists today. Often we find well-trained professionals who have mastered scientific facts, statistical proofs, and surgical techniques but who lack more elusive qualities such as respect for the dignity of man, empathy, humility, and interpersonal skills. The impressive scientific and technologic advances of the past, and particularly of this century, have perceptively displaced, to a disturbing degree, the humanistic tradition within the field of surgery. By using the term humanistic tradition, I refer to the cultural spectrum conducive to the development of artful physicians and true healers of mankind, rather than glorified technicians. Lest I be misunderstood, we should be justifiably proud of our scientific and technologic advances, including the numeric and deductive sciences which, more than ever before, have opened unimaginable diagnostic, therapeutic, and research opportunities.

I should also add here that the gulf between the humanities and science is equally disturbing. Stephen Hawkings has been particularly outspoken about the lack of understanding of contemporary developments in physics on the part of present day philosophers, including philosophers of science, as well as the consequent inability of these philosophers to participate meaningfully in the all-important discussions about current theories of the origin of the universe and many other important questions in science.

A meaningful background in the humanities requires schooling in philosophy, history, sociology, literature, and the arts—tonal, visual, and plastic. Such a background in the humanities widens the intellectual horizon, aids in the search for meaning, enriches judgment, and heightens the senses. History teaches that life entails competition and that inequality is innate. Set man free and he becomes less equal, whereas attempts to homogenize our inequalities limit our freedom. Similar to Heisenberg's "Uncertainty Principle" is Heinz Kuehn's proposal that uncertainty is a fundamental element of human life. As he so aptly put it, "The humanities open us to the uncertainty that is our common fate as travelers and sometimes help us to better accept the hazard of this journey. Humanities offer us a vision that transcends our own fate and, very importantly, teaches us understanding."

ETHICAL CONCERNS

It seems that ethical standards are declining and moral deficiencies are becoming more widespread. Frequent revelations of deceptions in politics and, unfortunately, also in science have triggered a renewed interest in ethical standards and larger moral issues. In medicine we have our own share of ethical dilemmas, including abortion, euthanasia, gene therapy, eugenics, human experimentation, confidentiality, allocation of increasingly more limited medical resources, and vexing problems in transplantation, just to mention a few. Although medical ethics offer us general guidelines which regulate our behavior in dealings with patients and among ourselves, most ethical dilemmas can rarely be resolved by logic alone, and simplistic solutions to complex ethical questions almost never suffice. It is here that a background in the humanities, particularly in philosophy and literature, can provide a more comforting position from which to generate more reasonable answers. Obviously, the study of humanities does not ensure humaneness, but, as already mentioned, a humanistic education does excite our imagination, creativity, social awareness, and tolerance. It also heightens our concern for our patients, not only as carriers of intrathoracic pathology but as beings in need of human contact and

compassion. We must never abrogate this unique and mutually rewarding surgeon-patient relationship and responsibility to others.

To effectively articulate our professional goals and our mission, we must understand both the underlying scientific and technical issues and their ethical implications. Perhaps one of the most far-reaching ethical dilemmas facing medicine today concerns advances in genetics that allow efforts to map and sequence all of our genes and to treat genetic disorders by manipulating DNA. The recognition that genetic inheritance is perhaps the most important determinant of our total being raises the potential of using genetic manipulation to create a "eugenically superior" society. In this regard, Walter Gilbert's reductionist statement, "by knowing the complete genome, we will know what it is to be human," will hopefully prove to be an oversimplification. Whether the chaos theory will fulfill its promise of revolutionizing our perspective of the physical world remains to be seen. As of yet, the chaos theory has certainly not brought about the anticipated end to the reductionist approach to biologic science.

When the Human Genome Project was funded in 1988, it was reassuring to learn that 3% of the total budget was designated to explore humanistic issues. In 1990 the Ethical, Legal, and Social Implication Program was initiated. For the first time in science, it seemed that the possible impact of new technology was being debated before the results of that technology had been fully developed.

A consistent moral foundation is important for us when interacting with others. Leadership implies guiding by example and creating an environment in which, among other things, the ends do not justify the means. No matter how sophisticated the attempts to prevent abuses or illegal acts, no amount of institutional check and balance is capable of effectively preventing professional misconduct. Personal and institutional integrity can be maintained only by establishing an esprit de corps in which individual and institutional ethics override the lure of personal gain. The same notions apply to social implications of scientific discoveries. As mentioned before, gene therapy is an appropriate example. The benefits of this dramatic technology are indisputable. However, the threatening potential of eugenic abuse has triggered renewed concern. In 1883, Francis Galton founded the Eugenic Movement in Great Britain. In the United States, in 1907, the state of Indiana was the first to legalize forced sterilization for persons with genetic abnormalities. The abhorrent memory of the originally "eugenically driven" murder of millions of Jews, Gypsies, and other so-called undesirables *(Lebens unwertes Leben)* by the Hitler regime is still fresh in our conscience. But the most effective protection against the recurrence of such incomprehensible behavior is not to curb human genius, scientific inquiry, or commercial entrepreneurism by restrictive laws or regulations aimed at either discouraging or downright forbidding genetic research. Rather it is to foster respect for individual freedom within a democratic and cultural framework in which there is a free exchange of ideas. Such an environment requires a trusting and responsible relationship between the scientific community and the public.

EDUCATION

The rate of expansion in scientific knowledge makes it increasingly difficult or even impossible for anyone, particularly a busy surgeon, to keep abreast of developments in medicine, science, and the humanities—that is, to be a Renaissance person. Medical school is neither the place nor the time to acquire the scholarly humanistic background so important to an ethical practice of medicine. Therefore, more attention must be focused, I think, on educational efforts during premedical school years, particularly at the high school level.

Alexis de Tocqueville, after visiting the United States in 1831, was impressed by what he termed "the equality of conditions" in American society, which were in stark contrast to the much more stratified social structures prevalent in the autocratic or despotic systems which most immigrants in this country had rejected. Hereditary privileges or aristocratic prerogatives owe their decline to the American, French, and, perhaps mostly, the Industrial Revolutions. American educators renounced the European example, which was aimed at creating an educated elite minority: only a small percentage of the total school population between the ages of 10 and 13 years had to decide, or, more accurately, were persuaded, mostly by family tradition and economics, to pursue a secondary education. Instead, Americans opted for a more egalitarian system in which all students attend primary school for 8 years and a comprehensive high school for 4 years. However, this system inevitably must aim its scholastic sights at the average student, protecting at the same time the interests and the rights of the underachievers. Consequently, with very few notable exceptions, the minds of the intellectually more gifted students go unchallenged. This pedagogic decision, although laudable from an ethical and political point of view, does seem to contradict another passionate notion held in this country, namely, that individual differences must be respected and encouraged, permitting the marketplace to determine the results and the rewards. Stated another way, let the best person win. This duality, namely devotion to egalitarian principles and at the same time enshrinement of individual achievements, poses a conflicting dichotomy, or what Myrdal coined "The American Dilemma."

We all recognize our diversities in intelligence, temperament, character, motivation, and, consequently, achievements. By aiming most of the educational efforts in high school to the average or below average student, we run the risk of creating a mediocre dominant majority with serious consequences. Kierkegaard warned against "the danger of egalitarianism so extreme as to be unrelieved by even the smallest eminence," and Alfred N. Whitehead, philosopher and mathematician, added that "in the condition of modern life, the rule is absolute, the race which does not value trained intelligence is doomed." James Conant, in his book, *The American High School Today*, published in 1957, did not share this concern about high school education. In fact, he concluded that "no radical alterations in the basic pattern of American education were necessary." However, he did add that, as a rule, the academically talented students were not "sufficiently challenged, that they did not work hard enough, and that the program of academic subjects, including science, mathematics, and the humanities, were not of sufficient range." This scenario continues to be true in 1994.

I include these comments about the American high school in a discussion about the education of cardiothoracic surgeons because I consider them central to the theme of this **address**. I am convinced that most high school students, especially the more gifted ones, can and must be challenged more intellectually. They can easily master subjects such as advanced mathematics, physics, and chemistry, as well as literature, philosophy, history, and art. In this regard, it is disconcerting that many parents, according to various studies, are unrealistically content with their children's scholastic achievements in high school, even when compared with scholastic achievements by European and Asian peer groups. This self-defeating attitude by parents and the young students themselves must be overcome to improve our vitally important intellectual competitiveness. Furthermore, by completing a more demanding curriculum in high school, I believe college could be reduced from 4 to 2 years, which, in turn, would help shorten the time required for the education and the training of gifted students, including cardiothoracic surgeons. Unfortunately, until disciplinary problems are reduced and more qualified and dedicated teachers are available, schools may not change a great deal.

The most important function of a teacher is to awaken in the student a lifelong desire to learn. A teacher must not force-feed pupils with esoterica but rather must train young minds to develop the capacity to reason and to develop values. The ancient Greeks introduced a comprehensive concept of education: physical, intellectual, and moral. These and other factors of our past combined to mold our Western humanistic-ethical values, which, since the Industrial Revolution (or the mechanization of man, if you wish), have suffered in comparison with the ascendancy of more behavioristic or materialistic philosophies.

Sparked in 1910 by the Flexner report, American medical schools have continually evolved, and their emphasis on basic science and research, carefully supervised early patient contact, and clinical instruction have kept American medical education at the forefront. Continuing preoccupation by deans, members of the faculty, and medical students themselves is evidenced by frequent modifications and innovations in medical school curricula. For example, the recently modified Harvard curriculum is aimed at better preparing its graduates to practice medicine in the twenty-first century. In 1985 the conventional classroom lectures were mostly replaced by the New Pathway, a system based principally on problem-based and student-centered learning. The teacher's role is that of a facilitator to help gather and disseminate information and to stimulate interactions among the students. As is to be expected, this interesting curriculum has many supporters as well as its share of detractors, but, most importantly, it has revived interest and enthusiasm among students and faculty alike. I have no doubt that most medical schools in this country succeed in preparing future physicians well from a scientific and clinical viewpoint and that 4 years are indeed required to cover the necessary medical school curriculum. But, can humanistic subjects and behavior be taught in medical school? I doubt that at such a late stage lectures can bring about an attitudinal change. An inspiring role model may occasionally have an effect on so-called bedside manners or interpersonal skills, but, in my experience, the yield from that endeavor is relatively low. The humanistic preparation must start at home, be continued throughout school, and eventually become part of life.

Let me remind you at this point of an interesting study by Bob Sade in which he compared the curricula of college students from South Carolina with their subsequent medical school performance. A liberal arts undergraduate major proved to be as good a preparation for medical school as were biologic sciences and engineering backgrounds. In fact, some humanistic qualities were less prominent in students who concentrated early on science; for example, they were considered less adept in interpersonal skills, were less articulate, and had narrower interests. Nationwide, only 4% of medical school matriculants major in humanities as undergraduates. Perhaps one should reassess the composition of medical school admissions committees and also the criteria by which medical students are selected.

TRAINING FOR SURGICAL SPECIALTIES IN GENERAL

Until now, surgery has continued to attract good-to-excellent residents, particularly when judged on past academic performances. Parenthetically, it is surprising that in the past only a few attempts were made to evaluate in any meaningful and consistent manner the psychomotor skills of surgical candidates, abilities that are particularly important in our technically demanding specialty. In most surgical training programs we do not systematically monitor progress, or for that matter lack of progress, in technical skills of the surgical trainees. In fact, important positions in surgery have been and continue to be awarded mostly on the basis of academic and administrative accomplishments, and there is less scrutiny of clinical and technical capabilities. In my own experience, only two institutions have sent a senior surgeon to observe

an operation performed by a candidate before offering that candidate a position on their staff. This is actually quite surprising considering that knowing how to operate is central to being a surgeon, including and particularly for a chief of a training program.

The potential for acquiring new motor skills is preserved into adulthood. A number of theories exist that try to explain the late psychomotor learning process, but this is neither the occasion nor am I expert enough to enter into a discussion of this interesting subject. Still, this intriguing matter of acquired psychomotor development and predictive testing of surgical skills should be of great interest to our specialty. Given the impressive advances that are occurring in neurobiology and related fields, the time may be near when such testing may minimize if not eliminate the sad spectacle of a technically incompetent surgeon, thus alleviating terrible hardship to the trainee, to the staff and the training program and, most importantly, to the patient.

Apart from specific muscular coordination, surgery requires an aesthetic appreciation of three-dimensional space, for form and texture. Like a work of art, to achieve perfection, an operation must transcend technique and become an intellectual and aesthetic endeavor.

TRAINING FOR CARDIOTHORACIC SURGEONS

Specifically with regard to cardiothoracic surgeons, preliminary training in general surgery is absolutely necessary. I strongly disapprove of the practice in some countries where, after graduating from medical school, individuals enter, for example, a pediatric cardiac surgical program without ever having been systematically trained in adult cardiac and thoracic surgery, much less in general surgery. It is my impression that graduates from such programs have significant limitations both in and out of the operating room. Training in general surgery offers fundamentals in surgical principles, the early imprinting of the science and art of surgery and of patient care, and exposure to a wide variety of mentors of differing surgical and personal styles. General surgery also teaches the need for an immediate and appropriate response to urgent or emergent conditions of the patient, the importance of confronting stressful situations (both medical and social), the need for a commitment to work long hours at a high level of performance, and the gradual gaining and granting of responsibilities. I should add that the animal laboratory is an excellent additional training ground for technical exercises. Anyone who has had the experience of constructing Heidenhein and Pavlov pouches and additional intestinal anastomoses in an animal knows that one has "arrived" as a gastrointestinal surgeon when these animals start eating and drinking soon after the operation and when their survival is long-term. However, I do not believe that anyone with average intelligence and technical abilities needs 5 to 6 years of general surgical training to acquire these necessary skills before entering a cardiothoracic surgical training program.

I was encouraged that 63% of the participants in the recent Snowbird Conference cast their vote against requiring continued mandatory American Board of Surgery certification. However, I do not agree with the compromise recommendation, also reached at Snowbird, of 4 years of training in general surgery and 3 years in cardiothoracic surgery. Instead, I share the opinion of those who advocate reducing basic training in general surgery from 5 to 2 years. Ideally, this training should include 1 year of senior resident operative experience. I see no reason to continue to demand, as a prerequisite, a complete residency, including a chief residency in general surgery for cardiothoracic surgeons. Our specialty has developed and diversified to such a degree that its dependence on a training program of 4 or more years in general surgery is difficult to justify. Granted, cardiothoracic surgery originated from general surgery.

Many of the pioneer thoracic surgeons continued to practice general surgery. Furthermore, initially, thoracic surgery was limited to just a few operations. However, with the advent of cardiac surgery and the subsequent expansion of thoracic surgery, including cancer immunobiology, esophageal pathophysiology and surgery, tracheobronchial surgery, and, more recently, heart and lung transplantation, the conventional 2-year cardiothoracic training program, which had its beginnings in the 1920s, is clearly too short and inadequate. In addition, to have future cardiothoracic surgeons dilute the operative experience of general surgery residents by competing for pancreatoduodenectomies or other complex operations usually performed during the last years of general surgery training does not make sense. If (and this is obviously a very questionable *if*) one could indeed strengthen the junior and senior high school science and humanistic curricula and consequently reduce college to 2 years rather than 4 years, the future cardiothoracic surgeon would be 26 years of age after completing the 2-year core program of general surgery. For trainees interested in a straight clinical cardiothoracic program, I propose a 42-month (3½-year) training period. During the first 6 months, the trainees would be exposed to the physiology and anatomy involved in cardiac catheterization, echocardiographic or pulmonary physiology laboratories, and cardiac pathology. This initial 6-month experience would then be followed by clinical rotations of 8 months each in thoracic and adult and pediatric cardiac surgery. Depending on the interests of the trainee, the final year would be spent either (1) as chief resident exclusively in thoracic or adult or congenital cardiac surgery or (2) a combination of 6 months each of adult cardiac and thoracic surgery. According to this time schedule, a clinical cardiothoracic surgeon would complete training between 29 and 30 years of age. For individuals interested in an academic career in cardiothoracic surgery, we should first of all seek to attract graduates of combined MD/PhD programs or other similar backgrounds and provide for them flexible opportunities for continuing laboratory research during their clinical training. For candidates with insufficient research experience, training options must be identified to offer a minimum of 2 or, preferably, 3 years in basic science research such as molecular biology, immunology or cancer biology, biophysics or physical chemistry, or experimental pharmacology. Opportunities should also exist for a few trainees with interests in numeric sciences, such as biostatistics or epidemiology, and also in the social sciences, such as philosophy of ethics. To accomplish these goals, we must ask for greater flexibility from the residency review committees and the Board of Thoracic Surgery; a more aligned collaboration between program directors of general and cardiothoracic surgery is needed to permit programs to be tailored to the needs and previous experiences of selected trainees and to optimize future developments of our specialty. For example, a highly qualified physician scientist trained in cancer biology who has already spent 3 or more years in a basic science laboratory and who is committed to a career in academic thoracic surgery should be permitted to spend only half the time in adult cardiac surgery and even less in pediatric cardiac surgery to accelerate a return to basic research and academic clinical work in thoracic surgery and to serve as a role model for the next generation of cardiothoracic surgeons.

It is surprising and regrettable that less than 3% of board-certified cardiothoracic surgeons in this country are women. One deterrent may be the age at which they complete their training and the impact of this on their childbearing years. A recent survey of the Association of Women Surgeons indicated that 74% of women delayed childbearing until all medical training was completed. If women could complete their training in cardiothoracic surgery by the age of 30, they might find the specialty more appealing.

Also, I am sure, that most of the cardiothoracic residents' wives or husbands would agree that shortening the total educational time would be a most welcome change. It also might even improve family interrelationships. Even if it would not affect greatly the total amount of time spent with the family, the

quality of that time should improve. Putting it perhaps more realistically, at least the lifestyle and the economic possibilities for taking better advantage of the few leisure opportunities available to a busy surgeon would benefit the family.

LOOKING TO THE FUTURE

Educational costs have increased year by year, which is an additional incentive to reduce the length of training. Although the present version of the Clinton proposal does not limit the number of years of support by the federal government for training residents, some of the alternative plans (for example, that of Congressman Cooper) limit total residency funding to only 4 years. Also, most cardiothoracic trainees require either federal or nongovernment loans during college and medical school. Approximately 75% of medical students nationwide receive some sort of financial aid. In 1993, the debt of medical students at the time of graduation ranged from $60,000 to $120,000. You probably also know that in government loans, such as the Stafford loan from the Department of Education, the 2-year residency deferment was discontinued on July 1, 1993. Varying according to interest rates and grace or deferment periods, the debt that many cardiothoracic trainees accumulate commonly exceeds $150,000. Therefore, trainees and beginning practicing surgeons must start earning sufficient money to begin paying off these student loans while leading a tolerable existence, caring for a family, and applying the significant intellectual and physical energies necessary to the pursuit of clinical excellence and innovations in our profession. Unfortunately, excessive interest in financial rewards by a minority has tainted medicine in general and our specialty in particular. This factor contributes, at least in part, to the low esteem in which we are presently held by the public. Fortunately we all rank much higher with our own patients. It seems certain that the overflowing financial cornucopia of the past will become less abundant in the future. We should not be surprised if even the present generations of cardiothoracic surgeons will have to adjust to a reduced budget. The only advantage of that development is that it might spare some the distracting worry about the management of their sybaritic interests. All of this may be easier to accept if we remember that less than 100 years ago, in New England, the annual pay of a physician was $500, and a good portion of it was in goods and livestock rather than money.

Traditionally, surgical and medical activities have been conducted within the respective departments of surgery or medicine. This practice was well established in the nineteenth century and has essentially persisted unchanged until today. However, strong subspecialty units within surgical and medical departments have begun to appear during the past few decades. For example, at Children's Hospital in Boston, separate and independent departments of cardiology and cardiovascular surgery were created in the 1960s. Over the years, a close collaboration in clinical work and research has developed between these two departments. Cognizant of the common mission and the close clinical, research, and administrative interdependence of cardiology and cardiovascular surgery, we concluded that integration under one common administrative umbrella was a logical, albeit perhaps unorthodox, opportunity. The association of these two departments, as well as that of pediatric cardiac anesthesia and all of cardiac-related nursing, was formalized in 1991. Our experience so far indicates a further strengthening of bonds between these professional groups, improved efficiency in patient care, and more rational, mutually agreed upon cost-reduction efforts. It is significant that this unified organizational structure also offers an improved intellectual environment, with the generation of ideas for clinical and scientific progress in the field of congenital heart disease, all of which has significantly strengthened our respective training programs.

A major threat to the future of cardiothoracic programs everywhere is a calamitous decrease in funding for patient care, teaching, and clinical and basic research. Given the economic and political climate, worsening restrictions of funds from the National Institutes of Health and other sources must be expected. Reductions in the reimbursement of surgical and laboratory procedures will almost certainly curtail the ability of academic programs to continue to support teaching and research at current levels. On the other hand, the spectacular progress in science and the proliferation of powerful and expensive research technology demands that clinical investigators and basic scientists continue to join in multidisciplinary teams to advance our understanding of biologic principles, which will ultimately result in improved patient care. Therefore, one of the important challenges facing the cardiothoracic leadership is to continue to secure the necessary funds, including those from philanthropic sources and industry, to pursue these essential goals. Academic training programs must continue to provide the intellectualand scientific ferment and opportunities for the training of cardiothoracic surgeons for the twenty-first century. Judging from the continuing impressive advances in biologic research, we are at the threshold of spectacular new discoveries. I am certain that the most exciting advances in our specialty are still before us. Notwithstanding our present uncertainties about the future of medicine in this country with respect to the different healthcare reform plans (including managed competition [an oxymoron to be sure], health alliances, health maintenance organizations [HMOs], preferred provider organizations [PPOs], gatekeeper, capitation, and single payer schemes), it seems doubtful that a radical departure from the present system will ultimately emerge from Congress. More likely, a compromise will be reached among the various Democratic and Republican proposals. Experience worldwide has shown that government-funded and centrally managed healthcare plans tend to be inefficient and create colossal and economically bottomless bureaucracies. Paraphrasing Clemenceau, healthcare is too important (and complicated) to leave to politicians. A most important additional concern is that whenever governments control and pay for healthcare, the emphasis is placed on delivery of care with little concern about education, research, and development of new technologies.

Nevertheless, I am optimistic that the American democratic process and tradition, the proverbial give and take, the sense for practicality and fair play will ultimately restrict excessive swings of the health reform pendulum and settle instead on a reasonable solution of some needed reforms, such as attempts at reducing cost, including administrative overhead costs, and achieving some form of a broader based insurance coverage. However, for any new and substantial reform to be successful, it will require a much greater involvement of the medical profession. We must continue to be the most responsible advocates of our patients and, most important, we must be the guarantors for continued and increased quality of care.

I am confident that cardiothoracic surgery will continue to flourish. To participate effectively and to lead rather than react to the upcoming developments and changes in science and society, we must maintain our professional integrity, prove that we can aim beyond narrow self interests, and distance ourselves from the image of the impersonal, socially unconcerned, and economically motivated technical robot. In short, we all must endeavor to regain our Appollonian aura.

Footnotes

Read at the Seventy-fourth Annual Meeting of The American Association for Thoracic Surgery, New York, N.Y., April 24-27, 1994.

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