I AM DEEPLY HONORED to receive the James B. Herrick Award and it is with considerable temerity that I respond to our Chairman’s request that I share with you my perceptions of the present state and future of academic cardiology.

There is no question that academic cardiology in this country today is vigorous. As cardiologists, we have a large patient base and broad clinical responsibilities and we can offer our patients concrete and valued services. Our abilities to derive a precise anatomic diagnosis and physiologic assessment and to establish an accurate prognosis, often noninvasively, have grown rapidly. Advances in cardiac therapeutics and cardiac surgery have substantially improved the care of the cardiac patient. Indeed, we have seen an impressive decline in cardiovascular mortality in the past one and a half decades. Cardiology is justifiably popular and attracts large numbers of trainees at all levels. Cardiologists are resourceful and our research programs are vigorous, as reflected in meetings such as the annual scientific sessions of the American Heart Association and in the pages of our journals.

But what of our future? I see a generally clear sky with just two clouds. However, these clouds are tinged with sufficient gray to give me concern, that once again, as happens so often in the course of human events, the future will not be a simple forward projection of the past. One cloud has resulted from the very success of cardiology to which I have just referred. Cardiology is larger and has more to offer than its sister specialties. Cardiology is also much wealthier, but that is largely a consequence of a peculiarity of our reimbursement system, which is based on "piece work," and rewards procedures more than "hands on" patient care. Thus, by interpreting ECGs and echocardiograms, a cardiologist can earn as much in 30 minutes as an equally well-trained diabetologist who supervises the care of a patient in diabetic coma in 10 hours! Such gross inequalities inevitably lead to jealousy and friction and it is fair to say that in most of our academic medical centers today there is at best an uneasy truce and at worst an outright war between departments of medicine and their divisions of cardiology.

I believe that there is justice on both sides of this conflict. The Chief of Cardiology justifiably feels that his division has the responsibilities for many, perhaps most, of the medical patients, and plays the largest role by far of any division in teaching medical students and house staff. If most of the funds it earns from patient care are not returned to the division for distribution to the faculty members responsible for the earnings, many of the most talented of the latter will be enticed into private practice, often in the same community, where they will inevitably compete with the academic center. At the same time, the mandate of the Chairman of Medicine is to develop a balanced program of training and to assure the highest possible quality of patient care in the broad field of internal medicine. He must champion the smaller, less glamorous divisions, lest their programs be further reduced in quality, scope and vigor. At the same time he must pay particular attention to primary care or general medicine will be amputated from internal medicine by departments of family medicine. He must accomplish all of this despite shrinking support from the medical school, hospital and federal sources, while expenses escalate. In private medical schools, and to a lesser extent in state schools, revenues from patient care are the only recurrent source of flexible funds for the academic missions of the department, and it is not surprising that the Chairman of Medicine casts covetous glances on the not inconsiderable revenues earned by the Cardiovascular Division.

Whenever either the Chairman of Medicine or the Chief of Cardiology is too greedy, the delicately balanced relationship between the department and division becomes destabilized and, after an unpleasant period of tension, this usually leads to the departure or "reassignment" of one of the two leaders, often to the detriment of the institution. Both must realize that, on the one hand, it is not possible to have a strong Department of Medicine if its Cardiology Division is weak and, on the other, that a strong Cardiology Division cannot exist for long in a weak Department of Medicine. My suggestion to both Chairmen of Medicine and Chiefs of Cardiology who find themselves in antagonistic positions is simple: "If you want to keep your job, don't be greedy. If you are, you may win a battle or two, but you'll lose the war."

Occasionally, I have heard disgruntled Chiefs of Cardiology fantasize that they will secede from their Departments of Medicine, perhaps join the Cardiac Surgeons, Pediatricians and Radiologists, and form separate Departments of Cardiology with their own beds, their own budgets, a permanent seat on the executive committees of the medical school and the hos-
hospital, and other mirages of power and self-determination. In short, "they'll get out from under.' My response to that fantasy is "forget it." Medical schools as a whole are now, and for the foreseeable future will be, under even more serious financial constraints than their Departments of Medicine. No Dean in his right mind will simultaneously approve the costs involved in setting up another department while accepting the responsibility for supporting the poor revenue earners who would remain in the Department of Medicine if Cardiology left. My suggestion to the disgruntled Chief of Cardiology who feels that his division is being treated unfairly by the Department of Medicine again is simple: "Make your case forcefully, but with due regard to the Department's overall mission. Then keep your nose clean, run a good division, and when the Chairmanship of Medicine opens up, which it probably will in a year or two, make a bid for the job. However, I bet you won't enjoy it very much and before you know it you'll find that you'll have to appoint a Chief of Cardiology, because no one can do both jobs properly. Then the tables will be turned and the whole process will start all over again!"

So much for the issues of money and autonomy. However, the second cloud that threatens the cardiological horizon is much darker. It is the cloud of the intellectual future of our specialty. I have felt for some time that the cardiology of today has already realized or will very soon realize its brilliant promise. Out of the genius of Einthoven, Roentgen, and Wiggers, of several previous Herrick Award Recipients and of many others, cardiovascular diagnosis has been brought to the high state of technical perfection for which it is so admired and of which we may be so proud. To be sure, the future still holds promise in the perfection and exploitation of diagnostic techniques, such as nuclear magnetic resonance imaging, digital radiography and Doppler echocardiography. But, we must ask ourselves, are we not now approaching the point of diminishing returns in the perfection of diagnostic techniques, or are ever finer measurements and images really essential for the next big steps in cardiology?

One of my major efforts between 1955 and 1968 involved the development and refinement of cardiovascular diagnostic techniques. I use and deeply appreciate the value of these methods in patient care. However, I believe the cardiology of the future will be influenced much more profoundly by students of molecular biology, cellular physiology and experimental pathology who are examining problems such as the mechanism of endocytosis of low-density lipoproteins, the control of cation fluxes across the sarcolemma of the myocardium and specialized cardiac tissue, the fundamental mechanisms by which platelets adhere to the arterial endothelium, or by which angiotensin acts on its receptors in vascular smooth muscle, the adrenal cortex and other tissues, than by scientists who are perfecting the recording of various wave forms and images. It is becoming ever clearer that in most forms of heart disease, the heart is an "innocent bystander," which has been injured by a process that primarily affects noncardiac cells; the most fruitful future research in cardiovascular disease may well not even be focused on the heart.

I do not wish to imply that there cannot be any more important accomplishments in cardiovascular diagnosis, such as the noninvasive measurement of intracardiac pressures and the elucidation of coronary anatomy. However, the time has come, I believe, to acknowledge that while we may have reached the happy state that allows us to establish an accurate anatomical and physiologic diagnosis with reasonable safety in almost all patients with heart disease, we still do not understand the cause of most forms of congenital heart disease, of hypertension, atherosclerosis, cardiomyopathy, of many forms of valvular disease and of most forms of congestive heart failure. Today's cardiology is the diagnosis and treatment of these conditions. Tomorrow's cardiology will be their elimination. This will require a major rechanneling of our efforts into the fundamental life sciences. Insofar as the most important cause of cardiovascular death — atherosclerotic heart disease — is concerned, we must not delude ourselves into equating risk factors with cause. Semmelweis's observation of an association between lack of hygiene during delivery and the subsequent development of fatal puerperal sepsis is of historic interest, but it is dwarfed by the microbiological identification of the causative organisms and their elimination by antibiotics. Similarly, effective control of the major forms of heart disease will require understanding of their fundamental causes and mechanisms rather than of associations and natural history.

Given this perception of our priorities, I feel that the schism between cardiology and the remainder of internal medicine is much more serious than a simple parochial struggle involving pride, power, dollars and turf, but one that operates to the detriment of the intellectual future of our subspecialty, and one that could inhibit its further flowering. Signs of this schism are abundant: There is an increasing trend of cardiologists to diminish their interest and involvement in internal medicine. Cardiologists are called upon progressively less frequently to teach internal medicine in university teaching hospitals. It has been my perception that residents who plan to subspecialize make this decision in an interesting way. They seem to decide rather early whether they wish to enter cardiology; if not, it usually takes them much longer to select the noncardiologic specialty. What they seem to be saying is that cardiology stands apart from the other medical specialties, while they look upon the latter as a closely related set of disciplines. Although cardiology is the specialty chosen by more of our residents than any other, I am afraid that these are not always the most creative of our young people. It is shocking how few young cardiologists training in academic medical centers are prepared to make a commitment beyond learning the tools of the trade and perhaps applying them to a simple clinical problem or two. It is alarming to observe at these Scientific Sessions of the American Heart Association that a progressively increasing number of the impor-
tant papers describing fundamental research on the cardiovascular system are presented by young, foreign scientists working in American laboratories. Where are the young Americans who will take the place of our current leaders when they leave the scene?

Another sign of the schism between cardiology and medicine is a decreasing attendance at and participation of cardiology in the scientific meetings of a broad medical investigative nature, such as those of the American Society for Clinical Investigation. Election to membership in these societies and publication in their journals by cardiologists is disproportionately small and declining. Perhaps this should not be surprising. So many of the modern techniques of cardiology have their roots in physics and engineering, while the biological sciences, particularly cellular and molecular biology, genetics, biochemistry and immunology, form the intellectual basis of the other medical specialties.

I think of internal medicine as a wide river and each branch of internal medicine as a separate stream. As information about an organ system and its disorders grows, and as the diagnostic and therapeutic technology involved in the care of patients afflicted with disorders of this organ system becomes more refined and demanding, a new stream splits off from the main river, i.e., a new subspecialty is established. Certainly there has been lots of splitting and a proliferation of subspecialties and of subspecialties during the past half century. However, it has been interesting and encouraging for me to observe a tendency for these separate streams to reunite, at least intellectually, during the past decade. Academic hematologists, virologists, oncologists, endocrinologists, immunologists, and rheumatologists now all speak the same scientific language, use the same research techniques and the same instruments, attend the same meetings, and read and publish in the same journals.

The opportunities and problems posed by specialization are not new. James Herrick began his remarkable career as a general practitioner in Chicago in 1890. His conspicuous abilities soon led to a concentration on medical illness in adults — in short, he became a consultant internist. His keen insight and creativity led him to make a variety of seminal contributions to internal medicine, including the description of sickle cell anemia in 1910. However, he felt that he could maximize his future contributions by concentrating his studies on one organ system and he specialized in cardiology. It is interesting to note his ambivalence about this decision, and I quote from his autobiography:

For several years now I have been dubbed a ‘heart specialist.’ I think I understand how this term, against which I long fought, came to be applied to me. Even after 1900, when I limited myself to office, hospital and consultation practice, it was difficult to find time to keep in close touch with all phases of medicine, such as diabetes or affections of the gastrointestinal tract and of the nervous system. Perhaps my old interest in the disease of the heart kept me in closer contact with this subject than with others. At any rate, in my reading of the literature of the day, in my clinics and in published papers this topic was the one most frequently considered and willy-nilly, I became a ‘heart specialist.’ I fought against having this term pinned on me, but the name stuck. I resented particularly a sort of corollary that seemed to be implied, namely, that because a man was a specialist it naturally followed that he was incompetent in other fields of general medicine: or, as Hunter McGuire expressed it, that my patients would now suffer from special attention and general neglect. Whatever the reason, I was now consulted less often for an opinion in a case of suspected Bright’s disease, pernicious anemia, tuberculosis, or cancer. Surprise was sometimes manifested if I ventured to test the knee-jerk or the pupilary reflex in a patient with supposed heart disease. To get permission to exercise what the witty Frenchman called the consultant’s prerogative and duty, that is, to examine the rectum, often required persuasion and argument; and the privilege might be refused. What business had a heart specialist to meddle in fields other than his own?... Yet I had to admit that, no matter how hard I tried, it was impossible to keep pace with the rapid strides made by medicine and its cognate sciences. Much of the newer knowledge, so enormous in its mass, eluded me. However, there was some comfort in knowing that other physicians were in the same predicament.

Shortly after he became a cardiologist Herrick wrote his monumental paper on coronary thrombosis. In view of the intense current interest in this subject I thought that it might be interesting to quote from Herrick’s musings about his contribution. Again, I quote from Herrick’s autobiography:

In 1912, my paper on ‘clinical features of sudden obstruction of the coronary arteries’ appeared, based on a case of coronary thrombosis in which I had made an antemortem diagnosis. Recognizing the radical nature of the views I held, which led me to conclude that this condition was not, as was then the belief, merely a pathologic curiosity but in reality a clinical entity with symptoms that often made it possible to diagnose it during life, I postponed publication for some time until, by search of the literature and further observation, I had reached conclusions that seemed to me justifiable and sound. The paper when read in 1912 before the Association of American Physicians aroused no interest. It fell like a dud.

Just as Herrick’s monumental contribution to cardiology was critically dependent on his intellectual base in internal medicine, so future important contributions to cardiology will require the full panoply of techniques and concepts developed by modern biology and already applied so effectively by many of the other medical specialties. Therefore, to continue to confront successfully its enormous tasks and to live up to its enormous potential, cardiology must not only remain within the family of medical specialties, but actually must make a concerted effort to strengthen its intellectual links to these fields. To be successful this effort must be multipronged. It must involve the NIH and particularly its advisory bodies, as well as the reviewers, editors and publishers of our journals and, perhaps most importantly, the professional societies, such as this Council of the American Heart Association and the more broadly based biomedical research societies, ranging from the American Federation for Clinical Research to the National Academy of Sciences. Stronger
links between cardiovascular research and the other biomedical sciences will, I hope, gradually shift the thrust of the cardiology of today from the exploitation of technologies designed to provide more accurate diagnosis and treatment of established disease to the cardiology of tomorrow, which I believe, will use the techniques of modern biology to elucidate the fundamental causes of heart disease and then eliminate it. This shift will lead to a new and even more exciting cardiology, and I would like to think that James Herrick, were he alive now, would approve heartily of such a gradual midcourse correction.

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James B. Herrick Lecture. The present state and future of academic cardiology.

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