universal concern is placing the onus on medicine to produce more doctors, and more care, than can possibly be accomplished by present methods. Second, medicine more than any other field has influenced the development of education as a science, and thus might reasonably be expected to be the leader in innovation. As Skinner has suggested, the contrast between non-rigorous approaches to education and the experimental analysis of teaching has “an illuminating parallel in the field of medicine.”

Documented in the several Rochester Conferences on Self-Instruction, in other meetings on educational technology, and in the ferment throughout the establishments of medical education, there is change, and a great deal of it. It is critical, however, that this be communicated to the profession and to society. Even more importantly, instructional materials and learning facilities must be made available in greater quantities to the students and practitioners who face the formidable challenges of these times. Specialty groups, medical schools, and regional planning agencies must join forces to see that new knowledge is provided to physicians and surgeons utilizing the most effective techniques and approaches available. Tradition, narrow parochialism, and lethargy must give way. The new science of education offers better hope than ever before that the knowledge explosion can be contained, and that life-long learning in medicine is a realizable goal to be accomplished through hard work and proved techniques.

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Structure and Function: Why Did the Heart Stop?

Among the many predicaments to try the physician, cardiac arrest constitutes one of the keenest. The difficulty is compounded when the conventional armamentarium of the cardiac physiologist and anatomist discloses no suggestion of the cause of arrest. The fact of dysfunction, for example asystole, may be obvious even when there is no morphologic distortion present. It is no surprise that the clinician-therapist becomes thoroughly frustrated.

A similar, though less sudden mishap, is the lack of myocardial contractility which has been found after open-heart surgery and which has been investigated in many cardiac research centers. One cardiac surgeon in particular felt keenly that this was a problem which could not be solved by workers each working alone and within the limits of his separate scientific discipline. He adapted a biopsy drill¹ and stimulated a group of pathologists, histochemists and cellular biologists to attempt to analyze the state of the myocardium in the biopsies he removed. They, like others, found that fixed muscle showed no abnormality. But analysis of unfixed sections demonstrated that there was disordered cellular chemistry, demonstrable in these biopsies in the myocardium of patients who developed cardiac dysfunction during the first postoperative week.² In commenting on the work, Pearse³ referred to the “truly functional or topobiochemical aspect of applied enzyme histochemistry. This is the use of techniques not only to demonstrate the existence, and thus the morphology, of lesions in tissues, but in order to discover their biochemical nature . . . It is unlikely that the biochemical lesions shown by their work could possibly have been demonstrated in any other way than by means of enzyme histochemistry.”

Since then, the significance of these methods has been studied in greater detail⁴ so that they are available to anyone who wishes to pursue the etiologic and preventive factors of myocardial degeneration and failure. The effects on myocardium of any drug or surgical or operative maneuver such as coronary perfusion or refrigeration, may now be studied more easily and reliably than heretofore.

The major obstacle which has retarded the detailed chemical and structural analysis of biopsies has been the understandable emphasis on fixing specimens to stop the chaos caused by autolysis. Chemical fixatives, of which formalin is the most used, stop autolysis and leave the tissue in a state which allows it to be stained with conventional dyes. The morphologic detail is well preserved, provided that relatively low-power objectives are used by the microscopist. Unfortunately they destroy not only autolytic chemistry, but normal cell chemistry; they also change the detailed cytologic structure. For some, the world of pathologic anatomy is bounded by the Y-shaped incision, formalin fixation, paraffin embedding and hematoxylin-eosin stain. These, no doubt, represent the easiest and least expensive ways in which to examine the large amount of tissue of various sorts which comes to any hospital pathology department. But there is more than one way to skin a cat and these

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techniques do not allow the examination of delicate questions of cellular physiology as they may apply to patients coming to autopsy or operation. Particular problems demand critical methods and planning. However, one simple procedure, if added to existing routines, will bring into range the entire battery of histochemistry. This is the rapid freezing of tissue at the time of sampling.

In the field of open-heart surgery where astounding new feats are accomplished with apparent ease, many unknowns persist. For example, myocardial degeneration and necrosis, (page 373) now turn out to be among the most common lesions associated with Starr-Edwards valve replacement. They are probably the anatomic counterparts of the previously undefined postoperative myocardial failure. Their picture differs somewhat from our familiar ischemic infarct and has defined clinical recognition, understanding of the pathogenesis, and of course prevention, although theories abound for all. The availability of both the tissue of question and methods for its study offers a rare chance, the solution of the cause of a common, yet mysterious, myocardial malady.

And so, contrary to the common idea of the fragmentation of medical sciences, scientific disciplines are in fact merging in focusing on cellular biology. Full cellular function depends on anatomic, chemical and physiologic integrity and the onset of disease can affect any one of these. The focusing of simple biochemical (histochemical) and biophysical (microscopic) methods on specially treated sections from myocardial biopsies has already indicated how this multidisciplinary approach can elucidate problems of myocardial disease, and has opened new possibilities in the study of the causes underlying dysfunction.

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REFERENCES


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Physicians and the Smoking Controversy

The Surgeon General of the United States Public Health Service states that cigarette smoking is the major cause of preventable illness, disability and premature death in this country. Very few physicians question this, yet the tobacco industry, by skillful advertising and by repeated and widely publicized denials, some of them by physicians, has succeeded in confusing many people about the harmful effects of cigarette smoking. Probably most people recognize the tobacco industry propaganda, but it provides many smokers with an excuse or rationalization for continuing the habit.

This issue of Diseases of the Chest carries a review of my new book Tobacco and Your Health —The Smoking Controversy. I have no information as to what this review may say. However, I do appreciate the invitation of the Editor to comment about the purpose of this book and its principal features.

I wrote this book to present a small, readable volume containing the basic information that people —physicians and laymen, smokers and non-smokers —should have concerning the many facets of the smoking problem.

The effects of smoking upon the body and the diseases and illness associated with smoking are summarized. Pictures are included to help the reader understand some of the effects of smoking. Data and reports of experimental work are presented to enable readers to draw their own conclusions.

The tactics of the tobacco industry, and the major arguments used by their spokesmen to raise doubts concerning the harmful effects of smoking, are analyzed. Why people smoke and what can be done by people who wish to give up the habit are considered. The responsibilities of government and the legislative actions taken and proposed are explained.

*Editor's note: page 464.