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Research and Medical Practice

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AS A STUDENT OF MEDICINE some 30 years ago, I was greatly attracted and stimulated by the prevailing aura of what might be called the romantic period of medical research. The light in Europe had moved about during the previous decades between France, Germany, and contiguous countries. Just then it was strongly emanant from Germany. Its reflections had reached American shores during the preceding quarter of a century, and new luminous centers were arising where the rays touched.

For some time scientific research had made such accelerating strides as to justify completely, in the minds of the intellectually optimistic, the idea of progress of mankind, which at first, with faltering steps, had gathered much strength with the industrial growth of the 19th Century. The theory of evolution was appropriated by Herbert Spencer as a summons to better and nobler ends through knowledge and adaptation. Scientific research was illuminating concepts of biological phenomena and their obvious implications for understanding, preventing, and eventually curing disease and alleviating suffering.

The cell theory had been established by Schleiden, Schwann, and Rudolph Virchow.

The germ theory of disease had, under the subtle tutelage of Pasteur, Koch, and their schools, grown from a lusty youngster to full stature in bacteriology.

Sanitary science and immunology, too, for the well informed, were promising offspring.

Could not all physiological functions and biological phenomena generally be brought to the experimental test?

Lavoisier's chemical interpretation of respiration and Wöhler's synthesis of urea surely left little room for the old concept of a vital activity which would forever be beyond the ken of materialistic searchers.

So it had seemed to Claude Bernard, who had predicted great advances in experimental medicine from a firmer foundation of scientific physiology which he himself had laid with a deft though largely single hand by the aid of chemistry. His predictions were coming true.

The industrial revolution had already realized stupendous material fruits from the trees of mathematics, chemistry, physics, and mechanics. The rich financial and economic rewards were certainly potent catalysts to greater and better things to come. Even the crowding of cities, with increasing density of industrial populations, and the demands of efficiency in production called of themselves for improvement of sanitation and greater protection of health—from an economic, if not from a humanitarian, point of view.

In the meantime, to sustain this rapid growth, financial support had to be forthcoming for the institutions within which the necessary technological training and scientific research were to be pursued. The fulfillment of this demand became increasingly disproportionate to the zeal of the growing, but none too numerous, young scientists and their academic houses.

Wealth from industry in our country accumulated rapidly through the instrumentalities of research and the application of its powers. The public spirit and generosity of philanthropic industrialists, together with limited State and Federal subsidies, gave the necessary stimulus and support for promotion of science in the early part of this century. In other countries government funds, supplemented by industry and private capital, provided the means. Thus reinforced, the idea of progress came marching blithely up the path of the 20th Century, led by the hand of science and nourished more and more with the economic fruits of research. Then progress, in its onward march, seemed to stumble, to stop dead in its tracks. Civilization shook with the convulsion of World War I, involving profoundly the German nation that for a full century had been most zealous for science.

The convulsive seizure was followed by the coma of a great depression. Chills and fevers ensuing were succeeded by the more violent convulsions of World War II, from which our patient even now shakes to his depths, but with intervals sufficiently lucid to perceive that, while his head and heart are bewildered and faint from his travails, his muscles and bones have

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grown stupendously strong through the titanic struggle.

During our period of growth, when investigations were increasing in number and in effectiveness, when universities were being provided with greater means for research, these private means played an indispensable role both in creating and in supporting the scientific environment. The needs have now outgrown this resource; furthermore, the time has come when greater responsibility should be delegated to the universities and investigators themselves, and in order to accomplish this the universities must be provided with large sums of money for education, research, and training as free as possible of restrictions.

Some private philanthropic foundations were very liberal in their organization; others were highly circumscribed in their operation; all of them, as matters stand, are severely limited in their financial capacities to meet the growing demands of research. The result is that by design, or necessity, or both, funds now available for medical research are inadequate in amount and usually expendable in the form of short-term grants for specific "projects" determined by the objectives of the donor or administrators. "Projects" tend to be selected for their developmental value rather than because of fundamental significance. The aid provided has been helpful and often essential to bringing initiated research to a useful conclusion, but the price paid is, to a considerable extent, a release by the investigator, the teacher, and the university of the only thing worth while academically—the responsibility for originality and initiative in the free pursuit of intellectual curiosity.

The board of trust of a university or a foundation is not willing, or able, freely to absorb the risk of original research. It prefers to play safe by investing in the development of occasional and fortuitous revelations of widely applicable principles and methods.

The limited tenure of research positions under short-term grants is precarious and injurious for the investigator in training or pursuing a career. The determination and direction of fields of research by the distant control, often from beyond the grave, of available funds is inhibitory and stultifying to those who prefer to follow freely the bent of their own curiosity.

In some instances a foundation has sought to remedy the situation by granting "fluid" research funds to certain medical schools to be administered by the faculty of the school itself. Wherever this has been tried I believe it has been eminently successful.

So, in the rapid development of medical research and teaching in this country, a dual mechanism has evolved: the university, the institution of learning, is largely controlled in its research policies and provisions by extramural influences.

Industry has not devised means of affording a free financial aid to universities; if anything, its aid, with few exceptions, is the most restrictive. It would seem entirely possible for industry to provide much greater aid to university training and research in science, provided industrial resources were pooled and allocated to universities in the form of "fluid" funds for fundamental, basic, or, as it is sometimes called, "pure research."

But postwar trends and developments seem to be fashioning a different procedure for support of scientific research and training—a procedure full of both promise and pitfalls. This procedure involves support, in and out of universities, by means of public or government funds to be administered through a mechanism simulating in important respects the private foundations, represented by the proposed National Science Foundation, but threatening to continue, possibly to a disadvantageous degree, the industrial plan of "project" development inherited from wartime needs and psychology, and including the element of political interest.

Regardless of possible disadvantages in its administrative machinery, one should emphasize that the legislation proposed recognized the importance of the interrelationship and interdependence of the sciences. All knowledge gained through research has a meaning for medicine, and, more specifically, we well know the dependence of medical research upon the natural sciences. Modern movement has related medicine to the university in such a way that medical research and medical practice are becoming more and more dependent upon these institutions of learning, so that whatever affects the university deeply concerns medicine. A place within our social structure such as the university, where serious students might forgather and freely, patiently, dispassionately, and objectively search fact and principle, would seem to be good in itself, even though it should lead to some concepts contrary to current thought. Although there is a near-universal demand and general acceptance of additions to knowledge in medical research, it would be regrettable if the privilege of freedom of thought and research should be justified only on the assumption that basic or "pure" research might lead to the discovery of facts, methods, and general principles that could be exploited usefully by contemporary local or national standards. Unfortunately, the universities have become merely the operating agencies for trustees and administrators of funds who reserve for themselves, in large measure, the privilege and responsibility of determining the trends of research, the training of scientists, and the extent and quality of the result.

My contention is that such privilege and responsibility should properly repose in the university facul-

ties, and could do so were it not for lack of money—an amount of money that would appear almost negligible in the accounting of our national fiscal affairs. One fears the industrial approach with its determination to get a job done as quickly as possible even in a National Science Foundation. The "job" is referred to in current usage as a "project," and the industrial form of management involves a decision, by those responsible for money, as to what projects should be supported and what not.

Following present practice the scientist himself in the university would be permitted as at present only to seek financial aid by submitting plans for his "project." A great deal of his time and energy are now devoted to this necessity to sell himself, his department, his insecure staff, and his university on a restricted market in order to devote the time that is left to scientific inquiry.

The public is satisfied to have the university authorities select teachers to staff their various faculties for the routine instruction of their sons and daughters, but there seems to be something more important about the conduct of research—really the highest form of teaching—something requiring regimentation and control through financial restrictions that to my mind is entirely incompatible with the best interests of research. I hope that this will not be projected into the future.

I believe the crux of the situation lies in the fact that exploratory research—teaching research, if you will—research that seeks basic principles, inapplicable until thoroughly understood, entails relatively great financial waste. The university does not have the financial resources to absorb the waste or rejections in its budgets, and donors of grants-in-aid, often not scientists themselves, try to select "projects," preferably of a developmental type, with as little risk of waste and failure as possible. *But the true interests of science require investigations that involve great risk, and if ultimate progress is to be expected in the application of scientific knowledge to human needs, the cost of the waste of original research must be met.*

It is to be hoped that those who should be responsible for the expenditure of public funds for scientific research and training will concern themselves more with the provision of conditions, in universities at least, that would be congenial and attractive to the investigators and students who need a liberal environment for the pursuit of problems to which their intuition and curiosity lead them, and whose satisfaction lies primarily in understanding rather than in utility. It is impossible to do this by contract or by a grant-in-aid of a "project." In addition to the grant-in-aid type of support, money in large quantity must be given to the universities to be spent by faculties at their own discretion for promoting research and absorbing its risks, as they may determine, to suit their own needs.

It is my opinion that, should money for research be provided by the Government, the philanthropic foundations should consider ways and means for providing from their funds the basic requirements of teaching faculties in order that teaching and training might continue on a level commensurate with research opportunities. To supplement the educational needs of science, these faculties, once secured, should be provided liberally with grants from government appropriations of the "fluid" type which would be expendable at the discretion of the faculties themselves to meet the needs of exploratory or basic research as a part of the teaching and training function. Grants-in-aid for developmental research should be provided also, but when a "project" is brought up to this level, there is relatively little risk involved and it is easier to judge of potential fruitfulness.

The great threat of our age to human welfare, as I see it, is that societies led or driven by industrialism are gathering the individual into their fold as a service unit. The individual as a member of society thus must do a society's bidding, regardless of the particular pattern that social organization might temporarily represent. To the true scientist, the present frame of social organization is not the end of all wisdom but just another phenomenon to be viewed objectively in the course of his inquiries. The scientist's limits are the boundaries of the universe, and his function cannot, without destroying him, be limited to the service of any particular social order. Industrial, social, religious, and political patterns are not yet drawn to serve mankind. It is to be hoped that each governmental power will provide an oasis for students who are individual elements of mankind first and servants of society last. Otherwise, intellectual growth will wither and die. Medicine is dedicated to the service of man and not to a social order. In this relation, medical research in its broadest sense has a pre-eminent call upon every social structure for support not merely for immediate needs but for the discovery of broad principles upon which the health of mankind depends. Let each social order therefore give the scientist a free hand and provide him with the environment and the tools he needs; make him accessible to students, for he is essentially a teacher; make the university his home; and otherwise, for humanity's sake, leave him alone.

Legislation to be considered in the next session of Congress is sufficient evidence of a changing social order, should we need more evidence than we have seen in past sessions. Proposed legislation would aid medical science by providing money for the train-

ing of scientists and facilitating their work of inquiry; other proposed enactments would affect the structure of medical practice. The latter disturbs organized medicine, for it is fearful of change and reorganization upon a different pattern. Awakened from its lethargy of conservatism, organized medicine has bestirred itself in an attempt to meet the challenge and still preserve its values, and there are values I believe worthy of preservation in so far as a physician is a servant of humanity. In those areas of conflict of interest where the best attainable medical practice is opposed by considerations of the best possible financial return to the doctors, there is little doubt that society will make the proper choice.

The practitioner of medicine, however lofty his ideals, has hardly realized the changes in his environment which medical science and social reorientation have brought about in this industrial age. The limitless authority he once possessed as the exponent of all theory and practice, as he called it, has rapidly been pared until in considerable measure he has become a relatively insecure specialist.

The first great inroad upon the domain of medical practice came by way of public health, or what physicians used to call state medicine. The real public health movement was founded upon the discoveries of the last half of the preceding century in the field of bacteriology. With the discovery of the etiological agents of many infectious diseases and their mode of spread, it became possible to institute preventive measures, such as water purification, sanitation, and food protection. Immunizing procedures were likewise devised that can be cared for by the health services. More recent research, particularly concerning the vitamins, has made it possible to remove the nutritional diseases and impairments as individual problems of the practicing physician to the sphere of public responsibility. Industrial hazards likewise are no longer in general the responsibility of the private practitioner. Increasing knowledge of chemistry, physics, physiology, pathology, and bacteriology have further limited the physician's authority, for now he must resort to expert advice from the laboratory for the fundamental knowledge necessary for diagnosis, prognosis, and even treatment. Electrocardiography, X-ray, chemical, bacteriological, and serological tests, the microscopic examination of tissues and specimens, have become such technical procedures and are so necessary to modern medicine that the practitioner cannot do without them and must rely upon the reports of specialists in these subjects.

There are also less exact but broader areas in which the physician has lost prestige, authority, and influence, namely, the social aspects of disease. The physician is being taken from the home of the sick to the hospital ward. When formerly he knew the hereditary, family, home, personal, and economic environments of his patients, he was presumably better qualified to judge of their importance in disease than he is today with office and hospital practice demanding such a large proportion of his time and energy. Consequently, social agencies are taking over where he has left off—the social service departments, the social worker, the nurse, the public health services are all concerned now with the environmental factors and the social implications of health. Especially is this true in our industrial environments. Research and the public conscience are two important factors in the rapid disintegration and redistribution of the competence and authority of the old family doctor of less than a century ago. Research has played the predominant role and has necessitated the creation of specialties.

In the hospital and the medical school there should eventually come to a focus the mutual interdependence of the various facets in the kaleidoscopic picture of modern medicine, and all in turn will find their most congenial and productive setting and their culmination in the university. The greater and greater dependence of medical research upon the natural sciences and the increasing need for cooperative relationships of the social sciences with the humanities will lend new and greater meaning to the university in terms of its public relations, responsibilities, and services. A tremendous opportunity lies before the public to elevate the university to the sphere of influence and effective humanitarian activity that it is designed for, through adequate support, spiritual and financial, for these institutions of learning.

The Passano Foundation Award, which Dr. Goodpasture won in 1946, is an unusual one **because it comes not from invested capital but from the operations of the Williams and Wilkins Company, Medical Publishers of Baltimore, of which Mr. Passano was president. The award, established for the purpose of advancing medical research, was granted for the first time this year, a few weeks before Mr. Passano died. Plans have now been made to continue the award as a memorial to him.**

Dr. Goodpasture received the award for his original development of the method for propagation of viruses in pure culture by inoculation of chick embryos and for his outstanding contributions to advancement of knowledge of the cell-parasite relationship in bacterial and virus infection.