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WINGS FOR THE SPIRIT[1]

The dedication to-day of facilities for the prosecution of laboratory and research work of the Mount Sinai Hospital has far greater significance than the addition of a unit to the institution. The achievements of this great hospital are well known to its patients and to their friends. The medical profession is familiar with the professional skill of your staff of physicians and nurses and the high efficiency of your administrators. Adequately supporting these, stands a Board of Trustees, noted for philanthropy, loyal to and sympathetic with the ideals of a modern hospital. The example you have so generously set will serve as a stimulus to other hospitals not as yet so fully equipped. The new facilities mean an increased effectiveness in the care of patients. The influence of your staff, improving their work with the facilities now offered, will be felt by the entire profession. The nation will more and more perceptibly become awakened to the conception that hospitals must move forward with the newer knowledge available to medical science. Contributions to prevention, diagnosis and cure of disease, inspired by the conveniences now offered in these walls, will be of lasting benefit to generations yet unborn. In discussing with you the achievement which your generosity has brought to fruition, I hope to make clear to you some of the matters, spiritual and material, which you may expect to result from your benefaction.

The fact that the practice of medicine in a well-conducted hospital requires a laboratory for aid in diagnosis and treatment is not generally realized by those who have the responsibility for providing funds. It is but too well known that numerous hospitals are designed without adequate laboratory space and equipment; and, even in those so provided, it is not uncommon to find insufficient appropriation for personnel and maintenance. For our own benefit, and perhaps for a more far reaching purpose, it may be well to support the implication which opens this paragraph. The primary objective of the laboratory is to aid in diagnosis, which is fundamental to proper treatment. The laboratory may even take its part in the treatment, through consultation with surgeons and by the preparation of such things as vac-

[1] Address at the dedication of the Laboratory of Pathology, Mount Sinai Hospital, Cleveland, Ohio, November 8, 1927.

cines and serums. The laboratory is also, in a sense, the guardian of the health of the hospital. Its workers detect the presence of infectious diseases in patients and hospital personnel and may guide the authorities in preventing the development of an epidemic. The efficacy of sterilization of materials used in the surgery may be determined, and services may be equally useful in other similar matters.

The work includes diagnosis of tumors and other surgical diseases, the selection of donors for blood transfusion, the identification of bacteria and other parasites, as for example of tuberculosis meningitis, pneumonia and malaria, the chemical examination of the blood in order to aid in distinguishing between several otherwise confusing diseases, the performance of such tests as the Widal test for typhoid fever and the Wassermann test for syphilis, and numerous other procedures. Without an accurate diagnosis, treatment is entirely empirical, may be worthless and might be dangerous. The laboratory, then, is concerned largely with aid in the diagnosis of disease. It is to be noted that the laboratory rarely makes the diagnosis, for there are few diseases in which the laboratory has a test which is absolutely and finally conclusive.

A matter deserving the frankest discussion is the autopsy. The Jew is considered to be the most reluctant to permit autopsy of all those who constitute Occidental civilization. Much attention has been given the religious aspects of this question. It is said that the rabbis of the Talmud consented to the autopsy if it honored the dead or if it gave information of immediate value to someone suffering with the same disease as the deceased. The autopsy was to be forbidden if it desecrated the dead or if the benefit were to be of only general rather than immediately applicable value. The far reaching significance of science of all kinds was not appreciated at that time. Men know now what science has done for them and the prospects it has in store. The autopsy is the basis of much that we have learned about disease and will continue to contribute to our progress. Religion is not static but shows evolution. Modern opinion in the church is generally to the effect that the value of the autopsy to the relatives, to the community and to medicine outweighs regulations that were made at other times and under other circumstances. Rabbi J. B. Levinthal, of Philadelphia, is quoted as saying that the postmortem examination is not forbidden by the Jewish Rabbinical Law, and further, that "where a postmortem examination may result in the discovery of the origin or cause of some serious disease, it is my firm conviction that thus to serve humanity is sanctifying, rather than desecrating, the dead." Any autopsy may serve this purpose and no one can say in advance what the results will be. Hospital administrators and officers are generally of the opinion that "the history of a hospital fatality is not complete unless the (autopsy) report of the pathologist is included," and what applies to hospital patients applies equally to those who may die at home. We must demand of our pathologists that the dead body be regarded as the material remains of a loved soul and that they treat it accordingly. Only with rare exception is such a caution necessary. In spite of all sentiment and even superstition, the autopsy may well be regarded as an honor to the dead and is certainly a service to mankind. "When a patient dies a great debt is owed humanity in order that the patient shall not have died in vain."

The time is not so long past when the physician considered it beneath his dignity to touch the patient and employed a barber to perform the surgical operations. Physical diagnosis, including palpation, percussion and auscultation, is little more than a century old. We have then only recently emerged into a period, where, in addition to taking a history and making an inspection, the physician actually handles his patient to discover what is wrong. Once having taken the step, the physician was whole hearted about it, and in the middle of the last century the physician was tasting certain body fluids to detect diabetes and the pathologist tasting cerebro-spinal fluid in order to give an accurate description. Now the physician uses a thermometer to determine temperature instead of feeling for it, he uses a sphygmomanometer to determine blood and pulse pressure instead of depending upon his sense of touch, he uses an electrocardiograph to study cardiac irregularity instead of guessing at the cause, he examines materials by chemical tests instead of by taste, and in a wide variety of ways has improved his methods. He has not only enlarged his field of examination but continuously has developed increasing technical precision. In brief, he uses every means available to determine the nature of his patient's disease.

The young men now in our medical schools, the physicians of the future, are trained in the methods of the clinic and the laboratory and learn to evaluate the results of each. They wish to know what causes the disease, to eliminate it if possible, what organ or organs exhibit disease and how the functions are disturbed, to correct them if possible. The problem has become so intricate that no one man can master all its ramifications. Hence, specialties have developed and a group of men has grown up who have a particular interest in the laboratory side of medicine. These men are of a special mould, foregoing the glamour of practice and its rewards, because of a peculiar interest in the scientific aspects of laboratory

work. They must have training and a proper equipment for work. The fact that in the past good work has been done and important discoveries made under adverse physical conditions should not divert us from the provision of better things. The world moves and the high speed of civilized life in general is reflected in the laboratory. If the commercial plant has labor saving devices, so should the laboratory. If the factory has special provision for light and ventilation, so should the laboratory. If the shop has precise instruments, so should the laboratory. The pathologist deals with affairs immediately concerned with human life and suffering. His is no eight-hour day. The import of his work is beyond question and he should be provided with equipment so that it may be conducted with convenience, speed and precision.

These notations have dealt with material conceptions, but only as the basis for the soaring of the spirit. This spirit is the series of motives which actuate medicine. First there comes to mind the spirit of service. This is the great humanitarian spirit of the votaries of medicine, but is shared in greater or less part by all professional and business activities engaged productively for the welfare of man. Ancillary is the spirit of sacrifice which in its highest form is vicarious. Typified in its extreme on the Cross of Calvary, it is found on the battlefield, in industry, in business and the professions. Medicine points with pride and humility to its list of heroes who have given their health and lives for the promotion of knowledge. Then there is the spirit of truth, truth for its own sake, truth without reward other than the supreme joy which its discovery gives. All problems put before us are no more than amplifications of the question, what is the truth?

The spirit of service and of vicarious sacrifice is inherent in the forward urge of mankind. It transcends the flesh. So also is the nature of the spirit of truth. The truth itself, however, requires constant search. Blessed are those who can provide wings for the search and even more so are those who can don them creditably. It is your privilege to provide the wings here, building, equipment, personnel, funds, and it is for us to show you the way of the flight.

Truth as we find it is not absolute, and may not be the same to-morrow as it was yesterday or is to-day. Truth is revealed by the demonstration of facts, which represent observations dependent upon methods. Human imagination and ingenuity evolve new and improved methods and, as circumstances alter, truth may alter with them. In the fifth century before Christ, Protagoras said, "Man is the measure of all things" and taught "that there is no absolute truth, that we know things only as they appear to us through the senses." Thus rational thinking through the ages has drawn attention to philosophical relativity, and we must face the fact whether dealing in pure reason or in material science.

This discussion is preparatory to a consideration of the truth as revealed in the laboratory. Without such a background misconceptions may arise in thinking our wings to be more sturdy than they are. When we say that the laboratory deals with facts, we mean that by methods of delicacy and precision which meet the rules of scientific procedure, a conclusion can be reached that, within the limitations of the methods available, the truth has been demonstrated. A truism of science is to the effect that it is wasteful to deal in the fourth decimal when the third decimal will provide the necessary information. The third decimal is not necessarily exact in such an instance, but for scientific purposes it represents the truth. When the laboratory furnishes a report, it must be regarded as exact within the factors of error inherent in human nature and in the methods of study available. Increasing precision of instruments and methods tends to obviate the fallibility of our unaided senses. Quoting a recent article of Peabody, "the popular conception of a scientist as a man who works in a laboratory and uses instruments of precision is as inaccurate as it is superficial, for a scientist is known not by his technical processes but by his intellectual processes; and the essence of the scientific method of thought is that it proceeds in an orderly manner toward the establishment of a truth."

As concerns the patient, the truth of a given situation may be provided by the laboratory, but the truth of the whole picture is made up of the results of laboratory and clinic correlated by orderly processes of thought. The methods of the laboratory are those of a high degree of exactitude and the material is in such form as to permit of direct study. This and this only gives the laboratory a distinct advantage over the clinic, and it is for this reason that the modern clinician asks the aid of his laboratory colleague. Many clinical examinations are of necessity by indirect methods, and the further information yielded by laboratory tests is often of inestimable value to the welfare of the patient. A noted hospital administrator, not a pathologist, Bluestone, has said that "broadly speaking no hospital is larger than its pathological laboratory," and that "the progressiveness of a hospital is in direct ratio to the laboratory spirit which it maintains." Permit me to point out that the maintenance of this spirit, springing primarily in the professional staff, must, in order to be effective, have not merely the assent of administration and trustees, but their cordial and enthusiastic sympathy and support.

You have provided not only a laboratory, but also

a center for research in the medical sciences. The activities of skilled physicians differ according to training, aptitude and opportunity. He who is a practitioner applies the knowledge of the day to the care of the patients of the present. He who teaches trains a group of students for the care of patients of the near future. He who investigates disease deals not merely in matters of the present, but rather of the future near and remote. Examples of how discoveries may reach far into the future are numerous, but a few will suffice. The discovery of the circulation of the blood by William Harvey has enlightened the world for centuries. The discovery of immune processes by Louis Pasteur has been of inestimable value long after his death and will be so permanently. The discovery of the insect transmission of disease brought forth amazing fruit within the lifetime of its discoverer. The discoverers of insulin are still young men.

Pasteur said that "in the fields of observation, chance favors only the mind that is prepared," a statement that might serve to clarify for you some of the features of investigative work that may have been puzzling. In the first place great discoveries often seem to come out of a clear sky, but this is not literally true. The investigations have been conducted by trained persons with the "prepared mind." Behind them is a background of experience personal to them and to others as recorded in the literature. The prepared mind is prepared partly by a reasonable familiarity with the work of others through conference, attendance on scientific meetings and access to the literature, and principally by experience in the methods of science and productive original work. When the "readiness is all," an isolated observation may open a field of vision for one who is prepared and may mean nothing for one who is not. An amazing example of this is given by the great physiologist Claude Bernard in his book, recently translated, "An Introduction to the Study of Experimental Medicine." The urine of well fed rabbits is usually cloudy and alkaline. Bernard, by chance, noticed that the urine of rabbits which had just been purchased for his laboratory was clear and acid, and found that they had not been fed for several days. By a series of experiments and further observations, this occurrence became the background for the discovery of pancreatic digestion, not only of singular novelty and significance to physiology but applied daily in the clinics of to-day. Kanavel wisely says "great knowledge acquired from reading and not from actual experimentation engenders a benumbing subservience to the written word." The worker has ever an opportunity to which the reader has no access. Nevertheless, the worker is in a superior position to profit by observations if he knows what has gone before.

In the history of science, it would seem that the world must be prepared for discoveries before their exploitation is possible. The receptiveness for new announcements seems to depend upon general world progress, contributed to in various domains of art and science, to the observation of facts that in themselves seem to be of little significance and to discoveries of outstanding importance. The use of the term exploitation is with all scientific reserve, but its importance to the common welfare should not be underestimated. The fact that the work of Mendel, which underlies the modern work on genetics and heredity, had to be rediscovered, was largely due to the fact that at the time it was not exploited. In your provision for research in this fine building, you have not completed the task until you make provision for the suitable publication of the results, and the workers in the laboratory have not fulfilled their trust until reports have been made in channels of publication where they will be most useful.

These implications are preliminary to a brief discussion of the costs of scientific research. All financial investments have an element of uncertainty. The most secure usually have the smallest rate of return. Generally speaking, this applies to research. There is this important difference, however, in that the research investments of apparently small return may, by accumulation or by chance observation, form the basis for a research investment of large return. A study, which from its inception is certain to give a useful result, positive or negative, may furnish what might be called one of the fragments of a puzzle picture. When a sufficient number of fragments is accumulated, a creative imagination, piecing them together, may see the way to providing the final fragment which will clarify the composite whole. The most recent example is the discovery of insulin. Studies of the changes of sugars within the body have been conducted for many years and formed small fragments of the complete picture. A large fragment was provided by von Mering and Minkowski in the discovery of the relation of the pancreas to the metabolism of sugar. Another larger fragment was contributed by Opie in relating changes in the human pancreas to diabetes. The vision and work of Macleod, Banting, Best and Collip, based on this background, furnished the final and immediately practical fragment which made the picture whole. Further studies along this line are directed toward filling in certain details of importance and rendering the practical features more satisfactory.

As with investments, the speculative factor must be considered. No wise investor indulges his gambling instinct in projects which examination shows are without the slightest guarantee of return. So the scientific investigator should not consume time and energy in

studies which to the experienced student are without promise. There are, however, speculative investments where the promise of large return is as great as the promise of a total loss. The investigator frequently finds himself facing a position of this sort. It is for him to say whether or not he will chance his time and energy on the study and if he decide affirmatively, those who give him financial support should back him without stint, for he has more to lose than mere money and what he gains is for the benefit of mankind.

You repeatedly entrust your health and lives to the judgment of the physicians and surgeons of this fine hospital. There should be no hesitation in entrusting the funds which you give to it, in expanding amounts, to the judgment of those who give their lives and energy to the research work within its walls. A great philosopher, René Descartes, said many years ago that "if ever the human race is raised to its highest practical level, intellectually, morally and physically, the science of medicine will perform that service."

The designer of the aeroplane gives little to humanity if his machine is to remain without fuel and there would be no practical benefit without the adventurous spirit which through pioneering in unexplored fields leads on to progress and to newer and broader visions. The plane is built, the laboratory completed. All honor to the designers and builders. The fuel is not merely the material means of operation, but it must volatilize as faith in the pilot and his crew, faith in their productive capacity, faith in their guiding genius. The pilot has many mechanisms to oversee. These should be as nearly perfect as the mind and hand of man can devise, so that the spirit shall not be hampered. The pilot is the directing intellect of the flight. Give freedom to his imagination and energy. The time will come when his wings are no longer rigid and he can fly freely in the skies of truth toward his ultimate objective, the welfare of man.

My congratulations to the trustees, the director and the staff of Mount Sinai Hospital. May they live long and may their work prosper.

HOWARD T. KARSNER
WESTERN RESERVE UNIVERSITY

COMMEMORATION OF THE BI-CENTENARY OF THE DEATH OF NEWTON[1]

THE fourth annual meeting of The History of Science Society was held in pursuance of an act of its council of last year, to commemorate the bi-centenary of the death of Sir Isaac Newton. In view of this unusual occasion, and of the manifold interests Newton had, it was therefore considered expedient to ask those societies most interested to cooperate by appointing representatives on the committee preparing the program. The following names are those who served:

COMMITTEE ON PROGRAM

Dr. R. C. Archibald, Brown University Dr. E. W. Brown, Yale University Dr. Florian Cajori, University of California	The American Mathematical Society and The Mathematical Association of America
Dr. A. O. Leuschner, University of California Dr. Frederick H. Seares, Mount Wilson Observatory	The American Astronomical Society
Dr. Leigh Page, Yale University	The American Physical Society
Dr. David Eugene Smith, Columbia University, Chairman Dr. Henry Crew, Northwestern University	The History of Science Society
Mr. Frederick E. Brasch, Library of Congress	Secretary to the Committee

The meeting was called to order by the president of The History of Science Society, Dr. David Eugene Smith, at 10 o'clock A. M., Friday, November 25, 1927, in the Educational Hall of the American Museum of Natural History, New York City.

The two days' program consisted entirely of papers on various phases of Sir Isaac Newton's contributions to astronomy, mathematics, physics, chemistry, religion, problems of the mint, and the development of science since his day, also some indication of Newton's influence on the early science in the American Colonies from 1687 to 1779. Two papers were devoted to each subject and these were given by scholars of distinction—from both the United States and Canada. Twelve papers reviewing Newton's work from the present historical standpoint made what is probably one of the most notable of single contributions to scientific literature. These addresses are to be published (by the History of Science Society) in a memorial volume.

The object of this American commemoration was twofold, first to honor the great name of Newton, and

[1] Report of the meeting and exhibition under the auspices of the History of Science Society, held at the American Museum of Natural History, New York, November 25 and 26, 1927.