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Convocation for the Conferring of Degrees, 1959

The Rockefeller University

Convocation for the Conferring of Degrees

18 JUNE 1959

Occasional Papers of
The Rockefeller Institute

The first Commencement for the Conferring of Degrees was held at The Rockefeller Institute on June 18, 1959. The remarks printed here were made by members of the faculty in presenting the first candidates for the degree of Doctor of Philosophy, and by President Bronk in citing the first recipients of the degree of Doctor of Science, honoris causa. OCCASIONAL PAPERS *by the faculty and friends of The Rockefeller Institute are published at irregular intervals by The Rockefeller Institute Press, New York 21, N.Y. This is Occasional Paper Number Eight.*

THE CONFERRING OF DEGREES

OPENING REMARKS BY DETLEV W. BRONK

PRESIDENT, THE ROCKEFELLER INSTITUTE

FOUR WEEKS AGO we expressed our debt of gratitude to the universities from which we are descended and to which we owe our heritage of ideals and knowledge. That was but a prelude for this occasion. Today we express our debt of gratitude for the regenerative cycle of young people who are students.

An occasion such as this is fraught with temptation to speak of many things regarding science and education and the objectives of ourselves and our Institute and our nation. But I have vowed that our Commencement should be for those whom we would honor rather than for a speaker to the public which seldom listens. Time I claim for only brief relevant reflections.

We are grateful to you students for many things: for your friendship; for your gay, enthusiastic zest for living; for your willingness to adventure with us in our new undertaking. You have enabled us to make the greatest contribution of a scholar: the inspiration and preparation of a younger colleague to carry forward the love of learning.

After spending many happy years in colleges and universities large and small it is a unique experience to have faculty and students in numbers so few as ours. There is significance in this. Opportunities for higher education are needed forevermore in a democracy such as ours. But for those who are to be the leaders and the catalysts in the world of creative learning the quiet intimacy of scholars is required, and close personal associations between teacher and student. We will devote our resources, time and effort to the furtherance of excellence,

not numbers. As I have said before, in the words of Ellery Sedgwick, we will seek to influence many by inoculating the influential few.

You were first selected because of your capacity for intellectual achievement. We have endeavored to nurture and increase that competence. You were chosen for other reasons too — quality of character, vision and enthusiasm. We shall have fallen short of our high goal unless we have inspired in you high regard for things of the spirit as well as of the mind — respect for good taste and form — esteem for the excellent. We look to you to represent science as a great odyssey of the mind and spirit which gives unique quality to man. Thus you may build the facts you discover into a beautiful structure and clothe the bare bones of science with the flesh of meaning.

PRESENTATION OF
WILLIAM FREDRIC ARNDT, JR.

BY HOWARD A. SCHNEIDER

ASSOCIATE PROFESSOR, THE ROCKEFELLER INSTITUTE

In seeking to assess the significance of a given contribution to knowledge in the natural sciences it is proper, I believe, to turn to philosophers of science for a yardstick to help us make such a measurement. On this occasion I would like to turn to one of our great American philosophers of science, William James. James once said that science had two proper tasks, to conceive simply, and to predict. The achievement of prediction is readily measured — that which is predicted occurs or does not occur — but the achievement of simplification has a more elusive calculus. To this aspect I would now like to direct your attention as I give a brief account of the thesis William Arndt has submitted to this faculty.

His thesis is entitled, "An Extension of the Shwartzman Phenomenon to Mice with an Analysis of its Ecological Parameters."

Here I am reminded of an incident in my youth. As a boy I received instruction in the doctrines of the Lutheran Church as set forth by Martin Luther in what he was pleased to call his "Small Catechism." At each stop in the presentation of this doctrine, the great theologian of the Reformation paused to ask, identically, "What does this mean?" I remember that he asked it after every item, including such apparently straight-forward statements as "Thou shalt not kill." So do simple facts lie on complicated circumstance. Luther was tireless. He asked, relentlessly, "What does this mean?"

William Arndt's thesis, as I have said, is titled, "An Extension of the Shwartzman Phenomenon to Mice with an Analysis of its Ecological Parameters." I think you will expect me to ask, "What does this mean?"

In this busy, buzzing world many forms of life come into collision with other forms and there are actions and reactions which follow. One of these interactions is infectious disease, wherein certain microbic forms of life bring about profound changes in an infected host. This problem and challenge of infectious disease is the setting in which this thesis is placed. In this setting there is an intriguing phenomenon which has occupied students of disease for more than thirty years since it was first delineated by Gregory Shwartzman of Columbia University. To this phenomenon has been given Shwartzman's name. What *is* the Shwartzman phenomenon? Classically described in the rabbit, it is briefly this: The injection into the skin of a rabbit of minute amounts of toxic material obtained from certain bacteria, in some mysterious way affects the skin, and if a day later a *second* injection of this toxic material is made at some distant part of the body, but into the blood stream, then, in dramatic fashion a large hemorrhage breaks out in the skin site which was thus injected on the previous day. I think you will readily understand that hemorrhages are of some importance in human medicine and why students of disease have pursued this subject.

Now the Shwartzman phenomenon, with its *two* injections, has been obtained with regularity in rabbits, but in other animals the picture is less clear. In the case of the mouse, that animal so useful to the research biologist, it has been said that the Shwartzman phenomenon doesn't appear at all.

In his research, William Arndt has been able to show that the Shwartzman phenomenon *can* be produced in mice, *but* only in certain genetic strains of mice. Like people, all mice are not alike. William Arndt succeeded by using certain mice which have been inbred in this Institute for over 50 generations. Transferring this statement to human affairs, and allowing 30 years for the length of one human generation, these mice have a pedigree similar to a human pedigree running in time from today back to the fall of the Roman Empire in 453 A.D.

In thus extending the Shwartzman phenomenon to mice, and hav-

ing specified how he has succeeded where others failed, Mr. Arndt has vastly broadened our investigational possibilities.

There is a second side to the coin of this thesis. I emphasized earlier that the hemorrhagic Shwartzman phenomenon rested on *two* successive injections of toxin. This thesis reports now, under certain conditions, a new phenomenon, based on, not two, but *one* injection, the injection into the skin. William Arndt's analysis of this new finding has shown that, while new, it is still the Shwartzman phenomenon, for in place of the *second* injection, there now automatically occurs, from bacteria in — of all places — the lungs, a flow of toxin into the blood stream, and the hemorrhage in the skin thus follows. This all depends on certain bacteria being present in the lung, and this depends on the environmental circumstance in which the mouse finds himself. The mouse then stands in relation to an external world, and this is one facet of that science of the environment, which we call ecology. The mouse is caught up in a web of the world. But we are *all* caught up in that web, from here out to the stars, and in thus penetrating that web William Arndt has added to our understanding.

PRESENTATION OF

SUYDAM OSTERHOUT

BY IGOR TAMM

ASSOCIATE PROFESSOR, THE ROCKEFELLER INSTITUTE

Suydam Osterhout's investigations during his period of study at The Rockefeller Institute have been in the field of virology and have concerned the relationship between virus growth and cell damage.

The recorded history of virus diseases goes back to the tenth century B.C. A Chinese description of a pestilence which occurred at that time apparently refers to smallpox. Yellow fever, known for centuries in tropical Africa and as a scourge of ships in the African trade, was probably responsible for the legends of cursed ships, such as those of the Ancient Mariner and the Flying Dutchman.

In the first half-century from the demonstration, in 1892, of a virus in extracts derived from diseased tobacco leaves, many different viral agents were discovered and much was learned about them. Numerous pioneering contributions came from The Rockefeller Institute.

Yet, as an integrated science, virology is young: it is only in the last ten to fifteen years that the general principles which govern the behaviour of animal, plant, and bacterial viruses have been elucidated. From an adjunct of human and veterinary medicine, and of agronomy, virology has developed into a fundamental biological science in its own right. Progress of virology is now dictated at least as much by the logic of its internal development as by the demands of applied areas.

Viruses, the subject matter of virology, are naturally transmissible cell components which are of exceedingly small size and simple structure, but which are capable of self-reproduction, variation of heritable properties, and of selective survival within the appropriate ecological system.

Virology emerged as a science when it became possible to study viruses quantitatively at the cell level and when their properties and behaviour could be subjected to rigorous genetic, biochemical, and biophysical analysis. The deliberate use of viruses of bacteria, called bacteriophages, as models for the study of the virus-cell relation provided perhaps the most important single factor for the present integration of virology into a unified science.

Viruses vary in size, shape, chemical composition, immunological properties and ability to cause disease. However, the fundamental features of their make-up and the basic mechanism by which viruses grow are similar in all systems. Indeed, viruses now serve as models of self-reduplication of nucleoproteins, for the fundamental biosynthetic mechanisms involved are probably common to all forms of living matter.

The outstanding unifying characteristic among viruses is that production of new virus in appropriate host cells is initiated and directed by nucleic acid released from virus particles. The whole process of virus growth takes place in two steps: 1) Synthesis of precursor materials, and 2) Assembly of precursor materials into new virus particles. Much detailed information has been accumulated regarding this process.

However, the mechanism whereby viruses cause injury to the infected cell has not been established.

Recognizing the existence of this deficiency in knowledge, Suydam Osterhout set out to investigate the relationship between virus growth and virus disease. He chose for his studies the virus of herpes simplex, a common infectious agent of man; it is believed that because of long association, a mutually satisfactory *modus vivendi* has been established whereby herpes virus only infrequently incapacitates its host and thus assures itself of wide distribution. The picture of disease due to herpes virus is protean: the manifestations range from a cold sore or fever blister on the lip to inflammation of the brain or brain coverings.

Suydam Osterhout considered it important to study herpes simplex virus under precisely controlled conditions in cells from its nat-

ural host. He therefore cultured in glass vessels cells from human fetal membranes obtained after birth.

To measure the concentration of virus precisely he developed improved techniques. In the process, he discovered important new factors which determine susceptibility of cells to virus.

To study the distribution of nucleic acids in cells infected with herpes virus, he applied, for the first time, a highly effective staining technique for deoxyribonucleic and ribonucleic acids which has only recently attracted the attention it deserves.

With the aid of this technique Suydam Osterhout has shown that the nucleic acid in herpes virus is of the deoxyribonucleic acid type, that is, of the type associated with chromosomal genes.

Results of Osterhout's parallel studies on herpes virus multiplication and associated cellular changes have significantly advanced our understanding of the dynamic aspects of growth of this medium-sized virus in cells of human origin. Of even greater importance are his contributions to the study of virus disease at the cellular level.

Osterhout has obtained evidence that the early disorganization of important nuclear structures seen in cells infected with herpes virus is due to the specific effects of the virus, whereas the later changes in the overall structure of cells represent a reaction to injury.

Suydam Osterhout's work supports the concept of step-wise development of pathological changes in cells infected by virus. Many of the changes are probably sequential, and taken together can be considered as a chain of events in which only the first is initiated by virus action.

Having spoken of Suydam Osterhout's scientific accomplishments and contributions I wish now to mention some of the benefits which, I believe, have accrued to him. He has become an investigator in possession of the most advanced scientific concepts and techniques and thus he is in a favorable position to continue productive research in microbiology. Of even greater importance may be the fact that his studies at the Institute have enlarged his stature as a reflective physician always ready to ask himself and others penetrating questions about how disease develops.

PRESENTATION OF

LEE DeBORDE PEACHEY

BY KEITH R. PORTER

PROFESSOR, THE ROCKEFELLER INSTITUTE

In presenting Lee DeBorde Peachey for the degree of Doctor of Philosophy it is my pleasant duty to explain to you the significance of his thesis work. In his studies he has examined the morphological pathways for impulse conduction in muscle cells and while the object of study is small it is of great importance to the functioning of muscle cells and cells in general.

The electrical properties of cells, and particularly of nerve and muscle cells, have been extensively investigated. Thus we know that the interior of a resting muscle cell is electrically negative with respect to the external environment and furthermore that this potential difference is maintained across the thin membrane limiting the cell. It is also known that this resting potential may be disturbed and that the resulting depolarization of the membrane will spread rapidly along the entire surface of the muscle fiber. This is recognized as the initial event in muscle cell stimulation and it is followed very quickly by a contraction of the myofibrils throughout the entire depth of the cell. Concerning these two phenomena, the surface excitation and the contractile response of the myofibrils, there is a wealth of information. But concerning the link between the two, how the first initiates the response in the second, almost nothing is known. A substance diffusing inwards from the surface membrane following excitation could serve to initiate the contraction of myofibrils just beneath the cell membrane, but rates of diffusion are too slow to account for the *simultaneous* contraction of myofibrils in the center of the fiber. The rapidity of the response demands rather that the excitation impulse move into the depths of the fiber as fast as it moves over the surface membrane.

The existence within the muscle cell of membrane systems that might serve for rapid impulse conduction was, until recent years, a subject only for speculation. Then it was found, through electron microscopy, that such systems are in fact present. They are made up of minute tubules arranged to form elaborate and continuous networks around and among the myofibrils. This system is known as the sarcoplasmic reticulum. The discoverers of this component of the muscle cell were unanimous in suggesting that it may play a role in the conduction of the excitation into the depth of the fiber. This idea attracted the attention and interest of Mr. Peachey and it was this that he set out to investigate.

Now I should remind you that the dimensions of these membrane-limited channels within the muscle cell are extremely small and preclude the introduction of microelectrodes for measuring membrane potentials or following the migration of changes in these potentials. Hence the approach had to be less direct.

Mr. Peachey reasoned that if this newly discovered system is functional, as proposed, then certain correlations should be evident between the extent of its development and the physiological properties of the muscle. Fast muscles, e.g., should show a full or extensive development of the system — slow muscles not so much. According to his reasoning, the system in small fibers, where the myofibrils are all near the plasma membrane, should show only a meager development compared to its counterpart in larger fibers where the excitation has to move across greater distances to reach the contractile elements. He reasoned also that an examination of primitive forms might describe the origins of the system and hence its functional relationships.

Mr. Peachey then made a careful selection of muscle forms concerning which good physiological information was available and proceeded to examine their fine structure. His observations, in essence, established the correctness of his reasoning. Fast muscles of the frog, where the sarcolemmal distances are relatively large, were uniform in showing an extensive system of membrane-limited channels. Very slow muscles, exemplified by smooth muscle fibers, were found, on

the other hand, to be essentially devoid of a continuous internal membrane system. In the myotome muscles of the primitive chordate, Amphioxus, the units of muscle structure were found to be extremely thin, with the result that the myofibrils are all near the sarcolemma. Here, where presumably it would not be needed, the sarcoplasmic reticulum was scarcely evident. In the skeletal musculature of the lamprey eel where, on the other hand, the fibers are large and have fibril-sarcolemmal distances as great as 15 microns, the reticulum is present in an extensive and elaborate form. He also examined muscle fibers of the crab and noted here an extensive system of surface infoldings which brings the sarcolemma or surface membrane into intimate contact with the deepest myofibrils. This repeats on a grand scale the occasional structural continuity between the internal membranes and the surface membranes observed in other muscle types and leads Mr. Peachey to conclude that these internal membrane-limited channels may in part represent invaginations of the plasma membrane. This suggests further that the content of the channel spaces, which he calls xenoplasm, resembles the composition of the extracellular fluids, and that therefore the semipermeable membranes limiting the channels support a membrane potential similar to that maintained across the external plasma membrane. In its entirety the evidence collected lends strong support to the hypothesis of internal impulse conduction by way of the sarcoplasmic reticulum.

The ideas developed by Mr. Peachey, the skill with which he has made his experiments, the insight and critical spirit he has shown in analyzing his results make him highly worthy of the recognition you are about to bestow. He has boldly entered a foreign field and already produced results of great interest to leading muscle physiologists as well as to all persons interested in cells and cell functions.

PRESENTATION OF
HOWARD RASMUSSEN

BY LYMAN CRAIG

PROFESSOR, THE ROCKEFELLER INSTITUTE

It is my privilege to speak of the research accomplishment of Howard Rasmussen while he has been enrolled in the Rockefeller Institute. His investigations have been concerned with the isolation and study of the hormone principle from the parathyroid glands.

It has been characteristic of the inquiring minds of scholars throughout the centuries to have asked why and how of the things concerned with life. With progress in science, the function of each part of an animal or plant, each organ, each cell, each part of the cell, each molecule and each atom has come under inquiry insofar as we have been able to distinguish and study them. The present mere beginning of understanding already constitutes a vast store of information.

In view of such complexity and specificity of function, what about the master plan by means of which the living things themselves organize the almost countless events which are constantly taking place in order to supply energy, regulate growth, repair damage and protect against invading organisms, to name only a few functions. In trying to answer this question, scientists have come to the conclusion that the required transformations are brought about by relatively large numbers of specialized chemical compounds known as enzymes.

What then controls the enzymes in such a marvelously concerted way? A partial answer to this question was forthcoming over fifty years ago from investigations concerned with the digestive process. Bayliss and Starling presented evidence for the presence of a group of substances secreted into the blood by specialized tissues when appropriately stimulated. These substances were called "hormones", a word derived from the Greek word meaning to arouse to action.

Their entrance into the blood caused certain tissues to secrete digestive enzymes. When the enzymes had done their work and removed the stimulus caused by the food, a fall-off of hormone resulted in a fall in enzyme concentration. We now call this automatic adjustment or way of maintaining balance a "feed-back" mechanism.

With the advance of experimental techniques, many hormones controlling functions such as blood pressure, growth, reproduction, salt regulation, water retention and many others have been isolated in pure form. An important one, known to everyone, is insulin which regulates the utilization of sugar.

About four years ago, Howard Rasmussen became interested in the hormone which controls the uptake and excretion of the elements calcium and phosphorous. The presence of these elements in the blood is particularly important for the proper function of nervous tissue and in the growth and maintenance of bone tissue. It was already known from the studies of others, begun more than fifty years ago, that two pairs of glands associated with the thyroid and called the parathyroids were necessary for the proper balance of calcium and phosphorous. Indeed a crude extract containing the hormone principle and able in part to regulate calcium and phosphorous balance in the absence of the parathyroids had been available for some years. Rasmussen set out to isolate the hormone in pure form. Many other skillful investigators had tried to do this before, not to mention others working at present toward the same goal.

Basic to the study was his development of an improved, more reproducible biological assay for evaluation of the activity of purified fractions. In addition it was not only necessary for him to become thoroughly familiar with specialized fractionation techniques such as electrophoresis, ion exchange chromatography, countercurrent distribution, membrane diffusion and others but also to adapt them to suit the particular requirement of his problem. Active principles of this type invariably undergo transformation easily and are, therefore, very fragile. They occur only in small amounts tightly bound to structurally similar but inactive material. In work of this kind, it is

anticipated that there will be many discouraging experiments. I can assure you Rasmussen encountered his share of these.

The degree of success gained in his undertaking is reflected in the fact that he has achieved a preparation many times as active as anyone preceding him. This preparation appeared to behave as a single substance with several different methods of testing but in spite of such promise, the final decision as to purity must await further study. This reservation is forced because of the great difficulty of proving purity with a substance of its type. For instance, the much studied hormone, insulin, which is of similar size and complexity does not even yet answer all the criteria of purity now available.

His most active preparation was shown to be built almost entirely from amino acids and to have a molecular weight of about 7000. It, therefore, has been shown to be a polypeptide or protein hormone similar to adrenocorticotropin, one of the master hormones from the anterior pituitary. In fact, Rasmussen has demonstrated certain very interesting chemical similarities between adrenocorticotropin and his parathyroid hormone.

The importance of his work largely relates to the fact that the hormone will now be available for further study as a discrete chemical substance instead of a crude mixture. Numerous interesting physiological investigations are now possible. A definite scientific advance has been made.

PRESENTATION OF

HAROLD JOACHIM SIMON

BY RENÉ DUBOS

PROFESSOR, THE ROCKEFELLER INSTITUTE

The Rockefeller Institute was founded during the period that has been called the Golden Era of Medical Microbiology — a period which saw the discovery of the bacterial agents responsible for many of the important diseases of man, animals and plants. From the very beginning of its existence, the Institute placed itself in the forefront of this field of studies, largely through the personal interest of William Welch, the first President of its Board of Directors, and of Simon Flexner, its first Director. In fact, Simon Flexner continued investigating the etiology of various infectious diseases throughout the time of his directorship.

This etiological phase of microbiological science has continued to be brilliantly represented on our campus. One needs only mention here the development of techniques for the identification of filterable viruses, which owes so much to Thomas Rivers, also one of our former Directors. The Institute has been just as influential in the other classical aspects of medical microbiology, in particular through the fundamental contributions made by the great schools of immunity and of immunochemistry identified with the names of Karl Landsteiner and Oswald Avery.

By the 1920's, many scientists believed that medical microbiology had worked out its most important theoretical problems and that its only remaining task was to fill in the gaps in detailed knowledge with further refinements at the chemical level. This, however, was not the opinion of Theobald Smith, the first Director of the Division of Animal and Plant Pathology of the Institute, then located in Princeton. From his vast personal experience with many different types of

infectious processes, Theobald Smith developed the view that it is not correct to regard infectious diseases as pathological deviations from the normal processes of nature. He believed instead that these diseases are specialized examples of a universal biological phenomenon. In his words, "As human beings intent on maintaining man's domination over nature, we may regard parasitism as pathological insofar as it becomes a drain upon human resources." However, Theobald Smith emphasized, "Biology teaches us that parasitism is a normal phenomenon."

This broad biological concept led Theobald Smith to perceive that in nature parasitism has a tendency to reach an ideal form — a state of biological equilibrium in which both parasite and host can survive. The most "efficient parasite" in his view is the one that lives in harmony with its host, feeding upon it of course, but not to the extent of depleting its vigor.

Although dutifully mentioned by textbooks in the form of brief quotations, Theobald Smith's views do not seem to have had much impact on medical thinking. To paraphrase Huxley, the germ theory of disease which had begun as heresy some eighty years ago, had become in many quarters a superstition or at least a narrow-minded orthodoxy. Theobald Smith's vision just did not fit well in orthodox teachings.

Fortunately, however, there were a few physicians who were not satisfied by the official concepts of infectious disease, and who transmitted some of this skepticism to their students. While in medical school and then as an intern at the New York Hospital, Harold Simon was exposed to this skepticism and thus was led to realize that the problems of infectious disease are not completely explained by the classical formula balancing the virulence of the parasite, the susceptibility of the host, and the immunological response. He became aware of the fact that the genesis, the course, and the outcome of infectious processes cannot be understood unless one takes into consideration the past histories of both the host and the parasite, and the precise environmental conditions under which they came into contact.

After joining the graduate program at The Rockefeller Institute, Harold Simon undertook to prepare himself for the experimental study of these problems at the cellular level, working with the type of material that had become familiar to him in the course of his medical training, namely animal cells and bacterial pathogens. Soon, however, he discovered that a very large amount of information relevant to his problem was available in the published literature — but often in a form that had remained unnoticed because it had not been correlated with the natural events of disease and integrated into a meaningful pattern. He found, for example, that several investigators at The Rockefeller Institute had accumulated a great deal of experience with latent, dormant infections. This was of special interest to him because latent infectious processes can be regarded as manifestations — even though temporary — of the ideal form of parasitism discussed by Theobald Smith. Furthermore, latent infections can be established by all kinds of parasites — viruses, bacteria, fungi, protozoa, helminths — and they occur in all forms of life — animals, plants, tissue cultures derived from them, and even microorganisms. In several Institute departments also evidence was being obtained that the characteristic of each type of host-parasite relationship is an expression of the genetic makeup of both components of the system and is affected by temperature, humidity, diet, external stimuli, indeed by each and every factor of the total environment.

With remarkable diligence and understanding, Harold Simon collected information derived from almost every kind of living material and from every biological discipline. He thus was able to paint in his dissertation a sophisticated and integrated picture applicable to all forms of life — a picture in which infectious processes appeared not as a form of warfare between a vicious parasite and a defensive host, but rather as normal manifestations of the constant interplay between living things. Nor did he present this picture only in terms of broad generalities. In many cases he could supplement the descriptive part of his material by the statement of precise mechanisms, either based on factual information or on helpful working hypotheses. Through a

thoughtful and bold utilization of the data available in a number of Institute laboratories, he thus managed to advance the understanding of infection one further step in the direction envisaged by Theobald Smith a generation ago.

CONFERRING OF THE DEGREE OF DOCTOR OF SCIENCE, *HONORIS CAUSA* ON PEYTON ROUS, Member Emeritus AND HERBERT SPENCER GASSER, Director Emeritus

DETLEV W. BRONK: It is a worthy custom on occasions such as this to confer degrees on those who, by exceptional achievement continued through many years, deserve scholarly recognition in high degree. Universities thus appropriately express the gratitude of society to those who have enriched mankind. Such an act at such a time as this is timely, for it stands before you, who have just earned the appellation of a scholar, older scholars worthy of your emulation.

There are two whom we would thus honor; they have much in common that is significant to me. And so you must forgive me if I perform this office as a person. It would be unnatural for me otherwise to do.

Both of whom I speak are graduates of the Hopkins, a university which to me is precious. Both love Britain as I do, and they hold the high honor of membership in the Royal Society of London as did Benjamin Franklin. Both are devoted with affection to this institution and have, through her, fulfilled their lives and served mankind.

PEYTON ROUS, it was fifty years ago you came to this place early in your career of great distinction. Those fifty years almost encompass the Institute so largely made by you. Throughout those years you have greatly increased man's understanding of the structures and the actions we know as life. You have been a pioneer in the quest for

understanding of those cancerous forces which erode the vitality of man. Countless generations will be indebted to you for the knowledge you have made available to those who will conquer malignant growth. It is especially appropriate that we should bind you even closer to your beloved institution on this occasion of historic significance for our students. It is appropriate, for the welfare and the progress of younger colleagues have been your constant concern. These words were yours: "The scope of an able man is increased through association with the right youngsters who become almost a part of him and he of them in turn. It is one of the finest things human beings do as social beings."

HERBERT GASSER, the final office which I now perform is a precious privilege that I may find too difficult for words. Through a quarter century you and I have worked and talked and played together. We have been of a single family. They have been happy, fruitful years enriched by friendship.

Two times before, at Pennsylvania and the Hopkins, I have been privileged to do what I am about to do for the Institute you have loved and served so well.

During eighteen years of economic depression, of war, and violent readjustment in the pattern of scientific effort, you have held high the ideals of excellence for this institution. You have valiantly opposed mediocrity and have scorned trivial undertakings. But your kindly spirit respected sincere, conscientious scientific effort. You nurtured the only foundations upon which a worthy Rockefeller Institute of the future can be built.

As you did so, you carried forward your own investigations which have enabled your physiological friends and colleagues to understand more clearly how man moves, and feels and thinks.

To our students I commend your whole-souled devotion to science and learning which has made clear and simple and admirable the pattern of your continuing career.