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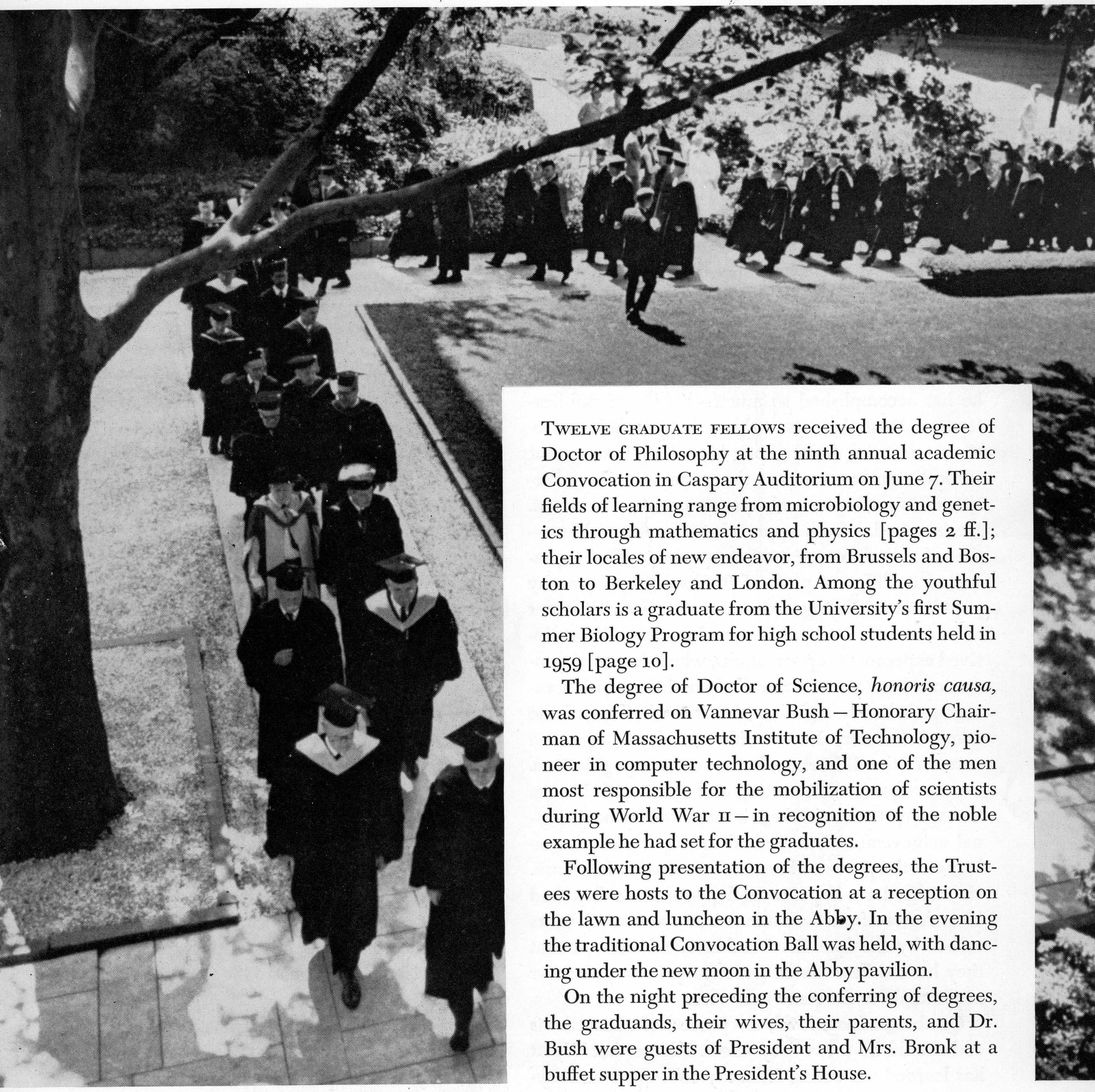
CONVOCATION 1967



TWELVE GRADUATE FELLOWS received the degree of Doctor of Philosophy at the ninth annual academic Convocation in Caspary Auditorium on June 7. Their fields of learning range from microbiology and genetics through mathematics and physics [pages 2 ff.]; their locales of new endeavor, from Brussels and Boston to Berkeley and London. Among the youthful scholars is a graduate from the University's first Summer Biology Program for high school students held in 1959 [page 10].

The degree of Doctor of Science, *honoris causa,* was conferred on Vannevar Bush – Honorary Chairman of Massachusetts Institute of Technology, pioneer in computer technology, and one of the men most responsible for the mobilization of scientists during World War II – in recognition of the noble example he had set for the graduates.

Following presentation of the degrees, the Trustees were hosts to the Convocation at a reception on the lawn and luncheon in the Abby. In the evening the traditional Convocation Ball was held, with dancing under the new moon in the Abby pavilion.

On the night preceding the conferring of degrees, the graduands, their wives, their parents, and Dr. Bush were guests of President and Mrs. Bronk at a buffet supper in the President's House.

Wyatt Wheaton Anderson

B.S., M.S. UNIVERSITY OF GEORGIA
PRESENTED BY THEODOSIUS DOBZHANSKY

In the process of scientific maturation of a scientist there comes a stage as wonderful to observe as it will be pleasant and inspiring to look back to later on. This is the stage when novel and stimulating ideas crop up in the mind of the scientist in quick succession. Indeed, in so quick a succession that only a fraction of them can be submitted to test by actual experiments and observations. Infinite vistas are opening up; there is so much that could be discovered so easily, so easily if only the days would have a few more hours than the traditional twenty-four!

Wyatt Anderson was fortunate to be in this stage at The Rockefeller University, and we were fortunate to have him with us in this stage. In his years here he has accomplished so much — his list of publications contains about ten titles — that I must be selective in choosing from among his achievements what is most significant and at the same time characteristic of Wyatt's personal style as a creative scientist. He invented a fresh approach to an old problem — that of race differentiation. A species is often represented in different parts of its distribution area by populations differing in various traits. From different races of the fly *Drosophila pseudoobscura* Wyatt derived experimental populations, which for many generations bred under controlled conditions in laboratory population cages on the seventh floor of the South Laboratory. He was able to analyze the genetic nature of the differences between these populations. He also observed interesting and significant changes in response to the novel environments. His most original achievement was to find an experimental analogue of the process of race differentiation in nature. He utilized six experimental populations that had been derived from the same source about seven years earlier by the late Dr. Vetukhiv, and showed that they have differentiated genetically in ways similar in principle to the races in nature.

On the graduate level, the process of education is and should be a two-way street. I hope that Wyatt has learned something from my colleagues and myself; I am quite sure that I have learned a lot from Wyatt. His quick insight and his ever-active interest in all aspects of genetics and of evolutionary biology have been most helpful and most stimulating. His leaving is regretted by his many friends. However, in seeing him go we feel comforted by knowing that Wyatt Anderson has chosen science for his way of life. Wherever he will find himself, he will be busy with scientific research — either in a physically well-equipped laboratory or in the well-equipped laboratory of his intellect.

Robert Brown Barlow, Jr.

A.B. BOWDOIN COLLEGE
PRESENTED BY HALDAN KEFFER HARTLINE

The science of optics began with the study of the eye. Many students of physics, encountering optics, have been enticed by its original subject, and have become true biophysicists as a result. Robert Barlow, while a physics major at Bowdoin College, developed a keen interest in optics. He spent a summer learning the new technology of fiber optics, by means of which light can conveniently be led through thin, flexible glass fibers. This technique was to prove extremely useful in his subsequent experiments on vision, which he undertook after coming to this University.

Among the foremost problems of visual physiology are those of pattern vision. How do we recognize shape and form? Patterns of light and shade and color focused on the mosaic of the visual receptors must be interpreted by the action of nervous centers. Nerve cells in the retina, activated to various degrees by the receptors that serve them, influence and are influenced by the actions of their neighbors. In this way, component parts of the pattern are compared. The extent of retinal interaction and its spatial distribution are factors that determine how the first steps of pattern analysis and recognition are achieved. It was to the spatial parameters of retinal interaction that Robert Barlow directed his attention in his thesis research.

No retina can be simple; its tasks are too complex. But the horseshoe crab, *Limulus*, has a retina considerably less complicated than our own or those of

most other higher animals. Moreover, the horseshoe crab has a compound eye that is coarsely faceted, and Barlow's fiber-optic light pipes are small enough to fit over single facets and thus restrict the stimulating light to single receptor units without disturbing scatter to neighboring facets. This was a great advantage to him in mapping the field of influence that a receptor, or a small, selected group of them, exerts on its neighbors. *Limulus* has another advantage in that its retinal interaction is predominantly inhibitory. Mutual inhibition is a contrast-enhancing mechanism. If the strength of the inhibition is greater for near neighbors in the retinal mosaic than for distant ones, contrast will be greatest where brightness gradients are steepest; thus contours and borders in the retinal image will be accentuated.

Here, then, lies the idea behind Robert Barlow's task: if one maps the field of inhibitory influence quantitatively around a small group of visual receptors, one can begin to understand how contours are detected and resolved in pattern vision.

In the experiments, a cluster of three or four facets, arbitrarily chosen, is illuminated. With a single glass fiber leading in light from another source, each facet in the neighborhood of the small cluster is tested — one by one, dozens of them — measuring for each the degree to which its individual responses to light are depressed by illumination of the small cluster.

The details of this lengthy and painstaking experimental program need not occupy us here. The results brought surprises: pattern vision is no slight problem. The strongest inhibition is not exerted on the facets nearest the chosen cluster, but on those a slight distance away. The contour map of the inhibitory field around a small group of receptors is like that of a hill with a crater at the top. The hill, moreover, always proves to be elongated horizontally. What can these details mean for pattern vision?

One way to answer this question is to calculate the effects such organizational details might have on the pattern of optic nerve information as generated by simple patterns of light and shade on the retinal mosaic. The computations needed are formidable, but we enjoy cordial working relations with scientists at IBM's Watson Laboratory, and Mr. Barlow found a ready collaborator in Dr. Donald Quarles, who takes a special interest in the problem of pattern recognition and who has access to the large computers needed for this theoretical work. Barlow's data furnished the basis for a variety of computations. It is as yet too early to draw extensive conclusions from the results, but it is clear that even small details in the configuration of the inhibitory fields may have significant effects on accentuation of contours in visual patterns.

The early results of the computations suggested still other possibilities: Barlow designed fiber-optic bundles arranged to provide simple patterns of light, and embarked on new experiments to generate new sets of data for the theories to digest.

At this stage, the reasonable limits of a doctoral dissertation had long since been passed — Bob Barlow has plenty to keep him busy for a long time to come. And should he momentarily tire of the scientific approach to the study of shape and form, he has his artist's sketch book to fall back upon for a different kind of approach to the same problems.

Mr. President, it is always rewarding to see how quickly those who enter our laboratories become less and less our students being taught and more and more our valued colleagues learning with us. Robert Barlow is no exception. His lively and varied interests, the scope of his training, and the high quality of his research contributions well merit the degree of Doctor of Philosophy.

Anthony Cerami, Jr.

B.S. RUTGERS, THE STATE UNIVERSITY
PRESENTED BY EDWARD REICH

I am happy to present to you Anthony Cerami. Cerami was born and grew up in a small farming community in New Jersey and obtained his early education in the rural schools of that area. When he entered high school he was enrolled in a program of agricultural studies. This period of his development coincided with the introduction of antibiotics and chemotherapeutic agents into livestock production and animal feeds. This permitted him to observe at first hand that the epidemic scourges, which only months before had frequently annihilated entire populations of domestic animals, could be largely controlled and even eradicated. These experiences

revealed in a stark fashion the pertinence of science to the problems of daily life. The powerful impression produced by these observations appears largely to have determined his subsequent activities. With the encouragement of his high school teachers, he entered the School of Agriculture at Rutgers University to prepare for a career in veterinary medicine, enthusiastic for the prospects of applying chemistry to the life sciences.

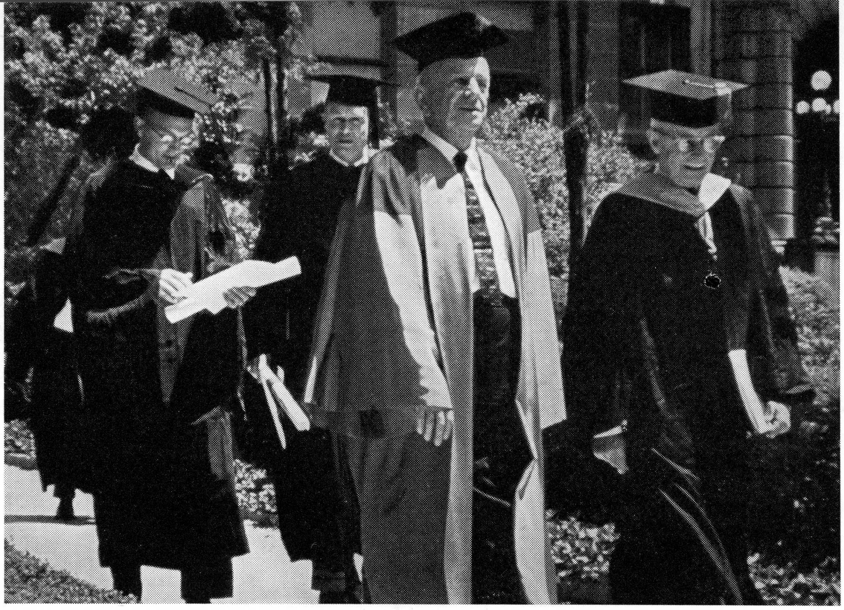
Because the program of the School of Agriculture was broad and flexible, Cerami's extensive interests could be pursued freely, so that he was able to acquire a sound scientific background in mathematics and chemistry, as well as in the life sciences. He soon appreciated that the practical implementation of chemical and biological abstractions had to be based primarily on biochemical rationale and technique, so he began to acquire the fundamental training needed for a career of research in biochemistry. He finally arrived here in 1962, warmly recommended by the faculty of Rutgers. His first research experience here was in the Laboratory of Cytology, where he developed competence in the use of the electron microscope and the diverse skills represented by this area of research. He then elected to pursue further his initial interest in biochemistry. His experimental work has been conducted in the biochemistry of the nucleic acids — the biological polymers that embody and express the hereditary potentialities of all living systems.

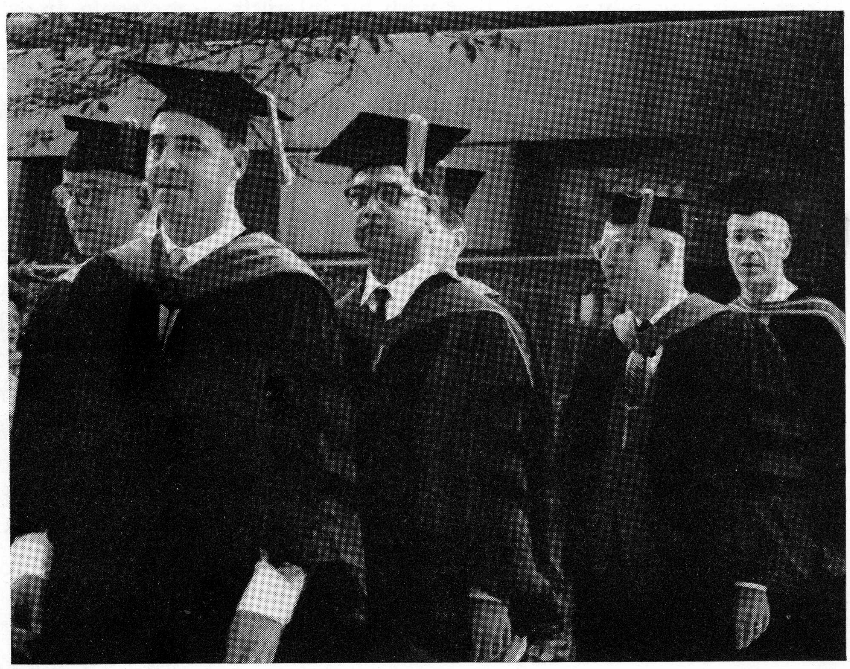
I will describe briefly only Cerami's major research contributions. The first problem on which he worked was concerned with the action of the antibiotic actinomycin. This antibiotic, while not useful in the treatment of disease, is of interest because its action is highly selective and specific: it binds to the DNA of cells in a characteristic manner, and the precise chemical elucidation of that binding reaction could lead rather directly to the design of useful drugs and to an understanding of the mechanisms which are responsible for the multiplication of the nucleic acids themselves. Cerami was able to demonstrate that actinomycin binds to a very small group of atoms on one of the components of DNA, located in a restricted portion of the DNA molecule. This work depended on a broad effort in organic chemistry, physical chemistry and enzymology. The experiments led to the isolation of several new classes of synthetic polymers resembling the natural nucleic acids, but having many new properties not previously observed.

A second major contribution was a study of the action of the drug 2-aminopurine. This agent resembles structurally some of the constituents of the nucleic acids, and it is known to be efficient in causing mutations — that is, hereditary changes in the DNA of many cells. In a complex and painstaking piece of work, Cerami succeeded in identifying the mechanisms by which 2-aminopurine causes hereditary alterations, and thereby produced unexpected insight which replaces previous theories on this subject. These findings also are applicable to efforts directed at the design of useful drugs. Much of this work was performed with no preceding background of information as a guide.

Cerami's work has always been pursued with intensity, imagination, sophistication, and skill. Because he was always generous and helpful, and willing to share his experiences, he engaged in numerous related collaborative and cooperative undertakings with colleagues in his own and other laboratories. These studies, which I will not describe, cover an area as broad as Cerami's interests, and range from morphology through genetics. In leaving us, Cerami plans to obtain additional research experience, which he will apply to the understanding and treatment of disease.

Here I would like to say a few words about Cerami's attitude toward science. If one surveys the spectrum of contemporary human activities and the frameworks in which they are conducted, one is struck by the shriveling of outlets for individual initiatives and constricting perspectives for personal creativeness. In contrast, science presents a perpetual frontier in a state of continuous expansion. The demands and the satisfactions of life at this surviving frontier, like those at other previous frontiers, are greater in the emotional than in the intellectual sphere. Cerami is especially well-suited for life at the frontier represented by science. His unusual tenacity and productiveness are driven by a deep personal commitment to science, and he has a well-developed taste for the adventure, excitement, and romance which are the most attractive elements of





scientific research. To him, science is an end, not a means, and it is apt to paraphrase a famous declaration by noting that Cerami is more concerned about what he can do for science than about what science can do for him.

Mr. President, Anthony Cerami's performance here has been exemplary in every respect. His scholarly activities have spanned a wide variety of disciplines, and he has fully exploited the unique opportunities provided by our graduate program. His scientific efforts will be a credit to science, to himself, and to this institution.

Dean Lee Engelhardt

B.A., M.A. AMHERST COLLEGE

PRESENTED BY NORTON DAVID ZINDER

My first contact with Dean Engelhardt came about a year before he arrived at The Rockefeller. It was summer, and I was teaching the Bacterial Genetics course at Cold Spring Harbor. A student arrived in the laboratory to inform me of a long-distance call from Dean Engelhardt of Amherst. While walking to the main building to take the call, I wondered what the Dean at Amherst might want of me. It was, of course, not the Dean, but Dean; he was starting his senior thesis and required some information on transduction techniques.

When Dean arrived at The Rockefeller the following year, it was only natural that with his interests in microbial genetics he should study in my laboratory. Although the orientation of the work of the laboratory had changed in part to the study of the small RNA-containing bacteriophages, Dean continued his studies of transduction. As will happen at times in science, the experiments were going nowhere. In a roundabout way, I learned Dean's version of our ensuing conversation. "Enough of this playing around, how about getting down to some science?" I doubt I was that explicit. More like, "Perhaps these experiments should be put aside for a bit and for the interim you might. . . ."

Dean then chose to study certain aspects of the translation of phage RNA in protein-synthesizing extracts *in vitro*. Since that time, with great ingenuity supported by superb technical competence, he has unraveled one problem after another in phage RNA-directed, protein biosynthesis.

Much of our knowledge of the genetic code comes from the use of synthetic polyribonucleotides as templates for protein synthesis in bacterial extracts. The only control for the fidelity of such extract systems is a natural messenger, such as phage RNA. While little can be inferred about the nucleotides involved, protein products can be compared with that which this RNA determines when the virus infects its host, such as the coat protein of the particle itself. To reduce the analysis to a more manageable size, and simultaneously to prove an inference about certain kinds of mutations found in many different genes, Dean analyzed the products produced by phage RNA containing amber mutants.

In vivo analyses in many systems had indicated that the amber phenotype was the result of a mutation within a gene to a signal that said "terminate here"; signals normally at the *end* of genes had been introduced *within* a gene. These mutants were preserved for study, as in a few special bacterial hosts the signals could be translated into amino acids and the protein chains propagated. When RNA containing such an amber mutation was used, the products of the *in vitro* system were compared in extracts of the two kinds of bacteria. In the one, which could not translate the termination signal as an amino acid, a small fragment was found that contained only six amino acids out of the 129 in the whole-coat protein molecule. In extracts of the bacteria that could translate the signal, whole-coat protein molecules were found. The difference between these bacteria was shown to reside in a special transfer RNA, those adaptor molecules which actually translate the genetic code. Our understanding of chain termination had been advanced. The little fragment that was produced was rigorously analyzed as to composition and sequence and, with one exception, was found to be identical with the amino terminal portion of the authentic coat protein. Thus the *in vitro* protein-synthesizing system was shown to exhibit considerable fidelity, even with regard to stop signals. The one exception proved to be extremely important. There was an extra amino acid, methionine, at the amino-terminus of the fragment, and its amino group was covered by a formyl group. Since that discovery, it

has been found that when they are synthesized, all *E. coli* proteins have this extra amino acid, which is subsequently removed *in vivo.*

An important clue to the nature of the signal that says "start protein synthesis here" had been discovered.

With start and stop at least partially in hand, Dean turned his attention to the translation of the other genes known to be on the single phage RNA molecule, for it is in the interplay of such signals that one might expect translational controls to exist. Again it was known from other systems that mutations of the amber type — especially when at a position affecting a site proximal to the amino-terminus of a protein — depress the production of gene products in other genes that are genetically distal to the mutation. Thus, a single mutation could turn off a whole block of genes. Dean studied the translation of RNA containing either of two amber mutations in the coat protein gene, the one at site 6 and the other at site 70. The former prevented the translation of all other genes, while the latter did not. When suppressed by the addition of the special transfer RNA, normal translation ensued. Thus was demonstrated translational polarity, whereby a single nucleotide at the right position can determine whether some 3,000 nucleotides can be translated — certainly an instance of the tail wagging the dog!

Many problems regarding the translation of natural RNA messages remain to be solved. But Dean's experiments have shown that the problem can be removed from the complications of the intracellular environment to the test tube.

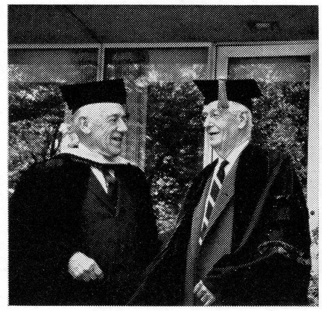
Dean will be leaving us soon. His interest in genes and gene action continues. He wisely plans to use the insights gained with the bacteriophages, and to attempt to apply them to the important tumor-producing, RNA-containing viruses, such as Rous sarcoma. We can, I am sure, look forward to significant progress in this area.

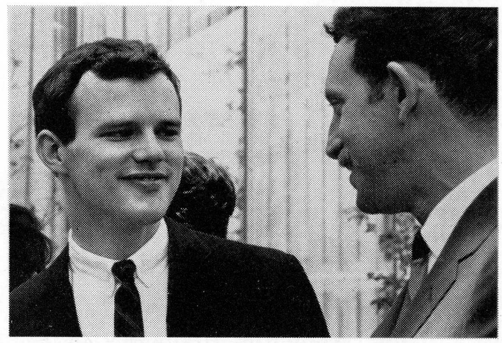
James D. Foch, Jr.

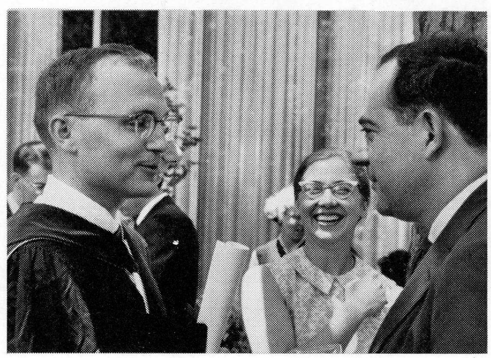
A.B. DARTMOUTH COLLEGE

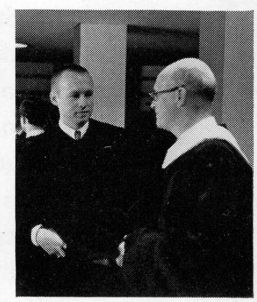
PRESENTED BY GEORGE EUGENE UHLENBECK

James Foch came to The Rockefeller University from Dartmouth, where, after taking his A.B. degree, he









was a premedical student for a year. His intention was to study biochemistry here, but then he turned to physics, mainly due to the inspiration and encouragement of the late Professor Berlin. I think that it is one of the many virtues of our University that such a change of field is possible. Of course, we don't especially encourage it, because it is not easy and is also risky. It is difficult to learn something new, and I think that in the beginning Jim, too, had a difficult time. His mathematics was quite rusty, and in physics he was still a beginner. But he started to work, and by using his remarkable persistence and good sense he was able in a relatively short time to acquire all the necessary mathematical tools and to learn the basic disciplines of theoretical physics. Of course, he had lots of help, but he did most of it on his own. I think it is greatly to his credit that he succeeded. It shows that he has a clear head and an orderly mind; even more important, it shows real character.

Jim started to work with me two or three years ago on various problems in statistical mechanics, and gradually he became more and more interested in the theory of the propagation of sound in gases. Let me try to explain. When the frequency of sound increases, the velocity of sound propagation increases; at the same time, the sound absorption becomes more and more appreciable. The problem is to explain these two facts from the kinetic theory of gases – that is, from the motion and the interaction of the molecules of the gas. The problem has a venerable age, but only recently has it attracted a good deal of attention, both from the experimental and from the theoretical points of view. I will not say more about it, but will tell you only that Jim developed a very nice and appropriate successive approximation method for calculating the dispersion and the absorption of sound as a function of the frequency. This led to a new way of analyzing the experimental data and of comparing them with the theory. And he then found a striking agreement between theory and experiment – always a most satisfying experience for a theorist!

I told you that James Foch started in 1961 as a complete beginner. I can assure you, Mr. President, that in at least one branch of theoretical physics he is now a real professional.

Stephen Grossberg

A.B. DARTMOUTH COLLEGE   M.S. STANFORD UNIVERSITY
PRESENTED BY MARK KAC

The growth and development of mathematics has always been intimately linked with nonmathematical disciplines through problems which originated in the external world and, after much simplification, would yield to a symbolic formulation and thus become amenable to a mathematical treatment. Of course, one is familiar with the many interrelations between mathematics and physical sciences and with the great benefits resulting from these interrelations. In more recent years, biological and even behavioral sciences have come to pose problems which could incite the interest of and present a challenge to a mathematician.

Stephen Grossberg became interested in the psychology of the learning process while still an undergraduate at Dartmouth, and it was then that he conceived the idea of providing a mathematical foundation for this highly complex field of human behavior on the basis of certain systems of nonlinear differential equations.

He continued with this interest (somewhat clandestinely, I think) as a graduate student in mathematics at Stanford, but it was only after coming to this University that a firm, clear-cut, and highly original mathematical content was extracted (with the help of Doctors Rota and Schreiber and not without difficulties for all involved) from a massive conglomeration of hopes, dreams, and conjectures.

It is difficult to predict now whether the mathematical models Steve invented and studied will someday support useful interpretations in psychology, the field which inspired their creation. For one thing, an extensive confrontation with experimental material will have to be made, and so far Steve has shown an Aristotelian reluctance to get involved with experiments.

But this does not detract from the value of his contribution in having discovered an interesting and promising class of networks which can be described in terms of truly novel systems of nonlinear differential equations. The behavior of these networks can

be rigorously predicted by mathematical analysis, and indeed they exhibit features strongly reminiscent of some aspects of learning.

Bertil Hille

B.S. YALE UNIVERSITY
PRESENTED BY CLARENCE MORLEY CONNELLY

How the nerve fiber carries its message—the impulse—is a problem that has intrigued scientists for two centuries. In that span of time, scientists have tended to precipitate and settle in layers as biologists or physicists or chemists or physicians in relatively pure form, whereas the problem has stood up well, resisting corrosion except from what today might be called an interdisciplinary attack. Bertil Hille has undertaken such an attack in the catalytic environment of this University. He came from Yale five years ago, and has extended by reading, by conference, and by research his already broad knowledge and understanding of biology, mathematics, physics, and organic and physical chemistry. For five years his initial interest in the movement of ions across biological membranes has matured and deepened. His association with Dr. Dodge and Dr. Mauro inspired him to consider how the nerve membrane might be modified chemically in such a way that he could measure its altered properties and gain insight into its functional molecular organization. His ultimate approach was to treat the nerve membrane with different drugs that were known to affect nerves, and to observe and analyze how each alters the inward sodium ion current and outward potassium ion current that underlie the propagation of the nerve impulse. One question he sought to answer was whether the ionic channels through which sodium ions traverse the membrane are the same channels that the potassium ions use or are spatially separate ones.

With techniques that used both an intricate electronic control system and high-speed recording and analysis by computer, he studied the effects of a wide range of neuropharmacological agents that inhibit or enhance the ionic currents across the nodal membrane of the myelinated nerve fiber of the frog. In terms of the mathematical model of nerve excitation developed by Hodgkin and Huxley, he observed and analyzed the effects of local anesthetics, veratrine, tetrodotoxin, and calcium and tetraethylammonium ions, among others. He found that a very low concentration of tetrodotoxin, a soluble poison derived from the sometimes-edible Japanese puffer fish, specifically and completely inhibits the sodium current without affecting the amplitude or kinetics of the potassium current and, conversely, that the tetraethylammonium ion produces the exactly opposite specific effect. From consideration of these specific effects and the sizes and properties of these inhibiting molecules, he concluded that sodium and potassium ions move through the membrane in different places or channels. The conclusions he has drawn from this application of pharmacology as a tool in biological research have significantly improved our view of the excitable membrane and are a first step toward a molecular description of that dynamic structure.

To indicate that Bertil Hille has not confined his interests to the laboratory, I should like to quote a line from each of his four annual reports, which, as one of his research advisers, I have been privileged to read: "At . . . other times of the year I have learned to identify many avian, arboraceous, and herbaceous organisms in the field." From the next year, "Have also considered the prehistory and early civilization of the Greek peninsula." Then, "This year I married Merrill Burr." "This year I enjoyed teaching one week of the neurophysiology course. . . ." Had he submitted a report this June, he might well have said, "I look forward to my year of postdoctoral work in the laboratory of Professor Hodgkin in Cambridge."

John Jacob Marchalonis

A.B. LAFAYETTE COLLEGE
PRESENTED BY GERALD MAURICE EDELMAN

From the beginning of his graduate studies at this University, John Marchalonis has been concerned with the evolution of living forms. He chose to study the evolution of the immune response and in particular the origins of antibodies. Antibodies are large protein molecules which appear in the blood after the injection of various chemicals known as antigens. They have the remarkable capacity to recognize and distinguish among the chemical structures of an

enormous variety of different antigens. As far as we know, antibodies appeared late in evolution, at the time of emergence of the vertebrates, and they play a major role in the means of immune defense. An understanding of the evolution of antibodies is essential to the solution of the problem of immunological specificity.

Mr. Marchalonis began his researches by inquiring whether molecules like antibodies could be found in invertebrates such as snails, insects, and lobsters. He chose first to study the horseshoe crab, a large invertebrate related to spiders. Noguchi, at The Rockefeller Institute, had observed that the blood of a horseshoe crab would agglutinate horse red blood cells much in the same manner as do antibodies. Mr. Marchalonis has isolated the protein responsible for this, and conclusively shown that its structure does not resemble that of antibody molecules. This might seem a negative result, but it should be stated that this initial research has allowed him to formulate one of the first models of a natural hemagglutinin molecule.

He then turned his attention to the antibodies of lower vertebrates, including the lamprey, the shark, and the bullfrog. Here he made an important discovery: the lamprey and the shark have only one class of antibodies, and it is not until the emergence of amphibia that additional classes appear to have evolved. These findings are of great significance in formulating a theory for the origin of antibodies and immunological specificity. They will undoubtedly be utilized by other workers in the field in their explanations of how information for the enormous number of different antibodies in an animal is stored and inherited.

I cannot discuss here the theoretical implications of these findings, but it does seem appropriate to comment on a larger issue exemplified by Mr. Marchalonis' work. Although his love is for biology and evolution, he recognized that a detailed knowledge of modern chemical and physical techniques was necessary to pursue his evolutionary studies. He was not content merely with the morphology of the visible, but wished to describe the morphology of the molecules concerned in the immune response. As a result, he was the first to show that the structure of antibodies known in mammals is also present in lower vertebrates. He has pursued his studies with enthusiasm and patience. He has traveled far for his specimens and deep with his thoughts.

Jack Marchalonis has learned not to disdain what has appeared old-fashioned; at the same time he has become familiar with the most modern methods in biological research. This is a powerful and harmonious attitude, and in the confidence, Mr. President, that he will continue what has been begun, I recommend him to you as a fellow scholar.

Sanford Ralph Simon

A.B. COLUMBIA UNIVERSITY
PRESENTED BY LYMAN CREIGHTON CRAIG

A few years after our graduate program at The Rockefeller Institute was begun, a second, much less ambitious but interesting educational undertaking was initiated. About 25 to 30 outstanding high-school seniors, selected from local schools by a committee of our Graduate Fellows, were given a summer laboratory course in biology. It was entirely planned and taught by the Fellows without assistance from the faculty. The main idea back of the plan was to interest promising young students in biological science by demonstrating how interesting it could be. In addition, it gave some of our younger Ph.D. candidates the inspiration that comes from teaching bright students. I wish there were time to tell you more of this "Little League" training.

I speak of it here because eight years ago Sanford Simon was in the first class of those high school summer students. He decided then and there that he was going to do well enough in the college courses recommended specifically by our Graduate Fellows to be accepted by us when he received the Bachelor's degree. Four years later, after graduating summa cum laude from Columbia University, he arrived here to begin his advanced studies.

Here he found particularly stimulating a team of young faculty and Graduate Fellows investigating the chemistry of hemoglobin, and promptly began laboratory work in this field under the direction of Dr. William Konigsberg. Although Dr. Konigsberg soon left us to become an Associate Professor at Yale

University, he continued to serve as Sandy's primary research adviser. For Sandy, his studies represented a logical progression, for he had kept in touch with us since 1959, during his undergraduate days.

Many of the world's most famous biochemists have found the complicated chemistry of hemoglobin fascinating, but none has succeeded in unlocking all the secrets contained therein, or in explaining completely the basis for the amazingly versatile way hemoglobin transports oxygen from our lungs to the various tissues of the body. Nonetheless, Sandy was bold enough to undertake the problem. His confidence was rewarded, for he was soon able to modify normal hemoglobin in a way that promised to contribute considerably to our understanding of the crucial oxygenation phenomenon. Quite apart from its own interesting chemistry, hemoglobin offers a readily available, specific association of cooperating protein subunits. In a certain sense it can be considered an enzyme, and therefore can serve as a readily available model to further the study of the more complicated enzyme systems so important in biology.

Sanford has made a definite contribution to science. His finding was of sufficient interest for him to receive an invitation from Professor M. F. Perutz at Cambridge University to take the beautifully crystalline-modified hemoglobin there for study. (In 1962 Professor Perutz received the Nobel Prize in chemistry for his X-ray diffraction work with hemoglobin.)

Sandy had an exciting experience there as well as in Professor Manfred Eigen's laboratory at the Max Planck Institute in Göttingen, Germany, where his preparation was examined by another new and famous technique — one that gives information about very fast chemical transformations.

Sanford has thus had a unique experience as a Graduate Fellow and has established an excellent base for further development. He has taken full advantage of the special opportunities The Rockefeller University offers, and it is the great privilege of Dr. Konigsberg and myself to recommend him for the degree of Doctor of Philosophy.

Larry Philip Simpson

A.B. PRINCETON UNIVERSITY
PRESENTED BY WILLIAM TRAGER

Larry Simpson has spent these past five years at The Rockefeller University training himself to be both a cell biologist and a parasitologist. We of the faculty have tried to help where we could — in part by not getting in his way. He has worked on cellular differentiation and the determination of form in certain parasitic protozoa called hemoflagellates. These organisms, some of which cause important human diseases, live in man or another mammalian host as intracellular parasites. In nature they can be transmitted only by the bites of sandflies, within which they undergo a developmental cycle. As they move from their warm-blooded mammalian host to their insect host, or from the insect to the mammal, they undergo profound changes in both structure and physiology — changes necessitated by these two very different environments.

Within the cells of their mammalian host these protozoa are tiny, ovoid, non-motile bodies. They are capable of growth at a body temperature of 37° C, but only if they are inside a living host cell. In the alimentary tract of the vector sandfly, however, and also in certain culture media, they multiply extracellularly as elongate, motile, flagellated cells. A temperature higher than 30° C is now lethal to them. If the intracellular forms are isolated in appropriate media and kept at a temperature of 27° C they transform into the flagellated insect form within eighteen hours. Mr. Simpson has shown that this transformation requires energy and appropriate amino acids, and that it involves synthesis of ribonucleic acid and protein. Only five hours after their exposure to a lowered temperature, the respiratory activity of the organisms begins to rise. Earlier studies had shown that at this same time changes begin in the fine structure of the kinetoplast, an organelle that is characteristic of the hemoflagellates.

The kinetoplast is a highly specialized form of mitochondrion that contains an unusually large amount of DNA. This DNA can be removed specifically by certain dyes, such as acriflavin, without otherwise injuring the cell, providing a way of trying to find out what the DNA of such an extranuclear organelle is doing. To what extent, for example, does it control the transformation from one parasitic stage to another? First, however, it was necessary to learn much more than we knew about the mechanism of the action of acriflavin itself. By means of clever experiments that combined biochemical approaches with microscopic observations, Mr. Simpson discovered some of the conditions influencing penetration of this dye into the cell and its accumulation in the kinetoplast. His work has contributed materially to our understanding the transformations undergone by these protozoa, and has set the stage for their experimental use as a favorable material for studies on the general role of extranuclear DNA in cellular differentiation.

Many years ago I heard Robert Hegner, a famous pioneer parasitologist at Johns Hopkins, say: "If you want to see the world, don't join the Navy — become a parasitologist." I'm not sure if I quoted this to Larry, but I think he was quick to realize the truth for himself. By combining cell biology with parasitology he will have the best of both worlds — the best of the world of the laboratory and the best of the world at large. He has already spent one summer on the Amazon, where he worked with Dr. George J. Jackson of this University, and this summer he will have a parasitological tour of Central America under an NIH program. Then next fall he will be back in the laboratory of Dr. Brachet at Brussels as a NATO fellow, again working on cellular physiology in the hemoflagellates.

Alan Burr Steinbach

A.B. THE UNIVERSITY OF ROCHESTER
PRESENTED BY ALEXANDER MAURO

Stoically, for many years, the gentle, common, green frog has been providing scientists with a nervous system easily accessible for investigating fundamental neural processes. Focusing more specifically, many physiologists have turned to that part of the nervous system extending to the frog's periphery where long strands of nerve fibers connect with muscle cells, forming junctions in the limb muscle.

One promising approach to understanding the general properties of junctional neural processes is to elucidate the fascinating, complex events at the nerve-muscle junction. Here the fundamental question is how the neural impulse, upon arriving at the junction, excites the muscle cell. And so Alan Steinbach turned to the nerve-muscle junction of a certain toe muscle of the frog, asking questions and seeking answers in experiments which, he learned very early, required skill and perseverance.

The physical events in the junctional region of the nervous system are reflected both in chemical reactions and in the flow of electric current. Indeed, one of the remarkable facts about the nervous system is that characteristic, minute variations of electrical potential can be recorded from specific regions and studied. Through several such studies, hypotheses have evolved that connect the chemical events underlying the junctional processes to the potential variations observed.

While studying the nerve-muscle junction potential, the investigator encounters unusual experimental difficulties. Imagine a cylindrical cell, the muscle fiber, fractions of an inch in diameter and in some instances an inch in length with, on its surface, a very delimited region — the endplate — where a nerve fiber even finer than human hair terminates. This minute junctional region can be probed only with delicate microelectrodes consisting of glass micropipettes tapering to a very fine point, and they must be inserted into the cell by finely controlled movements. Alan mastered these and many other facets of the technique. In experiments extending over several years and calling upon countless frogs for their cooperation, he discovered and established in detail a new potential variation that occurs when certain chemical agents are present in the cell's environment. These agents are variants of the rather common local anesthetic we have learned to expect from our dentist as a humane gesture to relieve pain. Thus, by analyzing the striking variations in electrical response of the nerve-muscle junction in the presence of various chemical agents, Alan was able to formulate a set of hypotheses that may well explain some of the basic chemical processes underlying the events in the junction.

It has been a gratifying experience for Alan's many friends to observe the growth in intellectual maturity and experimental skills which he so vigorously and enthusiastically has brought to bear on his research problem. He has just returned from a field trip to the Amazon, where he attempted to extend his work to the junction of the nerve and electric organ in the electric eel, a rather well-known electric fish. And now, having been awarded a fellowship by the National Science Foundation, he is off to University College, London, to join the group of distinguished workers — Doctors Katz, Miledi, and Fatt — who have contributed outstandingly to the body of research on the nerve-muscle junction. There he will surely find a fertile milieu for extending his research and perhaps even modifying some of his concepts in the light of new experimental data. Needless to say, over the next few years we will all look forward eagerly to news of Alan's progress.

James Thomas Tidwell

B.S. UNIVERSITY OF ALABAMA
A.M. COLUMBIA UNIVERSITY

PRESENTED BY VINCENT GEORGE ALLFREY

Thomas Tidwell came to The Rockefeller University from Columbia University, where he had been a graduate student under Theodosius Dobzhansky. When Dr. Dobzhansky came here, he made a special point of bringing Tom Tidwell along; no other students were transferred.

Until that time, Tom had worked on problems of heredity and evolution in populations of the fruit fly, *Drosophila*. This interest was continued in his first

year at The Rockefeller. In January 1963 he accompanied Dr. Dobzhansky on a collecting trip in Venezuela, the results of which led to some important observations on the sterility of hybrid flies from different strains and pointed to the importance of sterility and sexual isolation in the origin of new species.

As Tom Tidwell continued his studies at The Rockefeller University he became increasingly aware of the scope and techniques of modern biochemistry, and he began to broaden his laboratory experience in that area. He worked for a time with Dr. Curtis Williams on the separation and characterization of proteins from mutant strains of the fungus *Neurospora,* and with Dr. Peter Gomatos on the isolation of nucleic acids from the reovirus. By October 1964, Tom had made the decision to shift his field of major interest from population genetics to biochemistry, specifically to the biochemistry of the cell nucleus.

This was not an easy decision. I know he was reluctant to give up his long and profitable association with Dr. Dobzhansky as his research adviser, and that he shared with all of us who have had the privilege of learning genetics from this inspiring teacher and investigator a feeling of deep affection for a warm and stimulating personality. It should also be added that Tom's change in plans at this relatively late stage in his graduate studies obliged him to extend his competence into areas that were difficult enough for those who have always made biochemistry their field of major interest. Learning a new discipline always involves a sacrifice in time, a sacrifice Tom cheerfully made when he began work with Alfred Mirsky and myself in 1964.

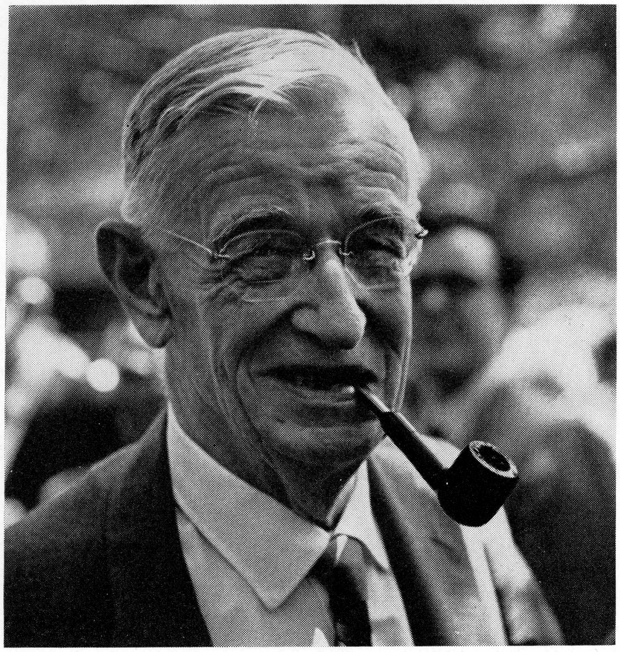
He elected to do research on the chemistry of the basic proteins of the cell nucleus, the histones. It was a good choice because of the resurgence of interest in the problem of histone function in the cells of higher organisms. Our early reservations about Tom's capacity to undertake a biochemical problem faded as more and more of our precious glassware vanished into his domain and as his expenses for radioactive compounds led to fears for the remainder of our laboratory budget. He quickly mastered the complexities of the amino acid analyzer, and in a short time, with Dr. Stanford Moore's advice, he had modified that analyzer so it would measure radioactivity and amino acid concentrations at the same time. This made it possible to proceed quickly to the study of the composition and metabolism of the histone proteins.

His research problem was of fundamental interest because the histones, which sometimes comprise as much as one-third the weight of the nucleus, are known to occur in close association with the deoxyribonucleic acid (DNA) of the chromosomes. Their presence on the DNA has led to speculations that histones might be involved in the control of genetic activity in differentiated cells, a view supported by findings that added histones inhibit the major synthetic activities of the nucleus, and that selective removal of the histones from nuclei results in a widespread stimulation of gene activity in ribonucleic acid (RNA) synthesis.

Tom's problem was to investigate some new reactions affecting histone structure — reactions that take a finished protein molecule and modify it by inserting smaller chemical groups at strategic locations. Among the groups known to be attached to histones in this way are acetyl, phosphoryl, and methyl groups. Tom concentrated on methylation, discovering that histones can be fractionated by simple techniques to yield proteins that are methylated and some that are not. He established convincingly that methylation takes place independently of histone synthesis. By comparing methylation and synthesis in the dividing cells of the liver during the course of regeneration after partial hepatectomy, Tom was able to show that histone methylation is a relatively late event in the course of cell division. Histones are synthesized first and methylated later, the peak in methylation being observed at a time when the rates of DNA and histone synthesis have already begun to decline.

What is the biological meaning of such reactions, which modify large molecules after they have been synthesized? Is it merely coincidence that nuclear RNA synthesis virtually ceases at the time of maximum histone methylation? Are methyl groups on histones merely some form of molecular jewelry or, like the poison rings of the Borgias, does the adornment serve another purpose at the nuclear feast?

Certainly, Thomas Tidwell's work has opened new areas for further study of control mechanisms in the cell nucleus. We are indebted to him for this, and we wish him well in his continuing studies of an absorbing problem.



VANNEVAR BUSH

DOCTOR OF SCIENCE, HONORIS CAUSA

PRESENTED BY DETLEV WULF BRONK

For our faculty and for me this is a day of rejoicing and of sadness. We rejoice that twelve of our young colleagues have justified our faith in them and have shown high promise of careers of distinction. We are sad that they will no longer be with us as companions; as their friends we will follow their future with confidence and pride.

At this annual Convocation, it is our custom to express our admiration and high regard for one who has done much to further human welfare through the advance of science. By doing so, we associate with our graduates a scholar they would do well to emulate throughout their lives of creative endeavor. Vannevar Bush is such a one. Rather, I should say, he is a galaxy any one of whom would be a notable example for our graduates to follow.

Computers have become essential tools of science and technology, of industry and finance. They have expanded man's ability to think and to remember. Fifty-odd years ago, while still a student at Tufts and at the Massachusetts Institute of Technology, Vannevar Bush, the ingenious genius, built the differential analyzer, which was the forerunner of modern computers. He thus prepared the way for what has proved to be one of the most exciting and useful fields of human endeavor. As Professor Kac has said: "In the development of computers the name of Vannevar Bush will live forever as that of one of the great pioneers of a new art that has changed ways of thought and patterns of life."

For twenty years Dr. Bush was a leader in the building of that modern miracle which is M.I.T., and there his inventive genius flourished. But fortunately for science, for our nation, and for the whole free world, Van was called in 1939 to be President of the Carnegie Institution of Washington. From that seat of science in our nation's capital, he soon marshaled a vast army of scientists and engineers who devised the weapons for the Allied armies. It is easy to forget the awful days of Hitler and his fellow tyrants, and many of those here are too young to have known them. But the Office of Scientific Research and Development, which Van Bush conceived and then created, will be remembered forever as a major factor in the conquest of those evil forces.

Almost thirty years have passed, the world has been rebuilt, our environment and our way of life are new. In these transformations, the applications of science have played a major role. They are now necessities of man for life on this complex, crowded planet. In the rebuilding, in the preparation for the future, the ubiquitous influence of Van Bush has been all-pervading. To recount his major roles – the scientist and engineer in government, in industry, and the academic world – would be encyclopedic. But of one I must speak. The National Science Foundation – his vision, mostly his creation – has opened a new era in the furtherance of science and in the use of science for the greater welfare of mankind.

Einstein once said of Isaac Newton: "In one person he combined the mechanic, the experimenter, the theorist, and – not least – the artist in exposition." All of that one can say of Vannevar Bush and more: inspiring administrator of great scientific endeavors, wise statesman, loyal friend, and counselor to thousands. We claim the privilege of conferring upon you, Vannevar Bush, the Degree of Doctor of Science, *honoris causa;* we bind you in bonds of affection to this institution.

HAIL TO THE GREATLY FORTUNATE!

BY PEYTON ROUS

Early in May an invitation came from President Bronk on behalf of the Trustees of The Rockefeller University to all those "colleagues of faculty and staff who have been members of the University family for twenty-five years or more" to dine with them so that they might express their "gratitude and admiration . . . for devoted and effective service." Formal words often mask prodigious warmth and generosity, as we soon realized when at the dinner. Only a few of us could not be there.

A first surprise when we dined on the last day of May was the prearranged seating at the tables, and this was amazing too. Mabel Bright and Jean Parmelee, who know everyone on our campus, had assigned us to seats near those whom we rarely see. Some of us found ourselves next to University folk whom we had never met during twenty-five years or considerably more. Hence our talk was wonderfully various. (I regret not even now having met Christopher Murray, the University's creative chief gardener, but will seek him out this fall. We have both been on the staff for more than forty years, and throughout this time he has bestowed delicious pleasure of flowering sorts upon me.)

After we had dined in a most substantial sense of the term, President Bronk rose and spoke of the remarkable, and to him precious, unity of the whole University; and he added that he wished now to voice again his lasting gratitude to Dr. Flexner and to Dr. Gasser; for it was they who brought to "The Rockefeller" those who were being recognized that night. He then called on Mr. David Rockefeller who spoke of his father's deep satisfaction and his own in their work as Chairmen of the Board of Trustees and in the personal friendships thus gained. Then in a few delightful words he let us know that, acting for the Board and for President Bronk, he would now present all of us with gifts. Those who had served the University for twenty-five years or more — which meant all fifty-one of us — would receive an armchair. No, he did not hand these out singly. They had already been placed at most of the tables but those of us who were not at convenient spots were relieved to see ours ranged in a long row against the wall behind Mr. Rockefeller. Next morning each chair had been conveyed to where we worked, or to our home if we asked. We found them to be beautifully made of ebony and of an exceedingly clever design; for they are not chairs in which to idle time away. No! No! They have most invigorating arms! On the front of each is the motto of the University, PRO BONO HUMANI GENERIS, in a circle around the official seal; and on its back we found a brass plate inscribed with our name and the dates of our twenty-five years.

Then Dr. Bronk named seventeen of us who had been at the University for forty years or more; and Mr. Rockefeller presented to each a replica of a silver bowl designed and made by Paul Revere on which was inscribed our name and the dates of our forty years.

Finally, to the four of us who had been with the University for more than fifty years, Mr. Rockefeller presented a circular silver tray, of just the right size to carry hors d'oeuvres around our bowl, thus tempting us to live high.

Our Silence

Now all the giving of gifts was done. Did any of us try to express our tumultuous thoughts in gratitude to the givers? Not one! We were speechless in our surprise and happiness. So the evening was soon done. But many were the letters written later.

During the next few days some of us who are experimenters cast back in mind to what we had done which might justify the Trustees' feeling for us, and of course we soon encountered, in thought, the aid of our eager, generous, laboratory helpers and technicians. The man whom Phil McMaster and I have most reason to recall in this relation stayed by us throughout an entire twenty-five years of physiological and pathological exploration; and so keenly was he aware of our dependence on him that during several of those years he got up at 5:30 A.M. (because his commuting was hard) so as to be on time at the lab. He not only took part in our surgical procedures but watched sharply, yet unobtrusively, to prevent us from making slips. Sometimes, like other zestful helpers, he would urge us on by setting everything up for an experiment before we arrived which, out of sheer inertia, we'd not chosen to do on that day.

Men of this sort are a leaven in the lump and they are not rare. Usually they do not stay at the University for many years because they are ambitious and while doing their tasks have been learning how to find out. The Rockefeller University, in carrying on its unique task of teaching gifted, postgraduate students how to discover, schools these others on the side, as one might say. Though awarded no degree their field of effort is often extraordinarily big, indeed nothing less than the wide world for what this may mean to them. Some, having saved, behave in a scholarly way and go elsewhere, both for change of scene and for further study, in the usual sense of this term; and now and again one rises high in science because of his brilliant work. Even more satisfying to the onlooker are those who do successful, peculiar things.*

A most pleasant thing about these accessory graduates of our University is their homing instinct. They

*Our twenty-five-year technician, an Americanized Italian, having acquired a little land near Newburgh, N. Y., built himself a small house with his own hands and joined a firm manufacturing wax candles. Here, with an almost Florentine zest, he designed and made, thanks to his laboratory training, pseudo-Renaissance candles of such fantastic form and hues as to be avidly bought by many rich visitors staying in luxurious New York hotels. The candles drip neither wax nor color and still sell for high prices today. In other ventures, less strange yet equally enterprising, he has actually become wealthy and he is highly esteemed in Newburgh today.

...THE GREATLY FORTUNATE

Fifty years or more

PEYTON ROUS: 1909-1959
BERNARD LUPINEK: 1911-1961
MOSES KUNITZ: 1913-1963
ANTHONY CAMPO: 1917-1967

Forty years or more

PEYTON ROUS: 1909-1949
BERNARD LUPINEK: 1911-1951
MOSES KUNITZ: 1913-1953
ANTHONY CAMPO: 1917-1957
CLARA LYNCH: 1918-1958
PHILIP MCMASTER: 1919-1959
STANLEY SVOBODA: 1921-1961
REBECCA LANCEFIELD: 1922-1962
THEODORE NADEJE: 1923-1963
GEORGE KARDA: 1924-1964
WALTHER GOEBEL: 1924-1964
THOMAS CAWLEY: 1925-1965
ARISTEA STERGIOU: 1925-1965
JOHN NELSON: 1925-1965
CHRISTOPHER MURRAY: 1926-1966
CHARLES GALATI: 1926-1966
NORMAN STOLL: 1927-1967

Twenty-five years or more

PEYTON ROUS: 1909-1934
BERNARD LUPINEK: 1911-1936
MOSES KUNITZ: 1913-1938
ANTHONY CAMPO: 1917-1942
CLARA LYNCH: 1918-1943
PHILIP MCMASTER: 1919-1944
STANLEY SVOBODA: 1921-1946
REBECCA LANCEFIELD: 1922-1947
THEODORE NADEJE: 1923-1948
GEORGE KARDA: 1924-1949
WALTHER GOEBEL: 1924-1949
THOMAS CAWLEY: 1925-1950
ARISTEA STERGIOU: 1925-1950
JOHN NELSON: 1925-1950
CHRISTOPHER MURRAY: 1926-1951
CHARLES GALATI: 1926-1951
NORMAN STOLL: 1927-1952
EUGENE OPIE: 1904-10, 1941-60
ROBERT MILLER: 1926-46, 1954-59
ALEXANDRE ROTHEN: 1927-1952
BERNARD MATTIMORE: 1927-1952
RENÉ DUBOS: 1927-42, 1944-54
MICHAEL BROWN: 1928-1953
LEWIS LONGSWORTH: 1928-1953
MARGERY PEDERSEN: 1928-1953
GERTRUDE C. SMITH: 1928-1953
GERTRUDE ROGERS: 1929-1954
GEORGINA DREW: 1929-1954
ALICE LOCKIE: 1929-1954
JOHN MCALISTER: 1930-1955
WILLIAM DUTHIE: 1930-1955
MERRILL CHASE: 1932-1957
LYMAN CRAIG: 1933-1958
WILLIAM TRAGER: 1933-1958
JEANNE ROSS: 1934-1959
LILLIAN GREGG: 1936-50, 1954-65
MARY HAYES: 1937-1962
WILLIAM STEIN: 1937-1962
RUTH MANDLEBAUM: 1937-1962
ARMIN BRAUN: 1938-1963
HAROLD MILLARD: 1938-1963
DAVID LLOYD: 1939-43, 1946-67
STANFORD MOORE: 1939-1964
MARGARET BROADBENT: 1940-1965
REGINALD ARCHIBALD: 1940-1965
WILLIAM EVERLY: 1941-1966
VINCENT DOLE: 1941-1966
JOSEPH KLECAR: 1941-1966
KENNETH SCHMITT: 1941-1966
VINCENT ALLFREY: 1941-1966
MACLYN MCCARTY: 1941-1966

don't come back in order to brag. (Indeed sometimes they couldn't do so.) They just want to tell their understanding, laboratory friends how they have fared. Most of them have fared well but recently one has reappeared who almost literally bummed his way around the world, often at the edge of starvation because he would nowhere stop and work long enough to be safe. He now has a smattering of several languages and he's very cheerful. We've suggested that his right place might be on the staff of some anthropological venture.

I turn now to ourselves. Why have we stayed here so long? The emphasis on age as determining gifts at the dinner justifies this question. To try and cite the multifarious, decisive, personal motives, some of them scarcely realized by their owners, would be absurd. Yet there is one simple, basic reason which holds for us all. It has seemed best for our lives.

The bestowal of gifts made plain that we belong in three distinct categories: —

Those who have stayed for twenty-five years or somewhat more are now mostly in their fifties, that is to say at or near the height of their capabilities. Here in the University they have reason to think that these abilities have most scope. Others, of equal caliber, far outnumbering the group who remain, have gone elsewhere because of opportunities special to them. The seventeen who have been here for more than forty years have reached or passed the age which would be regarded as the professorial climacteric in most academic institutions, and by administrative rote they would be cast loose from these latter without regard to how fruitful they are, to fend for their further years as best they can. Not so here! They are maintained because they have always been of such stuff that their work remains rewarding. The four ancients of days who are still on the staff, after more than fifty years of service, are still young in what they discover.

To disregard categories and sum up: we are a solidarity in our devotion to The Rockefeller University.

History of the University

Those of us here longest have had the good luck to witness, almost from its beginning, the emergence and growth of the University as a pioneer venture. When it was first started, as The Rockefeller Institute for Medical Research, the very idea of planned attempts to discover seemed presumptuous to not a few scientists, these believing it akin to inspiration. Indeed some of those who had already discovered so doubted their power to find out more as to decline to come to the Institute, and instead remained secure in the academic niches to which they had attained. After several promising men — who seemed quite odd and furthermore were of European origin — had been appointed to the staff some smart critics enjoyed terming the Institute a museum. Science was then supposed by many persons to be an ascetic occupation (and indeed it can be hard on an enthusiast's wife when he gets a new idea); so when a library and dining hall having singular beauty and ease were built after a few years as an adjunct to the laboratories in Founder's Hall they were denounced as a waste of money by some onlooking volunteers. The idea was prevalent then that scientists do their best when only moderately comfortable, and should take their lunches as a matter of course on folding chairs. Indeed is was precisely such chairs that the new dining hall supplanted with the aim, soon justified, of encouraging long, productive discussions while still at table. When a division for research into plant diseases as part of "medical research" was started, what witty attacks followed! But these ceased when one of the new workers crystallized the first virus ever, the one causing tobacco mosaic disease.

A fairly recent feature which still makes some visitors to The Rockefeller University uneasy is the introduction into our working lives of music, poetry and philosophy, superb architecture, assembly rooms adorned with modern art, all existing amidst exquisite gardens. Even the new laboratories have functional beauty! All this bodes well for the future since the word *scientia* in its original use included all knowledge. Humanism will have its way in the end. For are we not of man- and woman-kind?

The significance of the gifts from the Board of Trustees that will last longest is the thought behind them. Ours was a surge of gratitude for this thought when they were received. To what a series of descendants will most of the gifts be passed on as a family heritage, and cherished not alone for themselves but far, far more for what they will still betoken!

THE ROCKEFELLER UNIVERSITY

NEWS

Honoris Causa

Among the members of the faculty receiving honorary degrees during the commencement season were:

PROFESSOR THEODOSIUS DOBZHANSKY, Doctor of Science, Syracuse University: "Brilliant in research and gifted in teaching, you have helped train a whole new generation of geneticists . . . Sensitive to the cultural as well as the biological aspects of evolution, you have given man a better understanding of himself and the conditions under which his destiny depends."

PROFESSOR RENÉ DUBOS, Doctor of Science, Wesleyan University: "Distinguished scientist that you are, you press for a genuinely fruitful marriage of scientific and humanistic studies. . . . [We] are deeply indebted to you for the contagion of this hope and purpose and for the mind that pursues it."

PROFESSOR FRITZ LIPMANN, Doctor of Science, Harvard University, who was cited as "A productive scientist of vision and sensitivity; a patient and inspiring explorer of the secrets of the cell."

PROFESSOR GEORGE PALADE, Doctor of Science, Yale University, for his "brilliant scholarship, combining precision, clarity, and wisdom . . . and creativity and workmanship and excellence as a teacher of young investigators."

DR. PEYTON ROUS, Doctor of Science, University of Hartford: "We recognize you as a friendly neighbor as well as a distinguished scientist . . . We join the entire world in expressing appreciation for your contributions to mankind."

PROFESSOR DONALD R. YOUNG, Doctor of Letters, Lafayette College: "You were prepared to use learned diagnosis to lead our armed forces toward racial democracy . . . you sought to have science lead to the realization in action of 'the unity of mankind' which is for you the essential reality and for us all the ultimate goal."

...from the bookshelf

THE BIOLOGY OF ULTIMATE CONCERN, by Professor Theodosius Dobzhansky. New York: The New American Library, 1967. 152 pages.

"Organisms other than men have the 'wisdom of the body'; man has in addition the wisdom of humanity." This is in the second paragraph of Theodosius Dobzhansky's new book, and is a key to the development of his personal credo on the meaning of life. "Man, this mysterious product of the world's evolution, may also be its protagonist, and eventually its pilot," he predicts.

This work, the second in the "Perspectives of Humanism" series, planned and edited by Ruth Nanda Anshen, deals primarily with philosophical problems related to biology. In a review appearing in the October issue of *Natural History*, Dr. Jane Oppenheimer of Bryn Mawr says: "This volume will be of great interest to biologists who admire Dobzhansky's work in his own field and who will be curious to see where he is led by his incursions into others." Those "others" include philosophy, anthropology, paleontology, theology, and psychology. The book also evaluates the work and beliefs of Teilhard de Chardin, the eminent theologian and paleontologist who attempted to reconcile the apparent gap between science and religion. "Self-assertion which makes an individual break away from humanity," says Dr. Dobzhansky, "is inimical to the growth of the person as well as of humanity. Healthy growth is fostered by love and arrested or stunted by egocentrism or egoism. Self-fulfillment is possible only through love for, and in a spiritual union with, others."

He then quotes Teilhard: "The consummation of the World, the gates of the Future, the entrance into the Superhuman, they do not open either to a few privileged or to one chosen people among all peoples! They will admit only an advance of *all together*, in a direction in which all together could join and achieve fulfillment in a spiritual renovation of the Earth."

In his "Preface ad Hominem" Dr. Dobzhansky says of his book: "Whatever expertness I may possess is in biology, more precisely in evolutionary genetics. This is no warrant for embarking on speculations in the realms of philosophy and religion. Such specula-

tions are often regarded, among scientists, as regrettable foibles or even as professional misdemeanors. They are as often as not kept secret, for being caught at them is liable to damage a scientist's professional reputation. Let me, then, try to make clear the nature of my enterprise. This is not an attempt to derive a philosophy from biology, but rather to include biology in a *Weltanschauung*. It will probably be fairly generally admitted that biology is relevant to philosophy. Perhaps it is even more relevant than most other sciences. A biologist, qua biologist, may therefore be competent to sort out and to present facts, theories, and ideas which he believes to be of general humanistic interest and import."

President Bronk delivers the dedication address at the Monsanto Laboratory of the Life Sciences at Washington University in St. Louis on May 19th. Rockefeller University graduate Johns W. Hopkins III, Ph.D. 1960 (SEATED IN REAR), *is the new Chairman of the Department of Biology for which this additional building was constructed.*

Scientific Writing

DR. WOODFORD's "Sounder thinking through clearer writing," published as the lead article in the book issue of *Science* (1967, 156:743-745), has evoked a widespread favorable response from the scientific community. The author strongly criticized the writing of some scientific authors in the following terms:

He takes what should be lively, inspiring, and beautiful and, in an attempt to make it seem dignified, chokes it to death with stately abstract nouns; next, in the name of scientific impartiality, he fits it with a complete set of passive constructions to drain away any remaining life's blood or excitement; then he embalms the remains in molasses of polysyllable, wraps the corpse in an impenetrable veil of vogue words, and buries the stiff old mummy with much pomp and circumstance in the most distinguished journal that will take it.

His concern, he points out, goes beyond his own preferences.

I have definite and clear-cut evidence that the scientific writing in our journals exerts a corrupting influence on young scientists. . . . Bad scientific writing involves more than stylistic inelegance: it is often the outward and visible form of an inward confusion of thought. The scientific literature at its present standard distorts rather than forms the graduate student's view of scientific knowledge and thought, and corrupts his ability to write, to read, and to think.

Dr. Woodford has been led to these conclusions in the course of working as Executive Editor of the *Journal of Lipid Research* and teaching the principles of scientific writing to graduate students and faculty members at Rockefeller. He suggests that the undesirable situation could be remedied if all universities would recognize the necessity for training in writing, with its concomitant training in thinking, as an essential part of scientists' education.

To this end he has assembled a manual on the teaching of scientific writing, which is to be used by other research scientists when planning courses on this subject in their own graduate schools. The applicability of the manual in various universities will be discussed by 36 participants in a workshop on the teaching of scientific writing to be held at Rockefeller and then at Arden House in mid-August, and the manual will subsequently be published by The Rockefeller University Press.

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ℭ In May, President Bronk and Dr. Norman Stoll were elected Honorary Members of the Rockefeller University Chapter of the Sigma Xi, in appreciation for their "enthusiastic efforts in the establishment of the Chapter at The Rockefeller University, for their continued interest and participation in Chapter activities and for the added sense of academic unity that the Chapter's presence brings."

Honorary Members elected in previous years include Doctors George W. Corner, Moses Kunitz, Clara J. Lynch, John H. Northrop, Eugene L. Opie, and Ernest W. Smillie.

ℭ Professor Jules Hirsch, Dr. Howard Rasmussen PH.D. 1959, and Dr. Irving H. Goldberg PH.D. 1960, were elected Members of the American Association of Physicians, in recognition of their achievements in the advancement of scientific and practical medicine, at the 83rd Annual Meeting of the Association on May 3. The Association is dedicated to "continuing and promoting a heritage of excellence" in medical education, and the members number only 250. Faculty and trustees of the Rockefeller, who are already members of the Association, include President Bronk; Professors Ahrens, Dole, Dubos, James Hirsch, Kunkel, McCarty, Opie, Rous, and Van Slyke; and Dr. Robert Loeb, trustee.

ℭ The Rockefeller University and the Netherlands Universities Foundation for International Cooperation — with financial assistance from NATO — conducted an International School of Statistical Mechanics in The Hague during June and July. Sixty-five graduate students from twenty countries attended. Opening addresses were given by the United States Ambassador and the Dutch Minister of Education. Professors E. G. D. Cohen, Mark Kac, and George E. Uhlenbeck were among the faculty of ten.

ℭ Professor Maclyn McCarty was elected first vice president of the New York Heart Association at the meeting of the Board of Directors on May 22.

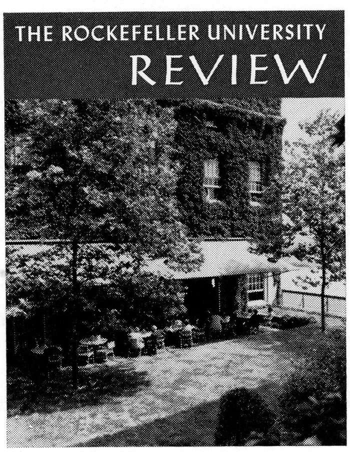
ℭ Dr. Robert W. Leader was elected Treasurer of the New York State Society for Medical Research at the annual meeting of the members of the Society on June 7.

◖ The Fifth International Teletraffic Congress held a week-long meeting in Caspary Auditorium this spring. The theme of the Congress — which was sponsored by the Bell System and the United States Independent Telephone Association — was the application of the theory of probability to telecommunication research, engineering, and administration.

◖ The Sloan Rockefeller Fellows of the Columbia University Graduate School of Journalism were the guests of the University at an all-day seminar in May. President Bronk and Professors Carl Pfaffmann and Donald Griffin spoke to the young writers on the theme, University-Government Relations in the Field of Science.

◖ Professor R. B. Merrifield was one of the principal speakers at the Anniversary Meetings of The Chemical Society in Exeter, England in April. Earlier this year Professor Merrifield and Professor Rollin D. Hotchkiss each delivered one of the Burroughs Wellcome Massachusetts General Hospital Lectures.

◖ The annual concert of the Children's Orchestra, under the direction of Dr. Hiao-Tsiun Ma, was held in Caspary Auditorium in May.



FACULTY and students find the terrace of Welch Hall pleasantly shaded for outdoor dining in the summer. Photograph by Joseph Barnell.

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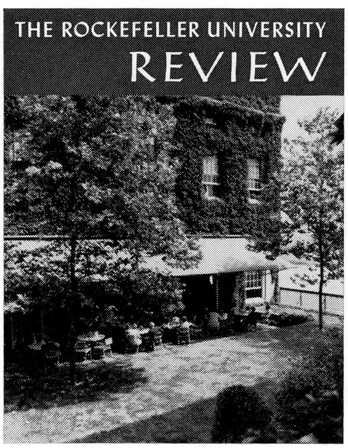

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