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THE ROCKEFELLER UNIVERSITY

news and notes

JUNE-JULY 1976 VOLUME 7 NUMBER 10

Seventeen Receive Degrees at Eighteenth Convocation; 75th Anniversary Celebrated with Three-Day Reunion

Seventeen young men and women received their Ph.D. degrees on Wednesday, June 9, in ceremonies marking the culmination of three days of celebration of the University's 75th anniversary, during which hundreds of alumni and former faculty members returned to the campus. In addition, nine men who have played significant roles in the history of the University and in the advancement of science were awarded honorary doctor of science degrees by President Seitz.

The nine honorary degree recipients were: Philip Bard, professor emeritus of The Johns Hopkins University School of Medicine and a major force in brain research, who served on the Rockefeller board of trustees for 17 years; George W. Corner, scientist, teacher, and author of *A History of The Rockefeller Institute 1901-1953*; Joseph S. Fruton, Eugene Higgins Professor of Biochemistry at Yale University, who began his distinguished career at Rockefeller in 1934; biophysicist H. Keffer Hartline, 1967 Nobel Prize winner and a member of the Rockefeller faculty since 1953; Lindsley F. Kimball, a humanitarian who has served many organizations, including this University as trustee for 28 years; George E. Palade of Yale University, who was a member of the Rockefeller faculty for 27 years and 1974 co-winner of the Nobel Prize for his pioneering work in cell biology; Keith R. Porter, another long-time member of the University's world-renowned cell biology group, who is now associated with the University of Colorado; James A. Shannon, guiding force of the National Institutes of Health from 1955 to 1968 and a professor at the University from 1970 to 1975; and physicist George E. Uhlenbeck, co-discoverer of "electron spin" and a member of the University's faculty since 1961.

Commencement was held in Caspary Auditorium at 2 P.M. As is the University's custom, the proceedings were limited to talks by presenters who

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Seated, left to right: Carl Pfaffmann, David Rockefeller, James Hirsch, President Seitz, Patrick Haggerty, Maclyn McCarty. Second row: Joseph Fruton, James Shannon, Lindsley Kimball, George Corner, George Palade, Keith Porter, H. Keffer Hartline, Albert Claude, Victor Wilson, Philip Bard. Rear: George Uhlenbeck, Alexander Bearn, Mark Kac, Christian de Duve, Floyd Ratliff.

President Seitz Announces Retirement

Frederick Seitz, president of the University since 1968, has announced that he plans to retire from his post after a successor has been appointed by the board of trustees.

In a letter written on June 8 to Patrick E. Haggerty, chairman of the board, President Seitz said that he felt it was important to abide by the University's regulations with respect to the official retirement age. His 65th birthday is July 4. However, he said he was fully prepared to serve until the board has named a successor. In his letter, he described his service as president as "a great honor. Working with our remarkably talented scientists, students, and staff—as well as with such active and concerned trustees—has been tremendously satisfying and rewarding."

In reply, Mr. Haggerty accepted the resignation with "deep respect and regret." He said that he would appoint a presidential search committee which he expected would take at least one year to complete its duties. A successor, he added, would probably not be

ready to take office until some time in mid-1978.

"The trustees have been enormously proud of your leadership as chief executive officer," Mr. Haggerty

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Sunderlin Retires

C. Eugene Sunderlin retired on June 30 as vice president of the University, a post he has held since 1969. He and Mrs. Sunderlin are returning to their home in Washington, D.C.

During his eight years on the Rockefeller campus, Dr. Sunderlin was involved in many aspects of the University's operation, to which he brought the knowledge and experience of a long career in science, education, government, and industry. In addition to his duties as secretary of the board of trustees, he had major responsibilities in connection with the University's building and maintenance programs, cooperative projects with neighboring

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EIGHTEENTH CONVOCATION

continued from page 1

explained the significance of the degree recipients' work.

Reunion and anniversary events began on Monday, June 7, with a day of scientific symposia. History day activities, on Tuesday, June 8, included talks by historian James Flexner, son of The Rockefeller's first director, Simon Flexner, Professor Saul Benison of the University of Cincinnati, Vice President Maclyn McCarty, Professors René J. Dubos, H. Keffer Hartline, Frank Brink, Jr., Board Chairman Patrick E. Haggerty, Trustee David Rockefeller, and President Seitz. On Tuesday afternoon, South Lab was dedicated in honor of Detlev W. Bronk and renamed The Detlev W. Bronk Laboratory (see photos page 8).

Following are condensations of the remarks made by the commencement presenters. The degree recipients' names appear first.

HAROLD BURGER

Walter Doerfler

Harold Burger had already become interested in molecular virology during his undergraduate years at the University of Chicago. It was, therefore, not surprising that he appeared in the virology laboratory soon after his arrival at Rockefeller University. When I accepted a position in 1972 at the Institute of Genetics in Cologne, Germany, Harold received permission to continue research on adenoviruses at this institution. Igor Tamm, Frank Brink, and later James Hirsch encouraged both Harold and myself in this unconventional, but not atypical, program for a graduate fellow from Rockefeller University. In his thesis, entitled "The Integration of Adenovirus DNA into the DNA of Productively Infected Human Cells," Harold adduced evidence for the occurrence of adenovirus DNA sequences covalently linked to the host genome in permissive human cells. This high molecular weight form of adenovirus DNA has been studied in great detail. The adeno-

virus system enables one to investigate in different cell types the exchange of information between the host genome and foreign viral DNA. Similar events leading to exchange between different parts of the cellular genome may, however, also take place in uninfected cells. The significance of this mechanism is only beginning to be recognized and may prove interesting beyond the field of virology. Harold finished the experimental part of his thesis work in 1974 and immediately enrolled in an intensive three-year M.D. program at the Albert Einstein College of Medicine.

DANIEL G. CALDI

Heinz R. Pagels

Four years ago Daniel Caldi came from the biochemistry department to pursue his studies in theoretical physics. It has been a fruitful transplantation. One of Dan's first research projects in theoretical physics was to calculate the magnetic moments of the hyperons. Hyperons are extremely short-lived subnuclear particles that have played an important role in our contemporary understanding of fundamental particle interactions. Some of these hyperon magnetic moments have been measured by Professor Rodney L. Cool of our experimental physics department. After this preliminary research project, Dan was given the problem of resolving the conflict between the quark model and the collective model of subnuclear particles. The quark model is an organizing principle of subnuclear matter much as Mendelev's periodic table organizes the chemical elements. While very successful, the quark model does not explain the interactions of pions with matter. They are, however, explained by the collective model. What resulted from Dan's thesis research was a reconciliation of two models which required discarding long-held prejudices about the structure of matter. The experimental and theoretical consequences of the new viewpoint are still under investigation.

LILY ANNE CONRAD

Donald W. Pfaff

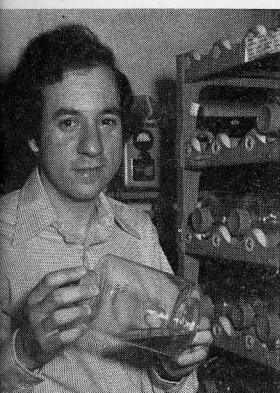
The hypothalamus is a small bit of brain tissue which helps to control blood pres-

sure, body temperature, food and water intake, as well as many aspects of reproductive function. Yet the pathways taken by hypothalamic nerve cell axons, through which these important controls are exerted, were not known. In fact, many anatomists seemed to regard the hypothalamus only as a very dense little jungle. Lily Conrad entered this jungle with characteristic energy and determination, scalpel flashing and micropipette at the ready. Using a new neuroanatomic technique, she described the exact pathways followed by axons from specific hypothalamic cell groups. She was perceptive in this choice of research problem, and industrious in the application of this new autoradiographic technique. As a result, her published work is receiving wide attention. For instance, interesting differences which she found between projections from different hypothalamic cell groups make good sense in terms of previous physiological results. One important implication of her work is that she has demonstrated the anatomical means by which pituitary hormone outputs are coordinated with behavioral responses during reproduction. Lily is concerned about the application of new neurological knowledge to problems of human disease. For this reason she will enter Harvard Medical School in September.

PETER D'EUSTACHIO

Gerald M. Edelman

The great organizing theory of immunology is known as clonal selection. Its main idea is that, even before encountering a foreign molecule or antigen, an animal has the different kinds of antibody-bearing cells (or lymphocytes) necessary to recognize that antigen. How is such a repertoire of different antigen-binding cells generated during embryonic development? Peter D'Eustachio, using ingenious methods, studied the capacity of lymphocytes from individual fetuses of inbred mice to bind a variety of synthetic and natural antigens. He found that the repertoire of antigen-binding cells of different specificities filled uniformly during development, without evidence of the influence of foreign antigens. Furthermore, he showed that in a major immunological organ, the spleen, the fre-



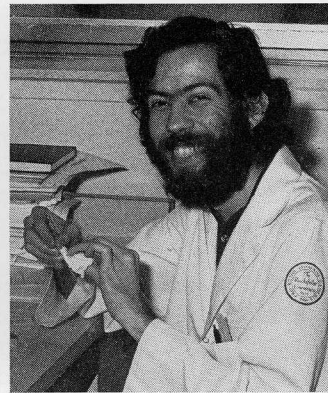
BURGER



CALDI



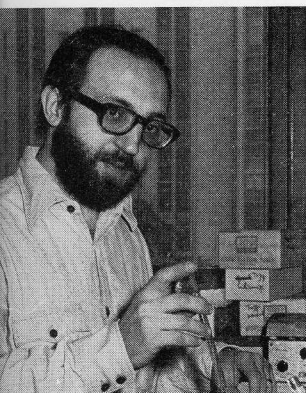
CONRAD



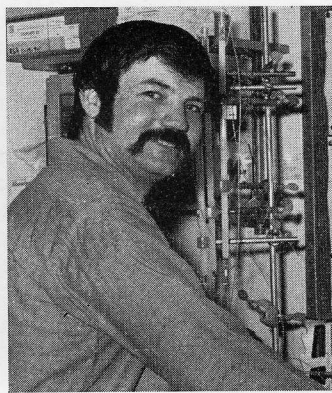
D'EUSTACHIO



DICKSON



ENE A



GRIFFITH



HAMBOURGER



KARN



KRIEGER



LIEBERBURG

quency and rate of appearance of antigen-binding cells is under control of at least one gene. This suggests that there is a general means of growth control that operates in the developing immune system. These conclusions are new and important to a complete understanding of the theory of clonal selection. They were deduced from the results of meticulously planned and beautifully executed experiments. In the course of this work, Peter mastered immunology, protein chemistry, and genetics, and he is now making large inroads upon developmental biology. This far-ranging approach, coupled with hard work and great esthetic sense, has resulted in the emergence of a scientific colleague with whom it is a privilege to work. His colleagues here look forward to working with Peter in the coming year.

ELIZABETH DICKSON

Hugh D. Robertson

When Elizabeth Dickson came to Rockefeller, she was already an accomplished scientist in the field of nucleic acid hybridization, and had been the principal author of an important paper establishing for the first time the probable size of the basic genetic unit in a higher organism. Within six months of joining our group, she was largely responsible for demonstrating that RNA labeled with iodine could be prepared, analyzed, and used to determine specific sequences in RNA molecules which were previously inaccessible to this kind of systematic study. Next she undertook a systematic review of current knowledge about the possible role of RNA in gene regulation, and her keen theoretical insight led us to propose several novel hypotheses. She also contributed to studies on sequence and structure of RNA-processing sites and enzymes in bacteria and in human tissue culture cells. Turning her attention to viroids, she was able to solve the two most important problems relating to these plant disease agents. Taking advantage of her techniques for studying iodinated RNA, she was able to demonstrate for the first time the complexity and lack of relatedness of several viroid RNA species. Her studies suggest that such RNA species could be important for the gene regulation of a number of cell types.

VINCENZO L. ENEA

Norton D. Zinder

Enzo Enea joined our laboratory after a tutorial with me in genetics. The first task that Enzo set himself was to continue an analysis of genetic recombination in phage fl. Experiments by others in the lab had led to the conclusion that an intermediate in genetic recombination was a long heteroduplex DNA molecule. He synthesized in vitro molecules of the kind envisaged to occur in vivo and showed that they segregated as predicted, thus supporting the hypothesis relating to the role of heteroduplex DNA in recombination. The next task that Enzo took on was an attempt to isolate for phage fl defective interfering particles, which generally are deletions of portions of the genome of a virus. Since the virus under study has a filamentous rather than the usual spherical shape, it should be possible to obtain deletion mutants of all sizes, as long as they retain any structural elements of the DNA molecule which are necessary for replication and for the assembly of the particle. After many passages of the phage at high multiplicities of infection, such particles were isolated. They have been analyzed both physically and genetically for their genome content. Most interestingly, they tend to have a tandem duplication about the position of the origin of DNA replication. In vitro construction of molecules lacking this duplication by use of appropriate DNA-cutting

enzymes yields an unstable particle that quickly evolves on further growth to give a duplication and even triplication of this region. Crosses between normal phage and the deletion phages also allowed a totally independent and corroborative test of our notions on the nature of genetic recombinational intermediate of phage fl.

OWEN W. GRIFFITH

(Degree Granted in absentia)

The topic of Owen W. Griffith's thesis was "Chemical Mechanism of Action of Carnitine Acetyltransferase." His research advisor was Leonard B. Spector.

ROBERT M. HAMBOURGER

(Degree Granted in absentia)

The topic of Robert M. Hambourger's thesis was "Determinism and Fatalism." His research advisor was Saul A. Kripke.

JONATHAN KARN

Vincent G. Allfrey

Jonathan Karn's thesis is unusual; it is a successful exercise in scientific detente, initiated as a collaboration between our laboratory and G. Georgiev's laboratory in Moscow. Jon began the project there, comparing techniques for the isolation of small nuclear particles containing newly synthesized RNA molecules. On his return, he improved the isolation procedures and began to characterize the proteins associated with newly synthesized RNA chains. His results indicated that a relatively small set of nuclear basic proteins plays a key role in the organization of nascent RNA molecules. Several of these proteins were purified and analyzed, and some were shown to contain an unusual amino acid, *N,N'*-dimethylarginine. In addition, Jon has studied the synthesis and phosphorylation of chromosomal proteins during the cell cycle, and followed changes in nuclear protein composition which accompany gene activation in lymphocytes.

DAVID E. KRIEGER

Bruce Merrifield

The reversible enzymatic acetylation of histones plays an important role in the regulation of chromosome structure. To understand the mechanism of this control, David Krieger has investigated the order and rate of release of acetyl groups from histones by a nuclear deacetylase. In this interdisciplinary study, protein isolation and purification were carried out in Professor Allfrey's laboratory and peptide synthesis in ours. Deacetylation was found to depend on the size and structure of the substrate. Furthermore, data from a 37-residue N-terminal fragment of histone H4, containing a [¹⁴C]acetyl at lysine 12 and an [³H]acetyl at lysine 16 showed that the enzyme can remove acetyls from the two positions independently and at similar rates.

IVAN M. LIEBERBURG

Bruce S. McEwen

When Ivan Lieberburg came to Rockefeller, I remember being very much impressed with his affinity for laboratory research on how the brain works. Ivan, however, had different ideas and turned his attention for several years to field research in animal behavior, but not before studying neurophysiology, developmental biology, and genetics. His work in Central America, Gabon, and Bermuda was fruitful enough to result in a number of publications in professional journals, and by the time he started thesis research in my laboratory, he knew a great deal about the ethology and ecology of tropical reef fish, African army ants, and West African fruit bats. When in 1974, he returned to the laboratory and to the biochemistry of brain function, Ivan's interests crystallized around the bio-

chemical interactions of the "male" hormone, testosterone, with the brain. Ivan accomplished his thesis research in a remarkably short time. Among his achievements was the first demonstration of the conversion of testosterone to the female hormone estradiol in the brain of the albino rat. This estradiol is believed to interact with receptors in the brain cells, where it is produced, and to be the hormone actually responsible for promoting male sexual behavior in the adult rat. Ivan also obtained evidence for the conversion of testosterone to estradiol in the brain of the newborn male rat. We are currently testing the hypothesis that this estrogen actually mediates the effects of testosterone on the sexual differentiation of the brain.

DAVID L. LIEBERWORTH

E. G. D. Cohen

The approach to thermal equilibrium of a dilute gas, where only pairs of molecules collide, was already studied by Boltzmann. The moderately dense gas, where more complicated collisions occur, has only been investigated recently. David has for the first time followed the approach to equilibrium here from beginning to end for a special case on the basis of kinetic theory. His calculations agree well with experimental results obtained recently. This proved not only that David is not afraid of involved mathematical and computer calculations, but also that he has become an original and competent physicist. David has decided to start a new career in law. Physics' loss may well be law's gain. Were not the only two Ph.D.s in physics of Leiden University who in this century received the Nobel Prize Ehrenfest's student Jan Tinbergen and Kramers's student Tjalling Koopmans—both in economics?

LEE L. RUBIN

Alexander Mauro

One of the truly intriguing structures in neurobiology is the synapse, namely, the region of contact between two nerve cells or a nerve cell and a muscle cell. This latter synapse—commonly referred to as the neuromuscular junction—has been studied for decades in a variety of invertebrates, such as lobster and crayfish. While many features of the physical and chemical mechanisms operating at the neuromuscular synapse are known, more remain to be discovered. Lee Rubin's research interests focused on this structure, and he proceeded to study it by using tissue culture methods. This entails dissociating muscle cells and nerve cells from chick embryos and growing them under controlled conditions with appropriate nutrients. Such research requires the utmost skill, patience, and perseverance. Lee has all these qualities, in addition to intellectual drive and an enthusiasm which is truly inspiring. By studying the structure and the electrical properties of growing nerve fibers in the presence of

black widow spider venom and other chemical agents, he has made new and significant observations. Based on his exciting results he has proposed a set of hypotheses concerning the nerve cell membrane and underlying microtubules and microfilaments which may elucidate how the fine branches of the nerve cell, in intimate contact with the muscle fiber release minute quantities of neurotransmitter, e.g., acetylcholine, and thus excite the fiber to contract.

RUTH ALLISON RYAN

Donald Davidson

Much contemporary philosophical discussion of the mind-body problem concerns the relations between various levels of generalizations that bridge, or try to bridge, the gaps between the levels. Allison Ryan was especially well prepared to undertake the analysis of the logical and epistemological properties of psychological laws. She majored in chemistry and went on to study neurophysiology and physiological psychology, as well as philosophy. Above all, she was fortunate to work with Professor Floyd Ratliff, who was able to direct her studies in physiological psychology as only a scientist alert to the philosophical issues could. Allison's thesis includes a detailed discussion of the conceptual problems that arise in formulating, testing, and applying nomological generalizations that connect physiological concepts with psychological concepts. Her careful examination of a number of recent experiments in the field of visual perception indicates that there is no sharp dichotomy between heterogeneous laws and others; rather, there is a continuum of cases. It is not probable that this result will close the books on the mind-body problem, but it does invite us to substitute for one original crude issue a number of better defined problems.

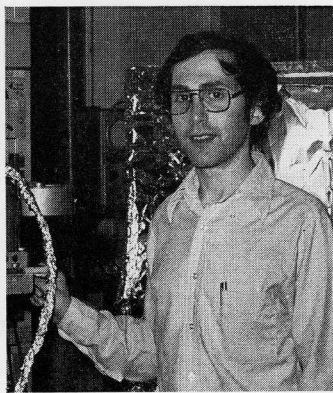
ADINA SCHWARTZ

Joel Feinberg

Before she began her dissertation on the social philosophy of John Stuart Mill, Adina Schwartz concentrated on the theories of human nature and of human society in the philosophies of Plato and Aristotle. In her thesis, she considers in analytic detail how social and individual ideals are logically related in the philosophy of a modern writer whose concerns she shows to be more relevant to our twentieth-century problems than is generally supposed. She shows that Mill's advocacy of total liberty in the "self-regarding sphere" is a plausible social policy, and one that is justified in Mill's philosophy, in part as a means to the general fulfillment of Mill's ideal for individuals—the promotion of distinctively human excellence of intellect and character. Her precise mapping of the logical architecture of Mill's arguments obviates misinterpretations and facile rejections, and is a valuable contribution in its own right to the critical literature.



LIEBERWORTH



RUBIN



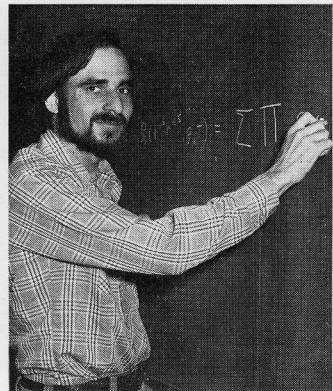
RYAN



SCHWARTZ



STACEY



ZIFF

DENNIS W. STACEY

Vincent G. Allfrey

Dennis Stacey's research has involved a combination of biochemistry and microsurgery on single cells grown in culture. He achieved what had never been accomplished before: the transfer of hemoglobin messenger-RNA from the red cells of birds into human cancer cells. The injected human cells not only could synthesize the hemoglobin characteristic of the foreign species, but also could divide, giving rise to daughter cells that continued to synthesize avian hemoglobin. Dennis also introduced innovations in the techniques for microinjection of concentrated protein solutions into small cells. He proceeded to study the factors which control the migration of proteins between the cytoplasm and the nucleus, and obtained definitive proof that the nuclear envelope functions as a highly selective intracellular barrier.

ROBERT M. ZIFF

E. G. D. Cohen

Bob's real interest is in how the basic principles of physics, when applied to a particular physical system, lead to a detailed understanding of its properties. Usually this can only be achieved for a system of sufficient simplicity such as, for instance, the ideal Bose-Einstein gas: a gas consisting of particles that move freely according to the laws of quantum mechanics and whose statistical behavior follows a prescription first proposed by the Indian physicist Bose. After Einstein, many physicists studied this system. Bob has now written, with help from in particular Professor Emeritus Uhlenbeck—who has a lifelong interest in this system—what may be called the definitive work on this gas. Bob has proved to be an independent and original thinker, who asks his own questions and does not rest before he has obtained a satisfactory answer. In other words, he is a real scholar.

HONORARY DEGREES

PHILIP BARD

Victor J. Wilson

In honoring Philip Bard, we recognize his outstanding contributions as scientist and educator. Bard came to Johns Hopkins as a young man, in 1933, as director of the physiology department. There he built up a distinguished neurophysiology laboratory in which he followed his varied interests. His work included pioneering studies on long-term decorticate and decerebrate animals that have provided insight into the role of various regions of the brain in the control of behaviors such as rage. It also included an interest in motion sickness. Some experiments he did in the 1940s have raised problems that have not yet been answered. Most important, however, was his use of the technique of making restricted lesions in

the brain for localization of sensory function in the cortex. At the time he began these studies, information about such localization was lacking. In ingenious experiments he was able to abolish the placing reaction, evoked by stimuli to the skin and mediated by the cortex, by lesions in the post central gyrus, thus localizing cutaneous sensation. At the same time, another technique for approaching this problem was developed in Bard's laboratory. With this method, potentials evoked by natural stimuli delivered to different areas of the skin were used for localizations. The results obtained with this technique confirmed and extended those obtained by the lesion method. All of us who at one time have used potentials evoked by discrete natural or electric stimuli for study of organization in the brain owe a debt to Bard and his colleagues for this powerful tool, and we can still benefit by reading the elegant papers written almost 40 years ago.

GEORGE W. CORNER

Alexander G. Bearn

George Washington Corner is a man of formidable aspect: anatomist, embryologist, medieval Latinist, and historian. A classicist who strolled companionably with Plautus and Cicero until, by happy circumstance, he chanced on an article by Theobald Smith with the earthy title "Texas cattle fever and its transmission by ticks." Thenceforth biology claimed him and the classicists strolled alone. Little did he then know that 60 years later, he would be on this campus writing our history in a building dedicated to the memory of Theobald Smith. Graduate of Johns Hopkins Medical School, he was bent on a career in gynecology until he fell under the spell of Florence Sabin and embarked on the task of understanding the physiological and biochemical mechanisms underlying the timeless rhythm of the female biological cycle. Studies on the ovary directed his attention to the corpus luteum, a yellow body of uncertain function, first recognized by Fallopi in 1561. With brilliance and pertinacity, he discovered that the little yellow body secreted a hormone which he isolated and named progesterin or progesterone, and which allowed the fertilized ovum to become safely cradled in the uterus. Without this gland faithfully secreting its hormone as month succeeds month, the biological rhythm of the female cycle could not be. His discovery helped to lay the foundation for modern birth control by oral contraceptives. Imaginative intellectual architect of scientific institutions, his administrative leadership placed the University of Rochester School of Medicine and the Carnegie Institution of Washington in Baltimore on pinnacles of academic excellence. From Baltimore he came to The Rockefeller University where he wrote our history while he dwelt among us, enriching our lives with his scientific wisdom and his knowledge

of medical history. A scientist whose ink never clogs his pen, his writings on the history of medicine combine an enviable felicity of expression with deep scholarship. How appropriate that this bicentennial year should find George Washington Corner serving as he has with so much distinction for the past 16 years, as the executive officer of the oldest learned society in America, the American Philosophical Society, founded by Benjamin Franklin for the promotion of useful knowledge.

JOSEPH S. FRUTON

Stanford Moore

(read by President Seitz
in Dr. Moore's absence)

In 1934 The Rockefeller Institute became host to Max Bergmann, a gifted and experienced organic chemist from Dresden. His first postdoctoral fellow in New York was Joseph Fruton, who had just graduated in biochemistry from Columbia University. Bergmann had been a pupil of Emil Fischer in Berlin and brought to these laboratories the tradition with which Fischer, at the turn of the century, laid the foundation for progress in so many domains of biochemistry. Joseph Fruton thereby began his career with an insight into the historical perspective of his science which has been reflected both in his research and his writings. His researches with Bergmann began with elegant syntheses of peptides and their use in discovering the specificities of proteolytic enzymes. His skill and accomplishment led to his receipt, at the age of 32, of the American Chemical Society's Eli Lilly Award for outstanding research by a young biochemist. In 1945, after 11 years of exceptional productivity at this institution, he accepted an appointment in biochemistry at Yale University. His researches at Yale on enzymic hydrolysis of peptide bonds included study in depth of the mechanism of action of pepsin. He also undertook a major writing task; he and his wife, Sofia Simmonds, who obtained her doctorate in biochemistry with Vincent du Vigneaud at Cornell University Medical College, published the first edition of their textbook, *General Biochemistry*, in 1953. This volume was the first synopsis to reflect the rapid growth of the science in the 1940s and 1950s and is a tribute to the breadth and scholarship of both authors. Through his knowledge of biochemistry, his contributions to the experimental art, his writings on the history of the science, his editorial service to the journals of the profession, and his linguistic skills and international travels, Joseph Fruton is fulfilling the modern responsibilities of the tradition that he treasures.

H. KEFFER HARTLINE

Floyd Ratliff

Hartline's research on vision and the retina began in 1923, at the age of 20, while he was still an undergraduate at Lafayette

College. He received his M.D. at Johns Hopkins in 1927. Following a year of study of physics at Munich and Leipzig, he returned to basic research in neurophysiology. Hartline's 40-year-old technique of dissecting single nerve fibers from the optic nerve by hand, based on the earlier work of Adrian and Bronk on the phrenic nerve, is still in use. But Hartline does not make a fetish of old ways; he is one of the few scientists of his generation who write their own computer programs in machine language. But his laboratory is not completely modern; there are antique but perfectly functioning devices of his own design along with the very latest in special electronic and optical instruments—all interconnected within rooms and between rooms by a tangle of wires and cables almost as complex and poorly understood as is the nervous system it is used to study. The essence of Hartline's half-century of research is best expressed in his own words: "The study of . . . retinal neurons has emphasized the necessity for considering patterns of activity in the nervous system. Individual nerve cells never act independently; it is the integrated action of all the units of the visual system that gives rise to vision." Hartline's basic studies on the integrative action of the retina provided the foundation for practically every advance that has since been made in the neurophysiology of vision. For this fundamental work of far-reaching significance, he has received many honors, among them the Nobel Prize in 1967.

LINDSLEY FISKE KIMBALL

David Rockefeller

Lindsay Fiske Kimball combines a mind of wide-ranging originality with an extraordinary ability to make vision a reality. For over half a century, his career has been devoted to the public's benefit through the many institutions he has helped to establish, guide, and support; to name a few: the Boy Scouts, The Greater New York Fund, the USO, the National Urban League, and the United Negro College Fund. In all his activities, he has demonstrated the capacity of an individual to exercise private initiative in working along with others to achieve great ends. The dedication of the Community Blood Council of Greater New York of the Lindsay F. Kimball Research Institute testifies to the depth of his personal commitment, his ability to inspire community leaders, and his consummate diplomacy. He has been a valued friend and advisor to the Rockefeller family for more than three decades. John D. Rockefeller, Jr. wrote of him: "Dr. Kimball has an almost uncanny ability to grasp the essentials of any situation, to state them in an orderly manner and to convince his hearers of the soundness and wisdom of his conclusions." The Rockefeller Foundation, the Rockefeller Brothers Fund, The Rockefeller University are only a few of the organizations

to have received the incalculable benefit of his unfailing good judgment and wise counsel. Trustee of The Rockefeller University for 24 years, trustee emeritus for 5 more, Lindsay Kimball has played a vital role in nurturing and sustaining the climate of excellence which has fostered the University's remarkable record of accomplishment.

GEORGE E. PALADE

Christian de Duve

Many other institutions have preceded us in honoring George Palade. But the degree about to be conferred upon him is of special significance. Far from being purely honorific, it is actually awarded for the most monumental and time-consuming thesis ever performed in the Rockefeller laboratories: more than 150 chapters, written over a record period of 27 years, encompassing almost every known part of living cells. In each case, morphological features are established by the most refined techniques, to yield images that are exquisite works of art; while all the resources of biochemistry and cytochemistry are brought to bear at the same time, to infuse life and movement into the pictures, and to reveal the functions subserved by the structures. Undoubtedly, the work of George Palade represents the greatest single contribution to cell biology. Also unequaled is the number of leading cell biologists who owe their early training to him.

KEITH R. PORTER

Albert Claude

Dear Keith: To recall within a few minutes the abundance, the variety, and the excellence of your deeds is obviously an impossible task. Wherever you have been, as professor and head of a laboratory, during your fruitful 50-year career, you have inspired and guided many undergraduate and graduate students and your own colleagues in teaching and research from both the United States and abroad. Now the world is peopled with those who received the benefit of your knowledge, your vision, and your counsel. In the laboratory, whatever the subject involved—by instinct, but also because you know that in science the new or better tool precedes progress—you have always tried to improve or innovate. In the early days of electron microscopy, your attention was attracted by important structures—the centrioles and the elements of the centrospheres by which the cell divides and reproduces—and you endeavored to establish, in the still-blurred electron micrographs of the time, the size of the smallest subunits of those structures. In the 1940s, when you demonstrated by electron microscopy that the milk factor, the cause of mammary cancer in mice, was a virus, you examined systematically a variety of other tumor cells as well. And it is in those tumor cells that later you found with ease what you had searched for with difficulty in normal

cells. As often happens in fundamental research, the search and study of microtubules, which at first might have appeared to be a futile and unproductive endeavor, has opened a field which, for the cell, is synonymous with life itself. "Motion" headed the enumeration of the attributes of life in ancient treatises on physiology. For the living cell, there is no rest in any of its parts. Progress during the past 25 years in the field of cell biology offers us a vision, not of tubules alone, but of an immense machinery of complex and interconnected fibrils of all sizes down to the submolecular level which, when coupled with energy, drive the cell, like rotors in the dark bottom of a ship. In all these years, you have been present, and have contributed to most of the significant forward steps of this great biological adventure of our time.

JAMES A. SHANNON

Maclyn McCarty

During the early decades of this century, biomedical research in the United States was represented by a small body of scientists, most of whom could be found working in a few medical schools and research institutes with support from private funds. The idea of increased participation of the federal government in the support of biomedical research was given an impetus by the activities of the Office of Scientific Research and Development during World War II, but this momentum did not result in a very significant expansion during the early post-war years. Then in the mid-fifties came the onset of the remarkable, explosive growth of the National Institutes of Health that led to an increase of about 15-fold in the support of biomedical research over the ensuing decade. More remarkable than the rate of growth is the fact that it was accomplished in so orderly a fashion, with the development of a well-designed plan and no sacrifice of quality. The predominant figure among those who brought about this phenomenal change was James A. Shannon, who served as director of NIH from 1955 to 1968. He forged the team of legislators, laymen, and scientists who sustained the forward thrust; framed the philosophy and operating principles that guided the development of the diversified program; and directed its evolution during the crucial years. The result was a spectacular expansion of the nation's biomedical research capacity and productivity, with fruits that have made clear to all but the most obtuse the essential role of research in the solution of our health problems. Dr. Shannon came to this task well prepared. He had had extensive personal experience with first-class research, both in his outstanding studies in renal physiology and in his work on malaria during World War II. Service as director of the Squibb Institute for Medical Research, as associate director of the National Heart Institute, and as associate director of NIH consolidated his skills

in research administration before he assumed the directorship. Thus, he understood well both the essence of research and the mechanisms required to foster it. The Rockefeller University was privileged to have Dr. Shannon as a member of its faculty after the NIH years and to benefit from his wisdom and vast experience.

GEORGE E. UHLENBECK

Marc Kac

Ever since the fundamental discovery of electron spin, made jointly with S. A. Goudsmit a little over a half a century ago, the name of George Eugene Uhlenbeck has been linked with most of the important developments of contemporary physics. In each case his name came to symbolize a unique blend of sharpness of formulation and clarity of exposition that comes only from profound understanding of Nature and of its symbolic description. It is the all-embracing understanding, combined with unerring critical sense and with the highest degree of scholarly commitment, that makes him not only one of the leading physicists of our time but also one of the truly great teachers of the subject. Although he left a mark on nearly every corner of the vast discipline, it is with statistical physics, his first love, and the magnificent bridge between the capriciousness of microscopic vagaries and the miracle of macroscopic order that the name of George Uhlenbeck has been most intimately associated. Here his ideas and views have been dominant and his influence unmatched. By constantly clarifying the past and pointing the way of the future, he became the undisputed heir to the great tradition of Maxwell, Boltzmann, and Gibbs, wearing the mantle that came from these founding fathers with stern grace and an uncompromising dedication to the standards they set. Woe unto the one who fails to live up to these standards in a lecture or, worse yet, in print. If the formulation is not absolutely sharp, if the presentation is ever so slightly on the sloppy side, the invariable comment reflecting the austere Calvinism of George's native Holland will come: "He should have been spanked when he was young." As one who has been spanked (to good effect, I hope) in his youth by the Master himself, I take special pleasure in presenting him for the award of an honorary doctorate.

Graduates on the Move

Future plans for the members of this year's graduating class include medical school for Harold Burger, at Albert Einstein, where he is also doing a year of postdoctoral work in virology, for Lily Conrad, at Harvard Medical School, for David Krieger, at Yale University School of Medicine, and for Allison Ryan, at the University of California, San Diego. David Lieberworth has decided to combine a law

career with his science and will enter Columbia Law School.

Daniel Caldi has a postdoctoral fellowship at Rutgers University in New Brunswick, and Dennis Stacey at the Center for Cancer Research, MIT. Vincenzo Enea has received a Helen Hay Whitney fellowship and will also go to MIT, to work with Rockefeller alumnus David Baltimore. Lee Rubin, another Helen Hay Whitney fellow, is headed for the department of pharmacology of Harvard Medical School.

Adina Schwartz has been a lecturer in philosophy at Yale for the past year and has been appointed an assistant

professor. Michael Hambourger is an assistant professor in the department of philosophy at the University of Wisconsin, Madison.

Jonathan Karn will travel the farthest, to the Medical Research Council Laboratory of Molecular Biology in Cambridge, England. Remaining at Rockefeller are Peter D'Eustachio and Ivan Lieberburg as postdoctoral fellows with Professors Gerald Edelman and Bruce McEwen, respectively. Owen Griffith has moved up York Avenue to the department of biochemistry at the Cornell University Medical College.

PERSONALS

Professor **Joseph W. Becker**, Developmental and Molecular Biology, was married on May 9 to Betsy Stern.

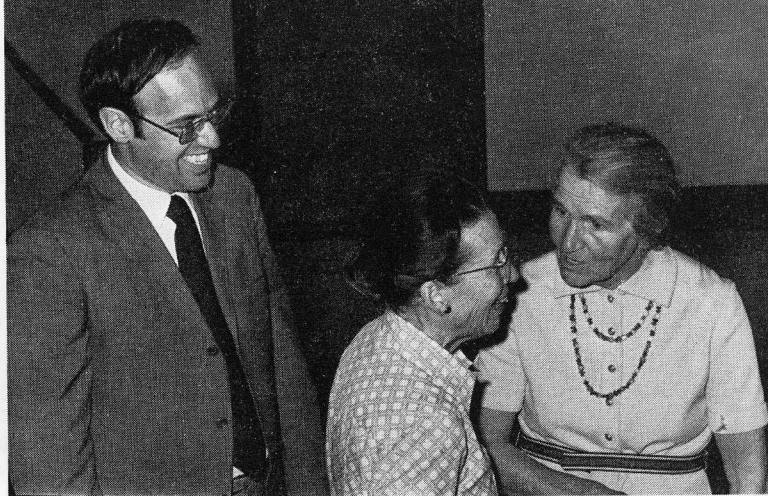
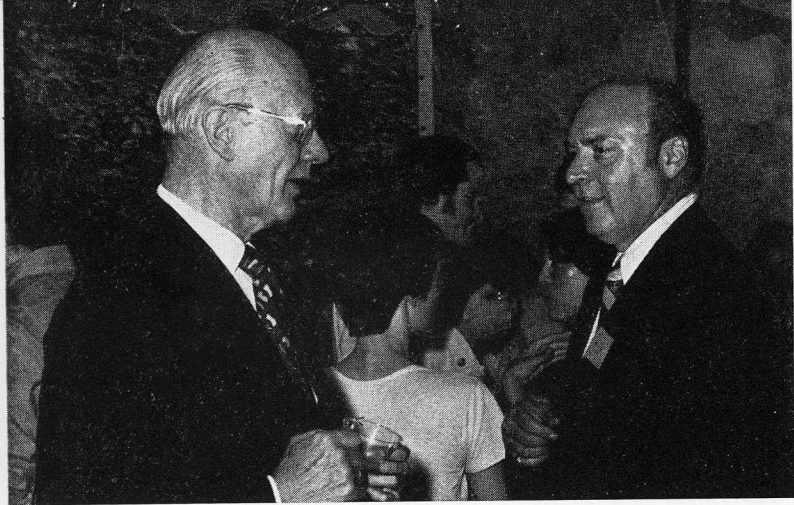
Professor **Abraham Pais**, Theoretical Physics, was married on May 29 to Sara Ector Via, assistant professor of Romance languages at Princeton University. The ceremony was performed in Princeton, New Jersey by Mayor Junius J. Bleiman.

Security Lieutenant **Frank Redling** retired on June 9 after seven years with the University. He began in 1969 as a guard, was appointed assistant security officer in 1971, and security lieutenant in 1972.

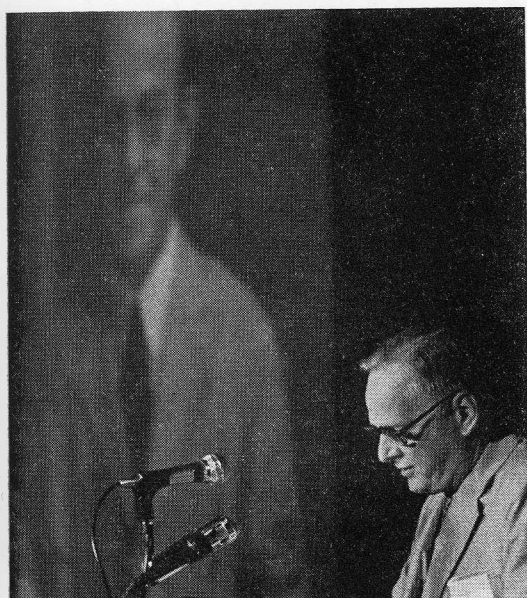
IN PRINT

Language and Perception by Professor **George A. Miller**, Experimental Psychology, and Philip N. Johnson-Laird, Reader in Experimental Psychology, University of Sussex, has been published by the Belknap Press of Harvard University Press. The 760-page volume "attempts to lay the foundations for a new field of language study," called "psycholexicology," a term coined by Dr. Miller, which deals with the relation between perception and language. Any theory about this relation, say the authors, "must necessarily be a theory of conceptual thought."





Around the campus on History Day: left, President Seitz and James Stewart; right, Adrian Bronk, Elizabeth Seitz, and Helen Bronk.



Speakers Maclyn McCarty, left, on "Fess" Avery, and James Flexner, on his father, Simon Flexner.

At the party: Walther Goebel and Henry Kunkel.



Returning visitors A. Baird Hastings and Tapio Nikkari in the lab with Paul Samuel and Edward Ahrens. Mathematicians and physicists at lunch reunion.

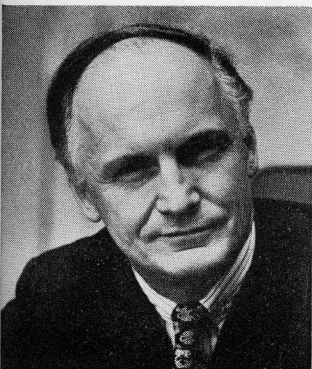
Below: Colloquia participants: left, neurophysiology-biophysics group, Floyd Ratliff, Paul Burgess, Charles Stevens, Barry Peterson, Robert Shapley, H. Keffer Hartline; right, cell biologists Christian de Duve, Vincent Allfrey, Albert Claude, Keith Porter.



Two Elected Trustees

Richard Furlaud, chairman and chief executive officer of Squibb Corporation, and John R. Stevenson, an expert in international law and former legal advisor to the Department of State, have been elected to the University's board of trustees.

Mr. Furlaud, a native of New York City, studied at the School of International Affairs, Princeton University (A.B. 1943) and received an LL.B.



FURLAUD



STEVENSON

from Harvard Law School (1947). He practiced law in New York until 1951, when he joined the Judge Advocate General's Corps. He later served as a member of the professional staff of the Ways and Means Committee of the U.S. House of Representatives. He was appointed executive vice president of Olin Mathieson Chemical Corporation, responsible for the Squibb pharmaceuticals group, in 1964. He was elected

PRESIDENT SEITZ

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told Dr. Seitz in his letter, which has been distributed to University faculty and staff members. "You have met the highest personal and professional standards in fulfilling your responsibilities during a most challenging and productive phase of the University's history. We are grateful for your willingness to serve the institution until the board has elected your successor. You have the strongest endorsement of the entire board and our pledge of total cooperation in your continuing exercise of full authority as president."

ARCS Visit

Some 70 representatives of the nine chapters of the ARCS Foundation (Achievement Rewards for College Scientists) visited the campus on May 17 as part of their yearly national

meeting. They were addressed by President and Mrs. Seitz and Dean James G. Hirsch on the work of the University. Mary Lucy McGrath Smith, president of the New York chapter of ARCS, presented a check to President Seitz, bringing to \$30,000 their contributions in support of the University's graduate fellow program since 1972.

Mr. Stevenson, who was born in Chicago, is a graduate of Phillips Academy, Princeton University (1942), and the Columbia Law School (LL.B. 1949, J.S.D. 1952). He is a partner in the law firm of Sullivan & Cromwell, New York. In addition to his career in law practice, Mr. Stevenson has held governmental posts for more than 30 years, including serving as The Legal Adviser of the State Department from 1969 through 1972. He has served on numerous United States delegations to international conferences, as Ambassador and Special Representative of the President, and as a member of the Permanent Court of Arbitration in The Hague, and of the State Department Advisory Committee on International Law. He is a trustee of the Andrew W. Mellon Foundation and of the National Gallery of Art, vice president of the Boys Club of New York, and a director of the *Columbia Journal of Transnational Law*, the Foreign Policy Association, and the Academy of Political Science.

THANKS TO MANY

Vice President Carl Pfaffmann, who has been serving as chairman of the 75th Anniversary Planning Committee, has asked *news and notes* to convey his warmest thanks and those of his committee colleagues to all the many members of the campus community who have helped them over the past months. "The skill, enthusiasm, and hard work of people from every area of the University combined to make our 75th celebration a superb and memorable event."

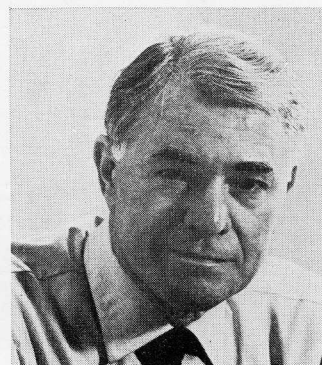
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SUNDERLIN RETIRES

continued from page 1

institutions, and the supervision of the University's various support services. He served as a member and as secretary of The Rockefeller University Academic Council.

A graduate of the University of Montana and a Rhodes Scholar who earned a B.A. and M.A. at Oxford University and a Ph.D. from the University of Rochester, Dr. Sunderlin began his professional life as a chemist and taught at Union College and the U.S. Naval Academy. He served as a



Naval officer in World War II and as a member of the Office of Naval Research, in London, for five years following the war. From 1951 to 1957, he was deputy director of the National Science Foundation, and from 1957 to 1962, was deputy director of Union Carbide European Research Associates, in Brussels, later becoming research manager of the company's defense and space systems department, in Washington and New York. For four years before coming to Rockefeller, Dr. Sunderlin was special assistant to the president of the National Academy of Sciences, a post then held by Frederick Seitz.

Dr. Sunderlin has been a member of many international scientific and governmental delegations. He is a fellow of the American Association for the Advancement of Science and of the Chemical Society of London, and a member of the American Chemical Society, the Royal Institution of Great Britain, and the Society of Chemical Industry. He is secretary of the Wadham Association of the United States (Wadham is one of the colleges of Oxford University), a member of the New York State Rhodes Scholar Selection Committee, and secretary of the Middle Atlantic States Rhodes Scholar Selection Committee.

In farewell, *news and notes* would like to express special thanks to Dr. Sunderlin for his unfailing encouragement and wise counsel since the inception of its publication.

BRIEFS

Professor **Edward H. Ahrens, Jr.** was awarded the degree of doctor of medicine *honoris causa* from the University of Lund, Sweden, on May 26. On May 21, Dr. Ahrens was keynote speaker at the Institute of Physiological Chemistry, in Cologne, Germany, on the occasion of the inauguration of the Ernst Klenk Foundation of which he is a trustee. He spoke on Ernst Klenk and Progress in Lipid Research.

Professor **Gerald M. Edelman**, Developmental and Molecular Biology, received an honorary doctor of science degree from Williams College. He also delivered the Klopsteg Lecture, at Northwestern University, on May 25.

Professor **Rebecca C. Lancefield**, Bacteriology and Immunology, received an honorary doctor of science degree from her alma mater, Wellesley College, at commencement ceremonies on May 28. The occasion also marked the 60th anniversary of her graduation from Wellesley.

Visiting Professor **David Baltimore**, American Cancer Society Professor of Microbiology at the Massachusetts Institute of Technology and a 1964 Rockefeller alumnus, received an honorary doctor of science degree from Swarthmore College at commencement exercises on May 24. Dr. Baltimore received his bachelor's degree from Swarthmore in 1960.

Professor **Joel Feinberg**, Philosophy, has been elected a fellow of the American Academy of Arts and Sciences.

Professor **Felix T. Hong**, Biophysics, is the winner of the 1976 Victor K. La Mer Award of the Division of Colloid and Surface Chemistry of the American Chemical Society. The award was presented at the International Conference on Colloids and Surfaces held in Puerto Rico June 21-25. Dr. Hong was also a guest speaker at the 1976 Peter A. Leermakers Symposium on the Chemistry of Vision, held on May 5-6, at Wesleyan University.

Thomas P. Bennett, 1965 Rockefeller alumnus, has been appointed president and chief executive officer of The Academy of Natural Sciences of Philadelphia, where he will head both the museum and the scientific divisions.

Professor **David V. Bowen**, Physical Chemistry, has been elected chairman-elect of the North Jersey American Chemical Society Mass Spectrometry Topical Group.

Gail W. Haslett, 1970 Rockefeller alumna, received the Lindback Award for Distinguished Teaching at the annual honors convocation of Beaver College, Glenside, Pennsylvania, held April 24. Dr. Haslett is an assistant professor of biology at Beaver and is also a postdoctoral fellow at the Penrose Research Laboratory of the Zoological Society of Philadelphia.

Charles P. Bean, a guest investigator with the neurophysiology laboratory of Professor Victor J. Wilson, was elected to membership in the National Academy of Sciences.

Professor **Frank H. Field**, Physical Chemistry, delivered a paper on the Thermochemistry of Carbonium Ions by MS Equilibrium Measurements at a symposium on Gaseous Ion Thermochemistry at the 24th Annual Conference on Mass Spectrometry and Allied Topics, held in San Diego May 9-14. He delivered a paper on Chemical Ionization after Ten Years at the Eighth Central Regional Meeting of the American Chemical Society, held in Akron, Ohio, May 19-21. Lectures on the latter topic were also presented at the University of Idaho, the University of Utah, and Utah State University.

Professor and Physician-in-Chief **Attallah Kappas** was an invited speaker at a conference on International Education: Link for Human Understanding, held May 18 at the Smithsonian Institution, under the sponsorship of the Board of Foreign Scholarships, in celebration of the 30th anniversary of the Fulbright-Hays Scholarship program. (Senator J. W. Fulbright was a participant in the conference.) Dr. Kappas spoke on Medicine and the Social Matrix as part of a session on Science and Technology under the chairmanship of University Trustee **C. N. Yang**.

Professor **David Mauzerall**, Biochemistry, delivered an address on Electron Transfer Reactions of Photoexcited Porphyrins, at the 28th Brookhaven Symposium in Biology, held June 7-9. Graduate Fellow **Norman E. Kagan** also presented a paper at the meeting, which was on Chlorophyll-Proteins, Reaction Centers, and Photosynthetic Membranes.

Professor **James Glimm**, Mathematical Physics, was an invited speaker at the Fourth International Symposium on Information Theory, held June 15-19 in Leningrad under the sponsorship of the Academy of Sciences of the USSR. He spoke on Phase Transitions in the Theory of Continuous Random Fields.

APPOINTMENTS

David Glass, professor of psychology, University of Texas, as a visiting professor, Physiological Psychology, and **June Goodfield**, professor of philosophy and human medicine, Michigan State University, as a visiting professor, Cellular Physiology and Immunology, effective July 1.

Stanley Read, Bacteriology and Immunology, and **Hung-sheng Tsao**, Theoretical Physics, as assistant professors, effective July 1.

Emile Jean-Baptiste, Cellular Biochemistry and Pharmacology, as research associate, effective June 1.

David Brydges, Mathematical Physics, **Karen S. Jakes**, Genetics, **Barry Klyde**, Human Behavior and Metabolism, and **Thomas H. Witherup**, Organic Chemistry, as research associates, effective July 1.

PROMOTIONS

Günter Blobel, Cell Biology and **Fernando Nottebohm**, Animal Behavior, to professors, effective July 1.

W. Einar Gall, Developmental and Molecular Biology, **Araxie Kilejian**, Parasitology, **Ralph Norgren**, Physiological Psychology, **George N. Reeke, Jr.**, Developmental and Molecular Biology, **Andreas Scheid**, Virology, **Robert Shapley**, Biophysics, and **Ralph M. Steinman**, Cellular Physiology and Immunology, to associate professors, effective July 1.

Larissa A. Pohorecky, Physiological Psychology, to senior research associate, effective June 1.

Irving M. Faust, Human Behavior and Metabolism, **Joel Granick**, Metabolism-Pharmacology, **Meredith Mudgett**, Immunology and Immunochemistry, **Gianni Piperno**, Cell Biology, **Linda Plapinger**, Physiological Psychology, **John Sogn**, Immunology and Immunochemistry, **Ivo van de Rijn**, Bacteriology and Immunology, and **Gerald F. Vovis**, Genetics, to assistant professors, effective July 1.

Allan Khoury, Viral Oncology, to research associate, effective May 1.

John Oates, Animal Behavior, to Research Associate, effective June 1.

Allen B. Clarkson, Jr., Parasitology, to research associate, effective July 1.