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Evolutionary Biology and Modern Culture

BY PROFESSOR TH. DOBZHANSKY

NO QUESTION is more perplexing and yet more inescapable than "What is man?" It was old and much debated when Darwin founded evolutionary biology and sketched the first scientific answers—man is a part of nature and a product of evolutionary development. I want to venture some ideas concerning the place of evolutionary biology in modern science and in modern culture, and I shall begin by presenting my conclusion before my arguments. Stated most simply, it is that evolutionary biology may span the much-discussed cleft between the two cultures into which the intellectual life of our society has become fragmented. Evolutionary biology may help to heal this schism.

Our bodies are "fearfully and wonderfully made." But so are the bodies of all organisms, animals and plants, down even to the simplest. The diversity of these "fearfully and wonderfully made" forms is staggeringly great. One has to be obtuse indeed not to be impressed by the sight of a summer meadow teeming with life, or of the microscopic world in a drop of pond water. I hesitate to mention in this connection the luxuriant tropical forests or coral reefs, since most people in our society have never seen them; they do not know what they are missing!

The aesthetic appeal of organic diversity has led to the emergence of the science of biology. During the eighteenth and much of the nineteenth centuries biology was chiefly natural history. Systematics and comparative anatomy were the branches that attracted most workers. Natural history is at present a designation which to not a few modern biologists has a slightly disdainful sound. It is, allegedly, something half-way between academic science and artistic contemplation of nature's wonders. However that may be, natural science created biology. Linnaeus undertook the formidable task of classifying the world of life. In 1758 he knew about 4235 species of animals and 5342 of plants, mostly from northwestern Europe. Two centuries after Linnaeus the number of named species of organisms was above one million. New species are still found, even in the most thoroughly studied faunae and florae. In the less well studied ones, mostly in the tropics, probably not even one half of the existing species have been named. The total number of species on our planet can hardly be less than two million, and it may well be twice as great.

Now, the naming of a species is only the beginning of its study. Ideally, we should know its structure, external and anatomic, gross and microscopic, and its physiology and embryology, and ecology, and many other things. To some extent all these things are being studied, described, and recorded in the scientific literature. But it is evident that even two million species cannot, and indeed need not, be described in equally minute details—in as much detail as, say, the human body has been described. Such a mass of observational data would no longer be fascinating, it would be depressing. For science is not a mere collection of facts, no matter how carefully and securely recorded. It is a rationally organized system of significant facts. Significant, that is, for our understanding of ourselves, of the world in which we live, and of our place in that world.

Professor Dobzhansky's appointment to the faculty of The Rockefeller Institute is announced in this issue. This article is based on an address before the Academy of Natural Sciences of Philadelphia at its Sesquicentennial Jubilee, 21 March 1962.

It is here that the importance of scientific theory comes in. It organizes the disjointed and therefore meaningless facts into a harmonious system. It gives facts their meanings, and restores to them their beauty and their aesthetic appeal. A scientific theory can be beautiful, just as a flowering meadow is beautiful, though in a more subdued, more recondite, more sophisticated, but also less evanescent way. The schism between the two cultures, made famous by C. P. Snow, is a result of, among other things, the inability of non-scientists, because of ignorance, to see the beauty of science, and the inability of scientists, even of those not devoid of an appreciation of beauty, to communicate this appreciation.

In biology, it is the theory of evolution which imparts significance to the greatest number of facts many of which may otherwise be trivial. The greatness of Darwin lies in that he restored the beauty to a great field of knowledge which was in danger of losing its fascination owing to piling up of accurate but disjointed data. Nothing makes sense in biology, except in the light of evolution, *sub specie evolutionis*. If the species were created as they are now, instead of having evolved, then why should there be so many of them, instead of, say, a dozen or so? The organic diversity becomes intelligible only as a response of living matter to the diversity of environments on our planet. The multitudinous kinds of creatures, from the biggest to the smallest, from the most complex to the "simplest," from the ordinary and nondescript to the bizarre, all are creative responses of protoplasm to the different opportunities of making a living, satisfaction of what looks like an unquenchable urge of resisting death and including more and more of the environment into the biosphere.

Similarities between at first sight quite dissimilar organisms in structures, in biochemical processes, and in developmental patterns do not come from a mere caprice or a lack of inventiveness on the part of the Creator; they are vestiges of common descent and signs of mutual relatedness of all that lives. There still exist some stubborn people who prefer to suppose that all these attestations of evolution are mere sham and delusion. For my part, I agree with Teilhard de Chardin who wrote: "Is evolution a theory, a system, or a hypothesis? It is much more—it is a general postulate to which all theories, all hypotheses, all systems must henceforward bow and which they must satisfy in order to be thinkable and true. Evolution is a light which illuminates all facts, a

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trajectory which all lines of thought must follow—this is what evolution is."

Evolution is a light which illuminates not only nature outside ourselves but also our own nature. It illuminates man, for man is a product of evolution. I said above that evolutionary biology may help to heal the schism between C. P. Snow's two cultures. I think this is so because understanding man is a prime concern of both cultures. It is a prime concern of just about any conceivable culture. You may, if you wish, be uninterested in atoms and electrons, in mountains and galaxies, in flowers and bugs and beasts; you will find it difficult to be unconcerned about human nature, or at least about your own nature. In his "On the Origin of Species," published in 1859, Darwin resorted to a little stratagem. He wrote about the evolution of animals and plants, wild and domesticated, but he diffidently left man out of consideration. The strategy fell flat; the storm of applause and the storm of abuse which greeted his book showed that the bearing on man of what Darwin said about other creatures was duly perceived by friends and by foes of his theory. So much so that "The Descent of Man," published 12 years later, where man was explicitly declared a descendant from nonhuman ancestors, caused no greater commotion than did "The Origin of Species."

MAN IN NATURE

Most of his life Darwin was a patient, at times even plodding, student of animals, plants, and geological strata. Yet he made the greatest discovery science has yet made about man—that man is a part of nature and a product of biological evolution. Here is something which many representatives of not only the literary but also of the scientific culture do not understand clearly. Suppose that somebody spends his life working like myself on Drosophila flies, or on birds, or bacteria. Can he "extrapolate" his findings to man? Suppose, for example, that one finds out something about the genetic damage produced by X-rays and atomic radiations in flies. Does this tell us anything about genetic radiation damage to man? It has been wisely remarked that man is not an overgrown Drosophila, and not even an overgrown mouse. Or maybe "extrapolation" used in this connection is a very misleading word?

We do not extrapolate from Drosophila to man, or vice versa. We know however that all forms of life, from microbes to man, are products of the evolution of living matter. Were we to secure a thorough understanding of the evolution of, say, the grasshoppers of Australia, this would inevitably improve our understanding of the evolution of man. And the converse is of course true also. Thus it comes about that the royal road towards understanding some aspects of man lies very often through research on organisms other than man. The basic rule of strategy of scientific research is admirably simple—every problem should be studied with materials which make this particular study easiest and most fruitful. It is not out of eccentricity alone that some scientists choose to work with what look like outlandish materials and problems.

One can gain insights into human nature through investigation of biological nature. To say this is not to fall into the hoary fallacy that "man is nothing but an animal." Man is an animal, but he is also a great deal else besides. Time and time again biologists, and among them some outstanding ones, made themselves and their science ridiculous by handing down magisterial judgments concerning human problems, judgments based on their biological discoveries. Now, the discoveries were often real but the judgments pathetically wrong, because they overlooked the singularity, including the biological singularity, of human nature. A consequence is that many students of man, from anthropologists and psychologists to sociologists, philosophers, and men of letters dismiss biology as wholly irrelevant to understanding man.

Here, for example, is a line of argument as plausible as it is misleading. Breeds of domestic animals are often different in behavior, and the differences are genetically determined. The behavioral differences are usually related to the different uses to which a given breed is put by man and for which it is maintained. Draft horses do not win races, and race horses are not used to move heavy loads. Pekingese dogs are worthless as hunting companions and boxers inconvenient as lap dogs. Now, human races are different breeds of the human species. The physical differences between them are largely genetic. Representatives of different races, and indeed of different castes or classes or professional groups within a society, often follow different ways of life and behave differently. Must these differences also be genetic? So must be, some people contend, the differences in achievement, social position, and economic status. Attempts to change the characteristics of human groups, or to ameliorate their lot by social, economic, or educational means are not only futile but also "contrary to nature."

NATURE VS. NURTURE

Now, people are genetically different; excepting identical twins, every human being is almost certainly genetically unique. But the genes determine not fixed "qualities" but rather potentialities, potentialities to be realized in the process of organic growth and development, which is a sequence of interactions between the organism and its environment. What the genes determine are the reactions or responses of the organism to the environment. The extent to which the path of development is fixed or is modifiable by environmental variations is itself genetically determined. The degree of fixity or of environmental plasticity is different for different characters. For example, the development of man and other higher animals is so buffered that, unless death intervenes, two and only two eyes are formed, one on each side. Cyclopic (one-eyed) monsters are known, but they are very rare. The color of your skin is fixed less rigidly—it becomes pale if you live indoors, and darkens after a good vacation on a sunny beach. Human behavior is most plastic.

Behavior in some animals may be set within rather narrow limits by heredity, but in others it may respond easily to the circumstances of upbringing, training, and learning. In many domestic breeds behavior is adjusted, by the selection practiced by the breeders, to the use which man makes of a given kind of animal. A draft horse with a temperament of a race horse would have to be shot, and a race horse with a temperament of a draft horse would win no races. What is the situation in the human species? The evolutionary emergence of man is the best example of what G. G. Simpson has called quantum evolution, i.e., of "discovery" of entirely new ways of becoming adapted to the environment, and of rapid transformations to ex-

ploit the opportunities opened by such "discovery." Man adapts to his environment by means of an instrument which is his exclusive possession—his culture. One of the definitions of culture is "what people do as a result of having been so taught." (Here the word "culture" is obviously being used in a sense different from C. P. Snow's "Two Cultures".) Culture has made man an unprecedented biological success. Adaptation by culture is vastly more effective, as well as vastly more rapid, than genetic adaptation. Birds have conquered the air by *becoming* flying machines; man has achieved a mastery of the air by *building* flying machines.

Cultures are transmitted from generation to generation not through genes but through teaching and learning. Only bare rudiments of cultural transmission exist among animals; the biological uniqueness of man lies in that our species has a genetic constitution which enables mankind to develop, maintain, and transmit culture. Culture is supra-genetic, or super-organic, but it has an organic genetic foundation. This genetic basis makes man able to learn and to adjust his behavior in the light of experience. In Waddington's words, man is, especially in his childhood, an "authority acceptor." Gene-determined fixity of behavior, if it ever existed, must have become relaxed at the very start of the process of hominization in man's evolution.

MANAGING EVOLUTION

Analogies between man and breeds of domestic animals are deceptive. They are deceptive because they mistake a peculiar biological situation for a universal law. This particular lead has turned out to be wrong. It is not overoptimistic however to hope that we have learned something by following this lead. Man's super-organic culture rests on a genetic foundation. And here mankind faces a challenge, to respond to which successfully our present understanding of evolution is woefully inadequate and must be improved. In recent years this threat has been discussed in the scientific as well as in the general press in connection with the genetic damage inflicted on human populations by high energy radiations. Radiation exposures induce genetic changes, mutations, and most mutations are more or less deleterious to their carriers, the damage ranging from incurably lethal diseases to mild constitutional weaknesses. Rather overconfident estimates have been published of just how many so-called "genetic deaths" will be caused by the fallout from test explosions of atomic weapons in the near and far future.

The problem of the genetic radiation damage is however only a part, and at that a minor part, of a vastly greater problem of management of human evolution. I can undertake here to indicate only the general outlines of this greater problem. The adaptedness of a living species to its environment, the ability of the species to conserve or to expand its hold on its means of existence, is always labile. It tends to be lowered by the pressure of genetic mutation and by shifts in the environment, and to be pulled upwards by selection—natural selection in wild forms and artificial selection in domesticated forms. The unsteady equilibrium can be tipped in either direction, towards a better hold on the environment and expansion of the species, or towards decline and extinction. The vital issue is whether mankind can rely on "normal" biological forces for maintenance and improvement of its genetic patrimony, or whether man will have to take it upon himself to control and direct his own evolution as he will see fit in the light of his knowledge, wisdom, and ethics.

Here is, indeed, a grave challenge, possibly the greatest that confronts man. What I want to stress is that to deal with this challenge successfully mankind will have to summon all the resources of his two cultures, or rather will need a synthesis of the two cultures. Half-truths or one-sided truths will here be almost as dangerous as ignorance. Take, for example, the assertion that natural selection no longer operates in modern mankind, and that it has to be restored to avoid genetic decadence. Now in the first place, natural selection does not guarantee even survival of the species, not to speak of progress or improvement. Paleontological museums are full of fossilized remains of organisms, the evolution of which was governed, or misgoverned, by natural selection. And secondly, natural selection does operate in man. Many hereditary diseases are still incurable; the hustle and bustle of modern life causes breakdowns of many persons who would live probably reasonably happily in conditions of bucolic simplicity; and one hears a lot about less intelligent parents producing more children than the more intelligent ones. This is natural selection. Natural selection is selection for reproductive efficiency; no end of misunderstanding has been caused by using the word "natural" as implying goodness or value or virtue.

The question is not whether natural selection is operating, but whether it is piloting mankind in a desirable direction. But is it not presumptuous of anyone to claim that he knows which direction is the best and noblest and wisest? There are some choices which will be concurred in by nearly everybody. It is surely desirable to reduce and to eliminate many crippling, disfiguring, painful, and incapacitating diseases. But a host of doubts immediately arise.

AMBIVALENT GENES

Some genes are adaptively ambivalent. For example, at least two different genes which in double dose (in homozygous condition) cause fatal anemias, in a single dose (in heterozygous condition) confer a relative resistance to certain tropical malarial fevers. Were such genes good or bad in populations which lived in malarial countries, before techniques for controlling malaria were invented? Other genes may be desirable in combinations with some but not with other genes. Epilepsy is a grave affliction; but Dostoevsky, and possibly also Mohammed, Pascal, and van Gogh, were epileptics. Who can tell whether the achievements of these men were or were not conditioned by their infirmities? Is it not probable that many a youth is stimulated to strive for excellence in intellectual pursuits by his inability to excel on sport fields and in lover's lanes? Granted that we would not want to disseminate genes for bodily weakness, is it necessary for everybody to be an athlete?

The attainments of medicine induce some people to underrate the importance of the genetic endowment. The symptoms of some genetic defects and diseases can be relieved by proper treatments. For example, insulin therapy is effective with some forms of diabetes. Is it not reasonable to hope that remedies will be found also for conditions which at present we are powerless to treat? H. J. Muller has argued eloquently against exclusive reliance on environmental remedies. Such reme-

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PROFESSOR DUBOS ON ART AND THE ANATOMY OF MADNESS

The Scottish anatomist, Sir Charles Bell, was also a skillful artist and gave courses in anatomy in London in 1804 for artists. The drawing above is from his "Anatomy of Expression in Painting," published, with his illustrations, in 1806.

AN INTEREST in social psychiatry as an expression of the effect of the total environment on the health of the individual has led Professor René Dubos, who considers himself an amateur in this realm, to discover the important place pictorial representation of abnormal behavior has had in this phase of the history of art and science. In Caspary Auditorium, recently, he showed the faculty and students some of the slides from his growing collection on this subject. A few of them are reproduced on these pages.

Artists for centuries have depicted insanity in terms very much determined by the prevailing view of medical men and the lay public. A striking example at lower left is an etching by the seventeenth-century Dutch painter, Weydmans, of an operation for removing "stones" from the head of an unbalanced patient. Charlatans by sleight-of-hand saw to it that tangible results from this painful and fruitless operation were visible afterwards. We see here the antiquity of the still-current vernacular description of the insane as having "rocks in the head." The operation must have been common, for it figures in works by many artists, including Bosch, Vinckeboons, and Allard.

Among early paintings to receive the stamp of approval of contemporary physicians was a representation originally done by P. Brueghel the Elder, of the dancing manias, common in Europe in the fourteenth, fifteenth, and sixteenth centuries. Below is an engraving by Hondius from Brueghel's original painting. The nineteenth-century French psychiatrist, Charcot, regarded this engraving as showing behavior strikingly similar to *grande hystérie*.

Both Charcot and the anatomist, Sir Charles Bell, in addition to being eminent scientists were accomplished draughtsmen. Bell illustrated his scientific works with his own exquisite drawings, and when he came to London in 1804 he began a series of lectures on anatomy for artists. The drawing at the top of this page which shows Bell's view of the physiognomy of the madman is from his *Essays on the Anatomy of Expression in Painting*, published in 1806. Dubos drew attention to the attitude toward insanity implicit in Bell's drawing. Assumed to be possessed by some demon, the victim was held in chains apart from human society. The expression given his face was that of abstract madness, rather than that of a particular person suffering from some behavioral defect. Bell wrote sternly: "If madness is to be represented, it is with a moral aim, to show the consequence of vice and the indulgence of passion."

A profound change in this view of the insane occurred during the late eighteenth and early nineteenth century, led by the school of Philippe Pinel, a contemporary of the painter, Louis David. Not unmindful of the parallel with the French Revolution, Pinel released his patients from their chains and cells, writing: "In lunatic hospitals as in despotic governments, it is no doubt possible to maintain by unlimited

LEFT: *an etching by the seventeenth-century Dutch painter, Weydmans, of an operation to remove "stones" from the head of a disturbed individual (from the Philadelphia Museum of Fine Arts).* RIGHT: *an engraving by Hondius in 1642 after P. Brueghel the Elder of the dancing manias.*

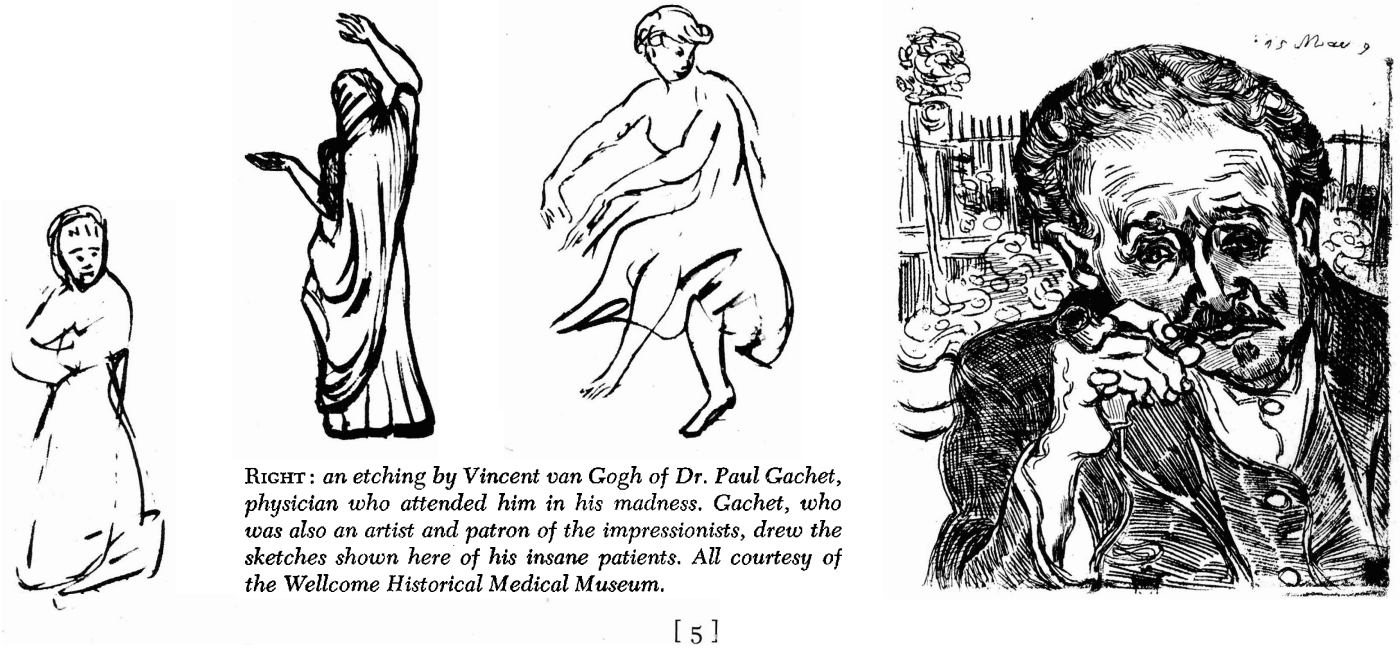
Théodore Géricault, friend of Dr. Georget on the staff of the hospital, La Salpêtrière, painted a series of ten portraits in 1822-1823, each illustrating a different pathological type. Above are three from the series. LEFT: *"The madman" (Musée de Gand),* CENTER: *"The insane kidnapper" (James Philip Gray collection of the Springfield Museum of Fine Arts in Massachusetts),* RIGHT: *"The madwoman" (Musée de Lyon). Two others are in the Louvre and a private collection; the remaining five were sold to a physician and have been lost.*

confinement and barbarous treatment the appearance of order and loyalty . . . A degree of liberty (in a hospital) contributes in most instances to diminish the violence of the symptoms and in some to relieve the complaint altogether."

This humane view of the insane soon led to quite different pictorial representations. Georget, a French psychiatrist of the generation after Pinel, interested the painter Géricault in doing a series of objective individual representations of the insane. Three of the portraits done in 1822-23 by Géricault, the founder of the naturalistic-romantic school of painting, are reproduced here. One perceives in Géricault's portraits, as Dr. Dubos pointed out, "an attempt to show in the face of the patients 'receptacles of feelings, not mirrors of response'."

Of a still later generation in the same tradition was Paul Gachet, well-known French physician, who is remembered as the friend and protector of the early Impressionist painters. He brought a friend, the artist Armand Gautier, to his hospital, La Salpêtrière, where he produced several much-discussed paintings. Gachet, himself, made fine pen sketches of his patients, three of which are shown below. Vincent van Gogh was under Gachet's care after he returned from Arles, and in 1890, shortly before his suicide, he painted the watercolor portrait shown below.

In closing, Dr. Dubos returned to Géricault's sensitive portraits of insane people, saying: "I find it difficult to escape the conclusion that all analytical scientists—whatever their field of specialization—may have something to learn from the holistic apprehension of the artist. It seems to me that the artistic perception corresponds to a kind of understanding which, although too complex for scientific analytical definition at the present time, nevertheless can provide valuable scientific material because it expresses in a very true form, the human awareness of the natural world."



RIGHT: *an etching by Vincent van Gogh of Dr. Paul Gachet, physician who attended him in his madness. Gachet, who was also an artist and patron of the impressionists, drew the sketches shown here of his insane patients. All courtesy of the Wellcome Historical Medical Museum.*

The Trustees

A. L. NICKERSON

A DEEP SENSE OF responsibility to the community and a recognition of the role of competition in strengthening individuals and organizations have guided Albert Lindsay Nickerson's career from service station attendant to his present position as Chairman of the Board of Directors and Chief Executive Officer of the Socony Mobil Oil Company, Inc.

Mr. Nickerson's manner speaks of the integrity his New England background and early responsibilities gave him. Tall, soft-spoken, he was born in Dedham, Massachusetts, in 1911, great-grandson of a Boston sea captain who left the sea to make his fortune in the Santa Fe railroad. After graduating from Harvard and a final trip to California with the Harvard crew, he went to work lubricating cars in a Socony service station in nearby Brookline.

Looking back on those first days in business, Mr. Nickerson realizes now that the dreary routine, the cold winter days lubricating cars in outdoor pits, disentangling chains, and arguing with customers taught him something about the ways of the world and the value of a dollar that he could have learned in no other way. At the time it seemed grim, but he soon began the ascent which has taken him to the top of one of the largest oil companies in the world. Within three years he had become station manager and attracted the company's attention by his sales ability. Mr. Nickerson had supposed selling to be far from his interests or ability but when it occurred to him that sales could be regarded as service, the idealism was aroused that has been a key to his success. As a result he was made a general salesman in 1936 under a management training program started that year. With his career begun, he married Elizabeth Perkins, daughter of a New York banker, in that year.

In four years he won his first management post with the company, becoming district sales manager at Brockton, Massachusetts, in 1940. He must have communicated to his organization his own sound view of sales as service, for his district soon showed by far the greatest gain of any in New England. He became New England Division Manager of Socony Mobil Oil Company in 1941, but this was interrupted in 1943 by the war, when he served for a year as Director of the Placement Bureau of the War Manpower Commission.

Mr. Nickerson returned as Assistant General Manager of the Eastern Marketing Division and was about to become manager of this 15-state division when the company asked him to fill another urgent need growing out of the war, which at the same time showed him a broader view of the business. The company's British

affiliate, Vacuum Oil Company, Ltd., was being re-established in 1945 after having been pooled during the war and managed jointly with all other British oil companies. Mr. Nickerson was chosen to help restore independent management and at the same time to help introduce American ideas regarding management and distribution into the British operations. At 34 he was made a Director, and a year later, in 1946, he became Chairman of the Board of the Vacuum Oil Company, Ltd.

Mr. Nickerson had expected to spend several years with the company abroad, but his value to the senior management drew him back to the United States unexpectedly soon. In November 1946 he returned to be elected to the Board of Directors of Socony Mobil Oil Company in New York with primary responsibility for domestic marketing. Behind this simple phrase lay a heavy responsibility. Socony Mobil Oil had lost heavily overseas during the war in both refineries and markets. It was necessary virtually to rebuild the postwar company along new lines, emphasizing the search for crude oil reserves. Mr. Nickerson's thorough grasp of sales and marketing in detail and from every level made him the obvious choice on the Board of Directors to guide the company's strong marketing division as it adapted its traditional functions to the new order.

The task was successfully accomplished, and in 1951 Mr. Nickerson returned to international operations, becoming responsible for foreign marketing and refining. It was at this time that he was elected a Vice President of the Company. In 1955 he became President, and in 1958 he was elected Chairman of the Executive Committee and Chief Executive Officer. In 1961, twenty-eight years after he went to work in one of the company's service stations, Mr. Nickerson became Chairman of the Board of Socony Mobil Oil Company, Inc., and he continues today as Chairman of the Executive Committee and Chief Executive Officer of the Company.

Mr. Nickerson is a member of the National Petroleum Council, a quasi-governmental body known to few laymen. This organization, composed of representatives of the petroleum industry, advises the Department of the Interior and the Department of State on matters pertaining to government policies affecting the petroleum economy of the country. At the time of the Suez crisis, for example, the Council's Foreign Petroleum Supply Committee was activated to consider measures to alleviate anticipated shortages in the United States. He is also Director of the American Petroleum Institute, a private trade association, and he is a member of the 25-year club of the Petroleum Industry.

Mr. Nickerson's strong sense of public responsibility has led him to give of his time and energies to numerous organizations more or less remote from the Socony Mobil Oil Company. During the past decade or so, Mr. Nickerson has served Harvard University in various ways, including the Alumni Association, the Harvard Foundation and, for the past three years, membership on the Board of Overseers of Harvard College. He is a member of the Trustee Committee for Economic Development and a member of the Council on Foreign Relations. He is a Director of the Federal Reserve Bank of New York and was a Director of the National Foreign Trade Council from 1952 to 1956.

He has also three times served three-year terms as a Director of the American Management Association.

Mr. Nickerson has also found time to serve as a Trustee of International House of New York City and of the American Museum of Natural History. He became a Trustee of The Rockefeller Institute in 1958. He is Chairman of a newly created Trustees' Committee on Gifts, Grants and Bequests which is working with President Bronk on plans for the financing of the Institute during the next decade.

The Nickersons have been fond of the out-of-doors since the early days of their marriage when they liked to go down to Cape Cod on weekends and sleep out under the stars. After spending a number of vacations sailing in Maine they acquired an island a few years ago. They have put up a small summer home there which gives the whole family much pleasure. They have four children. The oldest, Christine, is a computer programmer with the IBM Company, Albert, a senior at Harvard, is planning to join the Peace Corps, and Elizabeth and Victoria are students in the Rye Country Day School in the Westchester community where the Nickersons have their home.

DOBZHANSKY AND DE DUVE APPOINTED PROFESSORS

Appointment of two distinguished scientists as Professors in The Rockefeller Institute has been announced, beginning with the coming academic year.

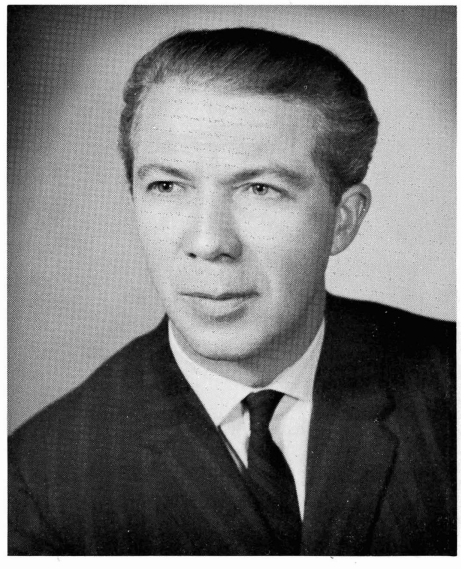
THEODOSIUS DOBZHANSKY, until now Da Costa Professor of Zoology in Columbia University, was born in Russia and completed his studies in the University of Kiev. He was a Fellow of the International Education Board of the Rockefeller Foundation, studying in this country, and in 1929 he was appointed Assistant Professor of Genetics in the California Institute of Technology. He was professor there from 1936 to 1940 when he was called to Columbia University as Professor of Zoology, to become Da Costa Professor in 1960.

Dr. Dobzhansky is a member of the National Academy of Sciences, the American Philosophical Society, and the American Academy of Arts and Sciences. He **has served as President of the American** Society of Geneticists, the American Society of Naturalists, and the Society for the Study of Evolution, and he is President-elect of the American Society of Zoologists. His contributions to genetics have been recognized by scientific societies throughout the world. He is a foreign member of the Royal Danish Academy of Sciences, the Royal Swedish Academy of Sciences, the Brazilian Academy of Sciences, the Leopoldine-Carolingian German Academy of Natural Sciences, and the Royal Anthropological Institute of Great Britain and Ireland among many others.

The National Academy of Sciences has twice honored Dr. Dobzhansky, awarding him the Daniel Giraud Elliot Medal in 1941 and the Kimber Genetics Award in 1958, and he was given the Darwin award of the Leopoldine German Academy in 1959. Numerous universities have conferred their honorary degrees on him, including São Paulo, Wooster, Münster, Montreal, Chicago, and Sydney.

CHRISTIAN DEDUVE, formerly Professor and Director of the Laboratory of Physiological Chemistry, University of Louvain (Belgium), received the degree of Doctor of Medicine, Surgery and Obstetrics from the University of Louvain in 1941. In 1946, after postdoctoral research at Louvain he received the degree of Master of Science in Chemistry. Thereafter he did research at the Nobel Institute in Stockholm with Professor Hugo Theorell and at Washington University in St. Louis with Professor Carl Cori. In 1951 he became Professor in the University of Louvain. His scientific interests have centered first around the physiology and biochemistry of the liver and the mechanism of action of insulin and glucagon. In recent years, he and his group have specialized in the use of centrifugal fractionation techniques and in the study of subcellular particles.

Professor deDuve was elected this year



corresponding member of the Royal Academy of Medicine of Belgium, and has received several scientific awards in his country. He is also a member of various chemical and biochemical societies in Belgium, France, Great Britain, and the United States. Among his activities on behalf of science, Professor deDuve has served on the board and committees of numerous organizations, including the National Funds for Scientific Research, the Funds of Scientific Medical Research and the National Council of Scientific Policy in Belgium. He is a member of the Advisory Board of the Ciba Foundation and of the Editorial Committee of the *Journal of Theoretical Biology*.

MISCELLANY

W. H. Auden Guest at Evening of Poetry Reading

A small group of students and faculty met with W. H. Auden on the evening of January 30th to hear him read from his works and to discuss the art of writing. An outstanding figure in the generation following Pound's and Eliot's "revolution," Mr. Auden is, of course, of great interest to all persons concerned with English letters. Auden, in return, finds the Institute of particular interest, for he has concluded that in contemporary cultures scientists have taken the place of the classical hero as the only class of modern society which embarks on real adventures. He believes that a significant task for modern poets is to help the scientist realize himself more fully in this role. Now a New Yorker, Auden, who was born in England, came to the United States in 1939 and became an American citizen in 1945. During the lively discussion, which lasted well into the night, Mr. Auden recalled his own education in science which was begun at home by his father, a physician first schooled in the Greek and Latin classics. During his formal education at Oxford, Auden studied biology under Julian Huxley and has vigorously continued his interest, for not only have scientific ideas and scientists been among his favorite poetic subjects but he is currently preparing an essay on similarities of method in science and art.

Additions to Institute's Collection of Contemporary American Paintings

New paintings have been added to the collection of works by contemporary American painters hung in Abby Aldrich Rockefeller Hall and Caspary Hall. Acquisition of these paintings has been made possible by the generous gifts of David Rockefeller. Abby Aldrich Rockefeller was a founder of the Museum of Modern Art, and that there exists an internationally recognized school of American painting is due in large measure to her encouragement and support. It is especially appropriate that paintings she would have loved should be purchased from gifts by her son and hung in buildings honoring her memory.

The trend away from purely abstract expressionism toward representation, which has been noted in contemporary American painting recently, is reflected in the Institute's new acquisitions. A large painting by Elmer Bischoff, "Landscape with Pink Clouds, April, 1961," in the foyer of Caspary Hall calls to mind Cézanne. The conference room in Caspary Hall is now ornamented with a strongly representational painting by Paul Delvaux, "Le Veilleur, 1961," somewhat in the style of Henri Rousseau. The abstract expressionists are represented among the new paintings by E. Briggs, whose study in yellow, green, and white is hung in the Club Room, and Kenzo Okada, whose "Wave" can be seen in the lounge of Abby Aldrich Rockefeller Hall. A small circular composition by Fritz Glarner called "Relational Painting, Tondo 22, 1951," has been hung in the Dining Room.

Brink on President's Committee for National Medal of Science

President Kennedy recently appointed Professor Frank Brink, Jr., to a twelve-man President's Committee formed to consider recommendations for the award of the National Medal of Science. The medal was established in 1959 by the Eighty-Sixth Congress "to provide recognition for individuals who make outstanding contributions in the physical, biological, mathematical, and engineering sciences." The President has appointed the committee to receive and select among recommendations from the National Academy of Sciences and other nationally representative scientific and engineering organizations for recipients of the award.

Graduate Education and Hemisphere Science

President Bronk delivered the Summation Address at a National Symposium on Graduate Education held in Dallas during the third week in March. One hundred and forty leading educators and government officials concerned with education discussed the place of graduate education in universities and its role in the furtherance of industry, in community life and in the national interest.

On March 28-30, Dr. Bronk convened a meeting of representatives of all Research Councils in North and South America and of American countries contemplating the creation of Research Councils. Common problems were considered and plans were formulated for annual meetings in order to foster the scientific development of the Western Hemisphere.

Palestinian Archaeology Subject of Sigma Xi Lecture by Albright

The application of Palestinian archaeology to the dating of historical events was the subject of an address by Professor William F. Albright of The Johns Hopkins University before the Society of the Sigma Xi at the Institute on February 13, 1962. Dr. Albright, who was among the first to recognize the antiquity of the Dead Sea Scrolls on the basis of paleographic considerations, was Spence Professor of Scientific Languages at The Hopkins where he is now Professor Emeritus. The lecture, which was the second public Sigma Xi Lecture during the academic year, was preceded by a dinner in Welch Hall for members of The Rockefeller Institute Chapter and their guests.

University of Leiden Honors Kac

The University of Leiden has honored Professor Mark Kac by appointing him 1963 Lorentz Visiting Professor in Theoretical Physics. The Lorentz Professorship was established in 1951 in memory of the distinguished Dutch theoretical physicist, H. A. Lorentz, who shared the Nobel Prize in physics in 1902 with Pieter Zeeman. Its aim is to bring distinguished scientists from other parts of the world to the Institute of Theoretical Physics at Leiden for a period of a few months.

Professor Uhlenbeck was the first to hold the professorship; other distinguished scientists from the United States appointed in later years were Eugene Wigner of Princeton University, John Van Vleck

of Harvard, and John Kirkwood of Yale. Dr. Kac is the first mathematician to be thus honored.

Royal Society of Medicine Honors Peyton Rous in London

Dr. Peyton Rous, much-honored member emeritus of the faculty of The Rockefeller Institute, will receive the Gold Medal of the Royal Society of Medicine in London. Selection of Dr. Rous to receive the award was announced by the Council of the Society in February, and Dr. and Mrs. Rous will go to London to attend ceremonies for conferring the medal in July.

Dubos is 1962 Herzstein Lecturer

The University of California and the Stanford University School of Medicine have honored Professor René J. Dubos by appointing him 1962 Herzstein Lecturer. Dr. Dubos's interest in man's adjustment to his environment, discussed elsewhere in this issue, determined the topics of his three Herzstein Lectures. The first two were on "Man Versus Environment," the third was titled "Adaptation for Survival and Growth."

Dr. Dubos's lectures, presented in the Medical Sciences Auditorium in San Francisco, California, were introduced by the Provost of Stanford University, the President of the San Francisco Medical Society, and Dr. Halsted R. Holman, executive of the Department of Medicine at Stanford, who was an associate of Professor Henry Kunkel at the Institute until 1960.

EVOLUTIONARY BIOLOGY *continued from page three*

dies, no matter how effective in restoring the health of the treated persons, do not prevent the transmission, and consequently the spread, of undesirable genes in populations. As Muller wrote in 1950 (American Journal of Human Genetics, Volume 2, pp. 111-176): the situation will accordingly be reached when "the amount of genetically caused impairment suffered by the average individual, even though he has all the techniques of civilization working to mitigate it, must by that time have grown to be as great in the presence of these techniques as it had been in paleolithic times without them. But instead of people's time and energy being mainly spent in the struggle with external enemies of a primitive kind such as famine, climatic difficulties and wild beasts, they would be devoted chiefly to the effort to live carefully, to spare and to prop up their own feeblenesses, to soothe their inner disharmonies and, in general, to doctor themselves as effectively as possible. For everyone would be an invalid, with his own special familial twists."

Yet another hope is that techniques may be developed, perhaps analogous to the transforming principles which are so effective with some microorganisms, for induction of directed genetic changes in the human germ plasm. This might make genetic defects remediable at their source, by implantation of superior genes in place of defective ones. It would not do to reject this bright hope altogether. History of science shows that discoveries once thought to be fantastic have sometimes been achieved. But it would be even more unwise to take it for granted that techniques for directed change of human genes are just around the corner, or for that matter that they are bound to be discovered.

In the meanwhile, the genetic trends in the human species may be detrimental, and this may call for remedies.

GENE BANKS PROPOSED

According to Muller; the danger is grave and present and justifies resort to drastic measures. Muller has sketched a tripartite program of "guidance of human evolution" by means of a) "presently available genetic techniques" b) "technical advances in the offing" c) "more distant prospects." Muller recommends artificial insemination of women by semen from selected donors, and conservation of semen in deep-frozen condition, to be used perhaps long after the donor's decease. An improvement in the offing shall be a technique to make the ovaries of superior women shed all the egg cells they contain, a majority of which go to waste at present, preserving these egg cells, combining them with superior sperms, and letting them develop in uteri of other women good enough for this purpose but not good enough to be chosen to pass on their own genes. Then it should be possible to invent a technique to preserve the diploid body cells of the most illustrious donors, to stimulate them to develop parthenogenetically, and thus obtain virtually any number of persons as similar in their genetic endowments to the donor and to each other as identical twins.

"When one considers how much the world owes to single individuals of the order of capability of an Einstein, Pasteur, Descartes, Leonardo, or Lincoln, it becomes evident how vastly society would be enriched if they were to be manifolded." I heartily agree with Muller that mankind is greatly indebted to these men of genius. But I cannot get rid of gnawing doubts, not indicative, I hope, of disrespect to these men. There is reason to infer, though no indisputable proof, that the genetic endowments of such men differ from those of a majority of persons. The growth and fulfillment of a genius is however an immensely complex and subtle problem; it is misleading to imply that there is anything like one-to-one correspondence between genotype and genius. What would Einstein's genotype have produced if its carrier happened to be born in a ghetto, or in a slum, or in a tribe in the highlands of New Guinea? Do we know how many priceless genetic endowments are now being wasted in the world's population?

A PLEA FOR HUMILITY

And finally, would it really be good to live in a world where everybody is an Einstein? Have we not arrived at a point where genetics, biology, and science suffice no longer? I do not mean for an instant that biology has nothing to say about man's fate. Man will not abdicate his birthright to judge what nature hath wrought, and to strive to improve on nature's works. But the judgment must be based on both knowledge and wisdom; we must avoid *hubris* which would be man's undoing.

FACULTY ACTIVITIES

Academic Appointments

RENÉ DUBOS
Herzstein Visiting Professor, University of California and Stanford University Medical Schools.

RICHARD M. FRANKLIN
Visiting Assistant Professor, Department of Virology, University of California, Berkeley.

MARK KAC
Lorentz Visiting Professor, University of Leiden.

ALEXANDER MAURO
Lecturer in Neurology, Laboratory of Neurophysiology, Columbia University.

WILLIAM TRAGER
Visiting Professor, Institute of Molecular Biophysics, Florida State University, Tallahassee.

Awards

PEYTON ROUS
Gold Medal of the Royal Society of Medicine, London.

Addresses and Lectures

EDWARD H. AHRENS, JR.
Albert Einstein College of Medicine.
Galeus Honorary Medical Society, University of Michigan Medical School.
School of Public Health, University of Michigan.

ALEXANDER G. BEARN
Genetics Study Unit, Yale University.
American College of Physicians, Postgraduate Course in Human Genetics, Ann Arbor, Michigan.

DETLEV W. BRONK
The Westinghouse Education Foundation, 21st National Science Talent Search Awards Dinner.

MERRILL W. CHASE
Robert A. Cooke Memorial Lecture, American Academy of Allergy, Denver.

RENÉ DUBOS
Society of the History of Medicine and Society of Psychiatry, Washington, D. C.
Keynote Speaker, International Journées Bretonneau, Tours, France.

LUDWIG EDELSTEIN
Cornell Medical History Society, Cornell Medical College, New York City.

MAURICE FOX
American Chemical Society, Biochemistry Group, Pittsburgh.

GUIDO GUIDOTTI
The Johns Hopkins University.

ROLLIN D. HOTCHKISS
Dyer Lectureship, National Institutes of Health, Bethesda.
Distinguished Lecturer in Biology, Department of Biological Sciences, University of Pittsburgh.

GEORGE J. JACKSON
New York Society of Tropical Medicine, New York City.

HENRY E. KYBURG, JR.
Graduate Philosophy Club Lecture, Yale University.

DAN H. MOORE
School of Medicine, University of California at Los Angeles.

GEORGE E. PALADE
Harvey Lecture, New York City.

HOWARD A. SCHNEIDER
Walter Reed Army Institute of Research, Washington, D. C.

IRWIN W. SHERMAN
New York Society of Tropical Medicine, New York City.

PHILIP SIEKEVITZ
Biology-Biochemistry Colloquium, Brandeis University.
Society of the Sigma Xi, University of Massachusetts.

WILLIAM H. STEIN
Philips Lecturer, Haverford College.

EDWARD L. TATUM
First Inter-American Conference on Congenital Defects, Los Angeles.

PAUL WEISS
Royal Swedish Academy of Sciences, Stockholm.
Wenner-Gren Institute, Stockholm.
Physiological Society, Stockholm.
Physiological Institute, Sorbonne, Paris.
Bucknell University Challenge, Lewisburg, Pennsylvania.
Yale University Lecture Series in Theoretical and Mathematical Biology.
University of California at Los Angeles.

CURTIS A. WILLIAMS, JR.
Rudolf Virchow Medical Society in the City of New York.

MAX A. WOODBURY
Columbia Medical Center, New York.

VLADIMIR K. ZWORYKIN
Meeting of the Philadelphia Chapter of the American Technion Society.

Participation in Conferences and Symposia

EDWARD H. AHRENS, JR.
Chairman, Special Review Panel on Diet and Heart Disease, National Institutes of Health, Bethesda.

VINCENT ALLFREY
Seminar on Synthetic Reactions in Cell Nuclei, Yale University.

ARMIN C. BRAUN
Gustav Stern Symposium on Perspectives in Virology, 3rd Conference, New York.

DETLEV W. BRONK
Symposium on Modern Graduate Education, Southwest Research Foundation, Dallas.

VERNON B. BROOKS
Conference on Brain and Behavior, American Institute of Biological Sciences and Brain Research Institute of the University of California at Los Angeles.

MERRILL W. CHASE
Symposium on Conceptual Advances in Immunology and Oncology, 16th Annual Symposium on Fundamental Cancer Research, Houston.

LYMAN C. CRAIG
Symposium Lecture, Colloid Division, American Chemical Society, Washington, D. C.

MAURICE FOX
Cytogenetics Seminar, Departments of Botany and Zoology, Yale University.

RICHARD M. FRANKLIN
Gustav Stern Symposium on Perspectives in Virology, 3rd Conference, New York.
Seminar, Department of Virology, University of California, Berkeley.

FRITZ LIPMANN
Symposium on RNA Coding, Indiana University, Bloomington.
Symposium on Basic Problems in Neoplastic Diseases, College of Physicians and Surgeons, Columbia University.

ALEXANDER MAURO
Kendall Award Symposium, American Chemical Society, Washington, D. C.

DAN H. MOORE
Conference on Mammary Tumor Virus, University of California, Berkeley.

FLOYD RATLIFF
Symposium on Physiological Optics, Optical Society of America, Washington, D. C.

THEODORE SHEDLOVSKY
Kendall Award Symposium, American Chemical Society, Washington, D. C.

LOUIS E. SILTZBACH
Trudeau Society Meeting, West Point, New York.

NORMAN R. STOLL
Conference on Laboratory Diagnosis of Microbial Diseases, New York Academy of Sciences.
Chairman and Participant, Symposium on Relation between Chemotherapeutic Drugs, Infecting Organisms and Hosts; Biological Council Co-ordinating Committee for Symposia on Drug Action, London.

PAUL WEISS
Symposium on Modern Graduate Education, Southwest Research Foundation, Dallas.

MAX A. WOODBURY
Scientific Session, Heart Association of Southeastern Pennsylvania, Philadelphia.

NORTON D. ZINDER
Gustav Stern Symposium on Perspectives in Virology, 3rd Conference, New York.
Symposium on Biological Replication, the Biophysical Society, Washington, D. C.

Society Elections

DETLEV W. BRONK
Honorary Member, The Royal Institution, London.

JAMES L. GERMAN, III
Fellow, American College of Physicians.

GEORGE E. PALADE
Council, Electron Microscope Society of America.

NORMAN R. STOLL
Life Member, New York Society of Tropical Medicine, New York City.
Affiliate, The Royal Society of Medicine, London.

PAUL WEISS
President, The Harvey Society.

VICTOR WILSON
Member, The Harvey Society.

Other Elections and Appointments

DETLEV W. BRONK
Member, Panel of Advisors, Center for Cultural and Technical Interchange Between East and West in University of Hawaii
Member, Advisory Committee, World Food Congress.
Member, National Committee of The Iran Foundation, Inc.

MERRILL W. CHASE
President, Metropolitan New York Branch, Animal Care Panel.

LYMAN C. CRAIG
Member, Selection and Scheduling Committee, Gordon Research Conferences.

ROLLIN D. HOTCHKISS
Advisory Committee, Oak Ridge National Laboratory.
Board of Associate Editors, *Biochemistry.*

DANIEL E. KOSHLAND, JR.
Editorial Board, *Biochimica et Biophysica Acta.*
Academic Council, Brookhaven National Laboratory.

FRITZ LIPMANN
Member, Scientific Advisory Committee, Massachusetts General Hospital.

ROBERT L. SCHOENFELD
Vice Chairman, Life Sciences Advisory Committee, Polytechnic Institute of Brooklyn.

PAUL WEISS
Member, International Advisory Council, Naples Zoological Station, Rome and Naples.
Member, Executive Committee, International Society for Cell Biology, Paris.
Member, Planning Committee, Henry Ford Hospital, Detroit.
Member, Executive Committee, Division of Biology and Agriculture, National Research Council, Washington, D. C.

FACULTY ACTIVITIES *continued from page eleven*

New Appointments to the Faculty

GERHARD BASCHANG, Research Associate with Professor Lipmann. On leave from Max-Planck-Institut, Heidelberg, where he is a Research Associate.

ZVI BOHAK, Research Associate with Visiting Professor Katchalski. Formerly Senior Scholar at The Hebrew University, Jerusalem.

V. MALCOLM CLARK, Affiliate. University Lecturer in the University of Cambridge and Director of Studies in Natural Science in Gonville and Caius College, Cambridge.

THOMAS W. CONWAY, Guest Investigator with Professor Lipmann. National Science Foundation Postdoctoral Fellow; formerly Research Scientist in the Clayton Foundation Biochemical Institute, University of Texas.

SID DEUTSCH, Affiliate in the Electronics Laboratory. Associate Professor in the Polytechnic Institute of Brooklyn.

LAWRENCE EISENBERG, Research Associate in the Electronics Laboratory. Formerly Electronic Engineer.

ROBERT B. GOLDRICK, Guest Investigator and Assistant Physician with Professor Ahrens. Overseas Medical Research Fellow of the National Heart Foundation of Australia; formerly Fellow in Cardiology, Sydney Hospital.

VICENTE HONRUBIA, Guest Investigator with Professor Lorente de Nó. United States Public Health Service Postdoctoral Fellow, formerly at the University of Chicago Medical School as a Fellow in the Department of Surgery.

ROBERT L. KIRK, Guest Investigator with Associate Professor Bearn. On leave from the University of Western Australia where he is Reader in Human Genetics.

PHILIP D. LUNGER, Guest Investigator with Associate Professor Dan Moore. From Indiana University.

FRITZ MILLER, Research Associate with Professor Palade. On leave from the University of Munich where he is an Associate Professor in the Department of Pathology.

JAMES OFENGAND, Guest Investigator with Professor Lipmann. United States Public Health Service Postdoctoral Fellow, formerly a Research Associate.

PAUL ROSEN, Research Associate in the Electronics Laboratory. Formerly Physicist.

CHARLES D. TOURTELLOTTE, Guest Investigator with Associate Professor Dziewiatkowski. Helen Hay Whitney Foundation Fellow, Instructor in Medicine in the Temple University School of Medicine.

Departures from the Faculty

JOHN W. FARQUHAR, Research Associate, left at the end of January to join the faculty of the School of Medicine of Stanford University, where he is Assistant Professor of Medicine.

MARILYN G. FARQUHAR, Research Associate, left at the end of January and has joined the Department of Pathology of the University of California School of Medicine in San Francisco.

DAVID KESSLER, Guest Investigator, left at the end of January to return to New York University College of Medicine.

Guest Speakers

WILLIAM F. ALBRIGHT, The Johns Hopkins University.

H. A. BARKER, University of California, Berkeley.

A. ALLEN BATES, New York University, University Valley.

ERNEST I. BECKER, Polytechnic Institute of Brooklyn.

CARL GUSTAF BERNHARD, Karolinska Institutet, Stockholm.

BARUCH S. BLUMBERG, National Institutes of Health, Bethesda.

SIR MACFARLANE BURNET, University of Melbourne, Australia.

WARREN L. BUTLER, U. S. Department of Agriculture, Beltsville.

F. H. C. CRICK, Cavendish Laboratory, Cambridge, England.

FRANK DIXON, Scripps Clinic and Research Foundation, La Jolla.

RICHARD W. DUTTON, Postgraduate Medical School, London.

MANFRED EIGEN, Max-Planck-Institut für Physikalische Chemie, Göttingen.

RALPH L. ENGLE, JR., Cornell University Medical College.

JOHN FAHEY, National Institutes of Health, Bethesda.

F. J. FENNER, The Australian National University, Canberra.

DAVID E. HUGHES, University of Oxford.

ELVIN KABAT, Columbia University.

FRED KARUSH, University of Pennsylvania.

KURT MISLOW, New York University.

GEORGE R. NAGAMATSU, Flower and Fifth Avenue Hospitals, New York.

J. LAWRENCE ONCLEY, Harvard Medical School.

LUIGI PROVASOLI, Haskins Laboratories, New York.

ALBERT B. SABIN, Children's Hospital Research Foundation, Cincinnati.

JACK SCHULTZ, The Institute for Cancer Research, Philadelphia.

M. SELIGMANN, University of Paris.

J. L. SIRLIN, University of Edinburgh.

LESLIE A. STAUBER, Rutgers University.

T. TOMITA, Keio University School of Medicine, Tokyo.

A. W. TUCKER, Princeton University.

DAVID A. J. TYRRELL, Medical Research Council, Salisbury, England.

K. VOGLER, Hoffman-LaRoche Laboratories, Basel, Switzerland.

MARTYNAS YCAS, Upstate Medical Center, Syracuse.