



NINETY-SIXTH ANNUAL REPORT  
**THE AMERICAN MUSEUM  
OF NATURAL HISTORY**  
JULY, 1964, THROUGH JUNE, 1965







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THE CITY OF NEW YORK  
1965





# NINETY-SIXTH ANNUAL REPORT OF THE PRESIDENT

*To the Trustees of  
The American Museum of Natural History  
and to the  
Municipal Authorities of the City of New York*

As I start my report I take pleasure once again in thanking all those who are in any way associated with or interested in the Museum for their constant and generous support in time and money. This group includes our staff, our Trustees, the officials of the City of New York, our members, donors, and all the friends who help us to function effectively.

The Museum reaches its audience in many ways. Courses, lectures, the library, publications, and film programs are just a few of the means of communication, but the principal method is our exhibition program. It is this program that is fundamental to our educational effort. It is gratifying, therefore, to report a substantial advance in the construction of new halls, the remodeling of existing areas, and in the design, preparation, and installation of new exhibits.

The Hall of the Eskimo, which was opened in March, shows Eskimo life as it was at the beginning of the present century. This hall is the newest and most comprehensive exhibit of Eskimo life in the Western Hemisphere. It is an excellent example of one of the most important functions of the Museum: the preservation and presentation in material form of cultures that are changing rapidly or disappearing.

The Hall of Early Mammals, which was opened in May, tells the story of the beginning of the Age of Mammals, some 63 million years ago, and contains specimens from some of the

finest collections of Paleocene and Eocene fossils ever assembled. The remarkable skeletons and other fossil materials displayed were collected over a period of 40 years by Museum expeditions that ranged from Mongolia to Argentina. The completion of this hall fills the gap in the series of exhibitions that follow the evolution of the vertebrates from the earliest known fishes of some 400 million years ago through the age of the dinosaurs to that of the earliest men.

The Hall of Primates, which was being completed in June, illustrates another principle of our exhibition program—the revision of material to reflect new scientific knowledge and modern techniques of presentation. The history of the hall dates from 1878, and it is interesting to note that the current change represents the third renovation. Significant gains were also achieved in the construction of other halls and facilities. Large-scale structural alterations to the Hall of Mexico and Central America, the Hall of Indians of the Woodlands and the Plains, and the Hall of Ocean Life were completed. This work paves the way for the installation of exhibits, and it is now anticipated that the Mexican and Indian halls will be opened next year, and the Hall of Ocean Life in 1967.

For some time the Museum has felt the need for a new hall of geology. Today, thanks to a generous grant from the John Lindsley Fund, plans and specifications are going forward for a major exhibition in which original color films, dioramas, specimens, models, and drawings will be used to explain the sequence of events that have shaped and reshaped the crust of the earth and that have resulted in the changing distribution of land, seas, and mountain-range formations. Exhibits will trace the evolution of animal communities as shown in the fossil record, with particular emphasis on invertebrate marine life. This hall will be known as the Lindsley Hall of Earth History.

The construction of two useful facilities was undertaken this year. One is a pedestrian ramp providing direct access from the visitors' parking lot to the first floor of the Museum.

The other is a new storage vault long needed for the preservation of our collection of motion picture films.

The initiation of a new project is always stimulating, especially when it also involves eager young people. The Louis Calder Natural Science Laboratory is such a project. In this laboratory-workshop boys and girls between the ages of eight and sixteen can conduct their own research and experiments in the natural sciences. The laboratory, made possible by a grant from the Louis Calder Foundation, is an adjunct to the Natural Science Center for Young People, which has been used by more than 350,000 boys and girls since it was opened in 1954.

The initial presentation of the Man and Nature Lectures sponsored by the Museum and its publisher, the Natural History Press, was enthusiastically received. The four inaugural lectures delivered in March by Dr. J. Bronowski, Deputy Director of the Salk Institute for Biological Studies, will be published in the fall of 1965 under the title "The Identity of Man."

Since the founding of the Natural History Press three years ago, 21 books have been published. This year a new series was started designed primarily for young people of junior high school age. These books, called the *Nature and Science Library*, are large volumes, richly illustrated in color. To date four titles have been published simultaneously in thirteen countries and in twelve languages. In addition, eight titles were published in the pamphlet series *Astronomy Highlights*. These texts are based on the content of sky presentations of the American Museum—Hayden Planetarium.

The magazine *Nature and Science* has become firmly established in schools throughout the country, and now has a circulation of a quarter of a million. Many professional educators consider this publication to be one of the most significant contributions in many years to science education in the elementary schools.



*Natural History*, our popular periodical for adults, recorded a new peak in circulation, which is now 175,000, as well as an increase in advertising revenue of 20 per cent over that of last year. A measure of the growing prestige of the magazine has been the marked increase in unsolicited manuscripts of exceptional quality received from distinguished scientists both in this country and abroad.

*Curator*, a quarterly professional journal, also enjoyed a steadily progressive year, and comments from readers indicated that it is a highly valued source of information on museology. We are indebted to the Lucius N. Littauer Foundation for a grant that has helped cover the cost of this publication.

In the fall the Museum experienced a shocking burglary. On the night of October 29, 1964, 22 items were stolen from the Morgan Memorial Hall of Minerals and Gems. I am very happy to report that nine of the gems, representing 70 per cent of the value of the material stolen, including the Star of India and the Midnight Star Sapphire, were recovered and are once again on public view.\* The protective systems of the Morgan Hall and other appropriate areas of the Museum have been modernized, and maximum security measures are in effect day and night. We are exceedingly grateful to the law enforcement authorities and the Office of the District Attorney for working so diligently and effectively for the recovery of these treasures.

During the year the Men's and Women's Committees, whose members raise funds that are vital to the initiation and continuation of essential programs, reported gifts in the amount of \$276,300 from a total of 2705 contributors. We are grateful to Messrs. L. F. Boker Doyle and Sidney S. Whalen, Jr., co-chairmen of the Men's Committee, and to Mrs. Constantine Sidamon-Eristoff, Chairman of the Women's Committee, and

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\* This report was on the press when we learned of the recovery of the de Long Star Ruby. We express our sincere thanks to Mr. John D. MacArthur for his pivotal role in effecting the return of this gem to the Museum.

her Assistant Chairmen, Mrs. Alfred L. Loomis, Jr., and Mrs. Gilbert G. Browne, for their effective leadership.

Among the additions to the endowment funds last year were a grant of \$2,500,000 from the James Foundation of New York, Inc., and a bequest of \$1,600,000 from the late Elmer C. Otto. The income from these funds will greatly advance our progress in exhibition, research, and teaching, and the exploration by our scientists of the world around us.

We were saddened by the loss of two outstanding men who served the Museum as valued Trustees for many years. Mr. Daniel E. Pomeroy, a member of the Board for 30 years, died on March 25, 1965. He participated in the 1926 Eastman-Pomeroy East Africa Expedition which brought back some of the outstanding collections now to be seen in the Akeley Memorial Hall of African Mammals. Mr. Childs Frick died on May 8, 1965. He was the founder and benefactor of the Frick Laboratory of Vertebrate Paleontology at the Museum which contains the finest documented collection of the fossil mammals of North America. Mr. Frick was a member of the Board for 35 years and also served as Honorary Curator of Late Tertiary and Quaternary Mammals.

Two new Trustees, Mr. Alfred M. Rankin and Mr. Edwin Thorne, were elected during the year. We welcome both to our Board.

The Museum goes forward with every intention of widening and extending its educational programs, and with the firm belief that the ever-growing body of scientific knowledge can most effectively be communicated to the public by being offered in the form of first-rate visual presentations. If we can fulfill our goals we will help to assure that the bright edge of curiosity will never be dulled and that the natural sciences will become more generally understood and appreciated.

*Alexander M. White*

## REPORT OF THE DIRECTOR

The rapid accumulation of a vast amount of scientific knowledge during the past quarter century has made it mandatory that we recognize the nature of the world around us, and understand our place in the world, and the manner in which this world is being shaped by the range and depth of scientific progress. Man has been carried into a paradoxical eddy by the same flood of knowledge that has increased our universal awareness. We are obtaining new information at an awesome rate, and each new fact that is uncovered leads to a further search for an additional piece of information. Such is the nature of science and progress. Yet, at the same time, the very torrent of the achievement overwhelms us. We gain knowledge, but not necessarily wisdom. On our ability to find a way out of this paradox depend our future, our well-being, and quite possibly our survival. We must assimilate the new information and relate it to our lives and conduct.

To help solve this dilemma of our times—to help people achieve a better understanding of the world in which they live—is a task that confronts both scientists and educators. It is a task that poses a double challenge to the scientist, but at the same time offers him a double opportunity, for the problem requires a two-pronged approach: basic research combined with education.

The American Museum of Natural History is engaged in this two-pronged approach. Our resident research and teaching staff numbers 105 individuals. Of this number, 24 are instructors in the Department of Education who teach either children or adults. In addition, 29 scientists are also teaching, at either the undergraduate or graduate level. These numbers do not, of



course, include the 80 individuals who hold appointments as Research Associates, many of whom are on the faculties of colleges and universities in different parts of the country.

Research is necessarily the forerunner of education and, as the reports that follow indicate, Museum scientists are conducting original research on many different problems. A comparative psychologist working in a quiet top-floor room, for example, watches the behavior of a bird inside a "sky simulator," a dome of special design. From these observations, the scientist hopes to learn new facts about the ability of birds to navigate by the stars. In another laboratory, a neurophysiologist, seeking to learn how hormones regulate growth phenomena in a species of land crab, studies the processes involved in the uptake and storage of water by this animal. In still another part of the Museum, a microbiologist is investigating the feeding processes of microorganisms that are close to the base of the food chain in the ocean.

Around the world, at four established field stations, in temporary camps, and in mobile units, Museum scientists are searching for clues to the solution of a variety of problems. Among the field studies described in this report is one on the mammals of Bolivia; it is hoped that this study may tell something of the ectoparasites of these mammals as possible vectors of disease. Described in the pages of this report, too, are far-ranging explorations and expeditions which have enlarged our understanding of living and extinct forms of life.

Staff zoologists have been studying the ecological relationships among animal populations of New Guinea. In the same area a Museum anthropologist has been recording cultural data as part of an extensive study of the relationship between education and social development in a rapidly changing society. Another anthropologist, working with families in heavily populated centers in India, is studying the biological responses of man to conditions of extreme crowding.

A paleontologist has been examining the fossil remains of

camels that lived twenty million years ago in the Big Horn Mountains of Wyoming in order to learn how these animals evolved. A geologist, combining field observations with the study of numerous collections of fossil invertebrates, has discovered evidence of a substantial and previously unknown change in world climate some 80,000 years ago. An astronomer working at our radio astronomy installation on Long Island is determining the polarization properties of the radio waves received from Jupiter and the sun. An electrophysiologist based at our field station in the Bahamas is collaborating with scientists in other institutions in a study of the physiological responses of sharks to chemical stimuli.

All of this research is eventually transmitted to other scholars and to the public for, as has often been said, science is a social product. The word science means, literally, to know, and scientists are well aware of their obligation to share their knowledge. The basic concept on which the Museum is organized is the conviction that science, and the knowledge that proceeds from it, are not the sole possession of its practitioners. The scientific knowledge that has been accumulated through the centuries belongs to all men.

By its very nature, however, this inheritance is difficult for man to acquire. Because of the many social, economic, and psychological factors that enter into the educational development of an individual, it is important that each person have the opportunity to learn at whatever time of life he is ready for learning. One of the most important contributions of the Museum, therefore, is that through its exhibits an individual can learn according to his needs, abilities, and interests; and the exhibits give him a broad base of learning upon which other phases of the teaching function of the Museum can rest. As President White has pointed out, the exhibits are vital methods of communication with individuals on all levels. These persons range from the wonderstruck youngster staring at a dinosaur for the first time to the graduate student closely observing some

minute detail of the process by which amino acids form the basic materials of life.

The major resources of our exhibits are the superb collections that have been assembled in the various departments of the Museum in the course of nearly a century. During the past year, for example, the collections of the Museum were increased not only in numbers but in quality, with objects and specimens notable for their beauty and rarity. These objects were added by gifts, field collecting, and exchange agreements with Museums around the world. The Department of Anthropology received such gifts as printing blocks from Tibet, and African masks, figurines, and bronze castings. Sixteen Philippine tektites, several larger than any of these stones previously acquired, were contributed to the Department of Astronomy. The collection of birds from New Guinea and the surrounding islands made by the late Dr. E. Thomas Gilliard of the Department of Ornithology on his last expedition was an important addition to the resources of that department. A gift of 12,000 mollusks, including a group of tree snails not previously in the collection, was made to the Department of Living Invertebrates. Animal carvings in jade, tourmaline, and other semiprecious stones, rare minerals from the Soviet Union, and meteorites from many different locations were added to the collections of the Department of Mineralogy. Thousands of specimens helped enrich the collections of the departments of Entomology, Ichthyology, Herpetology, Living Invertebrates, Mammalogy, and Vertebrate Paleontology. Probably none were more painstakingly collected than the 300 specimens of turtles, lizards, and frogs contributed to the Department of Herpetology by a school boy in Bangkok.

The growth of the collections is accompanied, of course, by advances in methods of interpretation. New exhibitions reflect not only the addition of new scientific knowledge and new materials but also new techniques of design, graphic arts, printing, and the preparation of specimens for display. Moreover,



as educators develop new principles and methods of teaching, these are employed in the development of new exhibitions to make each a more effective medium of communication. But the challenge continues, for we must assume that the more a person learns about the natural sciences the more he will want to know. It is our responsibility, therefore, to supplement our exhibits by means of a varied program of direct instruction. This we are doing, from the pre-school to the graduate level, and we are continually exploring new methods of teaching, both in our halls and by means of extension services.

In the Department of Education teaching activities are divided between daytime programs for young people on the one hand and programs for adults, including courses, field study, and evening lectures, on the other. The past year has been one of new developments and experiments with new approaches to teaching. Offerings included a weekly "Look and Listen" hour for pre-school children; a new series of courses combined with field walks for older boys and girls; and several new ventures in adult education. The last named included a special course for the blind, and two programs, "Operation Second Chance" and "The Golden Age," both conducted in cooperation with the Department of Welfare of the City of New York.

In all, 75,493 young people and 39,378 adults were enrolled in courses and lecture series. Among the adults were 590 New York teachers who took 21 college-accredited courses.

Progress at the Planetarium parallels that in the Department of Education. New courses in astronomy for junior high school students and new evening courses for adults have increased the teaching program of the Planetarium from two to four semesters. Thirty years ago 326 persons were enrolled in nine Planetarium courses. This past year, 1092 persons studied in 26 courses. At the same time, the National Science Foundation has helped expand the programs of the Planetarium by supporting the Summer Institute in Astronomy for 200 high school students and the In-Service Institute in Astronomy for 50 seventh-

and sixth-grade teachers. Also for the first time this year, the New York State Department of Education granted funds to support astronomy workshops for New York State teachers.

Another program through which the Museum is making a significant contribution to the national educational effort provides formal training for college students. For more than five years we have conducted an Undergraduate Research Participation Program, supported by the National Science Foundation. This program is designed to accelerate and enrich the development of selected college science students by enabling them to participate directly in current original research that is being carried on by Museum scientists. Students may apply for research positions on projects in various biological disciplines, including paleontology, and in anthropology and astronomy. To date, applications have exceeded the number of positions available by a ratio of approximately ten to one. In the first five years of operation, student participants in the program numbered 143. Of those who had obtained a bachelor's degree by the fall of 1964, 85 per cent were continuing their studies in graduate or professional schools.

For many years our scientific departments have conducted joint programs of graduate training with universities in the New York area. Under these programs candidates for higher degrees receive both formal instruction and project guidance at the Museum and make extensive use of our facilities and collections. Our scientists supervise the research of the doctoral candidates and regularly conduct courses and seminars for these students.

Another activity of particular interest on the graduate level is the program of indoctrination in marine biology at the Lerner Marine Laboratory of the Museum, at Bimini in the Bahamas. During the past year, the generosity of two donors, Mr. W. W. Knight and Mr. Michael Lerner, made possible the pilot offering in this program which is designed to give professors and graduate students teaching or studying at midwestern univer-

sities brief but intensive exposure to the rich tropical environment existing around the laboratory. The program is valuable in that it provides scholars residing in inland centers with insights into a part of man's environment that increases in importance daily—the sea.

A significant program of another kind which was inaugurated last year was directed to a broad group of scholars, teachers, and laymen of the metropolitan New York area. This is the annual series to which President White referred, called the Man and Nature Lectures. It was fitting that the theme of the inaugural lectures dealt with the identity of man. Dr. J. Bronowski posed profound and provocative questions, and there is no doubt that his discussions stimulated the audiences to further examination and study of the themes he explored.

The offerings I have described comprise some of the means by which the Museum is teaching individuals at nearly all levels. Dr. John W. Gardner, who is now Secretary of Health, Education, and Welfare, wrote in the magazine *Science* (May 7, 1965): "From now on, the individual is going to have to seek formal instruction at many points throughout his career. . . . Unfortunately, our institutional arrangements for lifelong education are ridiculously inadequate. Most educational institutions are still designed for young people who have nothing else to do." Museums represent a largely untapped resource for the provision of continuing educational opportunities of high quality and deep meaning, and it is up to all of us who are engaged in the work of museums to explore, enlarge, and fulfill this potential. The American Museum of Natural History will continue to seek all appropriate means for teaching the lessons of the order, the unity, and the variety in nature, of the differences and likenesses among men, and of the interrelationship of all living things. We will try to convey to all the individuals within our sphere of influence a better understanding of the world in which we live.

*James A. Oliver*



## REVIEW OF THE YEAR 1964-1965

The distinctions and honors received by our scientists from other organizations during this period include the following:

Dr. James A. Oliver, Director, served as vice-chairman of the New York Organizing Committee of the Seventh General Conference of the International Council of Museums (ICOM) for 1965. He was elected a vice-president of both the New York State Association of Museums and the Boone and Crockett Club. Dr. Joseph M. Chamberlain, Assistant Director, was elected a member of the Council of the American Association of Museums.

Department of Animal Behavior: Dr. T. C. Schneirla, Curator, served as sectional chairman at the Twelfth International Congress of Entomology, and as symposium chairman at the seventh annual meeting of the International Union for the Study of Social Insects. Both were held in France.

Department of Anthropology: Dr. Harry L. Shapiro, Chairman and Curator of Physical Anthropology, was awarded the Theodore Roosevelt Distinguished Service Medal for distinguished public service in science. He was also elected a Fellow of the American Academy of Arts and Sciences. Dr. Junius B. Bird, Curator of South American Archeology, was a vice-president of the Explorers Club. Dr. Gordon F. Ekholm, Curator of Mexican Archeology, was secretary-treasurer of the Institute of Andean Research. Dr. Margaret Mead, Curator of Ethnology, received three honorary degrees: a Doctor of Laws degree from Columbia University, that of Doctor of Science from the University of Cincinnati, and that of Doctor of Humane Letters from Bowling Green State University.

Department of Entomology: Dr. Jerome G. Rozen, Jr., Chairman and Curator, was re-elected president of the New York Entomological Society. Dr. Frederick H. Rindge, Curator, was elected president of the Lepidopterists Society.

Department of Fossil Invertebrates: Dr. Norman D. Newell, Chairman and Curator, was awarded the Medal of Merit by Hiroshima University in Japan. He also served as president of the Committee on Paleoecology of the International Paleontological Union. Dr. John Imbrie, Research Associate, was elected chairman of the Department of Geology at Columbia University.

Department of Herpetology: Dr. Richard G. Zweifel, Curator, served on the Board of Governors of the American Society of Ichthyologists and Herpetologists and on the Executive Council of the Herpetologists League.

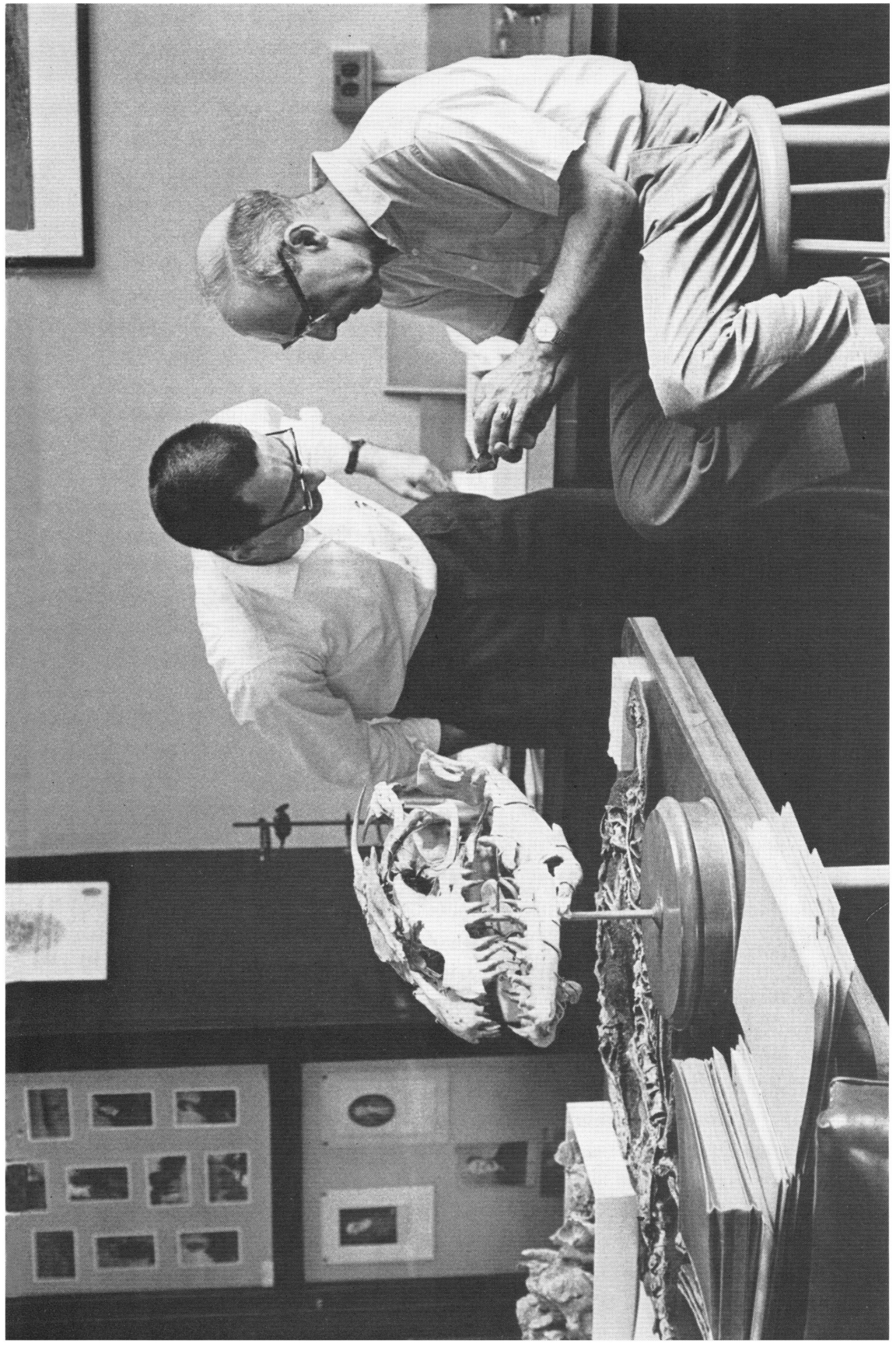
Department of Ichthyology: Dr. Donn E. Rosen, Chairman and Associate Curator, Dr. James W. Atz, Associate Curator, and Dr. C. Lavett Smith, Assistant Curator, served on the Board of Governors of the American Society of Ichthyologists and Herpetologists.

Department of Living Invertebrates: Dr. Horace W. Stunkard, Research Associate, was elected an Officer of the Order of Merit, Research, and Invention, Paris, France.

Department of Mammalogy: Dr. Richard G. Van Gelder, Chairman and Associate Curator, was elected recording secretary of the American Society of Mammalogists. Mr. Hobart M. Van Deusen, Assistant Curator, Archbold Collections, served as a vice-president and a director of the Explorers Club.

*The broad spectrum of educational programs offered by the Museum for individuals at all levels of learning includes the direct instruction of post-graduate students. Through collaborative arrangements with universities in the New York City area, candidates for higher degrees attend lectures, work with the collections, and receive individual guidance within the scientific departments. The Department of Vertebrate Paleontology, under the chairmanship of Dr. Edwin H. Colbert (right), provides advanced training in fossil vertebrates through a joint program with Columbia University.*

Photograph: Arline Strong



Department of Mineralogy: Dr. Brian H. Mason, Research Associate, was elected president of the Geochemical Society.

Department of Ornithology: Dr. Dean Amadon, Chairman and Lamont Curator of Birds, was elected president of the American Ornithologists' Union. He was assistant chairman of the United States Section of the International Council for Bird Preservation. Mr. Eugene Eisenmann, Research Associate, was secretary of the Pan American Section of the International Council for Bird Preservation. Mr. G. Stuart Keith, Associate, was elected secretary of the United States Section of the International Council for Bird Preservation.

Department of Vertebrate Paleontology: Dr. Edwin H. Colbert, Chairman and Curator, was appointed to the Museum Advisory Council of the State of New Jersey by Governor Richard Hughes. Dr. George Gaylord Simpson, Research Associate, was awarded the Daniel Giraud Elliott Medal of the National Academy of Sciences for the second time. No other individual has been awarded this distinction twice.

A record of staff changes during the year, including those that took effect July 1, 1965, follows:

In the offices of Administration, Miss Elizabeth E. Walldov was appointed Administrative Assistant to the Director.

In the scientific departments, the following promotions and appointments were made:

Department of Animal Behavior: Dr. Patricia S. Goldman was appointed Research Fellow.

Department of Anthropology: Dr. Stanley A. Freed and Dr. Colin M. Turnbull were promoted from Assistant Curator to Associate Curator. Dr. Richard A. Gould was appointed Assistant Curator of North American Archeology.

Department of Astronomy and the American Museum—Hayden Planetarium: Mr. James S. Pickering, Assistant Astronomer, retired and was appointed Astronomer Emeritus.

Department of Entomology: Dr. Jerome G. Rozen, Jr., was promoted from Associate Curator to Curator.

Department of Fossil Invertebrates: Dr. Keiji Nakazawa was appointed a Research Fellow.

Department of Herpetology: Dr. Richard G. Zweifel was promoted from Associate Curator to Curator. Miss Grace M. Tilger was appointed Scientific Assistant. Miss Margaret R. Bullitt resigned as Scientific Assistant.

Department of Ichthyology: Dr. Charles M. Breder, Jr., retired after 21 years as Chairman of the Department and 39 years at the Museum. He was appointed Curator Emeritus. Dr. Donn E. Rosen was appointed Chairman and was promoted from Assistant Curator to Associate Curator. Dr. James W. Atz was appointed Associate Curator. Dr. Reeve M. Bailey, Dr. P. Humphry Greenwood, Dr. Klaus D. Kallman, and Dr. John Tee-Van were appointed Research Associates.

Department of Living Invertebrates: Dr. Ernst Kirsteuer was appointed Assistant Curator. Dr. Linda B. Habas was appointed Research Fellow.

Department of Micropaleontology: Dr. Hugo D. Freudenthal and Dr. John J. Lee were appointed Research Fellows.

Department of Mineralogy: Dr. Brian H. Mason resigned as Chairman and was appointed Research Associate. Mr. D. M. Vincent Manson was appointed Assistant Curator.

Department of Ornithology: Dr. Walter Bock was appointed Research Associate. Dr. Edwin O. Willis was appointed Research Fellow. Mr. John Bull was appointed Field Associate.

Department of Vertebrate Paleontology: Dr. Donald Baird, Dr. John H. Ostrom, and Dr. Leonard B. Radinsky were appointed Research Associates. Dr. Leigh Van Valen was appointed Research Fellow.

Lerner Marine Laboratory: Dr. Perry W. Gilbert and Dr. M. Michael Sigel were appointed Research Associates.

In the Department of Education, Dr. Sune Engelbrektson was appointed Chairman. Mr. Peter Greenleaf was appointed Associate in Visual Education.

In the Department of Exhibition and Graphic Arts, Mr. Lyle E. Barton was appointed Manager of Exhibition.

In the Library, Mr. Gerald E. Holsinger was appointed Assistant Librarian.

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We were deeply saddened by the death of Dr. E. Thomas Gilliard, Curator in the Department of Ornithology. Dr. Gilliard, who died on January 26, 1965, had been associated with the Museum for more than 30 years and had made increasingly distinguished contributions to the field of ornithology.

We also record with sorrow the death of Mr. Ernest L. Bell, Research Associate in the Department of Entomology, who died on December 12, 1964.

## DEPARTMENT OF ANIMAL BEHAVIOR

*Lester R. Aronson, Chairman*

The design of research in the Department of Animal Behavior runs counter to the trend toward greater specialization now prevalent in many research laboratories. Instead of relying on the specialized approach to the solution of scientific problems, the department has marshaled the broad knowledge provided by several disciplines in meeting its complex task—that of understanding how animals function and how both internal and environmental forces affect their behavior.

Members of the department draw on the techniques of such sciences as zoology, anatomy, psychology, physiology, neurology, endocrinology, and evolutionary biology. They are making full use of tools provided by modern electronic and computer technology and of the techniques of modern biochemistry.

This broad approach has led to significant contributions to fundamental principles of behavior and to important advances in the understanding of behavioral development, brain function and behavior, interactions between the nervous system and hormones, foundations of social organization, and animal communication and navigation.

One of the foremost lines of research is a continuing study by Dr. Aronson and Mrs. Harriet Kaplan of the function of parts of the fish brain. Their aim is to discover the function of the forebrain and cerebellum in learning.

Mouthbreeders (small tropical fish) have been trained to perform certain tasks, such as pushing a target or swimming through a hole in a partition at a given signal. Experiments show that after surgical removal of either the forebrain or the cerebellum the fishes perform these maneuvers poorly. One significant finding of the experiments is that the forebrain serves as an arousal mechanism which keeps the remainder of the

nervous system working efficiently. It has been postulated that in the evolution of the forebrain, or cerebrum, in higher vertebrates, this nonspecific arousal mechanism forms the basis for the intricate mental processes involved in complex learning and intelligent behavior.

Another continuing study is one being conducted by Dr. T. C. Schneirla and Dr. Eleanor Lappano-Colletta into the biological basis for cyclic, two-phase behavior in army ants. These ants undergo a nomadic phase in which they nightly migrate to a new site after foraging and raiding activities, and a second phase in which they return to their brood after the nightly foraging. Research suggests that brood larvae, through secretions and other stimuli, trigger the onset of these phases in the adult ants.

In still another area of research, Dr. Helmut E. Adler has designed a device that may yield new insights into the age-old mystery of how birds navigate on long migrations. To answer the question of whether birds orient themselves through celestial navigation, as is popularly believed, Dr. Adler has developed a special "sky simulator," that is, a dome on which a projected light simulates the light of celestial bodies. With this device he is testing the ability of the birds to determine the basic elements of navigation, such as elevation, azimuth position, and the rate of movement of a spot of light (equivalent to the sun) in the mock sky.

At the same time, Dr. Adler is concentrating on another aspect of the problem. If birds do indeed use celestial navigation, they must be endowed with an accurate "internal clock," a biological mechanism that functions according to cyclic rhythms so that the reactions of the individuals shift as time progresses. He has found that starlings gradually lose their precise reactions to time if they are kept in continuous illumination, away from the rhythmic change of day and night.

A new line of research by Dr. Benjamin B. Kamrin indicates that elimination of the immune reaction in a chick exerts a pow-



erful influence on its neurological and morphological development. The immune reaction is the mechanism by which the body produces antibodies to fight off invading substances foreign to the organism. Using a technique developed in Czechoslovakia, Dr. Kamrin eliminates the immune reaction in fowl by uniting two developing eggs for several days, a technique that profoundly affects the basic biochemistry of the individual chick. Analysis of the resulting changes in the anatomy, physiology, and behavior of the individual may provide clues to the basic processes of structural and behavioral development.

Continuing studies of schooling in fish, conducted by Dr. Evelyn Shaw and her associates, have demonstrated that fish move in a school because of their attraction to the patterns they see, and that they appear to swim ahead of rather than to follow moving patterns. Recent work on this project indicates that fish develop schooling habits as they mature. Young fish are less selective in responding to patterns than are older fish.

The learning capability of young organisms may be a significant determinant in the development of individual behavior. Dr. Patricia S. Goldman this year undertook a study of learning in young rats and found that infants ten to twelve days of age take longer to learn than do rats a few days older. She is now investigating whether responses learned at a young age are remembered by older animals.

When disturbed, a curious marine invertebrate called the sea hare gives off a secretion of dense purple dye. Dr. Ethel Tobach is studying this "inking" process, about which very little is known, in an effort to determine whether it is involved in social interaction with other sea hares or is part of a predator-prey relationship. This study is one phase of Dr. Tobach's extensive program of investigation of the evolution of emotional behavior.

Dr. William N. Tavolga, continuing his study of the hearing ability of fishes, found that marine fishes are far less able to discriminate between sounds of similar or close frequency than is

man. In addition, he began another series of experiments on the auditory capacities of fresh-water goldfish and catfish.

Departmental research activities during the year were aided by grants from the National Science Foundation, the National Institutes of Health, the Office of Naval Research, and the United States Naval Training Device Center.

## DEPARTMENT OF ANTHROPOLOGY

*Harry L. Shapiro, Chairman*

The investigations that are currently in progress in this department range from studies of the earliest levels of human occupation of the New World to analysis of the interrelationship between culture and behavior. Geographically these researches extend from India to the American Southwest, with way stations in New Guinea, Africa, South America, Pakistan, Europe, and the West Indies. Two major areas are worth specific mention. The studies of Dr. Junius B. Bird are particularly outstanding. His detailed analyses of the prehistoric weaving techniques in Peru, linked as they are with the reconstruction of the development of civilization in South America, are proving to be of the highest importance. Dr. Margaret Mead's long-range studies in New Guinea, in collaboration with Dr. Theodore Schwartz, represent a major organization of cultural dynamics.

Dr. Shapiro's principal research revolved around a field trip he made to India at the invitation of the Indian Statistical Institute. The purpose was to establish a research program in human biology in India that would be centered at the Institute and carried on under Dr. Shapiro's direction with the cooperation of the members of the staff of the Institute.

Dr. Shapiro spent two months in Calcutta and devised plans for two research projects which will be conducted with the support of the Institute. One is a study of the biological responses of man to conditions of extreme crowding. For this

study, Indian families who live in heavily populated areas of Calcutta will be observed and will be compared with members of the same families who live in less crowded rural sections. A second major project will be a study of the biological effect of interbreeding between formerly highly inbred groups. Dr. Shapiro visited tribal groups in various places in India, from Darjeeling to the rural counties of Bengal. On his return he stopped in Sette Frati, a small hill town about 80 miles from Rome, where he plans to study the effect of isolation as a project that will parallel the program in India on the effect of overcrowding.

The research activities of Dr. Bird were devoted largely to the relationship of South American prehistory to culture outside South America. Early fabric production provides a valuable basis for comparative study, and Dr. Bird is occupied with both an analysis of the weaving techniques and the distribution of ancient loom types. He has made a world-wide survey of one of these, the backstrap loom, which was used in Peru for at least 2000 years. These looms appear elsewhere in the Americas and are widely distributed in southeast Asia. It has not been proved that the looms of Asia and those of America stem from a common source, but Dr. Bird is studying the possibility, together with other related cultural parallels between the two areas.

In the course of Dr. Bird's investigations, some 110 ethnological and archeological looms in the collection of the Museum have been assembled, mounted, repaired, and photographed. Diagrams of each loom have been prepared, and the technical data have been compiled. This exacting work is being done by Miss Milica Dimitrijevic.

Dr. Gordon F. Ekholm is also studying the possible relationships between the early civilizations of Asia and those of America. He has investigated the similarities in design motifs in the Shang Dynasty of China and the Olmec group of the eastern Gulf Coast of Mexico. The occurrence of certain distinctive scroll

motifs appears to support the possibility of a relationship. Such a relationship would be significant because the Olmec culture is the earliest of the high cultures of Mexico.

Dr. Mead reports that the five-year field study in cultural systematics in New Guinea, supported by the National Institutes of Health, is in its third year. A principal focus of Dr. Mead's field work in 1964 was on the relationship between education and social development in a rapidly changing society. Dr. Mead joined Dr. Theodore Schwartz and Dr. Lola R. Schwartz, who have been in the Territory of New Guinea since 1963 studying the Admiralty Island cultures. She spent two months recording culture change in Peri Village, Manus, Admiralty Islands, where she had worked in 1928–1929 and again in 1953. Dr. Mead began a new four-year project, with support from the National Science Foundation, on the cultural structure of imagery. Dr. Rhoda Metraux is the field director of this project which involves a comparative study of the people of Montserrat, West Indies, with the Manus and Iatmul peoples of New Guinea. Dr. Mead, with Dr. Metraux, is also completing a monograph, supported by the National Institute of Mental Health, entitled "The Factor of Allopsychic Orientation in Mental Health."

"Continuities in Cultural Evolution," the Dwight Harrington Terry Lectures that Dr. Mead gave at Yale University in 1957, were published in book form in 1964. In connection with

*The relationship between education and rapid social change in New Guinea is the subject of a five-year study being conducted by Dr. Margaret Mead and her associates. Here, Dr. Mead talks with a group of young people in the Manus village of Peri during a field visit to the Admiralty Islands in 1964. She had first studied the Manus people in 1928 and 1929. Since that time, she reports, they have moved from a stone age culture into a modern world in which children learn about rockets and satellites and parents discuss school budgets.*

Photograph: The American Museum of Natural History



a National Academy of Sciences-National Research Council study of food problems of the 1960's, Dr. Mead presented a paper, "Anthropological Contributions to the Development of Rational Dietary Practices," at the International Congress of Anthropological and Ethnological Sciences in Moscow.

Dr. Robert L. Carneiro continued work on a study of cultural evolution to determine whether or not there is a regular sequence in the way societies evolve cultural traits from such categories as political organization, subsistence, settlement, economy, social organization and stratification, and processes of law. In this comparative study, societies ranging from those of ancient Egypt to modern primitive groups were analyzed at one particular time in their existence. In a related project, Anglo-Saxon England was studied over a period of four centuries, and the rate of cultural development was determined. The study of Anglo-Saxon England was carried out in collaboration with Miss Daisy Hilse of Hunter College.

Dr. Colin M. Turnbull completed an analysis of field data on the Mbuti Pygmies. This work, "The Mbuti Pygmies: An Ethnographic Survey" (Anthropological Papers of the American Museum of Natural History, volume 50, part 3) is a study of the Pygmies of the Ituri forest in the Congo who are one of the few remaining hunting and gathering peoples of the world.

Dr. James H. Skinner and Dr. Harold C. Fleming were awarded Ogden Mills Fellowships for 1964-1965. Dr. Skinner is studying the origins of Upper Paleolithic cultures in western Europe of about 35,000 years ago. Dr. Fleming is studying the sources, routes of diffusion, and detectable effects of the introduction of iron-working into Africa, primarily in the sub-Saharan regions.

Two new exhibits were opened by the department in 1965. "Faces and Figures," 54 major works of primitive art from the Pacific Islands selected from the collection of Mr. Jay C. Leff by Mr. Philip C. Gifford, Jr., were on temporary exhibition from January to June. The Hall of the Eskimo, which was de-

veloped under the supervision of Dr. Stanley A. Freed, was opened on March 5, 1965. Progress was made on the planning and preparation of the Hall of Man in Africa, under the supervision of Dr. Turnbull; the Hall of the Peoples of the Pacific, under the direction of Dr. Mead; and the Hall of Indians of the Woodlands and the Plains, under the guidance of Dr. Freed.

Fifty-three collections were borrowed from the department by other organizations during the year, including material that comprised important sections of two major exhibitions. One, a large series of specimens from the Massim area of New Guinea, was exhibited at the Museum of Primitive Art in New York. The second, an important selection of objects from the Northwest Coast of North America, was shown at the Robert H. Lowie Museum of Archeology, University of California at Berkeley.

The collections were enriched by a number of important gifts. These included 20 Tibetan printing blocks from the Reverend Everett A. Ostrom; gold and pottery objects of Peru, Mexico, and Costa Rica from Mr. André Emmerich; a Nepalese bronze figure from Mr. Kenneth Heuer; 84 African carvings in wood and ivory, including masks, figurines, and brass castings, from Mr. and Mrs. Gaston de Havenon; ethnological specimens from the Peruvian Montaña from Messrs. Gerald Weiss and Robert L. Tripp; and ethnological specimens from the Waica Indians of southern Venezuela from M. Napoleon Chagnon.

#### DEPARTMENT OF ASTRONOMY AND THE AMERICAN MUSEUM—HAYDEN PLANETARIUM

*Thomas D. Nicholson, Chairman*

In an unprecedented expansion of the educational program of the Planetarium, nearly 1100 persons were enrolled in 26 courses in astronomy, navigation, and space science. The number of students represented an increase of 30 per cent over

that of the preceding year and an increase of more than 300 per cent over the figure for the fiscal year of just a decade ago when a program to enlarge the teaching facilities at the Planetarium was initiated.

Factors contributing to this impressive growth have been the construction of three classrooms since 1955, the introduction of courses in the late spring and summer in addition to those that are regularly offered from October through April, and increased cooperation from state and federal agencies.

Among the new programs added to the curriculum during the year was a series of two-day workshops for high school teachers of New York State, supported by the New York State Department of Education. The three workshops held in the spring of 1965 were received by the participants with such enthusiasm that four similar events have been scheduled for next year. In addition, the New York State Department of Education approved a proposal to support a teachers' institute in earth science during the fall and spring terms of 1965-1966.

For the first time, summer classes in astronomy were offered daily for students of junior high school age. The National Science Foundation continued its support of two other programs of education in astronomy: the summer institute for high school students of exceptional ability, and the in-service institute for elementary school teachers and supervisors.

The research program in radio astronomy at the Kalbfleisch Field Research Station continued to produce excellent results. The equipment, originally designed as an interferometer for the observation of the spectrum across a broad band of radiation from Jupiter, was modified to record right-hand and left-hand circular polarization and linear polarization on three separate channels, from the sun and from Jupiter. As in previous years, two students in the National Science Foundation Undergraduate Research Participation Program assisted in this research. In another phase of the Jupiter radiation studies, the Department of Astronomy of Yale University installed equipment at



the Kalbfleisch Station to be used in making observations in collaboration with the Planetarium.

Several temporary exhibits at the Planetarium dealt with the successful Ranger missions to photograph the lunar surface and with the progress of the Mars space probe, Mariner IV. Through arrangements made with the National Aeronautics and Space Administration, new photographs and other materials released by NASA are supplied immediately to the Planetarium in order that exhibits on space events may be kept up to date. The NASA Spacemobile presented lectures and demonstrations to Planetarium visitors during the summers of 1964 and 1965.

A small exhibit of unusual interest was the display of Philippine tektites, a gift from Mrs. Gertrude C. Hornbostel of Bellmore, New York. The collection of sixteen stones includes four large ones of exceptionally fine exhibition quality. Another important acquisition was the gift by Mr. Samuel D. Steinberg of Los Angeles, California, of a contemporary portrait of Galileo Galilei.

During the summer and fall of 1964, attendance at the sky presentations was at a somewhat lower level than normal, continuing a trend that began with the opening of the New York World's Fair in April of that year. Attendance figures for school groups, however, represented an increase over those of the previous fiscal year, and attendance by the public during the spring quarter showed a significant increase over that of last year.

The department undertook several new promotional and service activities to bring the Planetarium to the attention of a wider public. Dial-A-Satellite, a telephone answering service, was introduced to supply daily information on the appearance of artificial satellites and other interesting sky phenomena over the New York metropolitan area. The initial success of the project was so great that additional equipment was later installed to double the service. An automatic counting device shows that the recorded message, which includes information

about the Planetarium schedule, is being received by many more than a hundred callers a day.

A series of short, recorded talks on current astronomy, called "Sky Reporter," was offered to radio stations on a weekly basis as a public service. Starting in January, 1965, the service was broadcast by eight local stations in the New York City area. It was then offered to selected stations in New York, New Jersey, and Connecticut, 26 of which accepted it for regular broadcast. Both Dial-A-Satellite and "Sky Reporter" will be continued as long as the services prove useful.

In another radio venture, staff astronomers developed a series of half-hour recorded discussions, called "Armchair Astronomy," in cooperation with the subscription FM station WBAI. Since December, 1964, the programs have been heard twice weekly on WBAI and weekly on affiliated stations in Boston and Los Angeles.

At the invitation of the Empire State Building Corporation, a display that describes the sky presentations of the Planetarium was prepared for an exhibition in the Empire State Building.

## DEPARTMENT OF ENTOMOLOGY

*Jerome G. Rozen, Jr., Chairman*

In a department that deals with the animal group that contains many more species than any other, the problem of maintaining useful collections is a major concern. The Department of Entomology has custody of more than 13,500,000 insect and arachnid specimens, including a large number of type specimens and some of the most remarkable collections in the world of certain insect groups. The reorganization of the insect collection during the past year was, therefore, of major importance. The 110 new insect cases that had been purchased with funds granted by the National Science Foundation were used in the rearrangement of the collections of Hymenoptera, Coleoptera, Diptera, and Hemiptera. In addition, large por-

tions of the Lepidoptera and spider collections were transferred to new positions. As a consequence, much of the collection is now arranged in proper sequence and will be more useful to scholars.

Data on bee phylogeny are far from complete even though bees are a well-studied group. A promising fund of unused data is available in the biology of bees and the anatomy of their immature stages. Investigations by Dr. Rozen have been devoted to searching for biological characteristics and features of immature specimens that will aid in solving problems in phylogeny and in the classification of the 18,000 species of the superfamily Apoidea.

The result of one such investigation has been an important change in the classification of bees. Dr. Rozen studied the nesting site and immature stages of a species of the genus *Melitturga* in Switzerland. This genus has long been considered a link between two otherwise very dissimilar subfamilies of bees. The study clearly indicated that *Melitturga* was not intermediate and that the two subfamilies had not evolved recently from a common ancestor. Consequently, one subfamily was elevated to the status of family, and has been designated the Oxaeidae.

In a project supported by a grant from the National Science Foundation, Dr. Rozen continued his studies of the genus *Oreopasites* with field work at the Southwestern Research Station.

The researches of Dr. Willis J. Gertsch on arachnids, also supported by a grant from the National Science Foundation, were advanced substantially with the publication of four papers. One of these, prepared in collaboration with Dr. Donald M. Allred of Brigham Young University, was concerned with the scorpions of an arid stretch of land in southern Nevada that is used as a proving ground by the Atomic Energy Commission. The systematics and bionomics of the nine resident scorpion species were explored, and one of these species was described as new. In addition, Dr. Gertsch nearly completed his paper on

the South American fauna of the venomous and somewhat enigmatic spiders of the genus *Loxosceles*.

Another study by Dr. Gertsch, on the cave spiders of North America, continues to produce significant results. It is becoming increasingly clear that the North American fauna is equivalent in size and interest to that of Europe, which has been far more intensively collected and is generally better known.

Dr. Frederick H. Rindge continued his systematic revisions of the moths of the family Geometridae and carried out additional studies of various generic groups. His survey of the Lepidoptera of the Rocky Mountain region, a project financed by a grant from the National Science Foundation, proceeded with summer field work in the mountains of New Mexico, where excellent results were obtained by collecting at night with the aid of ultraviolet lights powered by a portable generator. Dr. Rindge returned with more than 20,000 moth specimens. One of the aims of this survey is to clarify the relationships and differences between the little-known fauna of the Neotropics and those of the Nearctic region.

Dr. Pedro W. Wygodzinsky completed the manuscript of his major monographic study of the assassin bugs of the subfamily Emesinae, a work on which he has been engaged intermittently over the past fourteen years. In addition, he devoted considerable time to the translation from German into English of an important paper by Dr. Willie Hennig on the Diptera of New Zealand. The paper is particularly significant because in it the principles of strictly phylogenetic systematics are applied to a complex zoogeographic problem. The translation will be made available in the *Pacific Insects Monograph* series published by the Bernice P. Bishop Museum.

The Research Associates and Research Fellows in residence pursued their important tasks in the curating of various collections. Mr. Wilton Ivie advanced his studies of North American spiders and prepared a paper on the genus *Islandiana*. Dr. Kumar Krishna continued to use the Emerson termite collection

in his research, and Dr. Herbert Ruckes completed six papers reporting on his long-term studies of the stink bugs of the family Pentatomidae. Dr. Alexander B. Klots, who was on sabbatical leave from the City College of the City University of New York, devoted full time to his work on the Nearctic Crambinae.

Collaboration with other institutions and individuals continues as a vital function of the department. It is a growing obligation which more and more identifies this Museum as one of the great repositories of insects and arachnids in the world. The basic pool of well-documented specimens, brought together during more than 30 years of intensive field collecting from numerous localities, but emphasizing the New World, is used by students from many lands for modern research projects. The identification of parasites, predators, and other key specimens for physicians, control biologists, ecologists, and researchers in various fields of study represents a contribution of great importance that is often available only from members of this department.

Approximately 224,000 specimens were added to the collections during the year. The most notable accession was the collection of black flies, leaf miner flies, bristletails, firebrats, and silverfish donated by Dr. Wygodzinsky.

## DEPARTMENT OF FOSSIL INVERTEBRATES

*Norman D. Newell, Chairman*

Some 80,000 years ago, when the great glaciers of the Pleistocene covered most of the Northern Hemisphere, the climate suddenly warmed and became even more mild than it is at the present time. Evidence of this significant break in the cold of the Pleistocene ice age has been discovered by Dr. Newell in the form of an elevated shoreline in the Bahamas. Research by other scientists in the Atlantic and Mediterranean

supports this finding that the last major continental glaciation was disrupted by a warm interval about 80,000 years ago.

Dr. Newell has discovered that the level of the sea in the Bahamas was raised eight or nine feet during the last, or Wisconsin, stage of the Pleistocene ice age. Presumably, the sea was fed by water from the melting of the vast ice sheets that at that time covered much of the Northern Hemisphere. The Wisconsin stage is commonly thought to have been characterized by a climate ranging from cool to glacial in nature and by a low sea level. Coupled with findings of others, however, Dr. Newell's research suggests that, for a brief period, the major ice sheets of North America disappeared. The last warm interval known before the Wisconsin was the Sangamon time, which is believed by many to have ended some 125,000 years ago. Dr. Newell, therefore, has presented the possibility that there were unexpectedly large oscillations of world climate at a time long supposed to have been characterized by stable continental glaciers.

In addition to this research, Dr. Newell has continued his investigations of the sudden and world-wide extinction of whole faunas, a hitherto unexplained event that has occurred many times in the past. He is also nearing the completion of a ten-year survey and synthesis of all present-day knowledge of fossil and living bivalve mollusks. This work has been supported by grants from the National Science Foundation. Grants from the National Science Foundation as well as support from the Museum made it possible for Dr. Newell to conduct a seven-month study of Permian bivalves in universities in Australia, Japan, India, and West Pakistan.

Dr. Roger L. Batten was invited by the Geological Survey of Great Britain to conduct a study of Lower Carboniferous gastropods, and the work was completed this year. The results of the study will be published as a monograph of the Palaeontographical Society, of Great Britain, an honor rarely bestowed on non-British investigators. Further research on Lower Car-

boniferous gastropods in Belgium, Germany, and the United Kingdom was conducted by Dr. Batten in the spring and early summer of 1965.

One of the highlights of the year was the discovery by Mr. Erik N. Kjellesvig-Waering of a Devonian fossil scorpion with perfectly preserved gill sheaths. It has long been supposed that the scorpions were the earliest land animals, and this discovery demonstrates that at least some of the early scorpions were aquatic.

Other studies by staff members progressed satisfactorily during the year. Dr. Robert M. Finks, one of the foremost authorities in the world on fossil sponges, continued his investigations of this group of animals. Dr. John Imbrie completed his work of several years' duration on sediments in the paleoecology of the Bahamas. He also undertook new studies in paleoecology in Kansas and Oklahoma.

Drs. Newell, Batten, and Imbrie continued their program of graduate instruction in invertebrate paleontology, an activity that is sponsored by the Museum and Columbia University and provides a major source of university teachers of invertebrate paleontology.

Planning by the department progressed on the scientific content and architectural structure of the Lindsley Hall of Earth History, which will be a new major exhibition. The departments of Micropaleontology, Mineralogy, and Education are also contributing extensively to the hall, which is being made possible by a grant from the John Lindsley Fund.

## DEPARTMENT OF HERPETOLOGY

*Charles M. Bogert, Chairman*

Members of the department combined field work with laboratory studies during the year in an integrated approach to the systematics, ecology, evolution, and behavior of amphibians and reptiles.

Dr. Richard G. Zweifel spent ten weeks collecting and studying amphibians and reptiles in New Guinea, and Mr. Bogert made field trips to two locations in Mexico and a brief visit to Ceylon.

Mr. Bogert's field work demonstrates the advantages of working in the same area on successive years. In order to obtain an accurate picture of the ecology and the behavior of the species in any region, work should be done over several years and during different seasons.

In the autumn dry season of 1964, Mr. Bogert discovered among the amphibians and reptiles of Oaxaca, Mexico, some unusual ecological and behavioral phenomena not encountered in the same localities during previous field work that had been largely restricted to the summer rainy season. He obtained one species of alligator lizard, for example, that he had sought without success on earlier trips. However, several species of alligator lizards easily collected during the rainy months were neither abroad nor active during the dry season. He also found that the common toad of the mountains and highland valleys departs from the usual breeding pattern of amphibians, most of which breed during the rainy season, by breeding during the dry season. This toad has been found at several localities in Oaxaca at altitudes ranging from 5000 to 8000 feet and was previously the only toad known in the valley of Oaxaca. Mr. Bogert, however, found that the Neotropical Toad, a characteristic inhabitant of the lowland coastal plain, has ascended to one swamp at an elevation of 5000 feet in the valley.

Mr. Bogert also spent a week collecting in southern Baja California during June. Few snakes were active at this time, but Mr. Bogert obtained representatives of most lizards native to the area between San Lucas and San Jose.

In the laboratory, studies of the egg-tooth of reptiles continued. The presence or absence of egg-teeth provides clues to the relationships of the major groups of reptiles. Thus far, small fossorial reptiles erroneously called "worm lizards" are the



only reptiles in which it is known that the egg-tooth is replaced by a large, functional tooth at the front of the upper jaw. Since he began studying the egg-tooth in 1964, Mr. Bogert has investigated the egg-tooth in hatchlings as well as the newly born offspring of as many species as possible in an effort to ascertain whether comparable tooth replacement occurs in any fossorial lizard.

Dr. Zweifel, whose studies of the frogs of New Guinea began when he joined the Museum staff in 1954, was able to expand his knowledge of these amphibians by observing them in their native habitat. Aided by a grant from the National Science Foundation, Dr. Zweifel spent ten weeks in New Guinea in the summer of 1964, using the town of Lae as a base and joining the Seventh Archbold Expedition for part of the period. He collected near Lae and at four other widely separated areas ranging in altitude from sea level to 8000 feet. His collection includes approximately 900 specimens, evenly divided between amphibians and reptiles. Dr. Zweifel also obtained tape recordings of the calls of 20 species of New Guinea frogs. Virtually nothing had been known of the calls of the frogs of New Guinea, so these recordings are especially valuable.

One of the interesting discoveries made by Dr. Zweifel during his New Guinea expedition was the fact that the call of one species of frog, when played back by tape recorder, elicited a totally different call from other individuals of the same species, a call that is not otherwise heard.

Before he reached New Guinea, and on his way back to the United States, Dr. Zweifel visited several museums in foreign countries where he studied type specimens of frogs. These included the British Museum, the Zoological Museums in Amsterdam and Leiden, and the Senckenberg Museum in Frankfurt. Later he visited museums in Australia and Hawaii. Dr. Zweifel has now examined type specimens of about 65 per cent of the New Guinea forms, including 80 per cent of those in the family Microhylidae, on which he has concentrated his research.

Herpetological studies continued at the Kalbfleisch Field Research Station during the summer. Mr. Erik Kiviat, a high school student, worked as a volunteer to further the turtle studies. He trapped most of the turtles in the population several times during the summer in order to gather information concerning the movements of turtles between ponds as well as the size and weight of individuals. This study, which is expected to continue for several years, should provide an interesting contrast to work of a similar nature done by other investigators on large populations of painted turtles inhabiting lakes in the Midwest.

#### DEPARTMENT OF ICHTHYOLOGY

*Donn E. Rosen, Chairman*

Dr. Charles M. Breder, Jr., who had been the distinguished Chairman of the department since 1944, retired in May, 1965. Although his departure represents a major administrative and personal loss for his associates, Dr. Breder will continue his research work at his home and laboratory in Englewood, Florida. It is the hope and expectation of the department that in his new role as Curator Emeritus, he will continue a productive relationship with his colleagues.

Among the important advances of the year was the start of construction on the expanded and improved quarters that have been made possible by a facilities grant from the National Science Foundation, supplemented by funds from the Board of Trustees of the Museum. The new quarters will include laboratories, offices, a library, accessioning and processing rooms, and collection storage areas. Provision is being made for the addition of a large greenhouse that will permit the study of various species of live fishes.

In expedition activities, Dr. C. Lavett Smith led three cruises as part of the long-range biological survey of the Bahamas and collected a total of 15,000 fish specimens. Dr. Reeve M. Bailey,

representing the department on the American Museum-Bolivian Expedition, collected approximately 35,000 fishes. In addition, Dr. Breder did field work in Florida. His studies on fish-produced sound and on the ecological aspects of fish pigmentary systems, which were supported in part by the National Science Foundation, were carried on both at his own laboratory at Englewood and at the Cape Haze Marine Laboratory at Sarasota.

Drs. Rosen and Smith spent two days in June surveying the fishes of Gardiners Island as guests of Mr. Robert L. D. Gardiner, owner of the island. Other Museum scientists who participated in the weekend biological survey of this faunally rich island at the eastern end of Long Island Sound were Dr. Wesley E. Lanyon, of the Department of Ornithology, Dr. Evelyn Shaw, of the Department of Animal Behavior, and Dr. Richard G. Zweifel, of the Department of Herpetology.

Five major papers were completed by department members. A book entitled "Modes of Reproduction in Fishes" by Dr. Breder and Dr. Rosen was in proof at the end of the fiscal year. Dr. James W. Atz, who joined the staff in November, 1964, contributed a chapter on intersexuality in fishes for a volume entitled "Intersexuality in Vertebrates Including Man," edited by Dr. C. H. Armstrong and Dr. A. J. Marshall. Dr. Smith completed an analysis of the patterns of sexuality and classification of the sea basses which was published early in the fiscal year. A new classification of the teleostean fishes, by Dr. P. Humphry Greenwood, Dr. Rosen, Dr. Stanley H. Weitzman of the United States National Museum of the Smithsonian Institution, and Dr. George S. Myers of Stanford University, went to press. The fifth major contribution, by Dr. Breder, provides one of the most significant discussions of the physical and biological aspects of the formation of fish schools yet presented. It is also in press. All of the above papers, with the exception of that by Dr. Atz, are based on work supported in part by funds from the National Science Foundation. The Foundation also provided a grant for

the publication of the volume on reproduction by Drs. Breder and Rosen.

Cooperative investigations were developed by Drs. Bailey and Rosen on various groups related to flying fishes and silversides; by Drs. Greenwood and Rosen on several major questions on the evolution of bony fishes; by Dr. Henry Clay Frick, II, Dr. John Tee-Van, and Dr. Smith on the shore fishes of Bermuda; and by Dr. Klaus D. Kallman and Drs. Atz and Rosen on the genetics, behavior, anatomy, and classification of several tropical American freshwater species of fishes. Drs. Rosen, Atz, and Smith are also serving as advisers for six graduate students.

Dr. Phyllis H. Cahn continued her studies of the superficial sensory systems of juvenile fishes with support from the National Science Foundation, and Dr. Atz initiated a new study of the biology and classification of a group of spiny-finned fishes, largely from South American waters, some of which practice oral incubation of their fertilized eggs. He and Dr. Rosen also began a joint project to investigate the evolutionary adaptations to the conditions of sightlessness in cave fishes.

In addition, Dr. Rosen with support from Mr. James C. Greenway, Jr., continued his taxonomic studies of Guatemalan fishes. Dr. Rosen also made progress in his population analysis of a cold-adapted strain of a species of mosquitofish maintained at the Kalbfleisch Field Research Station. This project is now in its fourth year, and highly significant results have been obtained on the ecological requirements for reproduction in the species. Continuing studies by Dr. Smith included work on the Neogene fishes and on his major revision of the American groupers.

Preliminary plans were drawn for the new gallery devoted to the biology of fishes, which will occupy the balcony of the Hall of Ocean Life. Outlines were completed for the first three series of exhibits, which will deal with the anatomy and general characteristics of fishes, and the problems of living in water and meeting environmental extremes.

## DEPARTMENT OF LIVING INVERTEBRATES

*William K. Emerson, Chairman*

Research on Cenozoic mollusks and modern land crabs, the development of new exhibits on bioluminescence and Protozoa, the publication of more than 30 papers, and the cataloguing of approximately 100,000 new specimens were among the activities that occupied the staff during this highly productive year.

Dr. Emerson continued his long-range program of research on the taxonomy and zoogeography of the late Cenozoic mollusks of the tropical and subtropical seas of the Western Hemisphere. This work and related studies were published in eight papers, including reports on the large collections of marine mollusks obtained by the Puritan-American Museum Expedition to western Mexico in 1957 and by the Belvedere Expedition to the Gulf of California in 1962. The numerous Pliocene and Pleistocene marine fossils collected on the latter expedition were recorded in a joint paper by Dr. Emerson and Dr. Leo George Hertlein of the California Academy of Sciences. Reports were also published on studies undertaken by Dr. Emerson in collaboration with Mr. William E. Old, Jr., Specialist in the department, on the marine mollusks of the Galapagos Islands; with Mr. Anthony D'Attilio on a new species of *Latiaxis* from the Western Pacific; and with Mr. Morris K. Jacobson on the terrestrial mollusks obtained by the Belvedere Expedition.

Dr. Dorothy E. Bliss and her research assistants extended their studies of neuroendocrine regulation in the land crab *Gecarcinus lateralis* to include an intensive investigation of its mode of water uptake. This land crab has a remarkable ability to absorb large amounts of water from slightly damp soil and to store it for later use. The ability is particularly marked just before the crab sheds its exoskeleton, and the water is subsequently used to stretch the new shell before it hardens. The present investigation is designed to show how the water is absorbed, where it is stored, and what neurohormones of the cen-

tral nervous system are involved. This work and other aspects of the research program are supported by a grant from the National Science Foundation. The research assistants working with Dr. Bliss during the year were Miss Stefanie Wang, Mr. Edwin Martinez, Mr. Morris Altman, and Mr. Christopher Ray.

Dr. Libbie H. Hyman, continuing her work on her treatise "The Invertebrates," made progress on volume 6, Mollusca, and published a paper describing a new seriate alloecocoel. Dr. Horace W. Stunkard pursued his studies of the morphology, life histories, and bionomics of parasitic flatworms, a research program that is supported by the National Science Foundation. His work resulted in the publication of five papers and the completion of seven additional manuscripts during the year. Dr. Henry E. Coomans completed the task of reorganizing the mollusk reference collection. He left the department at the end of 1964 to return to his home in the Netherlands. A grant from the National Science Foundation made possible the reorganization of this collection, which now constitutes a valuable reference facility for taxonomic and zoogeographic investigations.

Dr. William J. Clench and his colleagues at Harvard University continued to use parts of the mollusk collection in their research projects. In addition, Dr. Clench kindly identified a collection of fresh-water mollusks received from the Congo.

Other Research Associates made progress in their studies of various collections in the department: Dr. John D. Soule and Mrs. Soule working with marine bryozoans; Dr. Donald F. Squires with corals obtained by the research vessel "Vema"; Mr. D'Attilio with the muricid gastropods, and Mr. Jacobson with local molluscan faunas, and the land and fresh-water mollusks of the Caribbean and Central America.

Field work by members of the department included the collection of intertidal invertebrates at Cape San Lucas, Baja California, Mexico, by Mr. Old as well as his participation in the dredging cruise of the "Cavalier" in the eastern part of the Gulf of Mexico, and the collection by Mr. Jacobson of terrestrial

mollusks in remote areas of Nicaragua.

Dr. Bliss devoted much time to the planning of exhibits for the Hall of the Biology of Invertebrates. This hall is being developed jointly by members of the several departments concerned. She was assisted in this work by Mr. Gerald Thurmann and Mrs. Judith Ann de Graaff of this department, and received valuable help from Dr. John J. Lee of the Department of Micro-paleontology. In another phase of exhibition activity, Dr. Emerson, with the assistance of Mr. Old, planned a new permanent exhibition depicting the mollusks of New York State. In this connection, Mrs. Francis H. Low presented to the department a valuable collection of scientifically arranged shells, mostly marine mollusks from Long Island Sound, many of which will be used in the new exhibition.

Other notable accessions included a collection of 12,000 mollusk specimens from all parts of the world, donated by Mrs. Sophie V. Wisoff in memory of her husband, the late Dr. Julius Wisoff. The total of accessions represented a significant increase over the figure for the previous year. Mr. Old and several volunteer assistants catalogued approximately 100,000 specimens.

## DEPARTMENT OF MAMMALOGY

*Richard G. Van Gelder, Chairman*

Expeditions to Bolivia, New Guinea, and Australia, and the completion of the remodeled Hall of Primates, were important projects of the year.

The American Museum-Bolivian Expedition, begun in 1964, continued this year along approximately 1000 miles of the Río Itenez and Río Mamoré in northeastern Bolivia. The expedition, supported by the Museum, the National Geographic Society, and the United States Army Medical Research and Development Command, was conducted for the purpose of studying mammals

and their ectoparasites as vectors of disease. A second objective was to determine whether hemorrhagic fever, which afflicts human beings, is transmitted by the animals inhabiting the northeastern border of Bolivia. Approximately 1500 mammals, 400 birds, 1500 reptiles and amphibians, 800 lots of parasites, 200 samples of blood serum, and several hundred lots of dried insects and fishes in preservative were obtained. Dr. Van Gelder, Dr. Karl F. Koopman, and Dr. Sydney Anderson each headed the field work for a period of two months or more.

The Seventh Archbold Expedition to New Guinea, under the leadership of Mr. Hobart M. Van Deusen, returned this year with a valuable collection of mammals and other animal specimens, as well as color slides and film from the Huon Peninsula, a virtually unexplored area on the northern coast. The expedition spent about seven months in the field and obtained approximately 12,000 specimens of plants, 3000 vertebrates, and 18,000 invertebrates. Notable among the finds was a rare water rat of which there are only a few known specimens. Mr. Stanley O. Grierson, a photographer and naturalist, accompanied Mr. Van Deusen to photograph the mammals in their natural settings. Dr. R. D. Hoogland, a botanist from Canberra, Australia, also participated. The purpose of the Archbold Expeditions is the study of the geographical and ecological relationships of the animal and plant life of New Guinea and Australia. The expeditions are sponsored by Mr. Richard Archbold and by grants from both the National Science Foundation and the Explorers Club of New York.

The joint Western Australia-American Museum Expedition completed its second year of field work in Western Australia with the collection of both mammalian and herpetological specimens by Mr. W. H. Butler of the Western Australian Museum.

The remodeling of the Hall of Primates was completed at the close of the fiscal year. Specimens from a former hall were renovated, and new exhibits were added to show the major groups of primates from the primitive tree shrews to man



Specimens are grouped according to families, and the distinctive characteristics of each family, as well as those common to all primates, are described and illustrated. A large mural depicting the "family tree" of the primates traces their evolution over a period of 60 million years. The preparation of the hall was supervised by Dr. Anderson.

Dr. Van Gelder completed the gathering of data for his taxonomic revision of the skunks of the genera *Mephitis* and *Conepatus*, and continued to direct population studies of small mammals at the Kalbfleisch Field Research Station on Long Island. Both projects were supported by grants from the National Science Foundation. In collaboration with Dr. W. V. Mayer of Wayne State University, Dr. Van Gelder completed the editing of volume 2 of "Physiological Mammalogy" and began work on volume 3.

Dr. Anderson continued his studies of Mexican mammals and published a paper on the systematic status of two species of pocket mice from northwestern Mexico and a revision of a genus of bat (*Macrotus*). Dr. Koopman continued his research on bats of Africa and completed one phase of this work with the publication of a paper on Congolese bats. He also published a paper on bats from Arizona of the genus *Myotis* and identified more than 250 bat specimens for the New Jersey Health Department in connection with their studies of rabies.

The final manuscript of Mr. George G. Goodwin's studies of the mammals of Oaxaca, Mexico, was brought almost to completion. Mr. Goodwin, in collaboration with Mr. Arthur M. Greenhall, published a paper on bats of Trinidad. Mr. Fernando Dias de Avila Pires reported on the status of type specimens of Brazilian mammals collected by Prince Maximilian zu Wied, whose original material is, in part, in the department. Mr. Jon C. Barlow, who participated in the American Museum expeditions to Uruguay in 1962 and 1963, completed a dissertation on the ecological and geographical distribution of mammals in Uruguay.

## DEPARTMENT OF MICROPALAEONTOLOGY

*Brooks F. Ellis, Chairman*

A new publication, "Catalogue of Index Foraminifera," was begun this year. The first volume of the projected three-volume set has been completed. It deals with the larger foraminifera, the lepidocyclines and miogypsinids. Larger fossil foraminifera are excellent index forms, but because of their complexity few persons who are not specialists have been able to utilize them to advantage. The catalogue is designed primarily for the stratigrapher or micropaleontologist who is not a specialist, thus making it possible for a greater number of geologists to use this group of organisms effectively in research.

Laboratory work devoted to the study of living foraminifera progressed rapidly during the current year. Dr. John J. Lee has found that foraminifera are selective feeders and that they consume certain species of diatoms, chlorophytes, and bacteria in large quantities. The physiological age of the food organisms, the concentration of food, and the stage in the life cycle of the foraminifera all affect the feeding process. Nutritional studies of *Allogromia laticollaris* indicate that young forms may eat 200 times more food than older individuals many times their size. Also, the method of reproduction seems to be related to the kind of food eaten. This work was carried out by Dr. Lee under grants from the Atomic Energy Commission and the

*The family tree of the primates showing their divergence from a common ancestor and their development over 60 million years is depicted in a floor-to-ceiling model in the new Hall of Primates. Mounted specimens, skeletons, drawings, and charts are also employed to illustrate the similarities and differences among the various species of primates, the mammalian order to which man belongs.*

Photograph: Arline Strong



National Science Foundation.

Twelve sea voyages were made to collect and study planktonic foraminifera. The results were excellent because of new techniques for keeping organisms alive until they can be brought back to the laboratory. Studies of living foraminifera show that putting them under increased water pressure caused a proportionate increase in calcification. At the present time anatomical studies are being undertaken with the aid of an electron microscope. This work is being done by Dr. Hugo D. Freudenthal with support from the National Science Foundation.

Miss Angelina R. Messina made a three-month tour of India, Japan, Australia, New Zealand, Turkey, Iran, Lebanon, Jordan, and Egypt to do field work and to consult with scientists with whom the department has had previous contact. She also represented the department at the Twenty-second International Geological Congress at New Delhi, India, and collected living foraminifera on the Great Barrier Reef.

The "Catalogue of Ostracoda," which was completed last year and which is the most widely distributed of the three catalogues published by the department, was kept up to date with the publication of the first supplement late in 1964. The catalogue has been distributed to more than 400 subscribers in every country in the world where work in micropaleontology is in progress.

*Micropaleontology* continued to be the leading journal in its field. About 50 per cent of its subscribers and the same percentage of authors are from overseas. The "Catalogue of Foraminifera," compiled by Dr. Ellis and Miss Messina, has been made available on microfilm. Relatively new colleges and universities are beginning to subscribe to this reference work and probably will constitute the bulk of subscribers in the future.

The Shell Oil Company of New Orleans made a valuable gift to the department of more than 50 samples of microfossils from important localities on the Gulf Coast. Through an arrangement with the University of Berlin, the department received five large

samples from classic localities in East Germany. The University will continue to send samples until all the type localities in the area have been covered.

## DEPARTMENT OF MINERALOGY

*Norman D. Newell, Acting Chairman*

Dr. Brian H. Mason, who had been on the staff of the Museum since 1953 and had served as Chairman of this department since 1960, resigned in February to accept a position in the Division of Meteorites of the United States National Museum of the Smithsonian Institution. He retains his association with the American Museum in the capacity of Research Associate. Dr. Newell, Chairman of the Department of Fossil Invertebrates, served as Acting Chairman of this department for the remainder of the fiscal year.

Research interests in the department continued to be focused on meteorites and their mineralogical and chemical composition. These studies, which were largely supported by the National Science Foundation, included the chemical analysis by Dr. H. B. Wiik of stony and iron meteorites as well as minerals of terrestrial rocks. In this connection, the continued investigation of mineral inclusions from volcanic pipes revealed interesting analogies with the minerals of stony meteorites, and further study may provide tangible evidence for the origin of the earth by the accretion of meteoritic material.

The Australian Meteorite Expedition traversed some 7500 miles during ten weeks in the summer of 1964, mapping and collecting at numerous localities from which tektites had not previously been recorded. As a result of this expedition, the Museum now possesses what is probably the most extensive and best localized collection of Australian tektites in the world. The expedition was led by Dr. Mason and was financed by a grant from the National Geographic Society.

Approximately 500 specimens of minerals and gems were catalogued and added to the collection during the year. Outstanding among these were fine examples of rough and polished chrysoprase from Australia; a 56-carat emerald-cut stone of gem cassiterite from Bolivia; a fine cut cordierite from Madagascar; and a series of carved animals in carnelian, aventurine quartz, jade, tourmaline, and fluorite.

## DEPARTMENT OF ORNITHOLOGY

*Dean Amadon, Chairman*

The department and the Museum suffered a heavy loss in January with the death of Dr. E. Thomas Gilliard. Dr. Gilliard began his career with the American Museum of Natural History as a volunteer in 1932 and reached the rank of Curator in 1963. In September he had returned from a difficult expedition to New Guinea and the surrounding islands, bringing back valuable observations, films, and specimens not only of birds but of other groups, notably reptiles. His collection of birds from this expedition constituted the most important acquisition of the department during the year. Two books, one on the birds of paradise by Dr. Gilliard and one on the birds of New Guinea by Dr. Gilliard and Dr. A. L. Rand, Chief Curator of Zoology of the Chicago Natural History Museum, are in press. With the passing of Dr. Gilliard we have lost one of the great explorer-naturalists of the heroic stamp.

As a result of five weeks of field work in the Galápagos Islands last year, Dr. Amadon was able to complete a chapter on

*Some of the most important studies in recent years of the birds of New Guinea were made by the late Dr. E. Thomas Gilliard of the Department of Ornithology. This picture, taken on his last expedition to that part of the world, shows him recording bird sounds in West Irian.*

Photograph: The American Museum of Natural History





the evolution of birds for a book on the Galápagos Islands and a paper on the Galápagos Hawk. He also wrote a paper on the plumages and molts of birds and has in press another book, "The Distribution of Birds."

Dr. Wesley E. Lanyon, in addition to his studies at the Kalbfleisch Field Research Station, of which he is Resident Director, spent six weeks in the West Indies obtaining additional information on the relationships of island populations of crested flycatchers (genus *Myiarchus*), on which he is conducting a long-range study. He determined the ability of the male flycatchers to discriminate between the vocal sounds of representative members of the genus. This work was supported by a grant from the Leonard C. Sanford Trust Fund.

The second and final volume of a monumental work, "The Birds of the Palearctic Fauna," by Dr. Charles Vaurie was published. The result of six years of research, the books will be regarded for many years to come as the standard reference on the birds of the largest land area of the world. Dr. Vaurie also continued taxonomic revisions of the South American game birds known as curassows.

Dr. Robert Cushman Murphy published a book entitled "Rare and Exotic Birds" and two papers on Antarctic fauna. At the same time, he continues work on his handbook of the petrels of the world.

Mr. John Bull has published a book, "Birds of the New York Area." The volume, which is based largely on work done at the Museum, has been very well received.

Mr. Eugene Eisenmann spent several months in Panama studying the birds of the New World tropics. Mr. G. Stuart Keith devoted much of the year to field work in Africa in the interests of both herpetology and ornithology, and continued to conduct research on the bird collections that he has previously made. Dr. Edwin O. Willis did field work in Panama and Colombia in connection with his research on the relationship of birds to the army ants. Mr. Robert G. Goelet visited Patagonia,



Argentina, and returned with valuable films and records.

Members of the department completed the rearrangement of the ornithological collections on the basis of families rather than geographical areas. The several thousand specimens acquired this year included, in addition to the New Guinea collections made by Dr. Gilliard, birds from Mexico, Bolivia, and Mindoro Island in the Philippines. The work in Mexico, jointly sponsored by the Museum and the California Academy of Sciences, was financed by the Leonard C. Sanford Trust Fund, as was the participation by members of the department in the American Museum-Bolivian Expedition. The Mindoro Island collection resulted from a joint project with the Philippine National Museum. The Frank M. Chapman Memorial Fund granted substantial support to many other important ornithological projects in all parts of the world.

The work of the department was helped immeasurably by the interest and support of its friends, particularly Mr. and Mrs. W. Allston Flagg, Mr. James C. Greenway, Jr., Mr. Keith, Mr. Goelet, and Mr. Frank B. Smithe. In Mr. Eisenmann the department has a full-time volunteer who is an outstanding expert on the birds of the tropics of the New World, the richest avifauna known.

Mr. and Mrs. Flagg contributed funds for the cleaning and restoring of the Audubon collection of paintings. Paintings from this collection were lent to art museums in Tucson, Little Rock, Gainesville, and Utica, as well as to the Pierpont Morgan Library in New York, and to the New York World's Fair.

## DEPARTMENT OF VERTEBRATE PALEONTOLOGY

*Edwin H. Colbert, Chairman*

A major achievement of the year was the completion and opening, in May, of the new Hall of Early Mammals. This exhibition, which had been under development for approximately

fifteen years, represents the research and collecting efforts of many individuals, including former members of the department. The completed hall, depicting life in the Paleocene and Eocene epochs when the early mammals underwent radical changes in adapting to their environments, spans the gap in evolutionary time between the Hall of Late Dinosaurs and the halls documenting the later mammals including the earliest men.

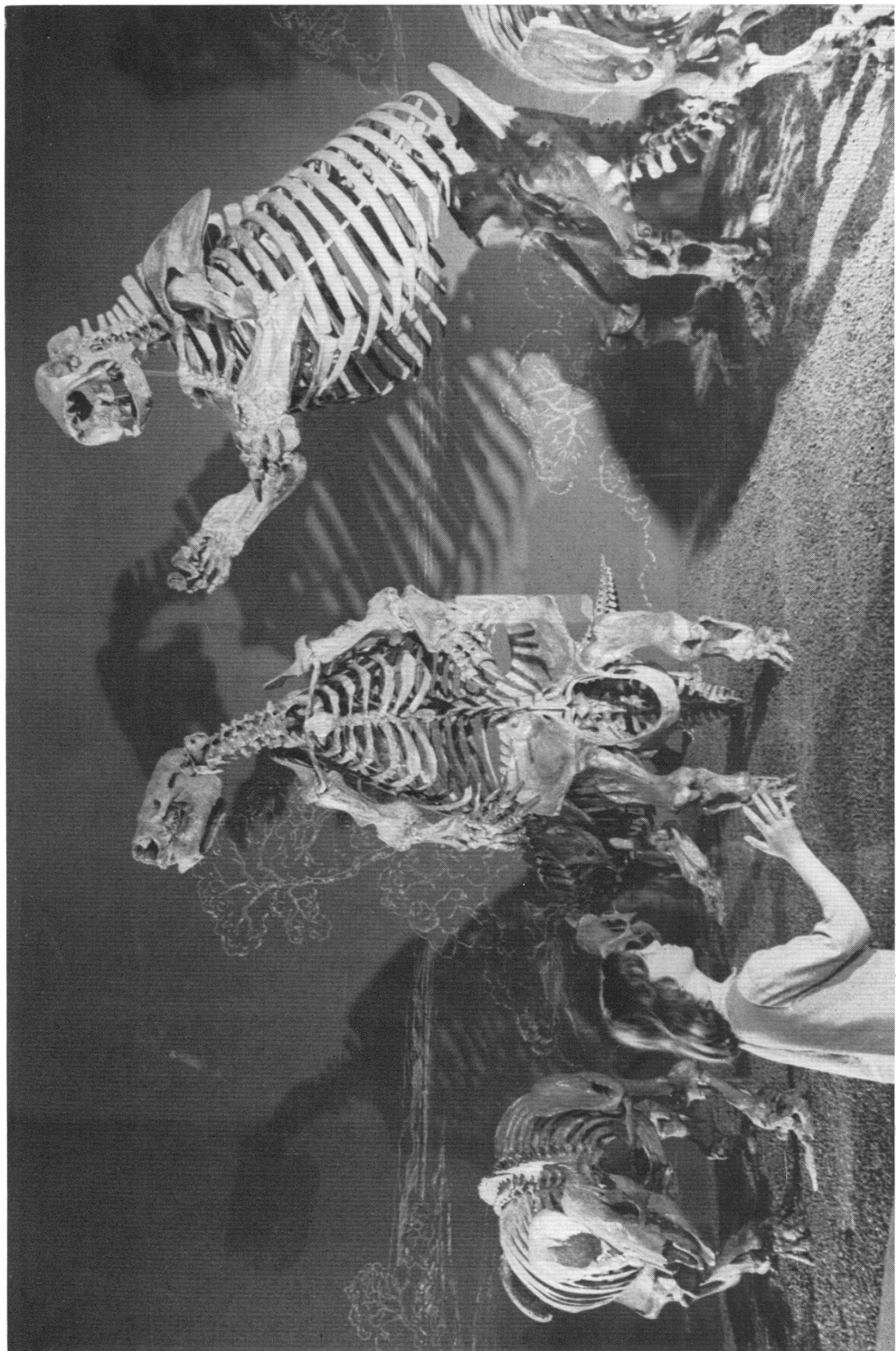
Research programs of the department were primarily concerned with Triassic and other Mesozoic fishes, amphibians, and reptiles, and with Cretaceous and early Cenozoic mammals. Dr. Colbert continued his studies of Triassic tetrapods with support from the National Science Foundation and gave particular attention to the interesting Triassic fauna from the Granton Quarry in North Bergen, New Jersey. Among the recent discoveries he described is a phytosaur specimen that makes possible for the first time the correlation of the North Bergen deposits with Triassic beds in other parts of North America.

Pursuing his work on Triassic tetrapods from other regions of the world, Dr. Colbert devoted considerable time to correlating the studies made during his extended trip to India, Australia, and other eastern countries in 1964. In connection with his studies in Australia, he completed a paper in collaboration with Dr. Duncan Merrilees of the Western Australian Museum on dinosaur footprints found in Broome, Western Australia.

Dr. Bobb Schaeffer, assisted by Miss Marlyn Mangus, compiled data for a long-range analysis of the Mesozoic fish faunas of the world. In a continuation of his studies of the Osteichthyes,

*The fossil skeletons of giant ground sloths and glyptodonts are dramatically exhibited with unusual lighting effects in the new Hall of Early Mammals. Other displays depict the diverse and often bizarre creatures of the Paleocene and Eocene Epochs during which mammals underwent radical structural changes, and show why some succeeded in these adaptations and why some became extinct.*

Photograph: New York Daily News



bony fishes ancestral to most modern fishes, Dr. Schaeffer found that in the primitive fish groups early diversification was related to feeding and locomotor mechanisms.

Another research project undertaken by Dr. Schaeffer involved the Jurassic fishes of North America. In field work in New Mexico, Colorado, and Wyoming, he collected more than 100 fossil-fish specimens, including the best specimens of North American Jurassic fishes now available.

At the close of the fiscal year, Dr. Schaeffer and Mr. Gilbert F. Stucker, a Specialist in the department, were preparing a paper on a fossil-fish collection from British Columbia made by two joint expeditions of the Museum and the National Museum of Canada. In a cooperative program of reconnaissance with the Royal Ontario Museum, Mr. Stucker led an expedition to northern British Columbia to prospect for fossil vertebrates.

Dr. Malcolm C. McKenna, continuing his research on the evolutionary diversification of the insectivores, concentrated on Tertiary hedgehogs and their allies. Because of the ever-increasing amount of new information in the field of vertebrate paleontology, he also devoted considerable time to the collection of data for his proposed revision of the classification of mammals made by Dr. George Gaylord Simpson in 1945. Dr. McKenna completed a review of the Miocene of western Nebraska and a survey of camelid evolution in the late Oligocene and early Miocene in the Bighorn Mountains of Wyoming. In addition, he carried out field work in the Paleocene beds of Wyoming and the Oligocene and Miocene beds of Wyoming and Nebraska.

In the summer of 1964, Dr. McKenna visited the Mongolian People's Republic to study the possibilities for future field work there. The following spring he spent one month in Moscow, studying early Tertiary and Cretaceous mammals from Mongolia, under an exchange agreement between the National Academy of Sciences of the United States and the Academy of Sciences of the Union of Soviet Socialist Republics.

As in previous years, the department functioned as a training center for students working for the doctoral degree in vertebrate paleontology at Columbia University. Drs. Colbert, Schaeffer, and McKenna supervised research and conducted classes and seminars for doctoral candidates and other graduate students. The department takes great pride in this important academic program which has been in operation for nearly 75 years.

As usual, much effort went into the care of the collections, not only in cataloguing and shelving specimens but in preparing fossils in the paleontological laboratory. This work, although tedious and apt to go unnoticed, is the basis of much of the progress made by the staff in research, education, and exhibition.

### SPECIAL ACTIVITIES

#### ARCHBOLD BIOLOGICAL STATION

#### LAKE PLACID, FLORIDA

*Richard Archbold, Resident Director*

Forty-four investigators representing 30 institutions conducted field studies at the station during the year. Dr. Thomas Eisner of Cornell University continued his investigations of a variety of animals that possess defensive secretions, and compared the repellent effectiveness of more than 30 components known to be active in arthropod defensive secretions. Studies begun last year on how orb-weaving spiders catch prey that secrete noxious fluids have resulted in the finding that orb-weavers are able to envelop the prey without causing it to discharge the defensive substance.

A study of the biology of the curculionid beetles was carried out by Dr. David G. Kissinger of Atlantic Union College. He was able to determine possible host plants for several species of weevils.

Dr. Stuart W. Frost of Pennsylvania State University returned to the station for the seventh consecutive year for further

observations of night-flying insects. Dr. Lawrence R. Penner of the University of Connecticut worked on parasite studies, a project he began in 1956, and Dr. Allan F. Archer of Tift College, Georgia, made progress on the research on web spiders which he began at the station in 1963.

Dr. John O. Pepper of Pennsylvania State University visited the station to pursue investigations of the aphid genus *Cinara*. In connection with this work, Mr. Archbold did macro- and micro-photography of mounted *Cinara* aphids. The results confirmed Dr. Pepper's belief that photographs of aphids mounted on glass slides may be used to show many taxonomic characteristics.

Dr. Leonard J. Brass went to Lae, New Guinea, in the spring of 1965 to represent the American Museum Archbold Expeditions at the opening of the new Papua and New Guinea herbarium. He collaborated with Dr. Ralph Bulmer of the University of Auckland, New Zealand, in work concerning the prehistory of eastern New Guinea and studies of the utilization of stone mortars and pestles found in that area. He also aided Miss Nancy Bowers of Washington State University in her studies of the distribution of edible *Pandanus* in New Guinea. At the station, Dr. Brass assisted visiting biologists in numerous ways and devoted considerable time to work on the plant collections in the station herbarium.

KALBFLEISCH FIELD RESEARCH STATION  
HUNTINGTON, LONG ISLAND, NEW YORK

*Wesley E. Lanyon, Resident Director*

Two new research facilities, an air-conditioned ichthyology laboratory and a heated aviary, were constructed at the station this year. The new aviary substantially aided Dr. Lanyon in his continuing study of the systematics and behavior of flycatchers by making it possible for him to maintain the birds throughout the year. Dr. Donn E. Rosen, Chairman of the Department of

Ichthyology, plans to use the new laboratory to make observations of fishes under controlled conditions.

Dr. Jack McCormick and Dr. Lanyon completed a survey of the land-use history of the station. They used personal interviews with farmers who had cultivated the land, aerial photographs, and photographs taken in the 1930's by or for Miss Augusta Kalbfleisch, who bequeathed the station to the Museum.

Several long-range studies on the populational ecology of vertebrate animals were continued from last year. These include investigations by Dr. Richard G. Zweifel, Department of Herpetology, on Fowler's toads and painted turtles; Dr. Rosen on mosquitofish and Southern platyfish; Dr. Richard G. Van Gelder, Department of Mammalogy, on several species of small mammals; and Dr. Max K. Hecht, Vertebrate Paleontology, on the spotted salamander. Dr. McCormick continued his study of the flora and of plant succession in representative communities at the station.

In addition, Dr. Kenneth L. Franklin of the Department of Astronomy and the American Museum—Hayden Planetarium, continued his study of high frequency radiation emanating from the planet Jupiter. Equipment was installed at the radio astronomy laboratory to facilitate a phase of the Jupiter study that is being conducted in collaboration with the Department of Astronomy of Yale University. The data are sent by direct telephone line to the Yale Observatory radio astronomy installation at Bethany, Connecticut.

Nine college undergraduates who were in residence during the summer of 1964 assisted the members of the staff of the Museum. Their studies were sponsored largely by the National Science Foundation Undergraduate Research Participation Program. In addition, several high school volunteers assisted in the summer programs. Groups from the University of Pennsylvania and from Adelphi University visited the station.

Two publications involving research performed at the station were published during the year, one by Dr. Franklin, the other

by Mr. Douglas E. Gill of The University of Michigan and Dr. Lanyon.

LERNER MARINE LABORATORY

BIMINI, BAHAMAS

*Robert F. Mathewson, Resident Director*

Research at the laboratory by 166 investigators, coupled with the first year of full-scale operation in the Biological Survey of the Bahamas, resulted in continuous, heavy use of the facilities of the laboratory.

Visiting scientists conducted research on such varied and interesting subjects as the association between a species of fruit fly, *Drosophila carcinophila*, and a species of land crab; the distribution and function of pit organs in sharks; electrophysiological mechanisms in sharks; the ecology of foraminifera; the food intake of fishes; and fish virology.

One aspect of fish virology about which very little is known is the mode of transmission of viruses in fish living in their natural environment. Dr. Liselotte Moewus-Kobb, in studies at the laboratory, has introduced a small ciliate organism capable of carrying a fresh-water fish virus into margate, grunt, and snapper fish. Dr. Moewus-Kobb, of the University of Miami School of Medicine, isolated the ciliate from sea horses and infected it with the virus before introducing it into the host fishes. These experiments offer new evidence in support of the theory that parasitic vectors, such as the ciliates, may be involved in the transmission of a virus.

Dr. Jerome Wodinsky of Brandeis University has started another interesting project, the study of food intake in fishes. Dr. Wodinsky is working with twelve species. The purpose of the work is to determine whether fish will thrive on chemically prepared and controlled food, whether they can be trained to feed themselves such food by means of an instrumental conditioning procedure, and whether they exhibit particular cyclic



patterns of food intake.

An important part of research at the laboratory in recent years has been shark biology. It is particularly fortunate that there are large populations of lemon and nurse sharks in and around the mangroves that border a nearby lagoon. Both species make excellent research animals. More than 200 sharks of these two species were collected and used as laboratory specimens during the year. Dr. Perry W. Gilbert of Cornell University, Chairman of the Shark Research Panel of the American Institute of Biological Sciences, Dr. Edward S. Hodgson of Columbia University, and Mr. Mathewson continued to collaborate on electrophysiological and behavioral studies of sharks. Their work involved the testing of free-swimming sharks in a controlled flow chamber to measure the responses of the animals to chemical stimuli. Dr. Igor Klatzo, of the National Institute of Neurological Diseases and Blindness, made further studies of the blood-brain barrier in sharks.

The year also marked the completion of three successful cruises, under the leadership of Dr. C. Lavett Smith of the Department of Ichthyology, in the long-range Biological Survey of the Bahamas. The survey, launched last year, is a cooperative effort of the laboratory, the Bahamian government, and the Biology Branch of the Office of Naval Research. Seventeen scientists participated in the cruises, each of which lasted one month and stopped at islands throughout the Bahamas. The scientists were able to study at first hand a large number of marine and island-dwelling organisms and to survey for themselves the ecological conditions of various areas of the Bahamas.

The laboratory embarked on a new educational effort at the postgraduate level with the pilot run of a marine biological indoctrination program. The program, organized last year through the interest and generosity of Mr. W. W. Knight, is designed to acquaint biology teachers and graduate students from inland colleges and universities with the marine environment. Five biologists, all faculty members, took part in the eleven-

day pilot program which included field study at Bimini and in the adjacent waters as well as a short cruise to nearby islands. The pilot session was jointly sponsored by Mr. Knight and Mr. Michael Lerner.

In October, the laboratory presented a two-day series of lectures at Nassau for officials of the Bahamian government. The theme of the gathering was the conservation and utilization of the natural resources of the Bahamas. Members of the Museum staff and other scientists who have carried out research at the laboratory described their studies to Sir Roland Symonette, Premier of the Bahamas, Sir Ralph Gray, Governor, and members of the government. The speakers included Dr. Oliver, Mr. Mathewson, Dr. Gilbert, and Dr. Smith, as well as Dr. Sidney R. Galler, Head of the Biology Branch of the Office of Naval Research; Dr. M. Michael Sigel, Research Director at Variety Children's Research Foundation and Professor of Microbiology at the University of Miami School of Medicine; and Dr. John R. Olive, Executive Director of the American Institute of Biological Sciences.

The laboratory is indebted to the Office of Naval Research, specifically to the Biology Branch under Dr. Galler, for continued support of scientific investigations. Personnel of the Office of Naval Research who in addition to Dr. Galler provided valuable assistance during the year, are Mrs. Helen Hayes, Dr. John E. Flynn, Mr. George H. Kisbany, and Mr. Silvio Ferraris.

#### SOUTHWESTERN RESEARCH STATION

PORTAL, ARIZONA

*Vincent D. Roth, Resident Director*

The number of visitors at the station increased from 329 in the previous year to 499 in the year covered in this report. The greater number of visitors over the past several years can be attributed to increased mention of the station in publications

and by word of mouth, and to a generally improved understanding of the work of the station. An issue of *Carolina Tips*, a biological trade journal which is distributed to teachers, carried an article about the station that prompted numerous inquiries.

Nine papers based on investigations made at the station were published by former visitors. Many other papers that were published on flora and fauna of the Southwest contained information from the records of the station on new species collected there.

A paper by Mr. Roth on the taxonomic significance of the spider *Trochanter* was published in the *Annals of the Entomological Society of America*. Mr. Roth also continued work on a review of the South American spiders of the family Agelenidae, and work on this project is nearing completion.

Scientists who conducted research at the station during the year represented the fields of acarology, arachnology, archaeology, bacteriology, botany, entomology, genetics, geology, geochronology, herpetology, ichthyology, mammalogy, ornithology, paleontology, and wildlife management. Among the projects conducted at the station were the following:

Mr. Frank L. Lambrecht of the Hooper Foundation, University of California Medical Center at San Francisco, made a survey of protozoan parasites in the peripheral blood of seven species of rodents. The only carriers of blood parasites were found among mice of the genus *Peromyscus*, 43 per cent of which were infected with *Trypanosoma peromysci*.

Dr. E. Wilbur Cook of Centre College of Kentucky completed the fourth year of studies on the occurrence of antibiotic and mutagenic substances in desert plants and the chromatographic analysis of plant extracts. The antibiotic and mutagenic activity of extractions of four parts of plants (flowers, fruit, leaves, and non-woody stems) was studied on the microorganisms *Bacillus subtilis* and *Streptococcus salivarius*. Paper chromatography was used to analyze the amino acid content of the extracts. Dr. Cook studied 67 species of plants during his visit to the station.

Mr. Howard Topoff, a Lincoln Ellsworth Fellow of the American Museum of Natural History, working under the supervision of Dr. T. C. Schneirla of the Department of Animal Behavior, investigated the physiology and behavior of the Nearctic Doryline ant *Neivamyrmex nigrescenes*. He studied the relationship between metabolism (as measured by oxygen consumption) and behavior throughout nomadic and statary phases, which are the cyclic behavioral phases characteristic of most Doryline ants.

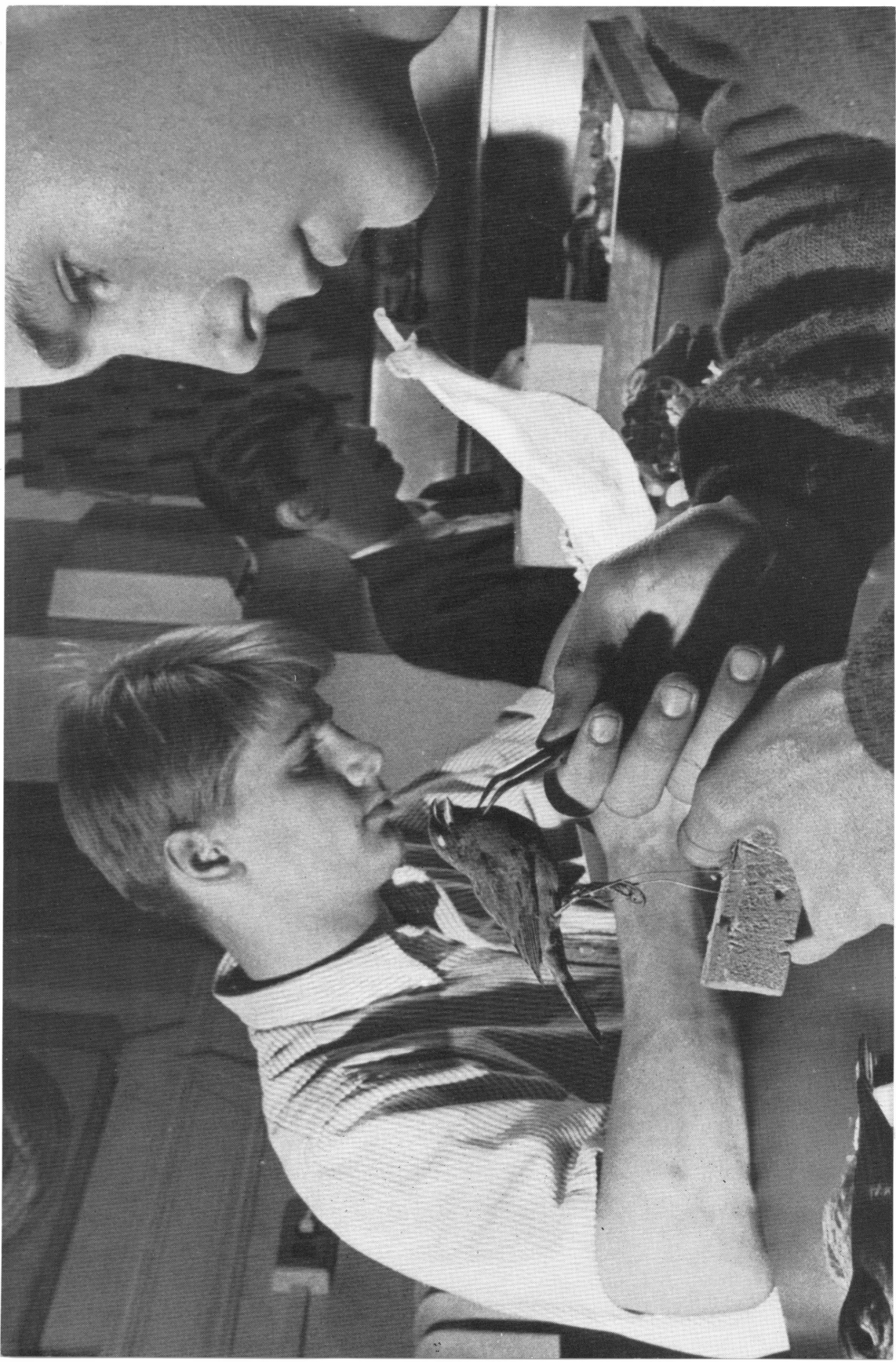
## DEPARTMENT OF EDUCATION

*Sune Engelbrektson, Chairman*

The Department of Education conducts extensive programs in the teaching of natural history to adults and children, and it administers a large number of special services also designed to enhance learning in natural history. The aim of the department is to apply the soundest and most creative teaching methods to the learning needs of the community with the use of the materials and exhibits available in the Museum. Examples of new or revised programs conducted during the year to fulfill this aim were the "Look and Listen Hour" for preschool children, a junior high school course in primitive art, a course in masks and maskmaking, a pilot program for the instruction of elderly blind persons, and a "Golden Age" program of gallery talks and exhibition hall tours for elderly persons. In another new venture, "The Living World," 28 illustrated lectures were

*The opportunity for young people to carry out their own research projects and experiments at the Museum was provided with the establishment of the Louis Calder Natural Science Laboratory. The laboratory, made possible by a grant from the Louis Calder Foundation, is an adjunct to the Natural Science Center for Young People.*

Photograph: Wide World



given on the subjects of geology, zoology, botany, and anthropology.

Most important in filling the special educational needs of the community were the activities of longer standing, the largest of which, known as "The World We Live In" program, is carried out in cooperation with the teachers and administrators of the Board of Education of the City of New York. This program provides an enrichment of the school curriculum by means of the selective, creative use of Museum exhibits and collections. Last year 37,265 pupils and their teachers participated. In addition, special classes were given for the physically and mentally handicapped. Topics offered included "Seasonal Changes in Plants and Animals," "Hot and Cold Lands," "Vanishing Wildlife," "Latin American Neighbors," and "Our Changing Earth."

A Saturday program known as "Museum Courses for Young People" included instruction in geology, the study of dinosaurs, birds of the New York City region, rocks and minerals, and winter activities for the young naturalist. Another course for young people, "Principles of Geology," was offered for the fifth year.

The Natural Science Center for Young People was expanded by the addition of the Louis Calder Natural Science Laboratory, opened on June 25. The new facility, made possible by a grant from the Louis Calder Foundation, includes equipment for carrying out simple control experiments and preparing study collections.

The important service provided by the Museum in bringing the study of natural history to young people confined to hospitals and special schools was expanded. This opportunity was made possible by a grant from the Avalon Foundation.

The adult education program featured a varied and popular series that included courses in the evolution of man; primitive and oriental music; mushrooms, mosses, and ferns; drawing and painting from nature; the changing earth; birds and their habitats; and wild flowers of the Atlantic seaboard.

Adults were given exceptional opportunities to observe some of the most interesting natural phenomena of North America while on tours guided by Museum lecturers. These included a 23-day archeological trip through Mexico and Central America, a mountain and valley tour of the northeastern states, and a thirteen-day bus trip to the Gaspé Peninsula.

The Nurse Education Program offered an opportunity for an enrichment and reinforcement of training to the 875 nurses who registered for the courses dealing with human biology, animals as transmitters of human disease, and the ways in which members of primitive cultures adapt to their environment.

These and other programs of the department were attended by 75,493 young people and 39,378 adults, who either visited the Museum to participate in them or were visited by Museum teachers. In addition the department, by means of its collection of films, slides, and photographs, its circulating exhibits, and many other extension services, provided information about the world we live in to countless other people at all the levels of education.

## DEPARTMENT OF EXHIBITION AND GRAPHIC ARTS

*Gordon R. Reekie, Chairman*

During this active year, three halls were completed and progress was made on the design and building of six others.

The halls of the Eskimo, Early Mammals, and Primates were completed. The first two were opened to the public in March and May respectively, and the last named was scheduled for opening early in the new fiscal year.

Work continued on the following halls: Biology of Invertebrates, Indians of the Woodlands and the Plains, Man in Africa, Peoples of the Pacific, Lindsley Hall of Earth History, and Ocean Life. Designs were started for exhibits in the gallery of

the Hall of Ocean Life. These will be devoted to the biology of fishes.

In addition, an exhibition of Pacific Island art from the collection of Mr. Jay C. Leff was shown in the Corner Gallery.

The time of the Graphic Arts Division was divided among technical illustrations for exhibits, scientific publications, the Natural History Press, and the production of the many brochures, catalogues, posters, and other forms of promotional material required by nearly all the divisions of the Museum. This work included the design and production of all the issues of *Nature and Science*, which is published eighteen times a year, and a large assortment of maps, charts, and illustrations for both *Natural History* and *Curator*.

A 50 per cent increase in the work load of the Print Shop reflected a growth of programs in many divisions of the Museum.

## LIBRARY

*George H. Goodwin, Jr., Librarian*

A substantial increase over previous years in the use of the Library, which has one of the most important research collections in the natural sciences in the world, was noted in the figures for attendance (14,799), circulation (43,801), and reference queries (9298). In one aspect of its work alone, the Library lent 1152 books to 180 museums, research institutes, universities, industrial organizations, and government agencies

*An Eskimo kayak equipped with typical hunting gear is displayed against a background painting of a whale hunt in the new Hall of the Eskimo. The hall, which includes many artifacts in addition to models, murals, maps, and life-sized manikins, exemplifies an important function of the Museum: the preservation of rapidly vanishing cultures in order to teach the history of man and his changing interrelationships with nature.*

Photograph: The American Museum of Natural History





in the United States and Canada. To meet the growing demands for its resources, the number of hours the Library is open to the public was increased by 50 per cent this year.

The Library collections were enriched by the acquisition of several out-of-print and rare items. Dr. Harry B. Weiss presented a copy of "Ephemeris Vita" by Jan Swammerdam, printed in 1681; Mr. W. B. Devereux, an unusually fine set of "American Ornithology" by Alexander Wilson; Mrs. Albert C. Whitaker, Jr., a four-volume work, "The Birds of the British Islands" by Charles Stonham; and Mr. Alvin Devereux, two albums of rare photographs taken during the Harriman Alaska Expedition of 1899.

By means of exchange agreements and purchases, 16,257 periodical items, 1703 books, and 330 new serial titles were added to the collection. At the present time, the serial titles in the Library number more than 8200 and represent 70 per cent of the total collection. The Library is currently adding enough material each week to fill nine to twelve feet of stack space.

Good progress was made on the large-scale bookbinding project that is supported by a National Science Foundation grant. More than 13,000 volumes have been bound since the beginning of the program. In addition, Mrs. Nancy Russell, restorer of rare books, examined and repaired more than 1250 volumes this year.

The Library is grateful for the interest and generous help of its friends. Particular mention should be made of the staunch support of Mr. Cyril F. dos Passos, Dr. Robert M. Stecher, and Mr. and Mrs. Robert D. Sterling.

## PUBLICATIONS

### CURATOR

*Harry L. Shapiro, Editor-in-Chief*

The response of readers in many countries to *Curator* makes it clear that this quarterly publication continues to be a source of practical suggestions and stimulating ideas to individuals in the museum profession. With the help of a grant received this year from the Lucius N. Littauer Foundation, the Editorial Board of the magazine has begun efforts to reach other potential readers and contributors who might benefit by sharing the specialized knowledge of museology that is to be found in its pages.

### NATURAL HISTORY

*Robert E. Williamson, Managing Editor*

*Natural History* experienced an increase in circulation greater than in any other year in its history excepting only 1960, when *Nature* magazine was acquired. As of June 30, 1965, the total paid circulation was 175,000, representing a net gain of 25,000 in a single year, or two and one half times that of the previous year. The rate of renewals continues at the excellent figure of 65 per cent, and 60 per cent of the renewals are for two-year subscriptions.

There has been an increase of more than 20 per cent in advertising income over last year. One hundred seventy-two revenue pages have appeared during the year, an increase of 20 pages over the number in 1963–1964.

Perhaps the most important editorial aspect of the last fiscal year has been the sharply increasing number of high-quality, unsolicited manuscripts received from outstanding scientists in various disciplines, both here and abroad. In addition, the scientific staff of the Museum has helped not only by writing for the magazine but also by offering advice and suggestions.

## NATURAL HISTORY PRESS BOOK PROGRAM

*Richard K. Winslow, Publisher*

In the brief period since its inception in 1962, the Natural History Press Book Program, under the editorship of James K. Page, Jr., has achieved considerable prestige in professional circles, and it has become an increasingly important medium for broadening the educational activities of the Museum. The Press has already published 21 books for both students and the general public, of which eleven were published during the fiscal year.

The *Nature and Science Library* was initiated this year with the publication of four titles. These books are volumes of large format printed in full color for readers ten to fourteen years old. They treat selected areas of natural history by means of a lively, informative narrative and exceptionally attractive illustrations.

Eight titles in the *Astronomy Highlights* series were published during the year. These are 32-page pamphlets that treat selected topics in astronomy and are based on the presentations given in the American Museum—Hayden Planetarium.

## NATURE AND SCIENCE

*Franklyn K. Lauden, Managing Editor*

The magazine *Nature and Science*, first published in 1963–1964, has become firmly established in the schools of this country, with a circulation of a quarter of a million. The reaction to the magazine by professional educators has been very favorable. Many regard its publication as one of the most significant innovations in education at the elementary school level that has occurred during recent decades, a period during which science education has become increasingly prominent in the elementary school curriculum.

## SCIENTIFIC PUBLICATIONS

*Ruth Tyler, Editor*

The Office of Scientific Publications published ten articles in the *Bulletin*, totaling 1160 printed pages; 37 numbers in *American Museum Novitates*, totaling 930 pages; and one part in *Anthropological Papers*, totaling 160 pages. The publication of the 1964 James Arthur Lecture on the Evolution of the Human Brain brought the total number of pages published during the year to 2272.

Among the projects in press are three articles for the *Bulletin*, one *Anthropological Paper*, and fifteen numbers of *American Museum Novitates*. Several other articles have been received for publication in all the scientific series. A major work entitled "Modes of Reproduction in Fishes" by Dr. Charles M. Breder, Jr. and Dr. Donn E. Rosen is now in galley proof.

## PLANT OPERATION AND MAINTENANCE

*Paul H. Grouleff, Plant Manager*

This division spent an active year engaged in the maintenance and repair of the nineteen-building Museum complex, the rehabilitation of existing exhibits, and the completion of the Hall of the Eskimo, the Hall of Primates, and the Hall of Early Mammals. Large-scale structural changes were finished in the Hall of Ocean Life, and alterations were made in the Hall of Mexico and Central America, the new Hall of Indians of the Woodlands and the Plains, and the Hall of Northwest Coast Indians. Work was started on a new pedestrian bridge connecting the visitors' parking lot and the Roosevelt Memorial on the first-floor level of the Museum. New equipment was installed in the Power and Service Building. Construction of a storage area for films was begun.

Construction has also been begun on new laboratories, offices,

a library, and storage space for the Department of Ichthyology, and plans call for completion in 1965. The amount of space covered in the alterations totals 9500 square feet. This work has been made possible by a grant from the National Science Foundation, supplemented by funds from the Board of Trustees of the Museum.

In the Custodial Services Division, every effort was made to plan the personnel schedule so as to achieve the maximum efficiency and effectiveness, but the number of employees in the department still remains inadequate to carry out all the necessary work, and it is hoped that more personnel will be added during the next fiscal year.

#### ATTENDANCE

During the fiscal year here reported, 2,349,732 people visited the Museum, and 558,720 visited the Planetarium, making a combined total of 2,908,452. This figure represents a decrease of 14,170 from the combined attendance for the preceding fiscal year.







**THE AMERICAN MUSEUM OF NATURAL HISTORY**

**FINANCIAL STATEMENTS**

**FOR THE YEARS ENDED JUNE 30, 1965 AND 1964**

**THE AMERICAN MUSEUM OF  
BALANCE SHEETS, June**

<b>ASSETS:</b>	<b>1965</b>	<b>1964</b>
<b>Current funds:</b>		
<b>General funds:</b>		
Cash	\$ 514,670	\$ 399,818
Accounts receivable	269,086	240,975
Inventories, principally publications, at cost	53,397	61,461
Prepaid expenses	73,090	80,695
	<u>\$ 910,243</u>	<u>\$ 782,949</u>
<b>Special funds:</b>		
Cash:		
Demand deposits	\$ 438,839	\$ 151,158
Time deposits	981,158	577,408
Investments (Note 1):		
U. S. Government bonds		350,000
Accounts receivable	23,788	23,917
	<u>\$ 1,443,785</u>	<u>\$ 1,102,483</u>
	<u>\$ 2,354,028</u>	<u>\$ 1,885,432</u>
<b>Endowment funds:</b>		
<b>Cash:</b>		
Demand deposits	\$ 43,511	\$ 7,446
Time deposits	1,500,000	1,000,000
Investments (market June 30, 1965, \$46,395,000)		
(Note 1):		
Bonds	19,247,445	15,870,610
Preferred stocks	1,709,309	1,742,313
Common stocks	14,716,193	13,496,262
	<u>\$37,216,458</u>	<u>\$32,116,631</u>
<b>Investment in bonds of The American Museum of Natural History Planetarium Authority, \$570,000 principal amount, at cost (Note 3)</b>	<u>\$ 425,000</u>	<u>\$ 425,000</u>
<b>Pension funds:</b>		
<b>Cash:</b>		
Demand deposits	\$ 100,309	\$ 79,863
Time deposits	700,000	600,000
Investments, at cost (market June 30, 1965, \$9,379,000):		
Bonds	5,706,207	5,542,651
Preferred stocks	468,961	469,620
Common stocks	1,980,731	1,800,236
	<u>\$ 8,956,208</u>	<u>\$ 8,492,370</u>
	<u>\$48,951,694</u>	<u>\$42,919,433</u>

The accompanying notes are an

# NATURAL HISTORY

30, 1965 and 1964

<b>FUNDS AND LIABILITIES:</b>	<b>1965</b>	<b>1964</b>
<b>Current funds:</b>		
<b>General funds:</b>		
Accounts payable and payroll taxes withheld	\$ 125,688	\$ 87,348
Deferred income, principally unearned subscriptions	671,376	590,656
Advance from City of New York	150,000	150,000
	<u>947,064</u>	<u>828,004</u>
Deficit	36,821	45,055
	<u>\$ 910,243</u>	<u>\$ 782,949</u>
<b>Special funds:</b>		
Balances of funds received or appropriated for specific purposes	\$ 1,443,785	\$ 1,102,483
	<u>\$ 2,354,028</u>	<u>\$ 1,885,432</u>
<b>Endowment funds:</b>		
Endowment funds, income available for:		
Restricted purposes	\$14,567,285	\$14,015,008
Unrestricted purposes	7,983,657	7,821,813
Funds functioning as endowment, principal and income available for:		
Restricted purposes	4,536,081	2,478,448
Unrestricted purposes (Note 2)	10,129,435	7,801,362
	<u>\$37,216,458</u>	<u>\$32,116,631</u>
Funds invested in bonds of The American Museum of Natural History Planetarium Authority	<u>\$ 425,000</u>	<u>\$ 425,000</u>
<b>Pension funds:</b>		
Pension fund balance	\$ 8,954,081	\$ 8,490,243
Welfare fund balance	2,127	2,127
	<u>\$ 8,956,208</u>	<u>\$ 8,492,370</u>
	<u>\$48,951,694</u>	<u>\$42,919,433</u>

integral part of these statements.

**GENERAL FUNDS**  
**SUMMARY STATEMENTS OF CHANGES**  
for the years ended June 30, 1965 and 1964

	<i>1965</i>	<i>1964</i>
Deficit, beginning of year	\$ 45,055	\$ 57,509
Less, Transfer from unrestricted funds functioning as endowment	<u>45,055</u>	<u>57,509</u>
	<u>—</u>	<u>—</u>
Income:		
Appropriation from the City of New York	\$1,760,079	\$1,770,487
Endowment funds	1,328,928	1,215,513
Outside trusts and foundations	24,674	59,591
Gifts and grants	276,299	256,263
Other (Notes 2, 3 and 4)	476,901	466,870
	<u>\$3,866,881</u>	<u>\$3,768,724</u>
Expenses:		
General administration	\$ 673,308	\$ 592,347
Educational activities	1,585,349	1,537,441
Operation and maintenance of physical plant	1,303,340	1,346,938
Pension and other social benefits	341,705	337,053
	<u>\$3,903,702</u>	<u>\$3,813,779</u>
Deficit, end of year	<u>\$ 36,821</u>	<u>\$ 45,055</u>

The accompanying notes are an integral part of these statements.

**SPECIAL FUNDS**  
**SUMMARY STATEMENTS OF CHANGES**  
for the years ended June 30, 1965 and 1964

	<i>1965</i>	<i>1964</i>
Balance, beginning of year	<u>\$1,102,483</u>	<u>\$1,311,429</u>
Income:		
Endowment funds	\$ 313,649	\$ 232,541
Gifts and grants	1,161,113	940,130
Other	242,817	193,731
Transfer from endowment funds	191,470	46,530
	<u>\$1,909,049</u>	<u>\$1,412,932</u>
Expenditures for the special purposes and objects for which the funds were established	\$1,549,078	\$1,566,878
Transfer to endowment funds	18,669	55,000
	<u>\$1,567,747</u>	<u>\$1,621,878</u>
Balance, end of year	<u>\$1,443,785</u>	<u>\$1,102,483</u>

The accompanying notes are an integral part of these statements.

**ENDOWMENT FUNDS**  
**SUMMARY STATEMENTS OF CHANGES**  
for the years ended June 30, 1965 and 1964

	<i>1965</i>	<i>1964</i>
Balance, beginning of year	<u>\$32,116,631</u>	<u>\$31,678,676</u>
Additions:		
Gifts, bequests, etc. (Note 2)	\$ 4,627,536	\$ 193,024
Net profit on sales of investments	698,634	399,911
Transfer from special funds	<u>18,669</u>	<u>55,000</u>
	<u>\$ 5,344,839</u>	<u>\$ 647,935</u>
Deductions:		
Expenditures for:		
Custodian fee	\$ 5,000	\$ 5,000
Plant alteration and rehabilitation	—	83,400
Transfers to general funds:		
For payment of certain expenses (included in general funds, other income)	3,487	17,541
To dispose of operating deficit of preceding year	45,055	57,509
Transfer to special funds	<u>191,470</u>	<u>46,530</u>
	<u>\$ 245,012</u>	<u>\$ 209,980</u>
Net additions	<u>\$ 5,099,827</u>	<u>\$ 437,955</u>
Balance, end of year	<u>\$37,216,458</u>	<u>\$32,116,631</u>

The accompanying notes are an integral part of these statements.

**PENSION FUNDS**  
**SUMMARY STATEMENTS OF CHANGES**  
for the years ended June 30, 1965 and 1964

	<i>1965</i>	<i>1964</i>
<b>Balance, beginning of year</b>	<u><u>\$8,492,370</u></u>	<u><u>\$7,983,116</u></u>
<b>Additions:</b>		
Contributions of members	\$ 177,986	\$ 174,293
Contributions of Museum	213,116	208,436
Income from investments	372,573	355,494
Net profit on sales of investments	65,944	102,102
	<u><u>\$ 829,619</u></u>	<u><u>\$ 840,325</u></u>
<b>Deductions:</b>		
Payments to members and beneficiaries	\$ 360,581	\$ 325,518
Expenses	5,200	5,553
	<u><u>\$ 365,781</u></u>	<u><u>\$ 331,071</u></u>
Net additions	<u><u>\$ 463,838</u></u>	<u><u>\$ 509,254</u></u>
Balance, end of year	<u><u>\$8,956,208</u></u>	<u><u>\$8,492,370</u></u>

The accompanying notes are an integral part of these statements.

## NOTES TO FINANCIAL STATEMENTS

1. The land, buildings and equipment utilized by the Museum are either owned by the City of New York or were charged off at the time of purchase and, therefore, are not reflected in the balance sheet. Land and buildings owned by the Museum are not significant in amount. No valuation of exhibits, collections, library, etc., has been established for balance sheet purposes.

Investments are recorded at cost in respect of those purchased, and in respect of those acquired by gift, bequest or otherwise, at market valuations at the dates of acquisition, probate court valuations or valuations established by the trustees.

2. The Museum owns an interest in certain mining properties acquired through a bequest. No valuation has been recorded on the books for the interest in these properties and, therefore, it is not reflected in the balance sheet. However, the Museum receives royalties from this source and such royalties are recorded, when received, as additions to unrestricted funds functioning as endowment (as bequests) or to current general funds. During the years ended in 1965 and 1964, royalties received amounted to \$41,219 and \$55,292, respectively, of which \$41,219 and \$50,000 were credited to general funds (other income) in the respective years.
3. The Planetarium Authority is operated under the supervision of the Museum's management. Its financial statements and the auditors' opinion with respect thereto are annexed. Interest income received from the Planetarium amounted to \$25,650 in each of the years ended in 1965 and 1964. These amounts are included in other income of the general funds.
4. Other income of the general funds for the years ended in 1965 and 1964 includes net income from magazine and book shop operations of \$79,081 and \$64,149, respectively. Gross income from magazine and book shop operations amounted to \$1,173,347 and \$1,073,192 for the respective years.



The Board of Trustees,  
The American Museum of Natural History,  
New York, N. Y.

We have examined the balance sheet of THE AMERICAN MUSEUM of NATURAL HISTORY as of June 30, 1965 and the related summary statements of changes in funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. We made a similar examination for the year ended June 30, 1964.

In our opinion, the accompanying balance sheets and related summary statements of changes in funds present fairly the financial position of The American Museum of Natural History at June 30, 1965 and 1964 and the results of its operations for the years then ended, on a consistent basis.

LYBRAND, ROSS BROS. & MONTGOMERY  
Certified Public Accountants

New York, August 10, 1965.



**THE AMERICAN MUSEUM OF NATURAL HISTORY  
PLANETARIUM AUTHORITY**

**FINANCIAL STATEMENTS**

**FOR THE YEARS ENDED JUNE 30, 1965 AND 1964**

THE AMERICAN MUSEUM  
PLANETARIUM  
BALANCE SHEETS, June

ASSETS:	1965	1964
Cash	\$ 55,076	\$ 49,036
Accounts receivable	2,626	1,888
Inventory, principally publications, at cost	26,027	24,020
	<u>\$ 83,729</u>	<u>\$ 74,944</u>
 Equipment, fixtures, etc. (Note 1) :		
Zeiss planetarium instrument, at cost	\$135,059	\$135,059
Less, Allowance for depreciation	37,138	30,385
	<u>97,921</u>	<u>104,674</u>
 Furniture, fixtures and equipment, at cost, less allowance for depreciation, \$139,526	 <u>1</u> 97,922	 <u>1</u> 104,675
Building, at cost (Note 1)	569,209	569,209
Land (donated by the City of New York)	—	—
	<u>\$667,131</u>	<u>\$673,884</u>
Prepaid insurance	—	\$ 2,543
	<u>\$750,860</u>	<u>\$751,371</u>

The accompanying notes are an

**OF NATURAL HISTORY**

**AUTHORITY**

**30, 1965 and 1964**

	<b>1965</b>	<b>1964</b>
<b>LIABILITIES:</b>		
Accounts payable	\$ 3,841	\$ 2,612
4½% Refunding Serial Revenue bonds, past due (Note 2)	570,000	570,000
Accrued interest, past due	<u>315,450</u>	<u>315,450</u>
	<u><u>\$889,291</u></u>	<u><u>\$888,062</u></u>

**CONTRIBUTED CAPITAL AND DEFICIT:**

Contributed capital:		
Charles Hayden	\$156,869	\$156,869
Charles Hayden Foundation	<u>250,925</u>	<u>250,925</u>
	407,794	407,794
Deficit, as annexed	<u>546,225</u>	<u>544,485</u>
	<u><u>\$138,431*</u></u>	<u><u>\$136,691*</u></u>
	<u><u>\$750,860</u></u>	<u><u>\$751,371</u></u>

**\* Denotes deduction.**

**integral part of these statements.**

## STATEMENTS OF INCOME, EXPENSES AND DEFICIT

for the years ended June 30, 1965 and 1964

	1965	1964
<b>Income:</b>		
Admission fees, less allowances and commissions	\$346,133	\$357,585
Special lectures and courses	11,951	13,316
Miscellaneous	<u>7,167</u>	<u>3,837</u>
	365,251	374,738
Auxiliary activity, sales booth	<u>79,807</u>	<u>79,038</u>
Total	<u><u>\$445,058</u></u>	<u><u>\$453,776</u></u>
<b>Expenses:</b>		
Preparation, presentation and promotional:		
Salaries	\$158,577	\$160,201
Supplies and expenses	<u>24,417</u>	<u>30,981</u>
	<u>182,994</u>	<u>191,182</u>
Operation and maintenance:		
Salaries	108,281	104,042
Supplies and expenses	19,750	29,634
Renovating and refurbishing expenses	<u>3,194</u>	<u>39,729</u>
	<u>131,225</u>	<u>173,405</u>
Administrative and general:		
Salaries	7,500	7,500
Pension fund, social security and other employee benefits	25,134	24,735
Miscellaneous	<u>11,499</u>	<u>10,366</u>
	<u>44,133</u>	<u>42,601</u>
Auxiliary activity, sales booth	<u>56,043</u>	<u>57,359</u>
Total	<u><u>\$414,395</u></u>	<u><u>\$464,547</u></u>
Income (loss) before interest and depreciation	<u><u>\$ 30,663</u></u>	<u><u>(\$ 10,771)</u></u>
Interest on past-due 4½% Refunding Serial Revenue bonds	\$ 25,650	\$ 25,650
Provision for depreciation (Note 1)	<u>6,753</u>	<u>6,753</u>
Total interest and depreciation	<u>32,403</u>	<u>32,403</u>
Net loss for year	1,740	43,174
Deficit, beginning of year	<u>544,485</u>	<u>501,311</u>
Deficit, end of year	<u><u>\$546,225</u></u>	<u><u>\$544,485</u></u>

The accompanying notes are an integral part of these statements.

## NOTES TO FINANCIAL STATEMENTS

1. The Authority's corporate charter terminates when all its liabilities, including its bonds, have been paid in full or have otherwise been discharged. At that time, title to its personal property passes to The American Museum of Natural History and title to its real property passes to the City of New York to be maintained and operated in the same manner as other city property occupied by the Museum. It is the policy of the Authority to capitalize only major additions and replacements of equipment, machinery and other plant items and to provide for depreciation of such items over their anticipated useful lives. Fully depreciated assets are carried at the nominal value of \$1. Because of the nature of the ownership of the property, provision for depreciation of the building is considered unnecessary.
2. The Planetarium Authority bonds were purchased by The American Museum of Natural History in 1948. The Charles Hayden Foundation contributed \$200,000 to the Museum toward the purchase of such bonds.

The Members of The American Museum of  
Natural History Planetarium Authority,  
New York, N. Y.

We have examined the balance sheet of THE AMERICAN MUSEUM of NATURAL HISTORY PLANETARIUM AUTHORITY as of June 30, 1965 and the related statement of income, expenses and deficit for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. We made a similar examination for the year ended June 30, 1964.

In our opinion, the accompanying balance sheets and related statements of income, expenses and deficit present fairly the financial position of The American Museum of Natural History Planetarium Authority at June 30, 1965 and 1964 and the results of its operations for the years then ended, on a consistent basis.

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Certified Public Accountants

New York, August 10, 1965.



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