



NINETY-EIGHTH ANNUAL REPORT

**THE AMERICAN MUSEUM
OF NATURAL HISTORY**

JULY, 1966, THROUGH JUNE, 1967



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THE CITY OF NEW YORK
1967

NINETY-EIGHTH 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 write this year's message for the Annual Report, I am happily aware that this venerable institution has succeeded in maintaining a youthful vitality remarkable for a 98-year old. The Museum, like some living systems in nature, has followed a pattern of growth and self-renewal. The growth has not been a random one, however, and the renewal has not been automatic. They have been part of a plan carved out by the hundreds of men and women of the Museum who, as well as being proud of their past achievements, are constantly seeking new ideas, new techniques, and new knowledge. This is the spirit that one finds in the Museum two years before its 100th birthday, and this is the spirit that will guide it through another century of growth.

Since the Museum's founding in 1869, our Trustees have shared a partner's desk with the Mayor of our city and members of his staff. Over the years numerous far-sighted city administrations have made important contributions to our Museum's growth. One result of this participation is that today the buildings that house our collections comprise one of the largest cultural and educational structures in this city. With the other cultural institutions of New York, we feel the benefits of a continuing understanding and growing interest on the part of the administration. During the past year we have welcomed the opportunity of working with Mayor Lindsay and his staff, feeling confident that fresh ideas and imaginative planning will further the Museum's contribution to life in our city and bring about a better understanding of man and his environment.

In addition to the role of the municipal government, our growth depends on the generosity of state and federal agencies, our Trustees, our members, our subscribers, and our ever-growing number of friends. All these agencies and individuals have regularly contributed both time and money to our efforts, and there is no way to express adequately our appreciation of their support.

The most visible aspect of the Museum's many-faceted role as an educator is our exhibition program. The reports that follow will detail our current activities in this field of the Museum's endeavor. I shall preface these reports by pointing out that today every floor is buzzing with activity—scientists, artists, artisans, carpenters, plasterers, electricians, yes, and even cost accountants, are working together as a team in the process of updating, restoring, and rebuilding halls and exhibits. Work is proceeding rapidly on six new halls, and their opening will signal the arrival of the Centennial Year of the Museum. In this process of renewal the old blends with the new and our Museum takes on a new look. This new look, I am happy to report, is being noticed today and commented upon by our visitors.

During the past year another section has been added to a recently opened hall on the Biology of Invertebrates. We believe that, when finished, this new hall will be a superb example of the most modern techniques of display, combining films, sound, three-dimensional scenes, models, slides, and diagrams showing the complex and little-known activities of the most populous division of the animal kingdom.

In February, the Hall of the Indians of the Plains was opened to the public. Here, models, dioramas, paintings, and sound recreate the atmosphere of the days when the Indians still dominated the vast American West. In addition, two temporary photographic exhibitions were mounted in the Corner Gallery; the first, "A Photographer's View of Africa"; the second, "A Stranger in India." These exhibits have been well attended, and the interest shown has encouraged us to plan more short-term exhibitions for the future.

The increased number of visitors in recent years has necessitated a general overhauling of the public food services, and shortly after

this report is distributed, a new cafeteria with more than double our present capacity will be in operation, thus providing vastly improved service.

The Museum Library, containing one of the finest collections of books on natural history, has been air-conditioned. The installation serves the important purpose of protecting and preserving our collection of priceless manuscripts and first editions. It will also add to the comfort of our members, staff, scholars, and students who make use of our library services.

By the nature of its activities, the Department of Astronomy and The American Museum—Hayden Planetarium is a microcosm of the larger parent body—the Museum. Through its continuing sky shows and exhibits it graphically illustrates basic astronomy and at the same time interprets the ever-growing stream of discoveries in space science.

During the past year *Natural History* magazine has grown in importance. Many of the articles have received attention in the press and other national publications. Under the imprint of the Natural History Press, 25 titles were published, including seven volumes in an important new series of textbooks on anthropology.

The records of both the endowment and pension funds for the past fiscal year have been notably satisfactory. It is pleasing to report that the investments held for our endowment fund had a market value of \$51,765,000, an increase of \$2,946,000. A larger percentage of this was due to an over-all rise in prices; the balance, to new gifts.

The pension fund also continued to grow, reaching the value of \$11,214,000, as compared with \$10,400,000 at the end of the previous year.

We are indebted to the members of the Finance Committee whose good judgment and alertness to our affairs have produced such excellent results.

The Men's and Women's Committees again played a vital role in raising funds which are annually essential to the Museum's progress. Setting high goals they obtained a record of \$314,000 as compared with \$290,000 the previous year.

We again extend our thanks to Co-Chairmen L. F. Boker Doyle and Sidney S. Whelan, Jr., of the Men's Committee; to Mrs. Constantine Sidamon-Eristoff, Chairman of the Women's Committee, and to her Vice-Chairmen, Mrs. Hart Fessenden and Mrs. Vincent de Roulet. We are equally grateful to the men and women of both committees for their fine record. I am pleased to announce that Messrs. Doyle and Whelan will continue as Co-Chairmen of the Men's Committee and that Mrs. Hart Fessenden has accepted the chairmanship of the Women's Committee, with Mrs. William C. Chanler and Mrs. John C. Bierwirth assisting as Vice-Chairmen.

It is a pleasure to record the addition of Mr. W. Gurnee Dyer and Mr. David L. Luke, III, to our Board of Trustees, and to welcome Mr. August Heckscher, Administrator of Recreation and Cultural Affairs and Commissioner of Parks, as *ex-officio* Trustee.

Plans are going forward for the celebration of the Museum's Centennial. In addition to the construction of new halls and the renovation of old ones, they include the preparation of several publications, a series of scientific meetings, the observation of a Centennial Day (April 7), with an academic procession, a convocation, a symposium, and the opening of an exhibit on "Man and His Future Environment."

Perhaps the most formidable challenge in the years ahead—for both the nation and the world—is the task of advancing and disseminating man's knowledge. Economists tell us that today the largest enterprise in the United States is the "knowledge industry," which includes schools, colleges, universities, museums, publishing houses, and numerous other fields. The Museum is proud to be actively engaged in this most creative of all enterprises. We will always have a distance to go, but I believe that the reports that follow indicate that our Museum is on its way toward meeting this challenge.

Alexander M. White

REPORT OF THE DIRECTOR

Answers to the recurrent question "What is man?" vary from a flippant retort to a philosophical essay or a series of scientific observations. The very complexity of man—which makes him, to many observers, both the most fascinating and the most dangerous form of life on this planet—finds any single answer incomplete and unsatisfactory. The question has engaged the thoughts of both ancient psalmists and modern statisticians, and the search for answers will continue as long as man exists.

Many biologists have pointed out that man differs from other mammals in a *quantitative* way only; he differs, as Raymond Pearl says, "by virtue of being only *more so* rather than by being completely alien in kind." This quantitative difference, however, involves the many attributes, developments, and characteristics that put man in a unique class. It is this difference that has enabled man to achieve the most diverse and adept behavior in the world—behavior that has produced a written record of symbols to transfer knowledge from generation to generation and from place to place and that has enabled him to modify his environment to an astounding degree and to develop the technology that will soon enable him to move from planet to planet before, it is to be hoped, he completes the destructive remodeling of the planet earth.

Man's intricate and complex behavior has no doubt fascinated and plagued his fellow man since the beginning of self-consciousness. Why *do* we behave as we do? Our progress and our hopes for human society depend to a great extent on the answers, and there are individuals and groups in many parts of the world attempting to find the answers through a wide variety of approaches. Because man is an animal with similarities to other forms of animal life as well as differences from them, we can find much to aid our understanding of his behavior through a study of the less complicated behavioral patterns of other living organisms. Thus, many studies in psychology and ethology are directed toward an increase in our knowledge of basic principles of behavior, knowledge that is essential for a better understanding of human behavior. As an

eminent biologist has said recently: "Study of animal behavior is one of the oldest occupations but it is one of the youngest sciences. The problems of interpreting, of understanding the behavior of other organisms are so great that a really rational approach to them has been developed only in recent years."

The American Museum of Natural History has been a pioneer in the scientific study of animal behavior. One of the first extensive laboratories for research in comparative animal behavior in both invertebrate and vertebrate animals was established at the Museum in 1928, under the direction of Dr. G. Kingsley Noble, when a division of experimental biology was formed as an adjunct to the Department of Herpetology. The research programs were broadened to cover the various ways in which animals respond to the physical and biotic features of their environment, and this change in orientation was reflected in the exhibition halls as well as in the laboratory. Whereas exhibits had previously emphasized the variety of size and structure in the animal kingdom, they began to illustrate principles of evolution and adaptation. As we approach the fortieth anniversary of this important event in the development of the Museum's philosophy, it is appropriate to cite some of the very important contributions that our scientists have been making to the study of animal behavior.

Early investigations in the department involved studies on endocrine physiology in relation to structure and behavior in fishes, amphibians, reptiles, and birds. Later, research work was extended to experimental studies of invertebrates and mammals. By 1933, the number of staff members working in experimental biology had increased considerably, and the division was separated from the Department of Herpetology and became the Department of Experimental Biology. Both departments remained under Dr. Noble's chairmanship until his death in 1940, when Dr. Frank A. Beach became Chairman of the Department of Experimental Biology and Dr. Charles M. Bogert became Chairman of the Department of Herpetology.

In 1942, the Department of Experimental Biology was renamed the Department of Animal Behavior. Dr. Lester R. Aronson was

appointed Chairman in 1946 and has continued in that post.

As Dr. Aronson points out: “. . . the department, since its inception, has operated on the sound premise that man's biological systems follow the principles and patterns found throughout the animal world; a strong thread of unity intertwines all forms of life. Because of the fundamental continuum coursing through various levels of organization from the simple amoeba to the highly complex mammals, we are able to study animals other than man and to identify and define those laws of nature that are directly applicable to man. Thus it becomes possible to comprehend more fully the forces that shape our lives.”

Dr. Aronson reports that the staff members of our Department of Animal Behavior are currently engaged in studies that involve many scientific disciplines. Members of the department apply the principles of many branches of zoology, such as anatomy, genetics, physiology, neurology, endocrinology, and evolutionary biology as well as psychology. In conducting their studies they use modern biochemical, electronic, and data-processing techniques. The research is concerned with animals of various phylogenetic levels and is aimed at gaining an understanding of how the combined forces of external and internal stimuli interrelate to shape the behavior of the animal.

It has long been recognized that in man and other animals there are long-term, pervading effects of experiences encountered in early life, and the templet of our adult lives is laid down when we are still very young. These molding forces can be traced back to early embryonic life, and Dr. Benjamin B. Kamrin has been able by appropriate techniques to alter the fundamental biochemistry of chick embryos, and thus produce changes in the later behavior of the newly hatched chicks. The biochemical changes produced involve modifying the immune reaction of the chicks to foreign proteins. The changes in immunity are similar to those involved in allergies in human beings. This study is in an early stage, but is yielding much valuable information on developmental changes, particularly in the nervous system, with related changes in behavior.

The importance of early experience and of biochemical factors, as exemplified by hormonal function, is revealed in Dr. Aronson's

studies of sexual behavior. Together with several assistants and students he has carried out a continuing series of investigations of the physiological and psychological processes involved in the ontogenetic development and maintenance of sexual behavior in male and female cats. This research has thus far discovered and analyzed the intricate interactions between the male sexual hormone and sexual experience that lead to the development of the mating pattern at puberty and that provide for its continuation in later life. These findings have considerable significance both theoretically and clinically.

Other aspects of the role of early experience are also being examined in a variety of animals. Studies of kittens, for example, have shown that removing them during early life from social contact with litter mates and from litter experience results in maladjustments both in the kittens and in the mother when they are returned to her. These findings are pertinent to human mother-infant relationships and are particularly relevant to infants deprived of early social stimulation as, for example, when they are brought up in disadvantaged homes, orphanages, or broken homes, and when the child is not cared for properly.

Additional studies deal with the development of early orientative processes in mammals. By following the spatial orientation of kittens before they are able to see, Dr. T. C. Schneirla and several departmental investigators have traced the mechanisms by which the kittens find their way around home base, using other than visual cues in the social situation of the litter period. A new research program by Dr. Ethel Tobach and Dr. Schneirla is studying rats before they can see so that we can understand the interrelations of early sensory capacities. Such senses as smell and touch, and sensitivity to heat and spatial orientation, relate to the later development of visual and acoustic orientation in the social behavior of the rat. The results of these studies may be significant in rehabilitation programs for people with specific sensory impairments.

The development of mature orientative functions is important for the survival of the organism not only in the physical world in which he lives, but also in his social world.

Emotional reactions are critical in many social crises of both local and international scope, yet we know singularly little of their psychobiological bases. Studies carried out in the department are yielding information about the evolution and the development of emotional behavior. For example, Dr. Tobach, in association with Dr. Schneirla and with the assistance of several associates and students, has carried on a number of experiments to investigate the effect of early environment on the reactions of mice and rats to situations of stress in later life. In one series of experiments, special cages were designed that could be used to modify the physical environment in carefully controlled ways. Young animals subjected to unstable physical or social environments exhibited marked differences in behavior from those reared in stable environments. It was demonstrated that specific environmental alterations during early life can lead to adjustment difficulties in adulthood.

In addition to the studies on processes of socialization in mammals, other phases of departmental activities are concerned with processes of socialization among lower forms. In the lower forms, such as ants and fishes, group socialization is based mainly on biological processes which we term biosocial, whereas in the higher forms, socialization may be based on processes of greater complexity concerned with greater mental processes, which we call psychosocial. In both cases, the factors that give rise to social behavior are extremely important in helping us to learn how men can live peacefully together. Through such studies, we gain insight into the systems of socialization in man in whom the magnitude of complexity defies the scientific tools at our present disposal.

The researches on ants show that the different bases for socialization preclude such comparisons except on a most superficial level. Ants can give us important clues about biological systems, but they cannot help us directly to explain human societies. The investigations of Dr. Schneirla and his associates have shown that the social and cyclical behavior of legionary ants are dependent upon their physiological state. In recent years, his studies have included such observations as the effect of the brood on the behavior of the colony and the consumption of oxygen by the ants

during the nomadic and statary periods. Dr. Schneirla has noted that the legionary ants of the Old World do not have as high development of social or cyclical structure as do ants of the New World. These researches are now culminating in a definitive book on the army ants.

Through the study of simple social groupings such as schooling fishes, we can identify many basic biological principles applicable to more complex social groupings such as mammals. The stereotype of schooling behavior allows us to delimit behavioral repertoire and to predict behavioral changes under specific conditions of growth and development and environmental variables. Schooling fishes, such as herring, tuna, and mackerel, are invariably attracted to their own kind. [In fact, it is the strong mutual attraction and tendency to form schools that make them an important protein food source for the world's population. Because they school, it is economically feasible to have fisheries. The results of the researches on fish orientation, behavior under different light intensities, and on the tightness and structure of schools help fishermen to find schools in the sea at different times of day or night. They know when the schools are tightest and, therefore, will give the greatest catch per seine haul, and they utilize natural orientation behavior to guide fish around barriers or into nets.]

Other large general areas of behavioral research involve intricate biological problems that have important corollaries in the technology associated with both oceanographic and space exploration. Knowledge of the acoustic characteristics of marine animals, such as their sonar reflectivity, becomes important in making the distinction between man-made and natural sound-producing objects under the sea. In addition, knowledge of the sound-production and sound-reception mechanisms of aquatic organisms is of considerable value in enabling man to develop more efficient ways of sending and receiving information under water.

Dr. William N. Tavolga and his associates are researching a wide variety of problems associated with sound production, underwater hearing, and communication in fishes. They have discovered that there are wide species differences in the hearing ranges. These

striking differences are believed to be related to a unique bony connection between the swim bladder, which acts as a receiving microphone, and the middle ear.

The studies of bird navigation may reveal new methods that will assist man in his navigation problems, may lead to greater understanding of biological timing mechanisms, and may give insight into man's ability to adjust to space flight, and to live in an environment where his visual world is mainly celestial.

Dr. Helmut E. Adler, with his assistants and students, is continuing long-term studies aimed at an understanding of the complicated way in which birds navigate over long distances. He is trying to determine whether a bird can determine the elevation, azimuth positions, and rate of movement of a spot of light or simulated star. The researchers are also probing the accuracy of the time sense of birds, and there are definite indications that the time sense of starlings kept under conditions of constant illumination begins to drift unless it is reset by regularly recurring environmental phenomena, such as night and day. Studies on the sensory capability of birds provide clues to making accurate sensors that can be flexible and adjustable to different situations.

Other investigations of the Department of Animal Behavior, described in Dr. Aronson's summary of the year's work, are also contributing effectively to advances in the areas of behavioral theory, function of the brain and central nervous system, hormonal interaction, foundations of social organization, animal communication, and animal navigation.

Studies of animal behavior are not only fascinating and intrinsically worthwhile, but are also giving us knowledge that is applicable to many of our current problems. This research is helping us learn more about man as a living, behaving animal, is teaching us how to expand our methods of contending with certain types of physical disability and disease, and is enabling us to gain increased knowledge of our environment, including the oceans and the atmosphere. Just as basic research in nuclear physics altered the course of human progress, so research into the basics of behavior will give man the tools to carry himself out of the Stone Age, sociologically,

into the nuclear age.

This important aspect of the Museum's contribution to the advance of knowledge has been made possible by the sponsorship of many organizations and individuals. The Trustees of the Museum have recognized and supported the work since its inception. Many private foundations, government agencies, and individuals have also lent strong support to our research in comparative animal behavior. We express our appreciation to all of them.

James A. Oliver, *Director*

REVIEW OF THE YEAR 1966-1967

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

Dr. James A. Oliver, Director, was elected Trustee of *Biological Abstracts*.

Dr. Joseph M. Chamberlain, Assistant Director, received the award of Distinguished Alumnus from Bradley University, Peoria, Illinois. The award was presented at the annual reunion banquet, at which he was the principal speaker, giving an address on "Our Changing World."

Department of Animal Behavior: Dr. Lester R. Aronson, Chairman and Curator, was elected Fellow of the Animal Behavior Society. Dr. T. C. Schneirla, Curator, was awarded the 35-year Service Medallion of the Alumni Federation of New York University. Dr. Ethel Tobach, Associate Curator, was elected a Fellow of the New York Academy of Sciences. Dr. William N. Tavolga, Research Associate, was awarded a John Simon Guggenheim Memorial Foundation Fellowship for the 1967-1968 academic year.

Department of Anthropology: Dr. Harry L. Shapiro, Chairman and Curator of Physical Anthropology, was re-appointed Honorary Associate in Anthropology for the year 1967 by the Bernice P. Bishop Museum in Honolulu, Hawaii. Dr. Margaret Mead, Curator of Ethnology, was awarded an honorary degree of Doctor of Letters by Emory University in Atlanta, Georgia. Dr. Stanley A. Freed, Associate Curator of North American Ethnology, was Lewis Henry Morgan Lecturer at the University of Rochester, New York.

Department of Fossil Invertebrates: Dr. Norman D. Newell, Chairman and Curator, was awarded the Addison Emery Verrill Medal of Natural History by Yale University for "helping lay the foundations upon which has arisen the vigorous and expanding new science of paleoecology." Dr. Roger Lyman Batten, Associate Curator, was elected to the graduate faculties of Columbia Univer-

sity and to membership in the Palaeontographical Society of Great Britain.

Department of Mammalogy: Dr. Richard G. Van Gelder, Chairman and Associate Curator, was re-elected Recording Secretary of the American Society of Mammalogists. Dr. Sidney Anderson was re-elected Director of the American Society of Mammalogists. Mr. Hobart M. Van Deusen, Assistant Curator, Archbold Collections, was re-elected Second Vice-President of the Explorers Club.

Department of Ornithology: Dr. Lester L. Short, Associate Curator, received a citation and a cash prize for the paper regarded as the best piece of research published by a member or former member of the United States Fish and Wildlife Service.

Department of Vertebrate Paleontology: Dr. Edwin H. Colbert, Curator, was elected Filial President of the International Paleontological Union.

The new "Pictorial Guide to the Museum" has received a Mead Award of Excellence for the Graphic Arts in a competition conducted by the Mead Corporation of Dayton, Ohio. Mr. Gordon R. Reekie, Chairman of the Department of Exhibition and Graphic Arts, and Mr. Joseph M. Sedacca, Manager of Graphic Arts, are responsible for the layout of the "Guide."

Staff changes are recorded below, including those effective July 1, 1967.

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

Department of Animal Behavior: Dr. Yves Rouger was appointed Research Fellow. Mr. George Rose was appointed Associate.

Department of Astronomy and The American Museum—Hayden Planetarium: Mr. Jeff Sparks was appointed Public Affairs Officer.

Department of Entomology: Dr. Frederick D. Bennett was appointed Research Associate.

Department of Fossil Invertebrates: Dr. Roger Lyman Batten was promoted from Associate Curator to Curator.

Department of Herpetology: Miss Ellen E. Bowler was appointed Scientific Assistant.

Department of Ichthyology: Dr. C. Lavett Smith was promoted

from Assistant Curator to Associate Curator. Dr. Gareth J. Nelson was appointed Assistant Curator. Mrs. M. Norma Rothman and Miss Toby F. Shaman were appointed Scientific Assistants. Dr. Ralph T. Hinegardner was appointed Research Associate.

Department of Living Invertebrates: Dr. Dorothy E. Bliss was promoted from Associate Curator to Curator. Mr. William E. Old, Jr., was appointed Scientific Assistant.

Department of Mammalogy: Dr. James N. Layne was appointed Curator, and Mr. Guy G. Musser was appointed Assistant Curator, both of the Archbold Collections. Miss Elizabeth A. Fryatt was appointed Scientific Assistant.

Department of Micropaleontology: Dr. Brooks F. Ellis retired as Chairman and Curator and was appointed Curator Emeritus. Miss Angelina R. Messina was appointed Acting Chairman. Dr. Richard Charnatz was appointed Assistant Curator.

Department of Ornithology: Dr. Wesley E. Lanyon was promoted from Associate Curator to Curator. Dr. Charles Vaurie was promoted from Associate Curator to Curator. Mr. G. Stuart Keith and Dr. Edwin O. Willis were appointed Research Associates. Dr. Charles T. Collins and Dr. Larry L. Wolf were appointed Research Fellows.

In the Department of Education, Mr. Edward C. Knoblich and Mr. Earnie W. Daniel were appointed Senior Instructors. Mr. Martin Rosenberg was appointed Instructor.

In the Library, Mrs. Mercedes B. Sharpless was appointed Assistant Librarian.

Mr. James K. Page, Jr., was appointed Publisher of the Natural History Press.

On *Natural History* magazine, Mr. Alfred Meyer was promoted from Senior Editor to Executive Editor. Mr. William Gilman was appointed Senior Editor. Mr. Jack Hope and Miss Judith Ireland were appointed Associate Editors. Mr. Thomas Page was appointed Art Editor. Mr. Harvey Oshinsky was appointed Advertising Manager.

Mr. Franklyn K. Lauden was promoted to Editor-in-Chief of *Nature and Science*.

In the Office of Public Relations, Miss Ruth Norton, who had served with distinction as Manager of Public Relations since 1951, resigned, and Mr. Roberto Rendueles was appointed to succeed her.

We are deeply saddened by the death on October 10, 1966, of Dr. Charles C. Mook, Curator Emeritus of Fossil Reptiles in the Department of Vertebrate Paleontology; of Mrs. Miriam C. Stryker, Senior Instructor in the Department of Education, on January 9, 1967; and of Mr. Joseph M. Guerri, Principal Preparator, Design, of the Department of Exhibition and Graphic Arts, on February 14, 1967, all of whom made outstanding contributions to the Museum. Dr. Mook served the Museum for more than 54 years and published 61 scientific papers on giant dinosaurs and fossil crocodiles. Mrs. Stryker had been with the Museum since 1950. Her intimate knowledge of Eskimo and Indian life made her a most valuable member of the teaching staff. Mr. Guerri served the Museum for 37 years, and most recently designed the Hall of Indians of the Eastern Woodlands and the Hall of the Indians of the Plains.

DEPARTMENT OF ANIMAL BEHAVIOR

The behavioral repertoire of every adult begins anew and in simple form in the embryo. After a long, complex series of developmental events, the individual's behavior attains its adult characteristics. No adult behavior appears *de novo*. Rather, it is based on continuous, and oftentimes subtle, changes in the animal's past. It goes from simple to complex, and so it is also in the evolutionary sense. In the course of millions of years, behavior has evolved from the relatively simple responses of the lower invertebrates to the highly complex interactions and learning processes of the mammals, including primates and man. Through laboratory and field studies, scientists in the Department of Animal Behavior are analyzing and interpreting the development and evolutionary changes in behavior in various species, as well as the physiological mechanisms that underlie all behavioral activity in the individual.

In the human brain the cerebrum is responsible for the organization of complex learning and of the cognitive processes. The cerebellum is responsible for the regulation of precise movements. In lower forms such as fishes, Dr. Lester R. Aronson and his students have found that these structures have a more general arousal function; that is, they keep the rest of the nervous system primed for efficient action. Presumably during the course of evolution the primitive arousal function of the cerebrum gave rise to mechanisms for the mediation of higher mental processes, while the comparable arousal function of the cerebellum gave rise to a system that is effective in the control of precise movements.

Sexual behavior is the most important of life's processes for the perpetuation and evolution of the species. In a continuous series of investigations, Dr. Aronson, together with several assistants and students, has been studying the interaction of neural processes, hormones, and sexual experience in the development and maintenance of mating behavior in domestic cats. Results indicate that the pattern of sensory input of the sexual behavior of males is different

from that of females for the maintenance of normal sexual functions.

The highly predatory army ants are renowned for their dramatic raids and regular periods of emigration. Dr. T. C. Schneirla, with his collaborators, assistants, and students, has shown, in studies extending over many years, that these raids and migrations are regulated by conditions in the larval broods and young workers. Early studies of Panamanian species showed that phases of emigration and non-emigration are quite regular. Dr. Schneirla has now extended his investigation to two Philippine species and to a comparison of their behavior with that of the driver ants of Africa. Although the colony schedules of emigrative phases differ among these three genera of ants, his evidence shows that they are regulated in each case by the same mechanism—stimulation by brood. His research also indicates that the most primitive system of communication between brood and adult workers is found in the Philippine ants, from which apparently evolved the more precise system found in the New World species.

A well-formed school of fish is a dramatic demonstration of the ability of these animals to maintain specific distances apart, to head in the same direction, to swim parallel, and to turn almost simultaneously. For several years Dr. Evelyn Shaw and her students have been learning how schooling fish maintain such precise swimming patterns. This year she has found, among other things, that a single experience with species mates during early life can be an essential component in the development of schooling behavior. Embryos that were hatched and reared in complete isolation for one to 25 days took at least 100 minutes to school when they were placed together in a bowl. When these fry were again isolated for periods of up to

Dr. T. C. Schneirla of the Department of Animal Behavior inspects an actual stump nest of a carpenter ant colony from Michigan. The nest is part of a new exhibit in the Hall of the Biology of Invertebrates.



20 days and were again placed together in a bowl, they all schooled within a few minutes. The single previous schooling experience obviously had a profound effect on the later formation of the school.

Dr. Ethel Tobach and her students, using the "open field situation" commonly employed in the study of problems of emotion and stress, have shown that the behavior of rats in the open field is highly dependent on the conditions in which the animals were born and reared. Animals were reared in either round or square cages. Those reared in round cages took longer to adjust to a novel arena of either shape. In general, the round area presented greater difficulty for adjustment regardless of rearing conditions. The best adjustments were made by rats raised in square cages and tested in square arenas. Also, rats reared in either square or round cages had more difficulty with a round arena. These results seem related to the fact that rats tend to seek corners and to move along walls. During the year Dr. Tobach extended her open field tests to a variety of species of wild rodents. She found important differences in the way that these species behaved in the standard test situation.

The immune response is a fundamental biochemical process by which the body protects itself against foreign proteins. This process has been studied extensively in relation to allergies, tissue transplantation, and treatments involving protein medication, but the relation of the immune response to normal development has received little attention. Dr. Benjamin B. Kamrin has developed a method of reducing the immune response of chicks by temporarily connecting two embryos together for several days in a technique known as egg parabiosis. He found that chicks from parabiosed embryos had only a minimal immune response and behaved rather differently from normal chicks in a series of approach-withdrawal tests. These changes in the normal biochemistry of the individual seem to alter developmental processes of the nervous and endocrine systems. These promising experiments may well open up new avenues for research on biochemical aspects of development, and may suggest ways in which biochemical genetics can throw light on evolutionary directions.

Sounds made by fishes, and hearing in fishes, have been subjects

of growing interest ever since sonar and other under-water devices showed that the sea is filled with noise. Most experimenters have used pure tones in a nearly silent background for signals, but such a situation is not natural. Dr. William N. Tavolga and his associates, therefore, tested the ability of fish to detect signals against noisy backgrounds, a far more natural condition. They found that goldfish have a more sensitive signal-detecting system than many other species. Dr. Tavolga related this special ability of goldfish to a unique bony connection between the swim bladder, which acts as a receiving microphone, and the middle ear.

In trying to understand how birds navigate over long distances, scientists assume that they use known sensory mechanisms rather than new or unknown mechanisms. It follows that study of the sensory capacities of birds can establish the limits of accuracy within which birds can navigate. For a complete navigational system, the position of a celestial body at a given time must be established, and an accurate "internal clock" would be most useful. Birds flying east to west or vice versa are subject to a systematic distortion of the time base they must use to establish their position. They do not have a chronometer such as modern navigators require. Dr. Helmut E. Adler and his associates have discovered that a bird's sense of time is distorted because of the presence of an internal rhythm which is somewhat less than 24 hours. This fact implies that internal rhythm alone cannot be used for navigational purposes and that external factors, based on experience, must serve as a source of synchronization to adjust the clock.

Several field studies were carried out in connection with the research described above. Dr. Schneirla's associates studied army ant behavior and physiology in the Philippines and at the Museum's Southwestern Research Station in Arizona; Dr. Shaw studied schooling fishes at the Stazione Zoologica di Napoli; Drs. Tobach and Rouger and their associates studied problems of stress in wild rodents at the Southwestern Research Station; and Drs. Tavolga and Jacobs studied the hearing of fishes at the Cape Haze Laboratory in Florida.

Departmental research investigations were aided by grants from

the National Institutes of Health, the National Science Foundation, the Office of Naval Research, and the American Philosophical Society.

Lester R. Aronson, *Chairman*

DEPARTMENT OF ANTHROPOLOGY

The detailed reports of each department member make it clear that the range of research pursued during the year has been exceptionally varied, including such diverse subjects as archeology in Peru, cultural change in New Guinea, and the effect of urban tension in Calcutta. What is less obvious, however, is that these projects to a very considerable degree represent pioneering studies of great potential significance to contemporary man and his culture.

Dr. Harry L. Shapiro is carrying on research on the biological effects of urbanization, crowding, and tension in India. Field work has been organized as a controlled study of the physiological and physical reactions of urban populations compared with those of relatives in ancestral villages.

Dr. Junius B. Bird has continued studies of a wide range of Peruvian archeological subjects in addition to a long-term study of Peruvian textiles. He devoted much time to devising a major plan for the archeological study of the Nepeña Valley, and estimates that it would take five years to clear and restore this major religious and civic center of the Mochica Period. Dr. Bird traveled to the Patagonian section of Argentina, where he checked on the occurrence of an axe that may antedate the oldest known cultural material of that region; to the Santa Cruz River, Argentina, where he collected

The mud in the cooking pot on the head of this Ik woman was being taken to make walls of a hut. Dr. Colin M. Turnbull of the Department of Anthropology has been studying the 1200 Iks of Northeast Uganda.



artifacts associated with terrace formation; to northern Chile, where he conducted excavations for organic material that can be used to date the appearance of maize in the area. He visited an area south of Piura in the northern part of Peru to examine the source of a newly discovered culture and to assess the problems for future work in that region.

Dr. Gordon F. Ekholm has been primarily concerned with his provocative studies of trans-Pacific contacts in prehistoric times. Of special interest, among the several papers he has nearly completed, is one on a scroll-ring motif which occurs in both Bronze Age China and the Olmec culture of Mexico. This motif is particularly significant because it appeared in Mexico at the beginning of the first high culture in the New World.

One of the major problems in the world today—in highly advanced areas that have developed their own tempo of cultural change, as well as among primitive people undergoing the tensions of rapid Westernization—is the way man adapts and responds to these pressures. Dr. Margaret Mead's work in New Guinea and elsewhere exemplifies the way in which anthropology is beginning to study such problems. She and Dr. Rhoda Metraux are involved in a four-year comparative study of the cultural structure of imagery in the West Indies, the Admiralty Islands, and New Guinea. This year, Dr. Mead made one visit to New Guinea, and Dr. Metraux made two trips to the West Indies.

The factors that underlie cultural evolution are equally significant for our understanding of the process of change. Dr. Robert L. Carneiro has recently devoted much of his research to this long-neglected field. One of his recent studies concerns the relationship between the size of a settlement and the complexity of its social

The most prominent exhibit in the new Hall of the Indians of the Plains shows a group of Blackfoot Indians observing a Thunder Pipe ceremony in a tepee. Thunder was a Blackfoot god, and the ritual was intended to appease him, thus protecting tribesmen from being killed by lightning.



organization. In another study, he ascertained that Anglo-Saxon England underwent a regular and relatively rapid period of cultural development from 450 to 650 A.D., and an equally regular but slower development from 650 to 1087 A.D. The results of these studies are being prepared for publication. In addition, Dr. Carneiro prepared a preface for an abridgement of Herbert Spencer's "Principles of Sociology." In the preface he traces Spencer's introduction of the evolution concept into scientific thought, and the development of Spencer's ideas on the nature and scope of evolution.

One of the problems facing many countries today, particularly the less industrially developed nations now experiencing rapid change, is the effect of this change on traditional village life. Dr. Stanley A. Freed is exploring this area in a study of the effects of urban influences on village life in India. As part of his investigation he and Dr. Ruth S. Freed are analyzing essays written by rural and urban Indian school children on their occupational goals.

Dr. Colin M. Turnbull's field investigation of the Ik Tribe in Uganda promises to reveal valuable data on the process of disintegration in a society that is under severe economic and political pressure. He has gathered, perhaps for the first time, a systematic series of observations on a primitive society under extreme stress, leading to disintegration. Almost nothing is now known about the capacity of such a society to withstand this stress, or about the factors that determine which societies disintegrate and which survive and adapt under such extreme conditions.

Dr. Richard A. Gould's parallel study in Australia of a living culture and its archeological remains offers exciting possibilities for gaining clues to a richer interpretation of archeological data.

Other department members are engaged in a variety of projects. Dr. Morton H. Levine, a former Ogden Mills Fellow, has finished his field work in a study of the cultural identity of the Basques and the factors that have insured their survival as a distinct group. Mr. Charles F. Brush is continuing his study of materials he excavated at archeological sites in Guerrero, Mexico. His data span 4000 years and include some of the earliest known ceramics from Mexico. Mr. Roger Peranio, 1966-1967 Ogden Mills Fellow, has concen-

trated on a study of Malaysian social structure.

Mrs. Carin Burrows, a volunteer with the department, is preparing for publication a comparative study of the ethnology of the Naga Tribes of Assam for publication. Her study is part of a larger investigation on the Tibeto-Burman cultural continuum.

The exhibition program of the department has been exceptionally active this year, and virtually everyone in the department has been involved in it. The Hall of the Indians of the Plains was completed and opened to the public in February. As was its companion hall on Indians of the Eastern Woodlands, it was prepared under the supervision of Dr. Freed, and has been well received.

Dr. Turnbull has been deeply involved in the new Hall of Man in Africa. The hall will demonstrate the way people live, think, and organize themselves. It should be an outstanding addition to the Museum's exhibits, and an invaluable aid to teaching.

Dr. Ekholm has been preparing the new Hall of Mexico and Central America. Architectural work has begun, and the hall should be ready for installation in October, 1967. Dr. Bird has revised a number of archeological exhibits, and Dr. Mead has been planning the new Hall of the Peoples of the Pacific.

Harry L. Shapiro, *Chairman*

DEPARTMENT OF ASTRONOMY AND THE AMERICAN MUSEUM—HAYDEN PLANETARIUM

Attendance at The American Museum—Hayden Planetarium during the fiscal year was 591,273, the highest in its 32-year history. The new record exceeds the previous one of 1957–1958, the year the space age began. New levels of participation were also experienced, for the second year in succession, in Planetarium educational projects. The school program drew more schools (3437) and more children (172,184) than heretofore. Enrollment in Planetarium courses was 1527, nearly double that of three years ago and 26 per cent higher than enrollment last year.

Perhaps the most outstanding activity of the year was the edu-

cational program for teachers, the most influential audience the Planetarium can reach. This educational service reached a new peak in both the variety of programs offered and the number of teachers who participated. The programs included an open house for some 500 teachers, during which pertinent materials were distributed and discussed; six two-day workshops in astronomy for elementary and secondary school teachers; and a new laboratory for elementary school teachers, emphasizing astronomy activities suitable for their classes. In addition, the Planetarium sponsored two astronomy courses for in-service elementary and secondary school teachers, and a series of special lectures for both in-service teachers and teachers in training. A total of 1098 teachers and 1484 teachers in training attended these programs.

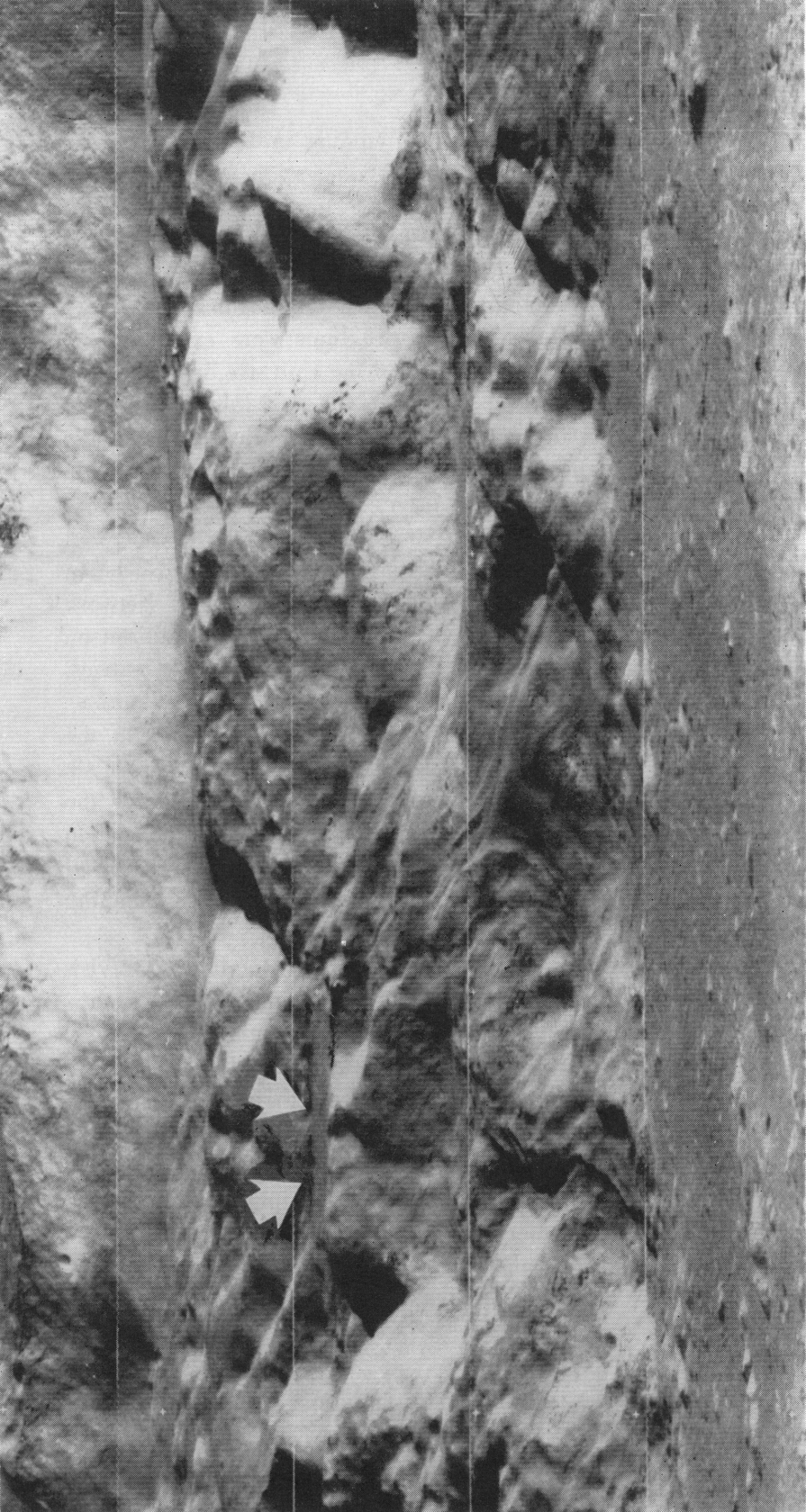
The National Science Foundation continued to support the Planetarium's summer institute for superior secondary school students. The Planetarium also had the support of the New York State Department of Education for several of the above-mentioned teacher programs.

The continued growth of the Planetarium and its services was also evident in the increase in the size and use of the library, expansion of promotional activities, an increase in the variety of groups for which special lectures were presented, the acquisition and development of new and changing exhibits, and the improvement of unused basement areas.

Two hundred sixty-four volumes were added to the library collection, which now contains more than 5500 volumes. During the year, 368 visitors used the research facilities of the library, and 1035

Dr. Kenneth L. Franklin of the Department of Astronomy and The American Museum—Hayden Planetarium investigated this Orbiter II photograph of the moon and found clear evidence of a lakelike structure (arrow) on the walls of the crater Copernicus. Dr. Franklin's conclusion that the area may be a thin skin covering a lower subsurface suggested that the weight of a vehicle landing or crossing might cause the "lake" to collapse.

Photographer: NASA



volumes were circulated. Since its founding in 1958, the library has outgrown its original quarters. A renovation program, which was started in the spring, will enlarge the storage capacity by about 300 per cent. The new facilities will provide a separate stack room and a reading room in the Planetarium's lower level.

A number of new promotional activities were begun at the Planetarium, and many of the existing programs were expanded. A WNYC-TV television series, "Man and the Universe," was inaugurated in cooperation with the Museum's Office of Public Relations. Weekly programs alternated between the Museum and the Planetarium, featuring staff members from both. Under a new title and revised format—"The Starcaster"—the weekly radio feature of the Planetarium reached 56 stations, double the coverage in 1965-1966. The two-minute astronomy recordings are also being broadcast internationally over the Armed Forces Radio Network and the Voice of America. An art contest for school children on "What Does the Universe Mean to Me?" produced 500 entries, from which nine winners were selected. The winning contributions were displayed at the Planetarium, on WNYC-TV, and in the gallery of the Union Carbide Building in Manhattan.

The Leonid Meteor Shower watch, which was planned by the Planetarium and the Department of Parks, drew 10,000 persons to Central Park on November 16. The program was so well received that the Planetarium and the Department of Parks are planning similar events for the future.

Special lectures were presented to 29 groups totaling 4634 visitors, nineteen per cent more than last year. Among the new groups that participated in this program were Pan American Airways pilots, Peace Corps students at Columbia University, and adults engaged in youth opportunity programs such as Project Headstart and the Center for Urban Education.

Exhibits acquired or developed during the year included a display of the photographs and photographic equipment of Robert T. Little, amateur astronomer and photographer; equipment and observations from the Leander McCormick Observatory in Virginia; a contemporary painting of Galileo; material on United States prog-

Declaration of Intent

As a friend of the Museum interested in its future success, I am pleased to advise that

☐ *I have already provided for the Museum in my Will.*

☐ *I intend to provide for the Museum in my Will.*

This Declaration of Intent is not a legal obligation and I may change it at any time.

Date..... Name.....

Address

.....

Please read the reverse side.

The Endowment Fund of the Museum was established in 1884 to provide income for the support of exhibition, research, education, and exploration. It has been the growth of the endowment that has made possible the high standards of exhibition, the completeness of the collections, and the significance of the scientific and educational programs of the Museum.

One important way of supporting these programs is by means of a bequest. If you intend to make a bequest to the Museum, the form on the reverse of this card may be filled out and sent to the Museum. Appropriate instructions should also be given to your attorney. *Bequests, as well as all other forms of donations, are exempt from federal gift and estate taxes.*

ress in space from the National Aeronautics and Space Administration; full-scale replicas of the Lunar Orbiter and Surveyor spacecraft; a collection of cordless electric clocks; and paintings by Norman Rockwell of an imaginary landing on the moon.

Several new projection devices for the Sky Theater were designed and constructed during the year. One demonstrates the expansion of the universe; another shows the motions of sunspots across the solar disk; and a third, a bright meteor-shower device, demonstrates the appearance of fireballs coming from a radiant. The staff is discussing the prospect of modernizing the present Sky Theater during the Centennial Year.

Construction began during the year on further improvements in the lower level of the Planetarium. In addition to the library, the new facilities will include administrative offices, an employees' lounge, and a new classroom. The lobby and stairs leading to the renovated area will also be refurbished.

The radio astronomy installation at the Kalbfleisch Research Station continues to obtain valuable records of radiation from Jupiter, under the direction of Dr. Kenneth L. Franklin. In another project, Dr. Franklin investigated an Orbiter II photograph of the moon, and found clear evidence of a lakelike structure in the vicinity of marked flow lines along the walls of the crater Copernicus. He investigated the possibility that the lake may have been previously composed of molten lava, and that over the years it drained out, leaving a subsurface covered by a relatively thin skin.

Dr. Thomas D. Nicholson tested and evaluated a sextant for the Gemini XII flight. He helped to prepare and review the final report of the performance of the sextant as well as the evaluation of the test program.

Student assistance was used in reducing and analyzing the records of Jupiter radio bursts from several years of observation. Staff members and Urban Corps interns decoded the daily teletyped and telegraphed summaries of geophysical and solar data for correlation with radio records obtained at the station.

Thomas D. Nicholson, *Chairman*

DEPARTMENT OF ENTOMOLOGY

The Department of Entomology is committed to investigations on the evolution, classification, and zoogeography of various terrestrial arthropods. These investigations fall into the category of basic research, which is frequently thought to have no application to mankind. In fact, however, these studies provide substantial background information on some of the most important insects and spiders that affect man.

Bees, the main research interest of Dr. Jerome G. Rozen, Jr., are responsible for the pollination of more than 50 kinds of field crops, orchard trees, forage, and ornamental plants. Information supplied by Dr. Rozen enables agricultural entomologists to improve the effectiveness of bees as pollinators.

Dr. Willis J. Gertsch's papers on venomous spiders and scorpions are sought after by physicians and venomologists. Dr. Frederick H. Rindge's studies on inchworms, which are a hazard to plants and food crops in most parts of the world, provide means by which injurious species can be identified and controlled.

Dr. Pedro Wygodzinsky is concerned with a variety of insects that are detrimental to mankind, including black flies, kissing bugs, and silverfish. Not only are black flies serious pests of livestock and man, but also they can transmit onchocerciasis, a disease that often results in blindness. Some species of kissing bugs transmit Chagas' disease to inhabitants of South America, and some silverfish and their relatives are household pests.

Under a National Science Foundation grant, Dr. Rozen carried on extensive field research in Arizona and South Africa during the year. Each of these arid regions has a distinctive and varied fauna of solitary and parasitic bees. He made detailed observations of the nest patterns of solitary bees, their mating behavior, and the plants from which they gather nectar and pollen. Dr. Rozen also investigated the searching behavior and egg-laying habits of cuckoo bees. Collections were made of larvae and pupae representing fourteen

genera of bees. The immature stages of seven of these genera have never been studied before. The ultimate purpose of Dr. Rozen's research is to shed new light on the evolution and classification of the 20,000 species of bees that inhabit the earth.

Mygalomorph spiders—tarantulas and their relatives—have occupied most of Dr. Gertsch's research time. He will soon publish a paper describing a new species of *Heptathela* that was collected many years ago by the late Walter Granger. This spider has abdominal tergal plates similar to those of segmented spiders of Carboniferous times. In addition, Dr. Gertsch has almost completed a paper describing five spider species from the western United States, and is progressing in his study of some of the most interesting trap door spiders. His revision of the venomous spiders of the genus *Loxosceles* in South America, with verbal and pictorial descriptions of about 30 species, was published in late June in the *Bulletin*.

Dr. Rindge's main research efforts have been directed toward a revision of the moth genus *Stenoporpia*, which occurs primarily in western North America. Several of his smaller projects on other groups of geometrid moths have been completed and submitted for publication. The Lepidoptera section grew at an unusually fast pace this year. Dr. Rindge collected 13,712 butterflies and moths in a hitherto poorly collected area of Nevada. Because of Dr. Rindge's efforts through the years, the Museum now has one of the largest and best-curated collections of North American butterflies and larger moths in the world.

Dr. Wygodzinsky has actively continued his systematic work on several important projects. Accelerated by a National Science Foundation grant, his studies of the black flies of South America have brought to light new facts on the relationships of the numerous species. Eventually, his research will provide significant data on the evolution of this family in the Americas. In addition, Dr. Wygodzinsky has progressed on a major study of the unique-headed bugs of the Western Hemisphere. He has begun work on South African silverfish, and is particularly interested in one group which comprises several genera and species of clearly common origin found in the nest of a single termite species. Also this year, Dr.

Wygodzinsky published a massive monograph of the reduviid subfamily Emesinae, two other papers on reduviid bugs, and a translation of a fundamental work by a German author on the zoogeography of the Diptera of New Zealand.

As a result of this research, 29 scientific papers were published by the curators and other resident staff members this year, and 20 more are in press.

The department's collections increased by 117,201 specimens during the year, bringing the total to 13,777,887. An especially important accession, the William Beebe collection of 29,355 insects from field stations in Guyana, Venezuela, and Trinidad, was a gift from the New York Zoological Society.

Plans are now under way to appoint a coleopterist. The new position will insure the proper care of the department's extensive collection of beetles, which now numbers more than 1,000,000 specimens.

Jerome G. Rozen, Jr., *Chairman*

DEPARTMENT OF FOSSIL INVERTEBRATES

In the past few decades, the artificial border between studies of present and those of past organisms has faded, and we find the interests of paleontologists ranging broadly over many aspects of biology, while students of living organisms have turned to such specialized fields as physiology, genetics, molecular biology, and animal behavior. Invertebrate paleontologists now not only work on fossils, but also are prominent in systematic work on a number of major groups of living invertebrates—for example, sponges, corals, brachiopods, echinoderms, and a majority of mollusks.

Paleontology supplies the main basis for the deciphering of geologic history. The evolutionary study of life, especially of marine organisms, provides stratigraphic clues in the study of the origins and distribution of such vital commodities as fuels and many chemicals. Consequently, invertebrate paleontology is involved in the systematic exploration of geological conditions over continents, continental shelves, and deep ocean basins.

Thus, a spectrum of opportunities confronts invertebrate paleontologists in the fields of systematic zoology, evolutionary and ecological biology, oceanography, and historical and economic geology. To an exceptional degree, invertebrate paleontology has become broadly interdisciplinary, and no single small department can presume to cover all the appropriate subjects. Therefore, a modest program within the scope of the science is being developed along the lines that are outlined below.

Since 1945, the Museum has collaborated with Columbia University in the training of professional invertebrate paleontologists for the doctoral degree. During 1966–1967, thirteen graduate students received training in invertebrate paleontology at the Museum, and three completed their residence, two with the doctoral degree. In all, 27 doctoral degrees have been granted in this program, a record that places our institution and Columbia among the leading academic institutions in invertebrate paleontology in the world. The department also engaged in other educational activities.

For example, Dr. Norman D. Newell participated in designing a nature facility for a New York City Vestpocket Park, and Dr. Roger L. Batten worked on a textbook on historical geology. The department made educational contributions to industry as well. Dr. Newell lectured on “Reliability in Geological Inferences” to the affiliates of the Esso Oil Company Exploration School. His audience included professional geologists from Europe, South America, and Asia. Dr. Newell also represented the Museum on the Smithsonian Council, a committee of scientists formed as an advisory group to the Administration of the Smithsonian Institution.

In research, Dr. Newell has been concentrating on animal extinction and filling major gaps in the fossil record of the history of life. Dr. Roger L. Batten continued his studies of gastropod systematics and evolution.

In Dr. Newell’s studies of mass extinctions of whole faunas, the current emphasis is on the faunal crisis that marked the close of the Permian period, 260 million years ago. Fifty per cent of all animal families known to be living during that period disappeared within a brief span of time, geologically speaking. Dr. Newell’s

monographic studies of Permian mollusks are expected to shed light on the mechanisms leading to the changes that occurred between the Permian and Triassic periods. Another monograph, written in collaboration with Prof. Keiji Nakazawa of Kyoto University, Japan, concentrates on upper Permian bivalve mollusks of Japan, of sorts not represented in most parts of the world. These fossils reduce the gap in the evolutionary record that characterizes the Permo-Triassic boundary. Dr. Newell is also involved in studies of Permian bivalves from West Pakistan, Texas, and Wyoming.

From February 1 through April 9, 1967, Dr. Newell was in the Caroline and Marshall Islands as a member of a Scripps Institution of Oceanography expedition, "Carmarsel," devoted to a study of coral reefs, atolls, and fluctuating sea levels. A comprehensive ecological-geological survey was completed along a 6000-mile route between Guam and Kwajalein, but it revealed no evidence of a recent high stand of seas widely accepted by geologists. Dr. Newell concludes that the sea has indeed risen some hundreds of feet from a low level of the last major ice age in the Northern Hemisphere, but that the rise did not exceed the present level of the sea.

Dr. Newell is chairman of an international group of 20 scholars who are undertaking a definitive revision of extinct and recent bivalve mollusks. He reports that the manuscript is 95 per cent complete, with more than half of it in galley proofs. Assisting Dr. Newell in this project is Mrs. Valerie Z. Newell. When complete, the work will be part of the "Treatise on Invertebrate Paleontology."

During the same period, Dr. Batten completed his study of the European lower Carboniferous gastropods, which was published by the Palaeontographical Society of Great Britain, and this work supplied material for a discussion paper in the *Journal of Paleontology*. The discovery of a Devonian slit-bearing mollusk by H. B. Rollins, a Columbia graduate student working at the Museum, initiated another project by Dr. Batten involving a reappraisal of the early evolution of the phylum Mollusca. The results indicate that the primitive gastropods may have arisen at least three times during the early Paleozoic, an explanation that would account for the discontinuities observed in the fossil record of primitive mol-

luskus. The results have been printed in *Palaeontology*, a British publication.

Dr. Batten also made advances in his long-term study of shell microstructures of both fossil and living primitive gastropods. Thus far, the results show that specialized shell structures occurred in the most primitive examples of the Paleozoic era instead of progressing from primitive to specialized forms, as was previously believed. Field expeditions took him to the Allegheny plateau, the mid-continent region, the Rocky Mountains, and three mid-eastern states during 1966 and 1967—a collecting program that enabled him to discover original wall structures of gastropods in Pennsylvanian black shales. Composed of aragonite, these mollusks will yield data on temperatures of ancient habitats through oxygen isotope studies.

A total of 100,000 specimens of upper Paleozoic mollusks were added to the collections as a result of Dr. Batten's extensive field trips this past year.

Research by non-resident staff members continued throughout the year. Dr. R. M. Finks worked on fossil sponges, publishing a number of papers and preparing others. Dr. John Imbrie developed mathematical concepts using geologic models. Dr. A. Lee McAlester was involved in extensive research in the paleoecology of Devonian rocks in New York State. Mr. Eric N. Kjellesvig-Waering approached completion of his monographic studies of fossil and living scorpions.

In exhibition, architectural work on the Lindsley Hall of Earth History was nearly finished by the close of the fiscal year. About one-half of the exhibits were planned by the department in collaboration with the Departments of Exhibition, Mineralogy, Micropaleontology, and Education. The entire resident staff participated in designing exhibits and assembling specimens and photographs. The department's one preparator spent most of his time during the year cleaning and dissecting specimens from rock matrix for display in the new hall. Four dioramas of ancient communities of marine invertebrates have been completed, under contract, at the University

of Michigan and delivered here. Eight more are expected to be delivered in the coming year.

Norman D. Newell, *Chairman*

DEPARTMENT OF HERPETOLOGY

Current investigations in the department range from a study of interspecific competition among salamanders in the Sierra Madre del Sur in southern Mexico to a systematic revision of a subfamily of frogs on New Guinea and adjacent islands.

Improved equipment and other technological advances have greatly facilitated the department's investigations, which have become increasingly diverse because of these improvements and because every study opens new vistas, raises new questions, or suggests new ways to solve old problems.

Dr. Charles M. Bogert, for example, required equipment weighing less than ten pounds to record the call of a small frog. Moments later, he was able to play back the tape in the vicinity of the same frog, and to observe and record its reactions. When the frog, in response to its "own" voice, began issuing a different sort of call, this too could be taped. To compare calls, Dr. Bogert could reproduce them at will or obtain a graphic representation of each by feeding them into a sound spectrograph. Following a similar procedure, Dr. Richard G. Zweifel used a tape recorder and the sound spectrograph to ascertain the effects of temperature, body size, and hybridization on the mating calls of different species of toads.

Investigations in Mexico were prompted in part by the construction of new roads in several mountainous areas that had rarely, if ever, been visited by collectors. These roads enabled Dr. Bogert to reach the principal subdivisions of the Sierra Madre del Sur in the state of Oaxaca. The collections he assembled inevitably contained undescribed species. Of even greater importance, however, was the information derived from these field investigations, which shed new light on such phenomena as interspecific competition, its role in evolution, and its effects on the distributional patterns of closely related species. Dr. Bogert expects to summarize his results in a

series of publications. Preliminary accounts of the work have appeared in *American Museum Novitates* in 1966 and 1967, and reports dealing with the salamanders of the area are near completion.

Dr. Zweifel divided his research activities between systematic investigations in the laboratory and ecological studies at the Kalbfleisch Field Research Station on Long Island. While working on his revision of the subfamily of frogs and preparing descriptions of new species obtained by the Archbold Expeditions, he has continued to supervise long-range studies on Long Island. Students are participating in his Kalbfleisch investigations, which are primarily concerned with the movements and growth of frogs, toads, and turtles, and with the fluctuations that occur in their populations as a result of environmental changes.

Meanwhile, Dr. Zweifel has supervised a series of breeding experiments with kingsnakes, *Lampropeltis getulus*, the subspecies of which are being crossed in an effort to determine modes of inheritance in the characters of the pattern.

Mrs. Ronald Keith continued her studies of the large and diverse collections she made in Africa. She has nearly completed a manuscript describing a new species of toad of the genus *Bufo*.

A total of 3833 specimens, mainly frogs and lizards, were added to the departmental collection during the past year. Among the additions were 82 specimens from the Amazon region of Brazil, 649 specimens from Colombia, 330 specimens from New Guinea, and 136 specimens from the Solomon Islands. A Field Associate, Mr. Ranil Senanayake, contributed material from Ceylon. In response to requests received from other institutions in the last five years, the department has packed, documented, and shipped well over 15,000 specimens. During the same period, more than 12,000 specimens were returned and re-installed in the collection.

Charles M. Bogert, *Chairman*

DEPARTMENT OF ICHTHYOLOGY

The essential quality of the year's activities may be characterized by the word "newness." This year has been the department's first

in its new laboratories and offices, and the increased space and more efficient means of operation have enabled the staff to initiate many new projects and give fresh starts to several old ones. The modern, spacious, and functional laboratories, designed specifically for the jobs to be done, have provided an important stimulus to efficient and productive work.

The beneficial effect of the new quarters may be measured in part by the department's strides in rehabilitating and building its research collections. Four hundred thirteen lots of type specimens have now been examined, authenticated, recatalogued, relabeled, rebottled, and placed in the new storage area. In addition, 913 lots from the general collection were processed, and 3205 new lots were catalogued and entered into the collection. Approximately 100,000 specimens have been identified, and prepared for cataloguing in future years, and about 30,000 individual specimens were added to the catalogued research collection of alcohol-preserved specimens.

In the collection of dry and wet skeletal materials, 3000 lots have undergone preliminary checking and cataloguing, and about one-fifth of these have been catalogued, labeled, and stored in specially designed boxes. Additional 1000 lots of dry and wet skeletons were prepared and now await processing.

More than 300 volumes were catalogued and stored in the department's new library. Of these, 97 volumes are new purchases.

Another measure of the department's increased efficiency has been its ability to provide work space and materials for 28 ichthyologists from this country and abroad. Some of the scientists worked on their own or department projects for as long as a month each.

The department's outstanding new project, an updating of the Dean bibliography of fishes, is being successfully guided by Dr. James W. Atz. The original "A Bibliography of Fishes," which was compiled by Bashford Dean and other Museum staff members, made a comprehensive list of the printed ichthyological material of the world available for the first time in a single source. The original three volumes were noteworthy in that even an amateur could use them to determine what had been written about fishes up to the year 1916. That bibliography contained more than 42,000 fully cross-indexed references.

The new extension of this work will attempt to include complete listings of the current literature on fishes. At present, no such bibliography exists. The proposed project will provide an annual list of the current ichthyological literature, with detailed indexes appearing after each annual. The department will also provide specific bibliographies or bibliographic information on request. In addition, the project will include compilations and analyses of the literature on various taxonomic groups of fishes, and presentations of controversial topics.

The initial stage of a project to establish an American Museum information center on all the cold-blooded vertebrates is under way. The department is exploring new computer methods of information storage, processing, retrieval, and dissemination. The first stages of this project have been made possible by a grant-in-aid from an anonymous donor.

Dr. Donn E. Rosen conducted field work during the year in the southern and central parts of Florida, the Florida Gulf Coast, and the coastal areas of Long Island. The Long Island project is part of a long-range program to study the annual occurrence of juvenile forms of tropical fishes arriving in the area as waifs.

In another project, Dr. Rosen, with National Science Foundation support, continued his work on the higher classification of teleostean fishes. For this project he worked with Dr. P. Humphry Greenwood and Dr. Colin Patterson, both of the British Museum, and Dr. Stanley H. Weitzman of the United States National Museum. Dr. Rosen also pursued his studies of the reproductive ecology of cold-hardy fishes at the Kalbfleisch Field Research Station. In collaboration with Dr. Reeve M. Bailey of the University of Michigan, he is making a complete faunal survey of Guatemalan fishes. This project is receiving continued support from Mr. James G. Greenway, Jr.

During the year Dr. Rosen completed studies on a new tribe, a new genus, and two new species of Guatemalan fishes that are important to an understanding of the zoogeography of Middle America.

Dr. C. Lavett Smith participated in the Biological Survey of the Bahamas, sponsored by the Lerner Marine Laboratory. Under a National Science Foundation grant, he studied hermaphroditism in fishes. He also did research on the systematics of the large seabasses

or groupers, and on oceanic fishes of the "deep scattering" layer. The last project is being done in collaboration with the Lamont Geological Observatory of Columbia University.

Dr. Atz began a comprehensive review of oral brooding in fishes, and continued his taxonomic studies of a genus of South American cichlid fishes, some of which carry their eggs and young in their mouths. Dr. Charles M. Breder, Jr., continued his work on the behavior and ecology of Gulf Coast fishes. He is also studying the reproduction and development problems of fishes of that area.

All resident members engaged in teaching and student guidance during the year. Dr. Atz again taught his graduate course in fish genetics; Dr. Smith gave a summer course on the ecology of fishes; and Dr. Rosen worked in graduate training programs and directed two students in the National Science Foundation's Undergraduate Research Program at the Kalbfleisch Field Research Station. Several students were also encouraged to work in the department during the year on independent research projects involving the taxonomy of catfishes, the comparative and functional anatomy of fishes, and the ecological and zoogeographic problems of coral reef fishes.

Published works of members of the department include Dr. Smith's papers on the gonad structure and reproductive cycle of the kelp bass, and the taxonomy of groupers, and Dr. Atz's studies on gene and chromosome homology in fishes. This latter work was done in collaboration with Dr. Klaus D. Kallman. All members of the department have other works nearing publication.

The department continued work on the Biology of Fishes Gallery in the Hall of Ocean Life. The gallery will include sections on fish morphology, phylogeny, and classification, zoogeography, reproduction, defense mechanisms, feeding behavior, community ecology, and the ecology of the Hudson River drainage.

Donn E. Rosen, *Chairman*

DEPARTMENT OF LIVING INVERTEBRATES

Barnacles, crabs, mollusks, free-living and parasitic worms are among the invertebrates that occupied the research interests of

scientists in the Department of Living Invertebrates. Ecological, physiological, taxonomic, and zoogeographic studies by department members resulted in the publication of 43 papers. Numerous other reports in these areas were submitted for publication or are in the final stages of preparation.

Dr. William K. Emerson completed several long-term research projects during the year. With the aid of Mrs. Margaret Richards, he compiled data for a critical study of the living and extinct species of the gastropod genus *Drupa*. These snails were found to have evolved in post-Pliocene times in association with the development of the modern distribution of coral reefs. The results of this study will be published in a monographic series, "Indo-Pacific Mollusca."

During studies on the fossil and living marine mollusks of the Galapagos Islands, Dr. Emerson and Mr. William E. Old, Jr., discovered additional Indo-Pacific molluscan faunal elements in the present fauna of the islands. One paper resulting from this investigation was published during the year. In another study, on shells taken from the digestive tracts of marine bottom-dwelling fishes, Dr. Emerson found new records for the molluscan fauna of Brazil.

In collaboration with Mr. S. Peter Dance of the Manchester Museum and with the use of both Recent and fossil specimens, Dr. Emerson began to study the distribution and taxonomy of the gastropod genus *Morum*. This study will eventually result in a monographic review of these little-known snails. At present, one report is in press.

Dr. Dorothy E. Bliss and her associates continued their investigation of neuroendocrine integration in the land crab, *Gecarcinus lateralis*. This study, which is supported by the National Science Foundation, concerns five hormones, all, or most, of which are synthesized and released by the central nervous system of the crab. One of those hormones concentrates red pigment and another disperses black pigment within the chromatophores, thus effecting color change; a third hormone prevents or delays molting; the fourth and fifth hormones regulate water balance.

A study of the physical and chemical properties of the hormones regulating color change is now virtually complete, as is a prelimi-

nary characterization of the hormone that prevents or delays molting. Among the most interesting recent findings is one relating to the hormones that control water balance. Experiments show that, when a crab is about to molt, it releases into its blood a hormone that is synthesized within secretory nerve cells of the thorax. This hormone causes water to travel from the blood into the stomach. As a result, the stomach becomes so distended that it stretches the new soft shell of the crab and holds it up as well as out, until the shell can harden at its new dimensions. The characteristic shape of this species thus depends on the movement of water from blood into stomach just before molt.

Some indication of the way in which this water-balance hormone of *Gecarcinus lateralis* may function has been obtained by Dr. Linda Habas Mantel. Using isolated pieces of living tissue, she found that during the intermolt and early premolt stages certain water-storage organs called pericardial sacs are only slightly permeable to radioactive water and salts, but that at molt the stomach is very permeable. Permeability of the stomach seems to be controlled by the hormone mentioned above that is produced in the thoracic group of secretory nerve cells.

With the help of Miss Stefanie M. E. Wang and Mr. Edwin A. Martinez, Dr. Mantel also collected and analyzed samples of blood and other body fluids of *Gecarcinus lateralis*. This type of information is needed for further studies on salt and water balance.

Dr. Ernst Kirsteuer continued to study the systematics and ecology of invertebrates found in the Indian Ocean and the Caribbean Sea. As a result of these studies, he completed papers describing the distribution of two groups of marine worms from Madagascar: nemerteans, which inhabit coral reefs, and sipunculids. The paper on sipunculids was written in collaboration with Dr. E. B. Cutler of the University of Rhode Island. During the year Dr. Kirsteuer submitted for publication a manuscript describing worms collected during the Bredin-Archbold-Smithsonian Surveys of Dominica, the West Indies, and began preparing another manuscript on marine worms from Venezuela.

In addition to the above, Dr. Kirsteuer did preliminary work on

material received from the Smithsonian Sorting Center, the results of which will be included in a monograph on marine worms from the Indian Ocean. He completed for publication in "Fortschritte der Zoologie" a contribution on the morphology, anatomy, and development of three kinds of higher invertebrates, and he published a paper on techniques for collecting bottom-living marine nemerteans from different habitats.

In September, 1966, Dr. Kirsteuer attended the First European Symposium on Marine Biology, which was held in Helgoland, Germany. Later he visited marine biological institutions in Germany and Yugoslavia.

Dr. Libbie H. Hyman completed the manuscript for volume 6, Mollusca, part 1, of her monumental treatise, "The Invertebrates." Because of Dr. Hyman's health, this project will be continued by specialists in the invertebrate groups not yet covered in the published volumes of this series.

Dr. Horace W. Stunkard continued his investigations of the anatomy, life histories, and ecology of parasitic flatworms under a National Science Foundation grant. During the period of this report he worked out the life histories of three parasitic flatworms and submitted his findings for publication.

Other members of the department who reported progress in their studies of various departmental collections included: Dr. William J. Clench, working on terrestrial snails; Dr. John D. Soule, studying Hawaiian bryozoans; Mr. Anthony D'Attilio, studying muricid gastropods; and Mr. Morris K. Jacobson, in collaboration with Dr. Clench, working on certain land snails of Nicaragua and Cuba.

Curatorial activities included the cataloguing of about 50,000 specimens of invertebrates under the supervision of Mr. Old. The purchase of nearly 10,000 mollusk specimens, many of which were not previously represented in the reference collection, was made possible by income received from the Beatrice S. Procter Fund.

Mrs. Margaret Richards and Mr. Arnold Ross made considerable progress on their annotated catalogues of the primary specimens in the collection, and Mr. Gerald Thurmann continued to sort samples of bottom-living animals obtained on the cruises of the "Vema."

Staff members continued to supervise the scientific content of exhibitions being prepared for new exhibition halls. With the assistance of Miss Rose Cupaiuolo and the collaboration of members of the Department of Entomology, Drs. Bliss, Kirsteuer, and Mantel prepared scientific scripts for several exhibitions in the new Hall of the Biology of Invertebrates. In the renovation of several existing exhibits and the preparation of new exhibits for the Hall of Ocean Life, Dr. Emerson served as consultant.

William K. Emerson, *Chairman*

DEPARTMENT OF MAMMALOGY

During the year considerable progress was made by staff members on a number of major faunal and revisional studies. Dr. Richard G. Van Gelder completed an analysis of the non-geographic variation of hog-nosed skunks from Uruguay, utilizing the fine collection made in 1962–1963 by the American Museum Uruguay Expedition. Some 35 characteristics for each of 100 skunks were studied and, with the help of Mr. D. M. Vincent Manson of the Department of Mineralogy, were analyzed by a computer. With the knowledge gained from this study, Dr. Van Gelder began the analysis of the interrelationships of four nominal species of these animals inhabiting southern South America.

Dr. Sydney Anderson made important gains on his major study of the mammals of Chihuahua. This study, which includes more than 100 species, will be completed this year. In addition, Dr. Anderson began the development of a random access key to the bats of America. This novel system of identification permits the user to start with any one of a number of different characters and narrow the search by using other characters in any combinations. The key utilizes punch cards and is an outgrowth of the department's data-retrieval system. Dr. Anderson, with Dr. J. Knox Jones, Jr., of the University of Kansas, also edited an important work in mammalogy, "Recent Mammals of the World, A Synopsis

of Families," published in May, 1967, by the Ronald Press Company.

Dr. Karl F. Koopman furthered his major study of the taxonomy and distribution of the bats of the Sudan. During the year, species accounts were prepared for six of the eight families of these animals. Dr. Koopman also completed a manuscript on the classification and distribution of bats of the Lesser Antilles, and contributed two chapters to "Recent Mammals of the World."

Mr. Hobart M. Van Deusen continued to prepare the summary of the Seventh Archbold Expedition to New Guinea. Two popular accounts of this expedition have appeared in print: one in the July, 1966, issue of *Bio-Science*; the other in *Nature and Science* in February and March, 1967. A paper on the range and habitat of the New Guinea bandicoot, *Echymipera clara*, was published, and data were gathered on the New Guinea spiny anteater, *Tachyglossus aculeatus*, and on the numbers of pouch young and mammary formulas of New Guinea marsupials. Mr. Van Deusen was a co-contributor of the chapter on marsupials in "Recent Mammals of the World."

Mr. Guy G. Musser, who joined the staff this past year as Assistant Curator of the Archbold Expeditions, continued work on his study of the species limits of the Mexican gray squirrel, *Sciurus aureogaster*. Aspects of the morphology, habitat, and geographic distribution of various groups of Latin American gray squirrels were studied, and the first draft of his manuscript was completed.

Mr. George G. Goodwin completed his taxonomic and distributional study of the mammals of Oaxaca, Mexico, and the manuscript is being revised for publication.

Relatively little field work was done by staff members during the year, but the department continued to benefit from cooperative field programs. Dr. Van Gelder participated in the eighth cruise of the Bahama Biological Survey in the northern Bahama Islands. Dr. Van Gelder also continued his long-range population studies at the Kalbfleisch Field Research Station, assisted by Miss Graciela Carreno, a National Science Foundation Undergraduate Research Participant.

In the spring of 1967, Mr. Peter B. Martin and Mr. Harry A. Beatty participated in the Martin Martinique Expedition, collecting mammals, reptiles, amphibians, and spiders for the Museum. Their collection of bats is especially interesting, because it contains new records for the island. Mr. Martin and the Explorers Club sponsored the expedition.

In another trip sponsored by the Explorers Club, Mr. W. H. Butler obtained a very valuable collection of 135 mammals on Barrow Island, Australia. Since the ecology of this island is being disrupted by extensive oil-drilling operations, Mr. Butler's collection and ecological notes will be of great importance in the future. His collection has been divided between the Museum and the Western Australian Museum.

The department's data-retrieval system, instituted in 1966 to handle its large collection, has received much attention. Only 14 months after its inception, the system held more than 60 per cent of the information on the 210,000 specimens in the department's collection. A total of 660,000 items of information are already stored in the system, and Dr. Koopman has coded 80,000 more items for future inclusion.

The department as a whole continued to serve the field by preparing the Recent Literature section of the *Journal of Mammalogy*. Some 2000 documents were reviewed by the department and were submitted for inclusion in this section of the journal.

Supervision and planning for the Hall of Ocean Life was continued by Dr. Van Gelder during the year. The harbor seal, elephant seal, and manatee groups were completed, and the polar bear, killer whale, fur seal, sperm whale, and dolphin groups are in progress. Considerable time was spent in planning the model of the 94-foot blue whale, including consultations with a number of display firms. Dr. Van Gelder also outlined a brief general concept for the Hall of the Biology of Mammals.

A total of 1265 specimens was added to the collection during the year, 554 of them for the department and 711 for the Archbold collections. The new specimens include collections from the island of Martinique, from Barrow, and from the Virgin Islands. Dr.

James R. Tamsitt of the University of Puerto Rico Medical School is now collecting bats in the Caribbean which will be added to the Museum's collection.

Richard G. Van Gelder, *Chairman*

DEPARTMENT OF MICROPALAEONTOLOGY

Since its creation in 1940, the Department of Micropaleontology has been largely concerned with data storage and retrieval. The "Catalogue of Foraminifera" and "Catalogue of Ostracoda" which the department has published for 27 years are in constant use by almost every micropaleontology laboratory in the world. The reputation of the "Catalogues" is based on their wealth of scientific information and on the highly organized manner in which that information is presented. The "Catalogue of Foraminifera," for example, contains data on more than 2000 genera and 30,000 species.

These data are drawn from current and past literature in all languages that deal with microfossils. Therefore, this great store of information bulks large—67 volumes in the "Catalogue of Foraminifera." Moreover, it is steadily growing as new genera and species are described. The "Catalogue of Ostracoda," which now consists of 25 volumes, is growing at the rate of two volumes a year.

The growing bulk of these two "Catalogues" makes them increasingly difficult to use. Moreover, a vast quantity of supporting data accumulated in the department's files is still unavailable to micropaleontologists unless they visit the department. For several years, therefore, the department has been seeking a more efficient method of utilizing the data in the "Catalogues" and files. A computerized data-storage and retrieval system seems to offer a practical solution.

A pilot study in which methods and procedures are being worked out is now nearing completion. The study has been supported by the American Geological Institute and the National Science Foundation and has been endorsed by the Society of Economic Paleontologists and Mineralogists. The computerization of the depart-

ment's entire store of data is expected to take five years. The development of such a data-storage and retrieval system will not only extend the usefulness of microfossils in pure and applied sciences, but will also serve other branches of paleontology.

Instead of replacing the "Catalogues," the new system will substantially augment their usefulness. Consequently, work on the taxonomy, nomenclature, ecology, and stratigraphic significance of foraminifera and Ostracoda continued during the year and resulted in one supplement to the "Catalogue of Foraminifera" and two supplements to the "Catalogue of Ostracoda." A total of 1967 printed pages and 970 illustrations are included in these supplements.

The third and last volume of the "Catalogue of Index Larger Foraminifera" was completed and issued during the year. It contains 187 pages and 432 plates. Much progress has also been made in the compiling of data on the stratigraphic occurrence of smaller foraminifera. The species to be included in the "Catalogue of Index Smaller Foraminifera" have been selected, and the relevant data have been assembled and integrated. Printing is expected to start late this year.

In addition to working on the "Catalogues," the department staff continued to publish the quarterly *Micropaleontology*, the leading professional journal in the field.

During the year, a total of 692 faunas, representing areas in 24 foreign countries and sixteen states, were added to the department's collection. Most of these newly acquired fossils are from the Cretaceous and Tertiary periods. However, some are as old as the Ordovician period; others are Recent. The department's collection is rapidly becoming one of the most important in the world.

In exhibition work, staff members are currently preparing exhibits in applied paleontology for the new Lindsley Hall of Earth History. These exhibits will show how microfossils are used for the correlation of rock layers from different parts of the world and will illustrate mapping of buried geological structures. They will also demonstrate the use of larger fossils in the mapping of surface rocks, and the use of spores and pollen in the correlation of marine

and terrestrial sediments. Diagnostic fossils will be included in the exhibit for the reconstruction of ancient environments.

Brooks F. Ellis, *Chairman*

DEPARTMENT OF MINERALOGY

Man's daily existence is part of an unfolding drama—a majestic sequence of events in time and space, reaching far beyond human grasp. To extend that grasp and to expand the frontiers of his knowledge, man must develop an understanding of the drama of historical time. The earth sciences, geology and mineralogy, play an integral part in the development of this awareness.

Basic research in the earth sciences has made a vital contribution to man's knowledge of his environment. Of equal importance in the modern world, however, is the need to inform the general public of the significant progress being made by scientific studies. The research, exhibition, and curating activities of the Department of Mineralogy have contributed to a realization of these dual objectives.

Mr. D. M. Vincent Manson is currently investigating the interrelationships among the elements that are present in significant amounts in the stony meteorites. A similar study of the empirical variations in the composition of terrestrial basaltic magmas has provided insight into the origin and subsequent evolution of this important rock type. Other studies currently in progress involve detailed examinations of various submarine rocks, peculiar xenolithic rocks from volcanic provinces, and ancient metamorphic rocks from Namaqualand in the Republic of South Africa. In addition to elucidating a particular area of scientific research, these studies provide a clearer understanding of the historic development of continents and oceans; the mountains and mineral deposits; the atmosphere; and conditions on other planets.

The department's expansive meteorite collection provided the stimulus for fruitful cooperation with many institutions. Under the direction of Dr. Brian H. Mason, research in the mineralogical and chemical composition of the stony meteorites was completed during

the year. This highly significant project resulted in the identification of a new extraterrestrial mineral, sinoite (silicon oxynitride), which in its synthetic form has potential as an important refractory. Dr. Mason's studies resulted in many valuable publications on meteorites.

Mr. David M. Seaman is completing a study of pegmatic processes and the sequence of mineral crystallization in New England pegmatites.

Considerable thought and energy are being devoted to the preparation of new exhibits. The dynamic nature of geological processes active in the shaping of the earth's crust will be graphically portrayed in exhibits currently being constructed for the Lindsley Hall of Earth History. "The World Beneath Our Feet . . . Minerals," an exciting temporary exhibit portraying the diversity of color and form present in the mineral kingdom, is currently in preparation and will be opened in the Corner Gallery in October. The Morgan Memorial Hall of Minerals and Gems had to be closed, because its entrance was blocked by construction in the Lindsley Hall of Earth History. While the hall is closed and itself awaiting renovation, new and old minerals are being prepared for exhibition.

About 600 new minerals and several gem stones were added to the collection by gift, exchange, and purchase during the year. Four meteorites and numerous tektites were also acquired and have extended the representation of this important collection.

Routine questions from the public and the identification of minerals and gems brought to the Museum by visitors continue to create increasing demands on the time of the department's staff.

The earth, evolving over billions of years, has provided for the development of man and all that he cherishes. This development has been accompanied by an increasing ability on the part of man to affect and control his environment. The activities in this department contribute to the awareness of earth history, to the advance of understanding of the natural world, and to enlightenment as regards man's future survival in the world.

D. M. Vincent Manson, *Assistant Curator*

DEPARTMENT OF ORNITHOLOGY

During the past year, the department has been active in research and scientific publication. Dr. Dean Amadon completed a two-volume work entitled "Hawks of the World," which is now in press. Dr. Amadon also conducted an ecological field study of bird life at the Archobld Biological Station in Florida. Dr. Wesley E. Lanyon has completed a revision of West Indian flycatchers based on seven years of field work, and has submitted the manuscript to the *Bulletin*. He is now preparing for the next phase of his research on these birds, which will involve field work in Argentina, Uruguay, and southern Brazil. In his position as Resident Director of the Kalbfleisch Field Research Station at Huntington, Long Island, Dr. Lanyon has been involved in a long-range study of vocal patterns of several species of birds. In connection with this project, he had reared house wrens, crested flycatchers, and other birds under controlled sound conditions at the station. In addition, Dr. Lanyon continues to supervise student projects and bird-banding operations at the station. More than 20,000 birds of 121 species have been banded thus far.

Dr. Lester L. Short's research is concerned primarily with the biosystematics and evolution of woodpeckers, a project for which he obtained a two-year grant from the National Science Foundation, and which took him to California and Mexico this past year. His other projects include a generic review of an economically important family of the grouse, Tetraonidae, and an analysis of species pairs of American birds. Mr. Charles E. O'Brien and Dr. Short identified and arranged a collection of 12,000 Argentinian birds, as part of the department's studies of the bird life of Argentina. In the successful operation of this long-term project, the continuing interest of Mr. Robert G. Goellet has been of great importance.

Dr. Charles Vaurie completed his studies on the taxonomy and distribution of the game birds known as curassows. He has pub-

lished six papers in the *American Museum Novitates* series on these subjects. Two more, plus a major synthesizing article, are in press. Dr. Vaurie has also resumed his studies of the birds of Tibet. Dr. Robert Cushman Murphy has completed studies of the distribution of seabirds of the North Atlantic for the American Geographical Society and continued his general studies of petrels.

In other areas of research, Mr. Eugene Eisenmann spent several weeks in Panama studying various birds; Mr. James C. Greenway, Jr., continued his work on an annotated list of the types of birds in the department's collection; Mr. G. Stuart Keith wrote a paper on Alaskan birds and did work on East African species; Dr. Charles T. Collins pursued his study of swifts; and Mr. Larry L. Wolf began research on the biology of Central American hummingbirds.

Continued efforts to acquire species lacking in the departmental collection have met with considerable success. Dr. C. Jouanin of the Muséum National d'Histoire Naturelle in Paris contributed a rare specimen of petrel from the Indian Ocean and Dr. P. A. Clancey, Director of the Durban Museum, donated two skins of a species of African weaverbird. Dr. Jürgen Haffer presented the department with 405 specimens from an area of hybridization in Colombia. The field work of Dr. Short and Dr. Collins resulted in a number of additions to the collection, and the department bought about 5000 specimens from Argentina as part of its long-term studies of the bird life of that country.

During the past year, two books were written by members of the department in collaboration with scientists from other institutions. One is "The Species of Birds of South America and Their Distribution," by Mr. R. M. de Schauensee, with Mr. Eisenmann as consultant; the other, "Handbook of New Guinea Birds," by Dr. Austin L. Rand and the late Dr. E. Thomas Gilliard. Three other books in which the department was involved were Elizabeth S. Austin's "Frank Chapman in Florida," Frank B. Smithe's "The Birds of Tikal," and Jean Delacour's autobiography, "The Living Air." In addition, members of the department published a total of 30 articles in various scientific journals.

Several departmental manuscripts are now being prepared. Dr.

Amadon and Dr. Delacour are at work on a book dealing with curassows. Mr. John Bull has studied the collections of several museums in the process of working on his new volume, "Birds of New York State." Mrs. Mary LeCroy is continuing her studies of the field notes and collections left by Dr. Gilliard so that a complete report can be published.

The physical plant of the department returned to normal during the year when the sixth-floor laboratories used by the New York Zoological Society were vacated. With the help of Dr. Walter Bock of Columbia University, plans are being drawn to renovate, equip, and air-condition these laboratories for departmental use. The Whitney Art Gallery has undergone renovation. The cost of cleaning and refurbishing the paintings and copper engravings by Audubon and other artists has been generously contributed by Mr. and Mrs. W. Allston Flagg and the Leonard C. Sanford Trust Fund.

The department was represented at an International Ornithological Congress at Oxford University in July, 1966, by Dr. Amadon, Dr. Lanyon, Dr. Short, Mr. Bull, and Mr. Keith. While abroad, they carried out field work and visited research institutions in various parts of Europe and in Turkey. Prior to the Oxford conference, Mr. Eisenmann, Mr. Bull, and Mr. Keith also represented the Museum at a general meeting of the International Council for Bird Preservation held at Cambridge University.

Dean Amadon, *Chairman*

DEPARTMENT OF VERTEBRATE PALEONTOLOGY

The department's research activities during the year have ranged from systematic investigations of Triassic fishes, reptiles, and Tertiary mammals to interpretive studies of adaptations in reptiles, diversification in the prosimian primates, and the evolution of the vertebrae in bony fishes.

Dr. Bobb Schaeffer completed a paper on Late Triassic freshwater fishes from the western United States, and began work on collections of Lower Triassic fishes from British Columbia, and

Upper Jurassic forms from Wyoming and New Mexico. Field work on the latter project was confined to a locality in northeastern Wyoming that is yielding the best-preserved Jurassic fishes yet discovered in North America. Dr. Schaeffer is also studying the basic radiation of the higher bony fishes. He made substantial progress in his long-range investigation of the composition, paleoecology, and paleogeography of the Mesozoic fish faunas of the world.

Dr. Edwin H. Colbert completed his monographic study of the gliding reptile *Icarosaurus*, which was discovered in 1960 in the Upper Triassic rocks in Bergen County, New Jersey. *Icarosaurus* is of particular interest because it represents one of the first experiments in aerial locomotion. Dr. Colbert deduced its way of life by comparing it with the modern gliding lizard *Draco*. In addition to his studies on Triassic dinosaurs and other tetrapods of North America and Brazil, Dr. Colbert continued his long-range analysis of the Mesozoic tetrapod faunas. He also completed a book, "Man and Dinosaurs," which will be published by E. P. Dutton and Company.

Dr. Malcolm C. McKenna continued his research on the early radiation of mammals. Two results of this research during the year were a paper on a new family of extinct hedgehogs and an investigation of a new family of ancient ungulates that has an important bearing on the origin of the proboscideans, sirenians, and desmostylids. Dr. McKenna is collaborating with Drs. Frederick S. Szalay and James S. Mellett on a series of papers concerned with

A rock impression of the fossil fish Semionotus, which lived 200 million years ago, was one of six new kinds of Triassic fossil fishes that Dr. Bobb Schaeffer of the Department of Vertebrate Paleontology found in ancient water deposits in the western United States.

Photograph: Chester Tarka



the fossil collections obtained by the Museum's Central Asiatic Expeditions. During the summer of 1966, he collected the first significant vertebrate fauna from the Cretaceous Mesaverde Formation in central Wyoming. Dr. McKenna also participated in joint field projects with members of the United States Geological Survey and the Carnegie Museum of Pittsburgh. In order to clarify the distribution of the mammalian faunas, Dr. McKenna spent July working on the stratigraphy of Miocene deposits in southern California.

Dr. Richard H. Tedford carried on his investigations of fossil marsupials from Australia, describing an extinct subfamily of kangaroos. He also initiated a broad-based study on the phylogeny of the canoid carnivores. This study will elucidate the history and relationships of dogs, bears, raccoons, and weasels, as well as those of several extinct canoid families.

Dr. Leonard B. Radinsky published a paper on a new method of determining relative brain size in both fossil and recent mammals. At present, he is examining the origin of the odd-toed ungulates and the adaptive radiation of the rhinoceroses. Dr. Leigh Van Valen is using Museum specimens in his analysis of a Paleocene mammalian group, the arctocyonids.

In March, Mr. Gilbert Stucker of the department, with Dr. Donald Baird, visited a clay pit in Chatham County, North Carolina, to check on the reported occurrences of Upper Triassic reptiles. Although bulldozer activity had removed all traces of the bone layer, a student from nearby Campbell College and local quarrymen presented the Museum with specimens they had previously collected. These included bones of the mammal-like reptile *Placerias*—an exciting discovery because it confirms that these advanced reptiles were living in eastern as well as western North America during Triassic times.

The Museum's graduate program in vertebrate paleontology, conducted jointly with Columbia University, continued to be rewarding for the department. Eight students were enrolled in Dr. McKenna's fall course on the history of mammals and in the spring seminar on vertebrate paleontology. Three students received their

doctoral degrees under staff direction, and three more are presently engaged in thesis research.

Bobb Schaeffer, *Chairman*

SPECIAL ACTIVITIES
ARCHBOLD BIOLOGICAL STATION
LAKE PLACID, FLORIDA

During the year, 41 investigators representing 22 institutions carried out field work at the Archbold Biological Station.

Mr. Thomas E. Pliske, a Cornell University graduate student, furthered his research on the chemical and morphological aspects of courtship in the butterfly *Danaus gilippus berenice*. He observed the courtship of males and females, and conducted experiments to determine the effects of the male sex pheromone on the development of the female ovaries.

With his assistants, Dr. Thomas Eisner of Cornell University continued his investigation of the active elements in the repellent secretions of the arctiid moth *Utetheisa bella* and the grasshopper *Romalea microptera*. They found that the composition of the repellent secretion of the grasshopper varies according to what it has eaten. To enable the Eisner group to identify the repellent components of the *Utetheisa* moth, specimens are raised at the station.

Dr. Stuart W. Frost of Pennsylvania State College operated insect light traps at the station for the ninth consecutive year. He published two papers on the subject during the year and has four more in preparation.

Dr. Frank E. Kurcwski of the State University College of Forestry at Syracuse furthered his investigation of the small digger wasp *Tachysphex similis*. He is studying the relationship between the nest-closing activity of this wasp and the temperature of the sand surface. Hundreds of observations were made of the opening and closing of the nest by females to bring in prey. In each case the time required for this activity and the sand-surface temperature near the nest were recorded.

Dr. James E. Lloyd of the University of Florida continued his

systematic and behavioral studies of fireflies. He observed a species of *Photuris* and found that these fireflies have signals that are entirely different from those studied anywhere else in the world. The signals of several individuals were recorded electronically with the aid of a chart recorder and photomultiplier tube.

Dr. Franklin H. Barnwell of Northwestern University and Drs. Donald E. Bright and B. V. Peterson of the Canadian Department of Agriculture made their first visits to the station. Dr. Barnwell conducted the first study of daily and tidal rhythms of fiddler crabs in a region of mixed tides, and the Canadian researchers collected more than 22,000 insect specimens.

Approximately 100 volumes were added to the library at the station in the past year.

Richard Archbold, *Resident Director*

FRICK LABORATORY

Research by the Frick Laboratory staff this year has dealt with the complex geological history of the Rocky Mountains and western plains of the United States throughout the past 30 million years. Placing the enormous number of specimens of the Frick Collection in their proper chronological sequence continues to be a major concern of the staff.

Dr. Malcolm C. McKenna continued his research on the stratigraphic framework of the Frick Collection and on the fossil insectivores of the collection. Mr. Ted Galusha continued his work on the ancient sediments and animal life of the Santa Fe area, New Mexico, and published a paper on the geology near Zia Pueblo. He also conducted field work in western Nebraska. Mr. Morris F. Skinner carried out field work in northern Nebraska and southern South Dakota. Two papers by Mr. Skinner, one on the geology of the Bijou Hills, South Dakota, with Mr. Beryl E. Taylor, and one on the Turtle Buttes area, South Dakota, with Mrs. Shirley M. Skinner, were completed. Mr. Taylor continued a long-term project on fossil camels, completing a manuscript on the genera and subgenera of the camelid subfamily Stenomylinae.

Dr. Michael Woodburne of the University of California, at Riverside, completed a paper on the fossil peccaries of the Frick Collection; Dr. James S. Mellett of New York University prepared a review of the fossil hyaenodonts, a group of ancient carnivores; and numerous smaller projects were undertaken.

Much of the enormous fossil camel collection was moved to the Museum during the year from Roslyn, Long Island, where it had been studied by Mr. Childs Frick before his death in 1965.

Malcolm C. McKenna, *Frick Associate Curator*

THE KALBFLEISCH FIELD RESEARCH STATION
HUNTINGTON, LONG ISLAND, NEW YORK

The station at Huntington, Long Island, continues to serve principally as a field laboratory where the scientists on the staff of the Museum can conduct long-term studies in animal behavior, ecology, evolutionary biology, and radio astronomy. Six staff members used the station for projects, most of which were initiated when the station began operation nine years ago, and supervised the research training of college students.

Dr. Wesley E. Lanyon achieved two breakthroughs in problems on which he had been working for many years. Attempts to breed meadowlarks in captivity, heretofore unsuccessful, finally resulted in the rearing of a hybrid from a cross of a captive eastern meadowlark and a captive western meadowlark. A crested flycatcher was successfully reared from the egg stage in an experimentally controlled sound environment to study the development of the vocal repertoire. Both projects will be vigorously pursued at the station.

Dr. Donn E. Rosen reports progress in learning the effects of predation and available breeding sites in their relationship to rates of colonization among egg-laying and live-bearing fishes.

Other staff members who were at Kalbfleisch during the year are Dr. Kenneth L. Franklin, who continued his studies of the radiation emanating from Jupiter; Dr. Richard G. Zweifel, who worked on the ecology of Fowler's toad and painted turtles, as well as on a

comparative analysis of growth and survival in a mixed population of frogs; Dr. Richard G. Van Gelder, who gathered data on the population ecology of several species of small mammals; and Dr. Jack McCormick, who was involved in a long-term monitoring of population dynamics in Long Island old-fields and coppice forests.

Nine college undergraduates were in residence during the summer of 1967, assisting members of the staff on their projects. The students were supported in part by the Undergraduate Research Participation Program of the National Science Foundation. Several high school volunteers also assisted in the summer research program.

In addition, Dr. Daniel Marien of the Department of Biology of Queens College continued his field study of the distribution and systematics of fruit flies at the station. Mrs. Linda Vardy completed a study of the alleged polymorphism in the white-throated sparrow, in partial fulfillment of the requirements for a master's degree at Queens College.

A major addition to the station's research facilities, an 11,000-gallon complex of concrete pools, was completed during the year. The interconnected waterways will be used by Drs. Rosen and Zweifel for their controlled studies of fish and amphibian populations. The station's water system, including wells, pumps, and storage tanks, was given a complete renovation, and all exterior woodwork of the main buildings was painted. A state road improvement project necessitated the relocation of the fence along Deer Park Avenue and caused the loss of nearly two acres of land.

Four scientific articles, based wholly or in part upon studies at the station, have been published since July 1, 1966. Two more manuscripts are in press, and three are in preparation.

Wesley E. Lanyon, *Resident Director*

LERNER MARINE LABORATORY
BIMINI, BAHAMAS

Twenty-eight years ago a tent was pitched on the property now known as "The Anchorage" at Bimini, and research operations

began at the newly instituted Lerner Marine Laboratory. Eleven years later, Mr. Michael Lerner assigned the grounds and buildings then comprising the research facility to The American Museum of Natural History. Since that time, the research scope and reputation of the Lerner Marine Laboratory have steadily developed, and today the station is regarded as one of the most important marine research laboratories in the world.

The steady increase in the number of scientists engaging in research demands more equipment and new facilities. Because of deterioration in plant facilities, a new building program is now under way at the station. The construction of a new set of piers extending about 400 feet into the lagoon completed the first phase of the operation. The piers provide a docking and loading area adjacent to the east side of the laboratory property. At the side of the piers, open-sea holding pens have been built to hold experimental animals.

A large work platform stands adjacent to the piers. Lockers will be built on the platform to hold wet marine equipment, such as SCUBA gear, snorkles, and nets, for visiting investigators. The new pier also provides excellent docking facilities for the station's fleet of boats. The laboratory is deeply grateful to Mrs. Mary O'Connor Braman and Mr. Daniel H. Braman of Victoria, Texas, who not only supported the construction of the piers and pens, but also donated a large plot of land and some buildings on Bimini to the laboratory.

Fifteen scientists participated in three month-long cruises aboard the research vessel "J. A. Oliver," as part of the Biological Survey of the Bahamas—a general survey of the environment of the area. Extensive collections were made at many new sites, as well as at sites previously visited. Much of the ichthyological material collected has already been classified and added to the Museum's collections. Support from the Biology Branch of the Office of Naval Research has enabled the laboratory to continue this survey. The Biology Branch of the Office of Naval Research has also made funds available for grants to researchers using the station's facilities. Particular thanks are again offered to Mrs. Helen Hayes of the Office of Naval Research in Washington, D. C., and Mrs. George H.

Kisbany and Mr. Silvio Ferraris of the Office of Naval Research in New York for their advice and support. The laboratory is also deeply grateful to Mr. Deane Holt of the Oceanic Biology Programs at the Office of Naval Research in Washington, and to Captain David Baldrige of the United States Naval Medical Research Institute at Bethesda, Maryland, for their assistance.

More than 120 investigators from universities and institutions in the United States and abroad used the laboratory to carry out their research in the past year. Research was conducted in the fields of microbiology, psychology, sensory physiology, geology, neurology, pharmacology, biochemistry, electrophysiology, algology, acoustics, invertebrate zoology, ichthyology, entomology, and herpetology.

One project of particular interest undertaken at the laboratory this year was the development and testing of a protective "screen" which greatly reduces the chance of shark attack. Dr. C. Scott Johnson of the United States Naval Marine Biology Facility at Point Mugu, California, developed the "screen" which consists of a plastic bag about three feet in diameter and seven feet in length. When filled with sea water, the bag provides enough space for a person to take refuge. The bag is made of dark green plastic, and it appears that sharks are not attracted to it either by the color, which blends with the ocean background, or by odors, which are effectively confined within the bag. Tests conducted at the laboratory indicate that this device will constitute an effective protection against shark attack.

Mr. Robert F. Mathewson continued basic research on the neurophysiology of sharks. A new project on the natural history of the pink-lipped conch, *Strombus gigas*, was instituted this year. This research, supported by the Bahamian government, will provide data to be used in formulating legislation to control the exploitation of this valuable natural resource.

Robert F. Mathewson, *Resident Director*

SOUTHWESTERN RESEARCH STATION

PORTAL, ARIZONA

Eighty-nine scientists representing 38 institutions worked at the Southwestern Research Station during the year. Although the dominant fields of study were entomology, herpetology, and ornithology, a number of projects were also carried on in arachnology, animal behavior, botany, and mammalogy.

Projects ranged from the collection of plants, insects, and animals to ecological and biological investigations of birds, insects, and bees, and from chromosomal studies of lizards to behavioral studies of katydids and army ants. Other topics investigated at the station were habitat selection in birds, sex attractants in darkling ground beetles, antibiotic substances in desert plants, and determining factors of food preference in hummingbirds.

Mr. Vincent D. Roth continued his redescription of all the poorly known genera of the spider family Agelenidae. He published four papers on the subject during the year, including a review of the South American Agelenidae, and has a fifth in preparation. He collected 2515 spiders and 1090 insects for the Museum's collection, as well as 600 insects for the station's collection. On a late winter trip through California and Oregon, Mr. Roth found the rare silverfish *Tricholepidion gertschi* Wygodzinsky.

Dr. Martin Cody of the University of California at Los Angeles counted bird species and plotted their territories in two areas—mesquite scrub region and a pine-oak-juniper woodland. By combining this information with his observations of behavior and feeding height, he was able to discover the ecological differences between the two members of any pair of species resident in the study area. Dr. Cody found that the ecological difference between each species pair was approximately constant for the two areas.

For the third year, Mr. Howard Topoff of the Department of Animal Behavior continued his study of army ants of the genus *Neivamyrmex*. By comparing the nomadic and statary activity metabolism rates of adult worker ants, he confirmed his earlier research findings that the metabolism of the ant increases abruptly (indicated by an increase in oxygen consumption) at the onset of

the nomadic phase. He also found that, in general, a more gradual change in metabolism accompanies the onset of statory conditions. Mr. Topoff also compared the nomadic and statory-phase reactions of the worker to its chemical secretions and to high- and low-intensity light sources. Miss Ann Young and Miss Marguerite Shilling of the Museum worked with Mr. Topoff on the project.

In addition to their work with Mr. Topoff, Miss Young and Miss Shilling pursued independent research on army ants. Miss Young studied the relationship between larval structural development and subsequent social behavior, and compared the reaction of callow and adult workers to mandibular gland secretions. Miss Shilling investigated the ecological and behavioral relationships between the army ant and the other ants on which it preys.

In addition to investigators, 163 students pursuing studies in ornithology, geology, and invertebrate zoology used the station's facilities during the year. The total number of guests was 469, a slight increase over that of the previous year.

The station lounge was redecorated, shelves were installed over all the laboratory tables, the laundry porch was completely enclosed, the grounds were graveled, and a rock incinerator was built.

Vincent D. Roth, *Resident Director*

DEPARTMENT OF EDUCATION

The Department of Education continues to provide public services ranging from single-visit lectures to courses and special programs in series to audiences at all age levels.

"The World We Live In," an instructional program for classes from public, private, and parochial schools in the New York City area, drew groups with a total of 35,767 students. Attendance is limited only by the number of Museum teachers available for assignments and the capacity of the exhibition areas. This program is one of the most effective offered by the department, as each visit is planned in advance in cooperation with the class teacher, and is designed to cater to the specific interest of the class.

In an attempt to provide useful information for those groups without a Museum teacher, a new program, "Exploring the World of Nature," was developed two years ago. It begins in the Museum auditorium on one of three topics: "Let's Dig for Dinosaurs," "Exploring Life at the Edge of the Sea," and "Hunting for Snakes and Other Cold-Blooded Animals." All lectures are accompanied with color slides, music, and sound effects. Following the auditorium presentations, the groups are encouraged to visit the exhibit halls. This year, 362 school groups took part in the program.

The Museum cooperated with other museums and cultural agencies in New York City in presenting a new program for high school seniors from upstate New York. The project is supported by the New York State Council on the Arts. The visiting groups made a two-day cultural tour of the city which includes a visit to The American Museum of Natural History. An instructor from the Department of Education leads the group to selected exhibition areas for instruction according to a pre-planned sequence. Reactions have been so favorable that funds have been provided for support for a second year.

Using Museum artifacts and materials, Museum instructors lectured in 173 hospitals and special schools. The Avalon Foundation supported this special program for individuals who are unable to make personal visits to the Museum.

The department arranged to circulate 7199 exhibits to New York City schools, eighteen other organizations, and two educational television programs. In addition, several special exhibits were arranged, including one for the Newton, New Jersey, Outdoor Educational Project and one for the Nanuet, New York, Public Schools, under the Elementary and Secondary Education Act of 1965. At Nanuet, a small natural science museum of 50 exhibits was set up as part of a program to help combat reading failure. Teachers whose pupils toured the museum reported that the visits stimulated the children's creative activity.

The Natural Science Center for Young People continued to be an attraction for school groups and individual boys and girls. A total of 22,879 youngsters visited the center during the eleven months

it was open. The two major exhibits of the year were "Introduced Plants and Animals" and "Tree Stories." Both grade school and high school students worked on individual projects in the Louis Calder Natural Science Laboratory. One of the projects, clay sculptures of local wild animals, by a thirteen-year old boy, is now on display at the center. The center also helped assemble and distribute 200 natural science kits, most of them to science consultants in the city's elementary schools.

Nearly 8000 visitors rented Acoustiguide equipment to hear taped tours through sections of the Museum housing African mammals, dinosaurs and other fossil reptiles, Pacific bird life, forests, and Indians. The dinosaur lectures continue to be the favorites.

Nine questionnaire guides to various subject-matter areas of the Museum are now available to visitors. Sales of these inexpensive guides, called "Trails," are exceeding expectations. Again, dinosaurs lead in popularity.

The efficiency of the Museum's information desk, which is operated by the Department of Education, has been greatly improved since March through the help of six volunteers: Mrs. Berto Rogers, Mrs. Henry D. Lauson, Mrs. Florence L. Krauth, Mr. Ronald B. Krauth, Mr. Israel De Leon, and Mr. Herbert Orange. They are part of a group of 25 Museum members who indicated interest in staffing the desk. With the help of the volunteers, a portable information desk was also set up between the two dinosaur halls. The new desk was heavily used by the public, and sales of the "Trails" guides alone tripled while the temporary desk was in operation.

For adults, the department offered gallery talks, films for older persons arranged in cooperation with the New York City Department of Welfare, highlight tours of exhibition areas for the general public, slide talks, a film program each Wednesday afternoon and Saturday morning, and a program in nurse education. In all, 37,927 individuals attended these functions. Twenty courses in the social and natural sciences were available to teachers in cooperation with the City College of New York and the Board of Superintendents of the New York City schools. These may be taken for credit through City College. Total enrollment in all teachers' courses was 577.

Evening lecture series, field walks, and Museum' tours for adults attracted 8072 individuals. One hundred twenty-three persons were accommodated on four different Museum field trips, including one to South America.

Joseph M. Chamberlain, *Acting Chairman*

DEPARTMENT OF EXHIBITION AND GRAPHIC ARTS

More new exhibition halls were simultaneously under construction this year than ever before. This increase in activity, the result of the exhibition expansion program formulated in 1960, will reach its peak in the months before the Museum's Centennial.

The animal behavior section of the Hall of the Biology of Invertebrates, the largest series of exhibits completed thus far, was opened to the public in September, 1966. Motion pictures, slides, sound, and sequential lighting of individual displays dramatically clarify the fascinating story of invertebrate behavior. Bright colors and bold illustration characterize this section as well as the section on the "The Naming and Classifying of Animals." Three other exhibits in the Hall of the Biology of Invertebrates—"The Classification of Invertebrates," "Continuity in Life," and "Invertebrates and Man"—are currently under construction. The first will be finished in 1967; the other two, in 1968.

Six more habitat groups were completed for the Hall of Ocean Life. Four of these are completely new dioramas, and two are renovations of existing exhibits. Six of seven remaining habitat groups within the hall are currently under construction. In February, 1967, an agreement was reached with Berton Plastics, Inc., for the construction of the 94-foot blue whale. Steel work for the suspension and inner structure of the polyurethane and Fiberglas whale will begin later this year, and it is expected that this project will be completed by June, 1968.

The Hall of the Indians of the Plains was opened to the public in February, 1967. This hall is linked to the Hall of the Indians of the Eastern Woodlands by a related color scheme, involving backgrounds that are color-coordinated by subject matter. The halls are also linked by a common musical background. The 22 songs and

narrations played through the ten ceiling speakers can, however, serve as more than background music. By following the sequence of songs and narrations and relating them to the appropriate exhibits, a visitor can enjoy a 30-minute, audio-visual tour of the two halls.

In October, 1966, exhibition work began on the newly constructed Hall of Man in Africa. Work on the hall, which is expected to be completed by May, 1968, has proceeded smoothly. Two of the three major dioramas are nearly completed, more than half of the figures have been sculpted, and more than a quarter of the 100 case displays have been installed.

Four hundred fish mounts and casts for the huge phylogeny display in the Hall of the Biology of Fishes are almost complete. Shooting of the ten-minute Hudson River film, the focal point of the display in this hall, is nearly finished. In addition, three mechanically animated exhibits are presently being assembled, and the background painting and foreground preparation for the four small habitat groups are well under way.

Design and layout of three sections of the Lindsley Hall of Earth History—"Physical Geology," "Methods of Dating the Past," and "Applied Paleontology"—have been completed and approved, and exhibits for "Physical Geology" are now being constructed. Two other sections—"Time Sequences of the Faunas" and "Biology of the Invertebrates"—are currently being designed. Eight of the ten dioramas for the hall are finished, and the six-foot geophysical globe, the centerpiece of the hall, is almost completed.

Work also continued on the reconstruction of the Hall of Mexico and Central America. In addition, preliminary plans were formulated for the Hall of Minerals and Gems, and work was initiated on the remaining section of the Hall of Biology of Man. For this last project, a population map, 40 feet in width, is being designed, and life-masks to be used in conjunction with the map are being cast.

Mr. Raymond H. de Lucia of the Department of Exhibition working in the new Hall of Ocean Life on an Arctic habitat group showing a killer whale.



"Natural History Illustrated," the Corner Gallery exhibit of rare books and original illustrations from the Museum Library, was closed in September, and two photographic displays, "A Photographer's View of Africa" and "A Stranger in India," were subsequently mounted.

Although the function of the Graphic Arts Division remains unchanged, the emphasis of its work has varied over the past year. More than two-thirds of the output of the division this year went into publications for the Natural History Press. Seventeen books were illustrated for the Press, compared with five the previous year. The division also handled the design and production of both the regular and the advanced editions of *Nature and Science*. In addition, Graphic Arts provided about half of the art work for *Natural History* magazine and prepared a new "Pictorial Guide to the Museum."

The Print Shop, previously housed in the lower level of section 13, acquired new quarters in the lowest level of section 11 in November, 1966. As a result of the February completion of exhibit labels for the Hall of the Indians of the Plains, and a reduction in the volume of materials printed for the Office Services Division, the shop was able to catch up with its backlog of other work by June.

Gordon R. Reekie, *Chairman*

LIBRARY

During the past year, the Library's circulation reached 65,514, an increase of more than 13,000 items over the figure for the previous reporting period. Although there was a slight decline in the number of readers who visited the Library, both inter-library loans (1838) and reference inquiries (15,637) increased. In addition to the 1223 inter-library loan requests filled by lending books and periodicals to 524 libraries, 615 requests were filled by substituting 7038 Xerox copies. These increases continue to reflect the awareness among scholars and students that the Museum Library is an important and excellent source of scientific information.

The number of books purchased increased significantly, although

the number actually cataloged and added to the collection decreased slightly, probably because the Library was without a cataloger for about four and one-half months. Seventeen thousand nine hundred one periodical issues were added to the collection, as well as 198 new serial titles. In addition, a large number of new serial titles have been received, but have not yet been cataloged and processed.

During the year, the Library received many gifts from individuals and institutions, the most important acquisition being an eleven-volume collection of 1700 original drawings in watercolor of land and water birds by Charles Hamilton Smith. Together with the Library's other holdings of this artist's work on such subjects as marine mammals and monkeys, the Museum possesses what probably is the most complete collection of Hamilton Smith original illustrations. This magnificent collection was the joint gift of Messrs. Frederick, George, Kenneth, and William Hard, and their sister, Mrs. Florence Coffey. The Library also received gifts of stocks and books from several individuals, notably Mr. Cyril F. dos Passos and Dr. Robert M. Stecher.

In February, the Library began reclassifying and recataloging the book and periodical collection from the Bibliographia Conciliorum to the Library of Congress system. This scheme, which is presently used by a large number of other research libraries, will permit the Library to exploit its holdings more fully by using currently accepted subject headings and by utilizing the catalog cards available from the Library of Congress. The initial phase of this project is being carried out under a grant from the New York State Council of the Arts.

The binding project funded by the National Science Foundation has been completed, and a total of 19,107 books, periodicals, and rare volumes have been bound or rebound.

Mrs. Nancy Russell, rare book restorer, handled 1564 volumes from July to January, when she left the Museum. Of these, 246 were rebaced with cloth, 79 were rehung in their original cases, and 48 were rebound with full cloth and hand-lettered labels. This work was supported through the generosity of Mr. and Mrs. Robert D. Sterling.

Several improvements were made during the year, including the installation of fluorescent lights and an air-conditioning system. The latter project was supported by funds from the National Science Foundation, the Board of Trustees of the Museum, and the City of New York.

Since the summer of 1966, the Library has benefited from student help available under the Urban Corps and Work-Study programs. Their work has involved charging and discharging books and periodicals, processing inter-library loans, typing catalog cards and charge cards for books returned by the bindery, compiling a periodical holdings list, and cleaning stack areas.

George H. Goodwin, Jr., *Librarian*

PUBLICATIONS

CURATOR

Subscriptions to *Curator* have grown steadily during the past twelve months, reaching a high point of 978, a substantial increase over the previous year.

The magazine continues to receive large numbers of written expressions of approval from readers. Other indications of heightened interest in *Curator* and in the service it renders are the increased flow of manuscripts received by the editorial desk and the many requests for reprints and complete sets of the magazine.

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

NATURAL HISTORY

This year was one of change for *Natural History* magazine. A program of extended membership benefits, which included the publication of a short annual report in the February, 1967, issue, was initiated. The new program necessitated a 40 per cent increase in the dues for Associate Membership. The year also marked an increase in participation by members of the Museum family. More

than one-third of the articles and book reviews were written by members of the Museum's scientific staff, Research Associates, members of the Department of Education, and a Trustee. In addition, there were changes in graphics, most notably the inclusion of full-color pages in every issue.

Among the new features was a regular column, "A Naturalist at Large," by Marston Bates, one of the country's most distinguished naturalists and biologists. Also, an important series of articles was published on the status of the American Indian today.

The magazine received considerable attention in the press. Two front-page stories in *The New York Times* highlighted this publicity: one of these, concerning the discovery of the earliest cave paintings in the New World, was later used by *Life* magazine; the second, a zoological spoof, was reported by local and national broadcast media, as well as in *The New York Times*.

Other outstanding articles which appeared in the magazine were a detailed summary of the complicated hydrology and ecology of the Everglades; a two-part article on the predators and scavengers of Africa; a study of animal mimicry; an anthropological research article on intra-tribal warfare in Venezuela; and a major article by Dr. Robert Cushman Murphy on the necessity for conservation in Antarctica.

Circulation figures were fairly constant for the year, remaining at about 184,000 subscriptions despite a 40 per cent price increase and generally unfavorable conditions in the mail-order industry. At the end of the year, there were solid indications that the renewal rate had ended its five-year decline and was on the rise. Meanwhile, acceptance of the magazine as an advertising medium grew sharply: net advertising revenues increased by more than 50 per cent over those of the previous year.

It was also a year of geographical change. In May, the entire staff of *Natural History*, together with the editorial staff of the Natural History Press Book Program, was relocated in spacious new quarters on the second floor at the Seventy-Seventh Street and Columbus Avenue corner.

James K. Page, Jr., *Publisher*

NATURAL HISTORY PRESS BOOK PROGRAM

During the year, a total of 25 volumes, including seven in a new and important series—American Museum Sourcebooks in Anthropology—appeared under the Natural History Press imprint. This group of college texts is under the general editorship of Dr. Paul Bohannon of Northwestern University and is issued in both hard and paper covers. The series was launched in January with “Law and Warfare” and will eventually contain twelve or more titles. The reception by the profession has been excellent.

Perhaps the most notable single volume published during the year was “Future Environments of North America,” edited by F. Fraser Darling and John Milton. The result of an interdisciplinary conference held in 1965 under sponsorship of the Conservation Foundation, the book has been widely acclaimed both here and abroad as a necessity for anyone concerned with the future of the planet we inhabit.

Not all of the output of the Press was in this serious vein. Among books published was a small volume called “Brain Boosters,” by David Webster. Based on the regular feature of the same title which appears in *Nature and Science* magazine, this book of exasperating science puzzles for children has rapidly become the best-selling book in hard cover.

James K. Page, Jr., *Publisher*

NATURE AND SCIENCE

For *Nature and Science*, this year was a time of transition—a change to a new method of distribution. During the past twelve months, the magazine was brought directly to the attention of teachers and science supervisors across the nation by the sales force of 45 men of the Doubleday School and Library Division. The major results of these efforts will be seen during the next school year, but some important breakthroughs have already occurred. From September through June, more than 5000 children in the Dallas school system maintained subscriptions to *Nature and Science*. In addition, it was placed on the approved lists of numerous cities through-

out the country, including New York. *Nature and Science* consultants carried the message to numerous workshops and in-service institutes where teachers gather to refine their techniques and learn about new teaching aids.

During the year, an experimental advanced edition of the magazine was published to reinforce existing readership and to increase service to the junior high school audience. It was discovered, however, that *Nature and Science* itself was broad enough in scope to fill the needs of this group of students, as well as those of the upper elementary grades. Therefore, the advanced edition was discontinued at the end of the school year.

The magazine is clearly becoming a more influential force in formal elementary and junior high school education, and it is also encouraging to note that the annual increase in single subscriptions for children at home has continued—a clear indication that youngsters enjoy the magazine.

Franklyn K. Lauden, *Editor-in-Chief*

SCIENTIFIC PUBLICATIONS

The office of Scientific Publications published nineteen articles in the *Bulletin*, totaling 1795 printed pages, and 47 numbers in *American Museum Novitates*, totaling 1028 printed pages—a combined total of 2823 printed pages for the fiscal year.

One part of *Anthropological Papers*, six articles for the *Bulletin*, and fifteen numbers in *American Museum Novitates* are currently in press.

Ruth Tyler, *Editor*

PLANT OPERATION AND MAINTENANCE

During the past year, four items in the Museum's Capital Improvement Program were completed: a security fence for the courtyard, a connecting corridor between sections 1 and 13 on the third floor, the Natural History Press offices on the second floor, and an air-conditioning system for the Library.

A number of other areas are undergoing construction. The new

cafeteria in the lower level will be finished in the late fall of 1967. Renovation in the Hall of Mexico and Central America is well under way, and the area will be turned over to the Department of Exhibition for the installation of exhibits by early fall.

Plans for a number of other items in the Capital Improvement Program are in progress. Work on the Hall of the Peoples of the Pacific has been authorized for bids. If favorable bids are received, construction should begin in the fall of 1967. Preliminary plans for the Hall of Amphibians and Reptiles is expected to be ready for the Mayor's approval by the spring of 1968. The scope of desired renovation for the Hall of Minerals and Gems has been sent to the Department of Parks, with the request that plans and specifications for the work be drawn up.

The Department of Parks is drawing up a service agreement for presentation to the Mayor, authorizing a study to determine the requirements for air conditioning the entire Museum. The drawing of plans for the modernization of the interior electrical distribution system and for the lighting of the Museum facades awaits authorization by the Mayor. Preliminary plans for an automatic fire detection and alarm system are being discussed with the Fire Department.

The Maintenance and Construction Division continues to be employed to full capacity in maintaining the Museum plant, in performing minor but essential alterations to existing facilities, in assisting the Department of Exhibition with mechanical support in their renovation of old exhibits, and in the preparation and installation of new exhibits.

Paul H. Grouleff, *Plant Manager*

ATTENDANCE

During the fiscal year here reported, 2,516,957 people visited the Museum, and 632,400 visited the Planetarium, making a combined total of 3,149,357.

RESEARCH IN PROGRESS OR COMPLETED

July, 1966, through June, 1967

The American Museum of Natural History

A complete list of all research projects carried out by members of the scientific staff, including Research Associates, Research Fellows, Ogden Mills Fellows, and Emeriti when working in residence, as well as independent investigators and graduate and undergraduate students, follows. It will be noted that the last column shows support other than that given by The American Museum of Natural History.

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ANIMAL BEHAVIOR		
Lester R. Aronson, Chairman and Curator, with Madeline L. Cooper, Research Collaborator; Robert Stolberg, Scientific Assistant; and A. Marie Tucker, Histologist; assisted by Robert Hoff, Garry Hawley, Robert Weiner, and James Brand, Undergraduate Research Participants	The interaction of androgen level, sexual experience, and genital stimulation on the sexual behavior of male cats	National Institute of Child Health and Human Development; National Science Foundation
Lester R. Aronson, with Carol A. Diakow, Predoctoral Fellow	Mating behavior in adult female cats following desensitization of the genitalia	National Institutes of Health
Lester R. Aronson, with Kenneth K. Cooper, Graduate Student; assisted by G. Wheeler, Undergraduate Research Participant	Neurophysiological studies of the tactile receptors of the glans penis	National Institute of Child Health and Human Development
Lester R. Aronson, with Harriett Kaplan, Predoctoral Fellow; assisted by Roy Gould, Undergraduate Research Participant	Function of the forebrain and cerebellum in teleost fishes	National Institutes of Health; National Science Foundation
Lester R. Aronson, with Lawrence F. Picker	Functions of the valvula cerebelli of teleosts	
Lester R. Aronson, with Harriett Kaplan; assisted by Stephen Tobias, Pamela Parker, and Ellen Frey, Undergraduate Research Participants	Reversal learning in the fish <i>Tilapia nilotica</i>	National Science Foundation
T. C. Schneirla, Curator, with Yvonne	Comparative studies on cyclic behavior	National Science Foundation

Wang, Histologist; and Michael Boshes, Research Assistant	and its biological basis in three genera of army ants: I. Laboratory investigations on preserved brood samples of two species in the Old World doryline ants <i>Aenictus gracilis</i> and <i>A. laeviceps</i>	National Science Foundation; National Defense Education Act
T. C. Schneirla, with Howard Topoff, Predoctoral Fellow	Comparative studies on cyclic behavior and its biological basis in three genera of army ants: II. Population characteristics, reversible physiological conditions, and cyclical colony behavior in <i>Neivamyrmex nigrescens</i>	National Science Foundation
T. C. Schneirla, with Michael Boshes	Comparative studies on cyclic behavior and its biological basis in three genera of army ants: III. A theoretical appraisal of behavior patterns and their biological basis in three genera of army ants, in terms of the brood-stimulation theory of colony cyclical function	National Science Foundation
T. C. Schneirla, with Marguerite Shilling, Research Assistant	Comparative studies on cyclic behavior and its biological basis in three genera of army ants: IV. The distribution of army ant genera of the world	National Science Foundation
T. C. Schneirla, with Peter Gold, Graduate Student	The functional and behavioral significance of stimulative factors in the embryonic development of the chick, studied in relation to post-hatching behavior	National Institutes of Health
T. C. Schneirla, with Howard Topoff; Marguerite Shilling; and Ann Young, Research Assistant	Field study of the behavior pattern of the army ant species <i>Neivamyrmex nigrescens</i> and its biological basis	National Science Foundation
Evelyn Shaw, Associate Curator, assisted by Evelyn Coppel, Undergraduate Research Participant	The effect of lack of experience with species mates on schooling development	National Science Foundation
Evelyn Shaw, with Phyllis Cahn, assisted by Ethel Atz, Research Assistant	The development of the lateral-line system and its relationship to the development of schooling	National Science Foundation

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ANIMAL BEHAVIOR (continued)		
Evelyn Shaw, assisted by Diane Welty, Research Assistant; Robin Kanarek, Scott Taylor, and Elaine Snyder, Undergraduate Research Participants	The relation of the optomotor response to schooling behavior in fishes	National Science Foundation
Evelyn Shaw, assisted by Scott Taylor and Elaine Snyder	Preliminary studies on the development of schooling in the blue acara <i>Aquidens latifrons</i>	National Science Foundation
Ethel Tobach, Associate Curator, with T. C. Schneirla; and Yves Rouger, Postdoctoral Fellow	The development of olfactory function in the rat	National Institutes of Mental Health
Ethel Tobach, assisted by Rita Coleman, Steven Chernesky, and Marie LoPiccolo, Undergraduate Research Participants	Factors in the adjustment of the laboratory rat to a "novel" situation	National Science Foundation
Ethel Tobach, with Yves Rouger; Thomas Leue, Undergraduate Research Participant; Cyrus Chess and Larry Bell, High School Students; Lynn Hofer and Myron Hofer	Escape behavior of wild rodents	American Philosophical Society
Benjamin Kamrin, Research Associate, assisted by Clyde Newton, Research Assistant; and Doreen Collins, Undergraduate Student	The effect of the immune tolerant state on early behavior of the domestic fowl	National Institutes of Mental Health
Benjamin Kamrin	Immune tolerance and antibody formation in chicks	National Institutes of Mental Health
	Immune tolerance and body temperature in chicks	National Institutes of Mental Health

William N. Tavalga, Research Associate; David W. Jacobs, Research Fellow; and Arthur Popper, Graduate Student	Auditory capacities in fishes	Office of Naval Research; National Science Foundation
Helmuth E. Adler, Research Fellow, as- sisted by Alfred Boulig, Seymour Antle- man, Alan Odess, Leonore Adler, and Barry Adler, Research Assistants	Sensory factors in bird navigation	National Science Foundation
DEPARTMENT OF ANTHROPOLOGY		
Harry L. Shapiro, Chairman and Curator	The effect of crowding and urban ten- sions on the biological reactions of human populations	Indian Statistical Institute, Calcutta; Frederick G. Voss Anthropology and Archaeology Fund, The American Mu- seum of Natural History
	Study of the care of the mentally ill in the town of Gheel, Belgium	Family Care Foundation for the Mentally Ill; Grace Foundation; University of Louvain
	Morphological characteristics of the Colonial population, New York City	
	Growth factors in the human skull	
Junius B. Bird, Curator of South Ameri- can Archeology	Preceramic cultures of Peru and the Paleo-Indian material of South America	Frederick G. Voss Anthropology and Archaeology Fund, The American Museum of Natural History; Junius B. Bird (per- sonal funds)
	The Pánamarca project, Nepeña Valley, Peru	Not yet funded
	Backstrap loom in the Old and New Worlds; indicator of cultural diffusion?	Textile Research Fund, The American Museum of Natural History; Junius B. Bird (personal funds)
Gordon F. Ekholm, Curator of Mexican Archeology	Series of projects all related to basic research on probable early trans-Pacific contact	

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ANTHROPOLOGY (continued)		
Margaret Mead, Curator of Ethnology	Accumulation of data relating to the scrolling motif in early China and Mesoamerica	
Margaret Mead, with Rhoda Metraux, Project Director	Principles of cross-cultural and cross- ideological communications	National Science Foundation
Margaret Mead, with Rhoda Metraux, Associate Director	Studies in individuality, culture, and cul- ture change, in connection with the project, "The Cultural Structure of Imagery"; project now in its third year	National Institutes of Health; Institute for Intercultural Studies; Margaret Mead (personal funds)
Margaret Mead, with Theodore Schwartz, Co-principal Investigator, and Lola R. Schwartz	A comparative ethnographic analysis of cultural determinants of orientation in time and space	National Institutes of Health
Robert L. Carneiro, Associate Curator of South American Ethnology	Field study of cultural systematics in New Guinea; project now in its fifth year	
	Research into the role of Herbert Spencer in the history of anthropology for an introduction to accompany an abridged edition of Spencer's "Principles of Sociology"	
	Study of the relationship between size of settlement, in terms of population, and complexity of social organization	
	Analysis of varying conceptions of the	

process of evolution, and their relative utility in the study of cultural evolution

Study of the influence of subsistence and warfare in the origin and evolution of the state

Study of the rates of cultural evolution in Anglo-Saxon England as measured by the inventory of certain cumulating culture traits enumerated at five-year intervals, from 450 A.D. to 1050 A.D.

Application of scale analysis to the study of cultural evolution

Social degeneration in a primitive society

Research for the presentation of social organization in a Museum exhibit

Diffusion of African culture in the New World

Family background and occupational goals of school children of Delhi Union Territory, India: A study of values and attitudes

A comparative study of role behavior among the Mohave and Washo Indians

Robert L. Carneiro, assisted by Sheron Whitten and Madeline Lorch, Undergraduate Students at Barnard College

Colin M. Turnbull, Associate Curator of African Ethnology

Stanley A. Freed, Associate Curator of North American Ethnology, with Ruth S. Freed, Assistant Professor of Anthropology, New York University

Stanley A. Freed, with Ruth S. Freed, assisted by Eve Spangler, Graduate Student, Yale University

Undergraduate Research Participation Program, National Science Foundation

Field research, 1957-1959, National Science Foundation and Social Science Research Council; computer time, Faculty Research Grant, New York University

Washo field work, grant from Department of Anthropology, University of California, Berkeley; Mohave field work, Frederick G. Voss Anthropology and Archaeology Fund, The American Museum of Natural History; Undergraduate Research Participation Program, National Science Foundation

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ANTHROPOLOGY (continued)		
Stanley A. Freed, with McKim Marriott, Professor of Anthropology, University of Chicago, and Ralph Nicholes, Associate Professor of Anthropology, Michigan State University	Hindu caste ranking	Frederick G. Voss Anthropology and Archaeology Fund, The American Museum of Natural History; University of Chicago; Michigan State University
Richard A. Gould, Assistant Curator of North American Archeology	Field study of the interrelation of the ethnology and archeology of aboriginal tribes in Western Australia	Social Science Research Council
Charles F. Brush, Field Associate	Analysis of materials excavated by him at archeological sites on the Pacific Coast of Guerrero in Mexico	Charles F. Brush (personal funds)
Roger D. Peranio, Ogden Mills Fellow	The structure of Bisaya society: A ranked ambilineal system	Ogden Mills Fellowship Fund, The American Museum of Natural History
Morton H. Levine, Associate Professor of Anthropology, Vassar College	Descent and alliance in cognatic social systems: An extension of Levi-Straussian theory	Ogden Mills Fellowship Fund, The American Museum of Natural History
Carin Burrows, Volunteer	A study of cultural isolation illustrated by two Basque communities	National Science Foundation
DEPARTMENT OF ASTRONOMY		
Thomas D. Nicholson, Chairman and Astronomer	Comparative study of the ethnology (especially the languages) of the Naga tribes of Assam and northwest Burma	Kollsman Instrument Company; National Aeronautics and Space Administration Ames Research Station
	Testing and evaluation of a hand-held space sextant for possible use in space navigation	

Kenneth L. Franklin, Astronomer

Observations of the radio sky to detect significant radio radiation from the sun and Jupiter on a broad spectrum at decimeter wavelengths

National Science Foundation

Investigation of a possible frozen lava lake on the walls of the lunar crater Copernicus

Decoding and classifying synoptic geophysical and solar data and correlation with radio observations

DEPARTMENT OF ENTOMOLOGY

Jerome C. Rozen, Jr., Chairman and Curator

The larvae of the bee family Anthophoridae (Hymenoptera, Apoidea)

National Science Foundation

Systematic-evolutionary study of the parasitic bee genus *Oreopasites* Cockerell (Hymenoptera, Apoidea)

National Science Foundation

Investigations on the beetle *Micromalthus debilis* LeConte in amber from Chiapas, Mexico (Coleoptera, Micronalthidae)

Systematics of the larvae of North American panurgine bees (Hymenoptera, Andrenidae)

National Science Foundation

Researches on the biology of panurgine bees, with observations on North American forms (Hymenoptera, Andrenidae)

National Science Foundation

The biology and larvae of the parasitic bee genus *Dioxys* (Hymenoptera, Megachilidae)

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ENTOMOLOGY (continued)		
Jerome G. Rozen, Jr., with Barbara L. Rozen, Independent Investigator	The biology and immature stages of the aberrant South African panurgine bee genus <i>Meliurgula</i> (Hymenoptera, Andrenidae)	National Science Foundation
Jerome G. Rozen, Jr., with F. D. Bennett, Field Associate	The biologies of South African bees of the family Anthophoridae belonging to the genera <i>Tetralonia</i> and <i>Anthophora</i> , and of their parasites (Hymenoptera)	National Science Foundation
Jerome G. Rozen, Jr., with P. Torchio, G. E. Bohart, both Independent Investigators, and Marjorie Statham Favreau, Scientific Assistant	Mature larvae of the Old World bee genus <i>Panurgus</i> (Hymenoptera, Andrenidae)	National Science Foundation
Jerome G. Rozen, Jr., with Karen Yager, Undergraduate Student	The biology of the Centridini and related tribes of bees	United States Department of Agriculture
Jerome G. Rozen, Jr., with Mark Deyrup, Undergraduate Student	Biology of the bee genus <i>Dufourea</i> and of its cleptoparasite <i>Neopasites</i> (Hymenoptera)	National Science Foundation
Jerome G. Rozen, Jr., with Charles D. Michener, Research Associate	Preliminary taxonomic study of the pupae of andrenid bees (Hymenoptera)	National Science Foundation
	Systematic studies on the larvae of the bee family Colletidae (Hymenoptera)	National Science Foundation
	The biology of <i>Scrapter</i> and its cuckoo bee <i>Pseudodichroa</i> (Hymenoptera)	National Science Foundation; The University of Kansas

Willis J. Gertsch, Curator	The spider families Atypidae and Mecobothriidae in North America	National Science Foundation
	The cave spiders of the United States	National Science Foundation
	The spider genera <i>Cyclocosmia</i> , <i>Bothriocyrtum</i> , and <i>Ummidia</i> (Araneae, Ctenizidae) in North America	National Science Foundation
	A new liphistiid spider from China (Araneae, Liphistiidae)	National Science Foundation
	Supplementary data on North American species of the spider genus <i>Loxosceles</i> (Araneae, Scytodidae)	National Science Foundation
	The spider family Filistatidae in North and South America	National Science Foundation
	Spider miscellanea: descriptions of various new American spiders, supplementing recent revisions	National Science Foundation
Willis J. Gertsch, with A. F. Archer, Professor, Tift College, Georgia	The spider genus <i>Eustala</i> in the West Indies (Araneae, Araneidae)	National Science Foundation
Willis J. Gertsch, with Michael Solegald, Independent Investigator, Minneapolis, Minnesota	The scorpions of the genus <i>Uroctonus</i> in North America (Scorpionida, Vejovidae)	National Science Foundation
Frederick H. Rindge, Curator	Revisionary studies of the genera of North American moths of the subfamily Ennominae (Lepidoptera, Geometridae)	National Science Foundation
	Studies of the moth family Geometridae of Chile	National Science Foundation
	Studies of the Geometridae of Baja California	National Science Foundation

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ENTOMOLOGY (continued)		
Pedro W. Wygodzinsky, Curator	<p>A review of the North American geometrid moths of the genus <i>Earophila</i></p> <p>A new species of <i>Nepytia</i> moth from the southern Rocky Mountains (Lepidoptera, Geometridae)</p> <p>A revision of the bug subfamily Emesinae (Reduviidae, Hemiptera)</p> <p>A study of a fossil machilid from the amber of Chiapas, Mexico</p> <p>The geographical distribution of South American silverfish and their relatives (Microcoryphina and Thysanura)</p> <p>Black flies of the genus <i>Simulium</i> from Peru (Simuliidae, Diptera)</p> <p>Microcoryphina and Thysanura from southern Africa</p>	<p>National Science Foundation</p> <p>National Science Foundation</p> <p>Instituto Nacional de Microbiología, Buenos Aires</p> <p>National Science Foundation; Instituto Nacional de Microbiología, Buenos Aires</p>
Pedro W. Wygodzinsky, with Sixto Coscarón, Entomologist, Instituto Nacional de Microbiología, Buenos Aires	<p><i>Simulium</i> (<i>Pternaspatha</i>) from southern and western South America (Diptera)</p> <p>A revision of the black fly genus <i>Gigantodax</i> (Simuliidae, Diptera)</p>	<p>Instituto Nacional de Microbiología, Buenos Aires</p> <p>National Science Foundation; Instituto Nacional de Microbiología, Buenos Aires</p>

National Science Foundation; Instituto
Nacional de Microbiología, Buenos Aires

University of California, Berkeley

National Science Foundation

Further studies on *Simulium* (*Pternas-
patha*) (Simuliidae, Diptera)

The bugs of the family Entocopephalidae
of the Western Hemisphere, with a re-
vision of the North American species
(Hemiptera)

Monographic studies on the North Ameri-
can moths of the subfamily Crambinae
(Lepidoptera, Pyralididae)

Melanism in the Connecticut moth *Pan-
thea furcilla* (Packard) (Lepidoptera,
Noctuidae)

Life history studies on various moths and
butterflies

A study of the butterfly *Erora laeta* with
notes on closely related species (Rhopal-
cera, Lycaenidae)

A generic revision of *Capritermes* and
related genera of termites

National Science Foundation

Revisions of the Oriental termite genera
Procapritermes and *Homalotermes*

National Science Foundation

A revision of the Neotropical termite
genus *Neocapritermes* (Isoptera)

National Science Foundation

The types of the butterfly *Colias* (*Zerene*)
eurydice amorphae Henry Edwards (Lepi-
doptera, Pieridae)

The butterfly *Speyeria* (*Speyeria*) *no-
komis* (Edwards), 1862, its distribution
and subspeciation (Lepidoptera, Nympha-
liidae)

Pedro W. Wygodzinsky, with Robert L.
Usinger, Professor, University of Cali-
fornia

Alexander B. Klots, Research Associate

Alexander B. Klots, with Cyril F. dos
Passos, Research Associate

Kumar Krishna, Research Associate

Kumar Krishna, with Renato L. Araujo,
Museu Nacional, Rio de Janeiro

Cyril F. dos Passos, Research Associate

Cyril F. dos Passos, with L. P. Grey, In-
dependent Investigator

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ENTOMOLOGY (continued)		
Cyril F. dos Passos, with Alexander B. Klots	The synonymy of the butterfly <i>Antho- caris (Falcipica) midca</i> (Hübner) and the description of a new subspecies (Lepidoptera, Pieridae)	National Science Foundation
Herbert Ruckes, Research Associate (de- ceased)	The bug genus <i>Eurystethus</i> Mayr, with the description of new species (Heterop- tera, Pentatomidae, Discocephalinae) An analysis and breakdown of the bug genus <i>Platycareus</i> Fieber (Heteroptera, Pentatomidae, Discocephalinae)	National Science Foundation National Science Foundation
Patricia Vaurie, Research Associate	The bug genus <i>Dryptocephala</i> Laporte (Heteroptera, Pentatomidae, Discocepha- linae) A review of the bug genus <i>Pelidnocoris</i> Stål (Heteroptera, Pentatomidae, Discoe- phalinae) A revision of the Neotropical weevil genus <i>Metamasius</i> (Coleoptera, Curculio- nidae, Rhynchophorinae), species group 3 The <i>nauradii</i> species group of the weevil genus <i>Rhodobaeus</i> (Coleoptera, Cur- culionidae) Revision of the weevil genus <i>Scypho- phorus</i> (Coleoptera, Curculionidae)	National Science Foundation National Science Foundation

Revision of the weevil tribe Sivalini (Coleoptera, Curculionidae)	National Science Foundation
Weevil miscellanea; descriptions of new species, with distributional notes	National Science Foundation
A study of the spider genus <i>Bathypantes</i> in North America (Araneae, Linyphiidae)	National Science Foundation
Synonymy in some American spiders	National Science Foundation
A study of the spider genus <i>Cicurina</i> in North America (Araneae, Agelenidae)	National Science Foundation
A study of the spider genus <i>Agelenopsis</i> in North America (Araneae, Agelenidae)	National Science Foundation
A study of the spider genus <i>Meioneta</i> in North and Central America (Araneae, Linyphiidae)	National Science Foundation
Systematic placement of spiders so far referred to the genus <i>Bathypantes</i> (Araneae, Linyphiidae)	National Science Foundation
Records and descriptions of Palearctic and South Asiatic moths of the tribe Laspeyresini (Lepidoptera, Tortricidae)	National Science Foundation
Notes on the descriptions of the moth genera <i>Aphelia</i> , <i>Clepsis</i> , and <i>Choristoneura</i> (Lepidoptera, Tortricidae)	National Science Foundation
Descriptions and records of South Asiatic moths of the tribe Laspeyresini (Lepidoptera, Tortricidae)	National Science Foundation
Neotropical Microlepidoptera, IX	National Science Foundation
Revision of genus <i>Pseudatteria</i> (Lepidoptera, Tortricidae)	National Science Foundation

Wilton Ivie, Research Fellow

Nicholas S. Obraztsov, Research Fellow
(deceased)

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ENTOMOLOGY (continued)		
	Neotropical Microlepidoptera, XI. Revision of genus <i>Idolatteria</i> (Lepidoptera, Tortricidae)	National Science Foundation
	Die palaearktischen <i>Amata-Arten</i> (Lepidoptera, Ctenuchidae)	
Tatiana Gidaspow, Independent Investigator	Revision of the beetle subgenus <i>Brennus</i> Motschulsky, genus <i>Scaphinotus</i> Dejean (Coleoptera, Carabidae)	
DEPARTMENT OF FOSSIL INVERTEBRATES		
Norman D. Newell, Chairman and Curator	Coral atolls and sea level in the Pacific	Scripps Institution of Oceanography
	Bivalvia (Mollusca), volume N, "Treatise on Invertebrate Paleontology"	The University of Kansas
Norman D. Newell, with Keiji Nakazawa, Professor of Geology, University of Kyoto	Pelecypods (Mollusca) of the Permian and Triassic of Japan	National Science Foundation
Norman D. Newell, with Donald W. Boyd, Professor of Geology, University of Wyoming	A study of oritocrassatellids (Bivalvia, Mollusca)	National Science Foundation
Roger L. Batten, Associate Curator	Lower Carboniferous Gastropoda (Mollusca) of Somerset, England	National Science Foundation; Geological Survey of Great Britain
	Lower Carboniferous Gastropoda (Mollusca) of Somerset, England	

Shell microstructure and histology of primitive living and fossil Gastropoda (Mollusca)	Columbia University
Upper Mississippian Gastropoda (Mollusca) of Arkansas	University of Arkansas
The problem of convergence in primitive gastropods (Mollusca) through geologic time	Columbia University
Permian Gastropoda (Mollusca) of Malaysia	Geological Survey and University of Malaysia
The genus <i>Ptychomphalina</i> , family Eotomariidae (Gastropoda, Mollusca)	National Science Foundation
The origin of major gastropod (Mollusca) groups	Columbia University
Population dynamics of the Devonian trilobite <i>Phacops rana</i> (Arthropoda)	Columbia University; National Science Foundation
The phylogeny of calymenid trilobites (Arthropoda)	Columbia University; National Science Foundation
The pattern of convergence in species of two gastropod (Mollusca) families	Columbia University; National Science Foundation
Functional anatomy and phylogeny of the family Bellerophonitidae (gastropod Mollusca)	Columbia University
Devonian cyclonryan Monoplacophora (Mollusca)	Columbia University
Bellerophonitid (Mollusca) shell microstructure	Columbia University

Niles Eldredge, Graduate Student, The American Museum of Natural History and Columbia University

Harold B. Rollins, Graduate Student, The American Museum of Natural History and Columbia University

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF FOSSIL INVERTEBRATES (continued)		
Stephen J. Gould, Graduate Student, Columbia University	Evolution of land snails (Mollusca) in Bermuda	Columbia University; National Science Foundation
	Biometric ontogenetic studies of land snails (Mollusca)	Columbia University; National Science Foundation
	Role in development of evolutionary theory in the discovery of <i>Trigonia</i> (Mol- lusca) clams, 1802-1865	Columbia University; National Science Foundation
DEPARTMENT OF HERPETOLOGY		
Charles M. Bogert, Chairman and Curator	Thermoregulation in amphibians and reptiles, and the evolution of endothermy	John Simon Guggenheim Memorial Foun- dation
	Egg-teeth in the suborders of the Squa- mata, and the origin of the median pre- maxillary tooth in the amphisbaenians	
	Revision of the patch-nosed snakes of the genus <i>Salvadora</i> , with special refer- ence to phenomena associated with speciation within the group	
	Variations in the tongue of lizards and an evaluation of lingual characters in families and genera of the suborder Sauria	
	A supplement to the monograph of the lizards of the family Helodermatidae	

A revision of the Mexican lizards of the genera *Abronia*, *Barisia*, and *Gerrhonotus*, with a reappraisal of diagnostic characters

John Sluder; John H. Peckham

Systematic revisions of the terrestrial plethodontid salamanders of the genus *Pseudoeurycea* in the Sierra Madre del Sur of southern Mexico

Interspecies competition, its role in the diversification and distribution of the plethodontid salamanders of the genus *Pseudoeurycea* in mountains of Mexico

Territorial behavior in the semifossorial arachnivorous snakes of the colubrid genus *Conopsis*

Variations in the vocalizations of the Mexican frogs of the genus *Tomodactylus*, and the significance of the voice in the regulation of population densities

The systematic implications of the pattern of the night snakes of the genus *Hypsigena* in Mexico and the United States, and the affinities of these snakes and other groups of colubrids

Richard G. Zweifel, Curator

Undergraduate Research Program, National Science Foundation

The effects of temperature, body size, and hybridization on the mating calls of the North American toads *Bufo americanus* and *Bufo woodhousei fowleri*

National Science Foundation; John Sluder

Revision of the Asterophryinae (Microhylidae), a subfamily of frogs of New Guinea

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF HERPETOLOGY (continued)		
	Temperature tolerances, developmental rates, and other aspects of the ecology of the embryos of frogs in the deserts of the American Southwest	National Science Foundation
	Ecology of a population of Fowler's toad, <i>Bufo woodhousei fowleri</i> , on Long Island	Undergraduate Research Program, National Science Foundation
	Ecology of a population of painted turtles, <i>Chrysemys picta</i> , on Long Island	Undergraduate Research Program, National Science Foundation
	Comparison of growth and survival in a mixed population of frogs, <i>Rana catesbeiana</i> and <i>Rana clamitans</i> , on Long Island	Undergraduate Research Program, National Science Foundation
	<i>Eleutherodactylus augusti</i> (account of the barking frog prepared for the "Catalogue of American Amphibians and Reptiles")	
	Description of a new species of frog, genus <i>Sphenophryne</i> , from New Guinea	National Science Foundation
DEPARTMENT OF ICHTHYOLOGY		
Donn E. Rosen, Chairman and Associate Curator	Faunal and zoogeographic studies of Guatemalan fishes	James C. Greenway, Jr.
	Studies of the relationship of reproductive specializations to colonization in northern hardy fishes	National Science Foundation
	Systematic and zoogeographic survey of killifishes of the western North Atlantic	

Donn E. Rosen, and Colin Patterson, Paleoichthyologist at the British Museum (Natural History)	Studies on the origins, relationships, and radiations of the spiny-finned fishes	National Science Foundation
James W. Atz, Associate Curator	Systematic studies in the cichlid genus <i>Geophagus</i>	Nixon Griffiths
	Survey of oral incubation in teleostean fishes	Nixon Griffiths
	Development of a storage and retrieval system for the ichthyological literature of the world	Anonymous donor
C. Lavett Smith, Assistant Curator	Reproductive systems and phylogeny in teleost fishes, especially hermaphroditism in the Serranidae	National Science Foundation
	Studies of Bahamian fish communities	Office of Naval Research
C. Lavett Smith, with Richard Rosen- blatt, Scripps Institution of Oceanography	Revision of eastern Pacific groupers of the genus <i>Epinephelus</i>	
Ralph T. Hinegardner, Research Asso- ciate, with Donn E. Rosen	Quantitative studies of haploid DNA in teleostean fishes, and an associated cyto- logical investigation	National Science Foundation
Jonathan N. Baskin, Graduate Student	Taxonomic studies of Middle American catfishes of the genus <i>Rhamdia</i>	James C. Greenway, Jr.
	Analysis of the genera of trichomycterid catfishes	The City University of New York
Joel J. Sohn, Undergraduate Student	Geographic variation in cardinal fishes	Office of Naval Research
	Feeding ecology of squirrelfishes	Office of Naval Research
Merrily McGee and John E. Darovec, Undergraduate Students	Reproductive ecology of the Japanese rice fish	National Science Foundation

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF LIVING INVERTEBRATES		
William K. Emerson, Chairman and Curator	Taxonomy and distribution of late Cenozoic molluscan marine faunas from the middle latitudes of the New World	
William K. Emerson, with S. Peter Dance, The Manchester Museum, United Kingdom	Monograph of the gastropod genus <i>Morum</i>	The Manchester Museum, United Kingdom
William K. Emerson, with William E. Old, Jr., Senior Technician	Survey of the fossil and recent molluscan faunas of the Galápagos Islands	
William K. Emerson, with Margaret Richards, Research Assistant	Monograph of the gastropod genus <i>Drupa</i>	
Dorothy E. Bliss, Curator, with Edwin A. Martinez, Research Assistant	Physical and chemical properties of the color-change hormones in the land crab, <i>Gecarcinus lateralis</i>	National Science Foundation
Dorothy E. Bliss, with Edwin A. Martinez	Differences in coloration between populations of crabs from Bimini and Bermuda	National Science Foundation
Dorothy E. Bliss, with Morris D. Altman, Research Assistant	Preliminary characterization of the molting-inhibiting hormone in <i>Gecarcinus lateralis</i>	National Science Foundation
Dorothy E. Bliss, with Stefanie M. E. Wang, Research Assistant, and Linda Habas Mantel, Research Fellow	Hormones controlling water balance in <i>Gecarcinus lateralis</i>	National Science Foundation
Dorothy E. Bliss, with Linda Habas Mantel, and Carol Ann Mason, Undergraduate Research Participant	Pathways of water movement in <i>Gecarcinus lateralis</i>	National Science Foundation
Dorothy E. Bliss	Morphological study of East Coast and West Coast species of <i>Gecarcinus</i>	

Ernst Kirsteuer, Assistant Curator	Systematics and ecology of marine Nemertini of the Indian Ocean and Caribbean Sea	Smithsonian Institution
Libbie H. Hyman, Research Associate	Studies on the marine invertebrate interstitial faunas	Smithsonian Institution
Horace W. Stunkard, Research Associate	Completed manuscript of volume 6, <i>Mollusca</i> , part 1, of "The Invertebrates"	National Science Foundation
	Worked out and reported the developmental stages and life cycle of the trematode <i>Himosthla tititorinae</i>	National Science Foundation
	Studied larval trematodes from the snail <i>Hydrobia salsa</i> (Pilsbry), including life histories of <i>Notocotylus atlanticus</i> , <i>Paramonstomum alocatum</i> (Criplin, 1846), and <i>Uniseriatis breviserialis</i>	National Science Foundation
Horace W. Stunkard, with Charles P. Gandal, New York Zoological Society	Redescribed the trematode <i>Parahaplometroides basiliscus</i> Thacher, from the crested lizard	National Science Foundation
Linda Habas Mantel	Salt and water movement in isolated tissues of the land crab, <i>Gecarcinus lateralis</i>	National Science Foundation
Linda Habas Mantel, with Stefanie M. E. Wang and Edwin A. Martinez	Analysis of blood and other body fluids in <i>Gecarcinus lateralis</i>	National Science Foundation
Anthony D'Attilio, Associate	Taxonomic studies of the muricid gastropods	
Morris K. Jacobson, Associate	A review of the terrestrial mollusks of Nicaragua	
Morris K. Jacobson, with William J. Clench, Research Associate	A monographic study of the Cuban helicid gastropods	National Science Foundation; Harvard University
William E. Old, Jr.	Taxonomic studies of the recent amphineurid and archaegastropod mollusks	

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF LIVING INVERTEBRATES (continued)		
William E. Old, Jr., with Anthony D'Attilio	Studies of the Recent muricid gastropods of western Australia	
Margaret Richards, Research Assistant	Annotated catalogue of the type specimens of mollusks in the Department of Living Invertebrates, The American Museum of Natural History	Beatrice S. Procter Fund, The American Museum of Natural History
Arnold Ross, Technician	Annotated catalogue of the type specimens (exclusive of mollusks) in the Department of Living Invertebrates	
	Taxonomic studies on the fossil barnacles of the southeastern United States	
Arnold Ross, with William A. Newman, University of California, San Diego	Systematics and distribution of the deep-sea barnacles collected by the U.S.N.S. "Eltanin" in polar waters	Antarctic Research Program, National Science Foundation; United States National Museum
DEPARTMENT OF MAMMALOGY		
Richard G. Van Gelder, Chairman and Associate Curator	Analysis of variation within a population of hog-nosed skunks, genus <i>Conepatus</i> , from Uruguay	United States Army Medical Research and Development Command; National Science Foundation
	A systematic revision of the hog-nosed skunks, genus <i>Conepatus</i>	National Science Foundation
Richard G. Van Gelder, with Graciela Carreno, University of Miami Undergraduate Student	Population dynamics of small mammals at the Kalbfleisch Field Research Station	National Science Foundation
Sydney Anderson, Associate Curator	The mammals of Chihuahua: taxonomy and distribution	National Science Foundation

A random access key to the species of bats of America north of Mexico		
The bats of the Sudan: taxonomy and distribution		National Science Foundation
The bats of the Lesser Antilles: geographic distribution and classification		
The southernmost bats		National Science Foundation
Taxonomy, distribution, and habitats of New Guinea mammals		University of Michigan Graduate School; Horace Rackham Grant of Edwin S. Hinsdale Fellowship, University of Michigan Museum of Zoology
The species limits of Central American true squirrels, genus <i>Sciurus</i>		
The mammals of Oaxaca, Mexico		National Science Foundation
Ranges of smaller index foraminifera		American Geological Institute; National Science Foundation
Computerized data storage and retrieval system for micropaleontology		
Taxonomy and nomenclature of foraminifera and Ostracoda		
Problems in practical application submitted by the exploration departments of oil companies		
A new approach to nutrition, physiology, and mineral cycling of foraminifera		Atomic Energy Commission
Karl F. Koopman, Associate Curator		
Hobart M. Van Deusen, Assistant Curator, Archbold Expeditions		
Guy C. Musser, Assistant Curator, Archbold Collections		
George G. Goodwin, Curator Emeritus		
DEPARTMENT OF MICROPALAEONTOLOGY		
Brooks F. Ellis, Chairman and Curator, with Angelina R. Messina, Associate Curator and Editor		
Angelina R. Messina, with Harold L. Cousminer, Research Associate		
Richard Charnatz, Assistant Curator, with Lili Ronai, Scientific Assistant		
The Staff		
John J. Lee, Research Fellow		

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF MICROPALAEONTOLOGY (continued)		
John J. Lee, with Stanley Pierce, Research Fellow	Environmental influences on the morphology, life cycle, and taxonomy of the Allogromiidae	National Science Foundation
Hugo D. Freudenthal, Research Fellow	Nutrition, ecology, and life cycles of planktonic foraminifera	National Science Foundation
DEPARTMENT OF MINERALOGY		
D. M. Vincent Manson, Assistant Curator	Geographic variations in the chemistry of basaltic lavas	
	Multivariate analysis of numerical data in the natural sciences	
	Chemical variations in stony chondrites	
D. M. Vincent Manson, with Martin Prinz, Tufts University	Ultramafic nodules in basaltic lavas, San Carlos, Arizona	National Science Foundation
David M. Seaman, Scientific Assistant	Mineral paragenesis in New England pegmatites	
Ben Powell, Columbia University	Investigation of the mesosiderites	Columbia University
DEPARTMENT OF ORNITHOLOGY		
Dean Amadon, Chairman and Lamont Curator of Birds	Book on natural history of curassows (Cracidae)	
	Evolution of polyandry in birds	
Wesley E. Lanyon, Associate Curator	Revision of <i>Myiarchus</i> flycatchers of the West Indies	

Studies of hybridization in meadowlarks, <i>Sturnella</i>		
Species characters in warblers of the genus <i>Oporornis</i>		
Species characters in flycatchers of the genus <i>Contopus</i>		
Analysis of avifauna of Kalbfleisch Field Research Station		
Systematics and distribution of the family Cracidae (curassows)		
Analysis of the avifauna of Tibet		National Science Foundation (partially)
Generic review of the grouse (Tetraonidae)		
Systematic studies of certain genera of woodpeckers		National Science Foundation
A generic revision of the woodpeckers, family Picidae		
Analysis of species pairs of American birds		
Biology and taxonomy of Neotropical swifts		The Frank M. Chapman Fund, The American Museum of Natural History
Reproductive biology of Central American hummingbirds		The Frank M. Chapman Fund, The American Museum of Natural History
Zonal distribution of sea birds of the North Atlantic		American Geographical Society
Check list of North American birds (Committee Chairman)		American Ornithologists' Union
Charles Vaurie, Associate Curator		
Lester L. Short, Jr., Associate Curator		
Lester L. Short, Jr., with Walter Bock, Research Associate		
Lester L. Short, Jr., with Ernst Mayr, Research Associate		
Charles T. Collins, Chapman Research Fellow		
Larry L. Wolf, Chapman Research Fellow		
Robert Cushman Murphy, Lamont Curator Emeritus of Birds		
Eugene Eisenmann, Research Associate		

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF ORNITHOLOGY (continued)		
James C. Greenway, Jr., Research Associate	Biology of birds of Panama Type specimens of birds in The American Museum of Natural History	
John Bull, Field Associate	Preparation of book on the birds of New York State	The Natural History Press
G. Stuart Keith, Associate	Research on the birds of East Africa	
Helen Hays, Research Assistant	Ecology of birds on Great Gull Island	Linnaean Society of New York
Mary LeCroy, Research Assistant	Biology of waterfowl at Jamaica Bay Sanctuary Taxonomy and biology of New Guinea birds, based on field work by E. T. Gilhard	Linnaean Society of New York
DEPARTMENT OF VERTEBRATE PALEONTOLOGY		
Bobb Schaeffer, Chairman and Curator	Late Triassic fishes from the western United States The embryology and phylogeny of vertebrates in the higher bony fishes (Osteichthyes) The basic radiation of the higher bony fishes (Osteichthyes), with emphasis on skull morphology A new actinopterygian fish from the Late Cretaceous of the western United States	Paleontology Endowment Fund, The American Museum of Natural History Paleontology Endowment Fund, The American Museum of Natural History

Early Triassic fishes from Wapiti Lake, British Columbia	Paleontology Endowment Fund, The American Museum of Natural History
Jurassic fishes from the Sundance and Wanakah formations	Paleontology Endowment Fund, The American Museum of Natural History
Mesozoic fish faunas, their composition, paleoecology, and paleogeography	United States National Museum
Studies on the fishes of the Upper Triassic Newark Series	Paleontology Endowment Fund, The American Museum of Natural History
Triassic tetrapods, a monographic study of their evolution and distribution	Paleontology Endowment Fund, The American Museum of Natural History
The Triassic dinosaurs of North America	
The late Triassic tetrapod fauna from Granton Quarry, New Jersey	
Gondwana Land and the distribution of Triassic tetrapods	
Triassic reptiles of Brazil	
A Jurassic pterosaur from Cuba	National Museum of Canada
The Cretaceous dinosaur <i>Dromaeosaurus</i>	
The Cretaceous Aguja fauna of Texas	Texas Memorial Museum; Paleontology Endowment Fund, The American Museum of Natural History
Classification of the Mammalia	
A new family of primitive hoofed mammals (condylarths)	
Homologies of multituberculate teeth	
A Paleocene insectivorous mammal (necithere)	
Bobb Schaeffer, with David H. Dunkle, Curator, United States National Museum	
Edwin H. Colbert, Curator	
Edwin H. Colbert, with Dale A. Russell, Vertebrate Paleontologist, National Museum of Canada	
Edwin H. Colbert, with Wann Langston, Vertebrate Paleontologist, Texas Memorial Museum	
Malcolm C. McKenna, Frick Associate Curator	

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF VERTEBRATE PALEONTOLOGY (continued)		
Malcolm C. McKenna, with Frederick S. Szalay, National Science Foundation Post-doctoral Fellow	Mesozoic Mammalia from the Mesaverde Formation	Childs Frick Corporation
Malcolm C. McKenna, with Mary Dawson, Associate Curator, Carnegie Museum of Pittsburgh	Asiatic Paleocene mammals (anagalids)	
Malcolm C. McKenna, Mary Dawson, and Craig C. Black, Associate Curator, Carnegie Museum of Pittsburgh	A new Oligocene (Chadronian) fauna	Childs Frick Corporation
Malcolm C. McKenna, with the Frick Laboratory Staff	Fossil Mammalia of the type Tepee Trail Formation, Wyoming	Childs Frick Corporation
	Geology of the Hay Springs area, Nebraska	Childs Frick Corporation
	Middle Tertiary stratigraphic paleontology of the Barstow Syncline, California	Childs Frick Corporation
Malcolm C. McKenna, with Peter Robinson, Associate Curator, University of Colorado Museum	Middle Tertiary stratigraphic paleontology of Middle Park, Colorado	Childs Frick Corporation; University of Colorado Museum
Richard H. Tedford, Associate Curator	Review of the North American hemicyonid bears	Childs Frick Corporation
	Comparative morphology of the earliest known Canioidea (Carnivora)	Childs Frick Corporation
	Classification of the Carnivora	Childs Frick Corporation
	Morphology of the late Cenozoic Macro-podidae (Marsupialia)	

Richard H. Tedford, with D. P. Whistler, Graduate Student, University of California, Berkeley	Miocene mammals from the Mojave Desert, California	United States Geological Survey
Richard H. Tedford, C. A. Repenning, Geologist, United States Geological Survey, and S. D. Webb, Curator, Florida State Museum	Miocene mammal faunas from Nevada	United States Geological Survey
Richard H. Tedford, with E. D. Mitchell, Cetologist, Fisheries Research Board, Canada	A new aquatic canoid carnivore from the early Miocene of California	Fisheries Research Board, Canada
Richard H. Tedford, with the Frick Laboratory Staff	Preliminary study of the biostratigraphy of the Barstow Formation (Miocene), Mojave Desert, California	Childs Frick Corporation
Richard H. Tedford, with R. A. Stirton (deceased), and M. D. Woodburne, Assistant Professor of Geological Sciences, University of California, Riverside	Tertiary deposits in the Australasian region containing terrestrial mammals	
Leonard B. Radinsky, Research Associate	The adaptive radiation of the phenacodontid condylarths (archaic hoofed herbivores) and the origin of the Perissodactyla	National Science Foundation; Brooklyn College
	The families of the Rhinocerotoidae	National Science Foundation; Brooklyn College
	Relative brain size; a new measure	National Science Foundation; Brooklyn College
	The oldest primate endocast ("brain cast")	National Science Foundation; Brooklyn College
	<i>Hyrachyus</i> , an Eocene helaletid tapiroid	National Science Foundation; Brooklyn College
	Prosimian brain evolution	National Science Foundation; Brooklyn College
Leigh Van Valen, Research Fellow	Review of the arctocyonids	National Institutes of Health
	The early Paleocene Tsosie mammalian fauna	National Institutes of Health

RESEARCH IN PROGRESS OR COMPLETED

Investigator	Research Project	Other Sources of Support
DEPARTMENT OF VERTEBRATE PALEONTOLOGY (continued)		
Frederick S. Szalay, Postdoctoral Fellow	A new classification of insectivores Mixodectids, microsyopids, and the insectivore-primate transition Revision of American early Tertiary primians	National Institutes of Health Columbia University; National Science Foundation National Science Foundation
James S. Mellett, Assistant Professor of Biology, Iona College	Hsanda Gol Oligocene mammal fauna, Mongolia A review of North American hyaenodonts	Childs Frick Corporation Childs Frick Corporation
Giles T. Mac Intyre, Assistant Professor of Biology, Queens College	Systematic studies of the early Carnivora (Miacidae) Mesozoic Mammalia and near mammals	Queens College Queens College
Alan Gentry, Staff Paleontologist, National Museum, Nairobi	Fossil antelopes from Samos and Fort Ternan, Kenya South American Pleistocene mammals	National Museum, Nairobi John Simon Guggenheim Memorial Foundation
Fausto Luiz de Souza Cunha, Vertebrate Paleontologist, Museu Nacional, Rio de Janeiro, Brazil	The Osteoglossidae, fossil and recent	Adelphi University
Harold Roellig, Graduate Student, Columbia University	The semionotids of the eastern Triassic basins The pholidophoroids and the origin of the teleosts	Carnegie Museum of Pittsburgh
Richard Lund, Graduate Student, Columbia University	Anatomy of the head and neck of recent opossums and its bearing on American fossil marsupials	Queensborough Community College
Sylvia F. Graham, Graduate Student, Rutgers University		

THE AMERICAN MUSEUM OF NATURAL HISTORY

FINANCIAL STATEMENTS

FOR THE YEARS ENDED JUNE 30, 1967 AND 1966

THE AMERICAN MUSEUM
BALANCE SHEETS, June

ASSETS:	1967	1966
Current funds:		
General fund:		
Cash	\$ 591,122	\$ 468,568
Accounts receivable	340,672	395,931
Inventories, principally publications, at cost	85,968	50,943
Prepaid expenses	86,415	90,237
	<u>\$ 1,104,177</u>	<u>\$ 1,005,679</u>
Special funds:		
Cash:		
Demand deposits	\$ 111,657	\$ 462,036
Time deposits	1,137,484	1,125,752
Accounts receivable	6,154	18,581
	<u>\$ 1,255,295</u>	<u>\$ 1,606,369</u>
	<u>\$ 2,359,472</u>	<u>\$ 2,612,048</u>
Endowment funds:		
Cash:		
Demand deposits	\$ 59,600	\$ 54,916
Time deposits		75,000
Investments (market June 30, 1967, \$51,705,000) (Note 1):		
Bonds	21,496,738	20,881,981
Preferred stocks	1,938,406	2,141,407
Common stocks	16,302,676	15,696,949
	<u>\$39,797,420</u>	<u>\$38,850,253</u>
Investment in bonds of The American Museum of Natural History Planetarium Authority, \$570,000 principal amount, at cost (Note 4)	<u>\$ 425,000</u>	<u>\$ 425,000</u>
Pension fund:		
Cash:		
Demand deposits	\$ 182,120	\$ 65,881
Time deposits	20,000	20,000
Investments, at cost (market June 30, 1967, \$11,012,000):		
Bonds	6,695,449	6,482,156
Preferred stocks	436,024	475,759
Common stocks	2,496,721	2,337,235
	<u>\$ 9,830,314</u>	<u>\$ 9,381,031</u>
	<u>\$52,412,206</u>	<u>\$51,268,332</u>

The accompanying notes are an

OF NATURAL HISTORY
30, 1967 and 1966

LIABILITIES AND FUNDS:	1967	1966
Current funds:		
General fund:		
Accounts payable and accrued liabilities	\$ 160,289	\$ 137,884
Deferred income, principally unearned subscriptions	828,697	744,005
Advance from City of New York	150,000	150,000
	<u>\$ 1,138,986</u>	<u>\$ 1,031,889</u>
Deficit	34,809	26,210
	<u>\$ 1,104,177</u>	<u>\$ 1,005,679</u>
Special funds:		
Balances of funds received or appropriated for specific purposes (Note 2)	\$ 1,255,295	\$ 1,606,369
	<u>\$ 2,359,472</u>	<u>\$ 2,612,048</u>
Endowment funds:		
Endowment funds, income available for:		
Restricted purposes	\$15,804,851	\$15,426,230
Unrestricted purposes	8,417,412	8,185,965
Funds functioning as endowment, principal and income available for:		
Restricted purposes	4,719,490	4,596,145
Unrestricted purposes	10,855,667	10,641,913
	<u>\$39,797,420</u>	<u>\$38,850,253</u>
Funds invested in bonds of The American Museum of Natural History Planetarium Authority	\$ 425,000	\$ 425,000
	<u><u>\$ 425,000</u></u>	<u><u>\$ 425,000</u></u>
Pension fund:		
Pension fund balance	\$ 9,830,314	\$ 9,381,031
	<u>\$52,412,206</u>	<u>\$51,268,332</u>

integral part of these statements.

GENERAL FUND
SUMMARY STATEMENTS of CHANGES
for the years ended June 30, 1967 and 1966

	<i>1967</i>	<i>1966</i>
Deficit, beginning of year	\$ 26,210	\$ 36,821
Less, Transfer from unrestricted funds functioning as endowment	26,210	36,821
	<u>—</u>	<u>—</u>
Income:		
Appropriation from the City of New York	\$1,851,776	\$1,809,282
Endowment funds	1,469,053	1,446,685
Gifts and grants	314,300	290,620
Other (Notes 3, 4 and 5)	542,914	518,120
	<u>\$4,178,043</u>	<u>\$4,064,707</u>
Expenses:		
General administration	\$ 722,375	\$ 665,755
Educational activities	1,704,393	1,639,077
Operation and maintenance of physical plant	1,349,346	1,383,472
Pension and other social benefits	436,738	402,613
	<u>\$4,212,852</u>	<u>\$4,090,917</u>
Deficit, end of year	<u>\$ 34,809</u>	<u>\$ 26,210</u>

The accompanying notes are an integral part of these statements.

SPECIAL FUNDS
SUMMARY STATEMENTS of CHANGES
for the years ended June 30, 1967 and 1966

	<i>1967</i>	<i>1966</i>
Balance, beginning of year	<u>\$1,606,369</u>	<u>\$1,443,785</u>
Income:		
Endowment funds	\$ 355,115	\$ 343,220
Gifts and grants	817,413	1,433,386
Other	454,306	284,999
Transfer from endowment funds	67,887	84,749
	<u>\$1,694,721</u>	<u>\$2,146,354</u>
 Expenditures for the special purposes and objects for which the funds were established	 \$2,015,283	 \$1,749,963
 Transfer to endowment funds	 30,512	 233,807
	<u>\$2,045,795</u>	<u>\$1,983,770</u>
 Balance, end of year (Note 2)	 <u>\$1,255,295</u>	 <u>\$1,606,369</u>

The accompanying notes are an integral part of these statements.

ENDOWMENT FUNDS
SUMMARY STATEMENTS of CHANGES
for the years ended June 30, 1967 and 1966

	<i>1967</i>	<i>1966</i>
Balance, beginning of year	<u>\$38,850,253</u>	<u>\$37,216,458</u>
Additions:		
Gifts, bequests, etc.	\$ 265,707	\$ 634,994
Net profit on sales of investments	752,933	894,674
Transfer from special funds	30,512	233,807
	<u>\$ 1,049,152</u>	<u>\$ 1,763,475</u>
Deductions:		
Custodian fee	\$ 5,000	\$ 5,000
Transfers to general fund:		
For payment of certain expenses (included in general fund, other income)	2,888	3,110
To dispose of operating deficit of preceding year	26,210	36,821
Transfer to special funds	67,887	84,749
	<u>\$ 101,985</u>	<u>\$ 129,680</u>
Net additions	<u>\$ 947,167</u>	<u>\$ 1,633,795</u>
Balance, end of year	<u>\$39,797,420</u>	<u>\$38,850,253</u>

The accompanying notes are an integral part of these statements.

PENSION FUND
SUMMARY STATEMENTS of CHANGES
for the years ended June 30, 1967 and 1966

	<i>1967</i>	<i>1966</i>
Balance, beginning of year	<u>\$9,381,031</u>	<u>\$8,956,208</u>
Additions:		
Contributions of members	\$ 191,037	\$ 187,510
Contributions of Museum	228,922	224,667
Income from investments	437,872	397,197
Net profit on sales of investments	18,645	10,299
	<u>\$ 876,476</u>	<u>\$ 819,673</u>
Deductions:		
Payments to members and beneficiaries	\$ 421,842	\$ 389,488
Expenses	5,351	5,362
	<u>\$ 427,193</u>	<u>\$ 394,850</u>
Net additions	<u>\$ 449,283</u>	<u>\$ 424,823</u>
Balance, end of year	<u>\$9,830,314</u>	<u>\$9,381,031</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 balance of special funds at June 30, 1967 is net of overdrafts of approximately \$400,000. These overdrafts represent expenditures in anticipation of gifts, grants, other income and transfers from other funds.
3. 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 fund. During the years ended in 1967 and 1966, royalties received amounted to \$47,149 and \$36,017, respectively. Such amounts were credited to general fund (other income) in the respective years.
4. 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 1967 and 1966. These amounts are included in other income of the general funds.
5. Other income of the general funds for the years ended in 1967 and 1966 includes net income from magazine and book shop operations of \$99,203 and \$82,770, respectively. Gross income from magazine and book shop operations amounted to \$1,521,481 and \$1,288,321 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, 1967 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, 1966.

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, 1967 and 1966 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 4, 1967.

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

FINANCIAL STATEMENTS

FOR THE YEARS ENDED JUNE 30, 1967 AND 1966

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

ASSETS:	<i>1967</i>	<i>1966</i>
Cash	\$132,000	\$ 75,829
Accounts receivable	2,021	2,473
Inventory, principally publications, at cost	21,635	24,269
	<u>\$155,656</u>	<u>\$102,571</u>
 Equipment, fixtures, etc. (Note 1) :		
Zeiss planetarium instrument, at cost	\$135,059	\$135,059
Less, Allowance for depreciation	50,647	43,890
	<u>84,412</u>	<u>91,169</u>
 Furniture, fixtures and equipment, at cost, less allowance for depreciation, \$139,526	 <u>1</u>	 <u>1</u>
	84,413	91,170
Building, at cost (Note 1)	569,209	569,209
Land (donated by the City of New York)	—	—
	<u>\$653,622</u>	<u>\$660,379</u>
	<u>\$809,278</u>	<u>\$762,950</u>

The accompanying notes are an

OF NATURAL HISTORY
 AUTHORITY
 30, 1967 and 1966

LIABILITIES:	1967	1966
Accounts payable	\$ 4,830	\$ 5,096
4½% Refunding Serial Revenue Bonds, past due (Note 2)	570,000	570,000
Accrued interest, past due	315,450	315,450
	<u>\$890,280</u>	<u>\$890,546</u>

CONTRIBUTED CAPITAL AND DEFICIT:

Contributed capital:		
Charles Hayden	\$156,869	\$156,869
Charles Hayden Foundation	250,925	250,925
	<u>407,794</u>	<u>407,794</u>
Deficit, as annexed	488,796	535,390
	<u>\$ 81,002*</u>	<u>\$127,596*</u>
	<u>\$809,278</u>	<u>\$762,950</u>

* Denotes deduction.

integral part of these statements.

STATEMENTS of INCOME, EXPENSES and DEFICIT
for the years ended June 30, 1967 and 1966

	1967	1966
Income:		
Admission fees, less allowances and commissions	\$445,556	\$373,109
Special lectures and courses	17,273	17,286
Miscellaneous	7,829	4,725
	<u>470,658</u>	<u>395,120</u>
Auxiliary activity, sales booth	87,033	82,360
Total	<u><u>\$557,691</u></u>	<u><u>\$477,480</u></u>
Expenses:		
Preparation, presentation and promotional:		
Salaries	\$172,270	\$161,355
Supplies and expenses	30,459	29,915
	<u>202,729</u>	<u>191,270</u>
Operation and maintenance:		
Salaries	115,219	108,062
Supplies and expenses	29,551	28,051
Special improvements	15,000	—
	<u>159,770</u>	<u>136,113</u>
Administrative and general:		
Salaries	7,500	7,500
Pension fund, social security and other employee benefits	31,200	27,526
Miscellaneous	13,914	11,737
	<u>52,614</u>	<u>46,763</u>
Auxiliary activity, sales booth	63,578	60,096
Total	<u><u>\$478,691</u></u>	<u><u>\$434,242</u></u>
Income before interest and depreciation	<u><u>\$ 79,000</u></u>	<u><u>\$ 43,238</u></u>
Interest on past-due 4½% Refunding Serial Revenue bonds	\$25,650	\$ 25,650
Provision for depreciation (Note 1)	6,756	6,753
Total interest and depreciation	<u><u>\$ 32,406</u></u>	<u><u>\$ 32,403</u></u>
Net income for year	<u><u>\$ 46,594</u></u>	<u><u>\$ 10,835</u></u>
Deficit, beginning of year	535,390	546,225
Deficit, end of year	<u><u>\$488,796</u></u>	<u><u>\$535,390</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, 1967 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, 1966.

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, 1967 and 1966 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 4, 1967.

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Department of Biology, University of California, Santa Barbara, Goleta, California

PROFESSOR DR. GEORGE P. DEMENTIEV

Zoological Museum of the University, Herzenstr. 6, Moscow K-9, U.S.S.R.

- PROFESSOR CARL O. DUNBAR
1615 Santa Barbara Drive, Dunedin, Florida
- DR. FRANK K. EDMONDSON
Indiana University, Bloomington, Indiana
- DR. CLIFFORD FRONDEL
Department of Mineralogy, Harvard University, Cambridge, Massachusetts, 02138
- DR. CARYL P. HASKINS
President, Carnegie Institution of Washington, 1530 P Street, N.W., Washington, D. C., 20005
- DR. RAFAEL LARCO HOYLE
Avenida Bolivar 1515, Pueblo Libre, Lima, Peru
- DR. ARCHIBALD G. HUNTSMAN
Professor of Marine Biology, University of Toronto, Toronto, Ontario, Canada
- DR. J. ALLEN HYNEK
Dearborn Observatory, Northwestern University, Evanston, Illinois
- DR. LAURENCE M. KLAUBER
Curator of Reptiles, Zoological Society of San Diego, San Diego, California
- DR. DAVID LACK, F.R.S.
Director, Edward Grey Institute of Field Ornithology, Oxford University, Oxford, England
- DR. CLAUDE LÉVI-STRAUSS
College de France, 11 Place Marcelin-Berthelot, Paris, France
- PROFESSOR DR. ROBERT MERTENS
Director, Naturmuseum und Forschungsinstitut, Senckenbergische Naturforschende Gesellschaft, Senckenberg Anlage No. 25, Frankfurt-am-Main, Germany
- DR. RAYMOND C. MOORE
The University of Kansas, Lawrence, Kansas

DR. H. W. PARKER

South Deep, Teynham Peate, near Sittingbourne, Kent, England

DR. NORMAN DENBIGH RILEY

British Museum (Natural History), Cromwell Road, London, S.W.
7, England

PROFESSOR ALFRED SHERWOOD ROMER

Alexander Agassiz Professor of Zoology, Museum of Comparative
Zoology, Harvard College, Cambridge, Massachusetts, 02138

DR. HARLOW SHAPLEY

Sharon Cross Road, Peterborough, New Hampshire

DR. NIKOLAS TINBERGEN

Department of Zoology, University Museum, Oxford, England

DR. ETHELWYNN TREWAVAS

Department of Zoology, British Museum (Natural History), Crom-
well Road, London, S.W. 7, England

DR. BERNARDO VILLA-R.

Instituto de Biologia, Ciudad Universitaria, San Angel, D. F.,
Mexico

PROFESSOR DAVID MEREDITH SEARS WATSON

Department of Zoology, University College, Gower Street, London,
W. 1, England

PROFESSOR T. STANLEY WESTOLL

Department of Geology, University of Durham at King's College,
Newcastle-upon-Tyne, England

DR. YOSHIMARO YAMASHIMA

Yamashima Institute for Ornithology and Zoology, 49 Nampeidai-
Machi, Shibuya-Ku, Tokyo, Japan

