

THE AMERICAN MUSEUM
OF NATURAL HISTORY

EIGHTY-FIFTH ANNUAL REPORT
JULY, 1953, THROUGH JUNE, 1954

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THE CITY OF NEW YORK
1954

EIGHTY-FIFTH 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*

THE Museum's fiscal year, which ended June 30, 1954, was a good one. As in our previous annual report, I believe we can fairly state that continuing progress is being made on our long-range plan for the Museum. The cooperative attitude of the scientific staff and of our other employees towards the program set forth by management has been largely responsible for what has been accomplished.

The record of both the Endowment and Pension Funds during the past twelve months has been notably satisfactory. In a year of wide swings of optimism and pessimism in the security markets, the Finance Committee is pleased to report an increase in the market value of the Endowment Fund of \$3,011,800 (87 per cent of which has been due to the over-all rise in prices and 13 per cent to new gifts). Common stocks held by the fund increased in value approximately 30 per cent in the year. The Pension Fund likewise continued to grow, reaching a valuation of \$4,498,600, as compared to \$4,024,100 at the end of the previous year. Yield at cost for the Endowment Fund as of July 1 stood at 4.97 per cent and for the Pension Fund at 3.74 per cent. In recent years the Museum has pursued the same principle of balanced investing that has been adopted by most of the country's large university and charitable funds, with approximately an equal division be-

tween high-grade, fixed-income securities and a diversified list of common stocks. Less than one-quarter of one per cent of our investments is now in real estate and mortgages, as compared with 10 per cent twenty years ago. We are greatly indebted to the members of our Finance Committee whose alert attention to our affairs has been producing such excellent results.

Our present financial condition is particularly important in the light of plans for the future of the Museum. Because we employ some 550 persons and carry on a continual schedule of exhibition, research, instruction, and exploration, our financial needs not only are constant but are growing. We must return each year to seek public support, and we must strive always to make the most effective use of the funds which we seek.

The American Museum of Natural History has been called one of the principal public attractions in New York. This is flattering, but we must be careful not to judge numbers of visitors as the primary measure of our effectiveness. We should ask ourselves (1) if we are making proper use of personnel and material at our disposal; (2) if our influence in the community is constructive; and (3) if we have succeeded in translating the past into the living questions of the present and in showing that lessons of the past have a bearing on the future. The arrival of the age of supersonic speeds has brought the world to frighteningly small proportions. Jet planes have already flown from London to Australia in twenty-two hours, and in the near future this distance will undoubtedly shrink in relation to time. Oceans have disappeared and continents have become minute, so that there is no longer room on earth for critical divisions of people. The part that natural history museums can play—in showing how life exists in all parts of the world—can be a most useful one. It is a current fear that, with the possible use of hydrogen and

atomic weapons, large cities may some day be removed from the face of the earth, but we could never go on with our work if we believed that this was inevitable. Certainly as of today the metropolis is far from obsolete. A distinguished member of the French Cabinet recently commented that the city is still the center of gravity of modern civilization. Suburban growth will undoubtedly continue, but only in a place like New York could a museum such as ours exist. We can and should be an oasis where the bustle and overcrowding of modern life can be tempered. The reflection and peace of mind which a visit to the Museum can give should provide a helpful change of pace to the rapid tempo of twentieth century life.

The public has had to bear with us while we underwent a major operation—the painting of most of our exhibition areas. In addition to the painting work, certain parts of the building have been screened off for the preparation of new exhibits. As the ambitious program which we have undertaken for the renovation of our halls will extend over a period of several years, we must continue to ask the public's indulgence.

Of major importance has been the completion of the North American Hall of Mammals, with the addition of seven new groups. Progress continues on the new halls of Paleontology, North American Forests, and Petroleum Geology; this will be commented on more fully in the Director's report. Our new library building is nearing completion, and architect's plans have been finished and approved for the 1600-seat auditorium (to be located near the Planetarium), with construction due to start this year.

The New York State Theodore Roosevelt Committee can point with pride and gratitude to a permanent exhibition, "The Life of Theodore Roosevelt," which was opened to the public last October in Roosevelt Memorial Hall, and to the eight new flags which now hang there.

The CBS-Museum TV show has now been on the air for a little over a year. The program has consistently maintained a quality of which we can be proud, and it has presented us with an unusual opportunity to tell our story to a large number of people. Over fifty stations have been carrying "Adventure" weekly, with sample tests indicating a Sunday audience exceeding 5,000,000 people.

During the fiscal year, six elective trustees were added to the Board—Messrs. Thomas Bancroft, Harold Boeschstein, Duncan S. Ellsworth, Luke B. Lockwood, John P. Stevens, Jr., and Dr. Albert E. Parr, our Director. Messrs. S. Sloan Colt, Chauncey J. Hamlin, and H. Nelson Slater—all of whom had served on the Board for a long time—retired from the elective group and became Honorary Trustees. Also, Mr. Robert D. Sterling, who has been one of the most generous supporters of our new exhibition program, was elected an Honorary Trustee.

Our officers and trustees have given generously of their time and money in supporting the work of the Museum. Again we are indebted to the many men and women who have served on our fund-raising committees, bringing in approximately \$150,000, to enable us to operate with a very small deficit. Mr. C. DeWolf Gibson was chairman of the Men's Committee, while Mrs. Paul E. Peabody completed her third year as a most effective head of the Women's Committee. For the coming year Mr. Gibson will again head the Men's Committee, while Mrs. James B. Campbell replaces Mrs. Peabody as head of the Women's Committee. We hope that we will continue to appeal successfully for public support by showing that the Museum presents an opportunity to perpetuate the best of what has been taken from the past and passing on to future generations the best of what we are learning today. At some future time the twentieth century may be looked back upon, not only as the period when the United States was the most powerful nation in the world, but

as the period when a cultural renaissance was led by the young democracy that was supposed to be decaying through over-industrialization. It is our aim to keep this Museum one of the outstanding symbols of this cultural progress as well as a center of pleasurable and rewarding experience for the millions who visit us each year.

Alexander M. White

FILLING THE GAPS OF KNOWLEDGE. II
SYSTEMATIC RESEARCH
IN THE
BIOLOGICAL SCIENCES

Charles M. Bogert, Chairman
Department of Amphibians and Reptiles

EARLY natural history had its origins in the need for practical information. First it became necessary to distinguish between and to apply names to plants or animals that were edible or otherwise useful. Later, as primitive medicine came into existence, there was the search of herbalists for new plants that might be useful in curing disease. Indeed Latin names had been applied to plants and animals long before 1735, when Linnaeus first attempted to catalogue all the known kinds of animals and plants. It was he, of course, who first established the hierarchical system that permitted closely related organisms to be placed in the same groups. Still it must have become apparent at an early date, even in more primitive societies, that it was useless to make observations on a plant or animal unless one knew its name.

For example, the Aztecs had a rather extensive knowledge of the species inhabiting their domain prior to the arrival of Cortez. Furthermore, while it is generally known that the Aztecs had established zoological and botanical gardens, it is not so generally realized that they had adopted a naming system somewhat comparable to that of Linnaeus, even though it is uncertain whether it was carried into the higher categories. Nevertheless the Aztecs did employ names to indicate relationships. Plants now placed along with the tomato in a single family were called by such names as *xitómatl*,

coztómatl, and *xaltómatl* and similarly the names of various species of *zapote*, or *sapodilla*, had common endings that were essentially generic indications, with descriptive prefixes that corresponded to specific names.

It is apparent, therefore, that naming systems arose from practical necessity, and in one form or another they have probably existed in all primitive as well as modern societies. The discoveries of Charles Darwin in the middle of the nineteenth century, however, gave a tremendous impetus to the study of species and classification that Linnaeus' work had initiated a century before. With the advent of Darwin's work it came to be realized that the earlier descriptions of plants and animals were too crude to be of real value. Slowly but steadily systematics acquired refinements, making increased use of the disciplines of other fields, until it began to assume the attributes of a science.

Museums, long in existence as show places for curiosities of nature, including freaks and bizarre or exotic animals and plants, began to transcend their earlier role, which differed but little from that of the modern side show, and to assume their present-day functions. Natural history societies and academies of science began to burst into bloom throughout the civilized world. Such institutions and organizations undertook the assemblage of the materials required for the classification of organisms. Thousands of workers devoted their energies to studies of animal or plant structures, with the classification and naming of all living as well as fossil animals and plants as the ultimate goal.

Prior to the turn of the century the groundwork of systematics was pretty well covered and consolidated. Some groups of animals had become far better known than others, but the major groups had been reasonably well sorted out. Systematics began to approach the end of its purely descriptive phase, and after passing through a relatively dull period of minor activity during the first two or three decades of the

present century, it began to flower once more as ecology supplanted the old-fashioned natural history, and genetics began to throw new light on concepts that had arisen largely from an evolutionary approach to descriptive morphology. Systematics became a bonafide science with the introduction of biometric methods and more especially with the application of experimental techniques to the solution of its problems. Studies of single specimens looked upon as representing individual species were supplanted by studies that used newly devised sampling techniques to study populations. Increasingly the facts and the theory of other disciplines were brought to bear on the problems of systematics, and it became increasingly clear that the catalogues and check lists of previous decades, while useful, were of limited value.

Thus the "new systematics" was developed not by the "pigeonholers," who still remained, nor by the legalistic virtuosos of taxonomy whose knowledge of or interest in zoology was limited, but by the biologists with training in genetics, ecology, psychology, paleontology, animal behavior, comparative physiology, and related fields, the backgrounds of which were essential for the solution of many systematic problems. Systematics became the focal point for many branches of biology, partly because of the fact that its central problem, in the words of Julian Huxley, "is that of detecting evolution at work."

Changes in the procedures as well as in the scope of systematics have come about as the result of several factors. But to some extent these changes have resulted from the acquisition by museums of collections sufficiently extensive to bring to light problems that earlier workers could not have foreseen. With small collections it was almost inevitable that a static sort of philosophy arose, with the species looked upon in terms of individual morphological types, a viewpoint that barely went beyond the dogma of special creation. It was only when large collections began to become available that the

phenomena of variation were considered and the species was looked upon as a population with special attributes amenable to study by precise methods. Thus museums, particularly the older and larger ones, played a major role in the development of the new systematics.

THE MUSEUM'S CONTRIBUTIONS TO OUR KNOWLEDGE OF LIVING NATURE

REPORT OF THE DIRECTOR

A. E. Parr

LAST year's report gave a brief outline of how the Museum has helped advance our knowledge of man himself. As an introduction to this year's task of attempting to review how the Museum has contributed to the development of our systematic knowledge of the life around us, it would be difficult to improve on the statement made by Mr. Bogert on the preceding pages.

One difficulty in reviewing our work in zoology arises from the fact that the responsibility for dealing with particular aspects of this subject has often shifted from one department to another, nor has the over-all responsibility for all phases of the work continued to remain under the administration of a single integrated museum division, as in the case of the anthropological disciplines. Starting within a single unit, the work has at times been divided among as many as nine separate departments, with seven currently carrying on. Our survey must therefore follow the lines of subject matter rather than departmental organization, with identification of the units and individuals as we go along.

As in other subjects a museum's efforts in the biological sciences generally begin with a vast and heterogeneous accumulation of specimens that please the public's imagination or the collector's interest. But even in this random harvest there are usually some trends that can be observed. Among the higher animals, such as the mammals, the number of species

in any country is small compared with the myriad lower forms of life. Their size makes their peculiarities stand out in spectacular relief and makes them primary objects of curiosity, further increased by the sense of kinship that develops from intimate familiarity with the behavior of many of their kind in captivity or domestication. Their agility and responsiveness to danger make them good game for the hunting instincts of man. A hunt for mammals from all over the world, often with the emphasis upon those of distant lands, therefore tends to play an important role in the early accumulation of a museum collection. The birds offer many of the same challenges and fascinations as do the mammals, and they are sought after more or less in the same manner, with the whole world as the territory of the search from the beginning.

But as we go lower in the animal kingdom the picture changes. The mere weight of numbers makes it obviously impractical for the collector to entertain world-wide and all-inclusive ambitions. And the almost endless variety of forms to be discovered and recorded on home territory provides an inexhaustible outlet for an interested person's curiosity and acquisitive urge, without any great need to go beyond far horizons. In insects and similar groups, collections therefore generally begin with a heavy emphasis on the species of our own country, with the search of the rest of the world more or less confined to the outstandingly peculiar or beautiful.

Because life in the ocean will always be foreign to man in the personal sense, geography plays a comparatively insignificant role in his curiosity about what the sea contains. A specimen from the Gulf of Mexico is as exciting as one from the Bay of Bengal. Wherever it was caught, it came from a foreign world. A hall of African mammals has a special meaning for our visitors; a hall of Indian Ocean life as distinct from the life of the Atlantic would mean nothing except to the advanced specialist, and very little even to him. Add to this the cost and difficulty of organizing far-reaching marine

expeditions, and it becomes plain why early collections of marine life are largely concentrated on the life of neighboring waters, with some additions of material collected along the tracks of distant cruises and through the interests of seafaring men.

These trends imposed by circumstances on the beginnings of museum collections naturally also find expression in the first organization of museum research. But as the work progresses, the actual needs of new material for the further advancement of human knowledge through research begin to exert a stronger and more rationally planned influence on the continued growth of the collections and on all the activities of which the collections form the center. The scientists not only take stock of the gaps in our knowledge waiting to be filled, but also consider where and in what manner the location and circumstances of their institution will give them the opportunity to make the most effective contribution towards filling these gaps.

Tracing the history of this evolution from indiscriminate collecting to a planned program, and of the contributions to an orderly knowledge of the living world that the Museum has been able to make in the process, is the task of this report.

In the resolutions leading to the creation of the American Museum of Natural History in 1869, a special point was made of the need to take immediate action in order to secure "by purchase, in Europe, the largest and most valuable collection of objects of Natural History, which has been offered for sale in many years."

The collection that the founders had particularly in mind was the complete museum of Prince Maximilian of Weid-Neuwied, which was especially rich in mammals, birds, reptiles, and amphibians, and also included a considerable assortment of fishes. The acquisition of this collection in its entirety was followed immediately by large but more selective purchases from other important collections of foreign verte-

brates offered in Europe, and by the D. G. Elliot collection of North American birds during 1869. In January, 1870, Baron R. von Osten Sacken presented his large collection of North American insects other than butterflies, and more than ten thousand specimens of American and European butterflies were received from Coleman T. Robinson.

Within less than a year from the date of incorporation of the Museum, April 6, 1869, a substantial start had been made on the collections of four of the zoological departments that now carry on as separate units of the Museum's organization.

It is interesting to find, even in these very first acquisitions, the pattern of geographic emphasis which reappears later as the logical pattern on which the Museum now operates for the advancement of our systematic knowledge of living nature. In the purchase of vertebrate collections a world-wide representation was immediately sought after. Among the insects received by generous gifts there was an overwhelming emphasis on the species of our own country.

By means of these gifts and purchases the Museum was able to inaugurate its public exhibition program in the zoological subjects. The collections also served as invaluable reference material for the research that subsequently developed. But objects obtained in this manner offer little incentive or opportunity to add to our knowledge by original research. The collections have already been investigated and put in systematic order before they are received, and the first novelty value of the new information they may contain has been extracted.

The accumulation of classified collections, by gift and by purchase, could therefore be continued for a number of years without a compelling need to organize scientific departments or engage the services of research personnel. The title Curator of Zoology appears for the first time in 1880, and the first scientific paper published by the Museum on a zoological subject was issued in 1882.

During the seventies and the early eighties the annual reports refer only to gifts and purchases as sources of new collections. It would seem that the credit for having launched the Museum on a zoological collecting program of its own belongs in a large measure to J. A. Allen, who joined the staff as Curator of Ornithology and Mammalogy in 1885 and immediately began to urge the creation of adequate study collections of North American birds and mammals by the Museum's own systematic efforts. In the report for the next year collecting activities on a modest and mainly local scale are reported for the first time. During the following years field work increased very rapidly both in quantity and in geographic extent, and from 1895 forward the records of the Museum's own expeditions occupy a prominent place in all the annual reports.

The growth of zoological collections that can be sustained by gifts and purchases is both very limited and very poorly balanced. The private collector must choose the objects of his efforts to fit his space and means. He generally seeks esthetic and emotional satisfaction, as well as an intellectual occupation, from his hobby. Moderate or small size, beauty, and ease of collecting and preserving become dominant factors in his choice. He is also strongly influenced by passing trends of public interest in nature. An outstanding book on some segment of the animal kingdom may give birth to hundreds of private collections within its subject. Butterflies and beetles, seashells, and birds and birds' eggs are among the outstanding competitors for the enthusiasm of the amateur collectors, while there are large groups of "unattractive" but therefore no less important animals of which significant private collections have never existed.

When a museum begins to undertake collecting activities of its own it is therefore not merely acting on the personal desires of its staff but is driven by necessity, if it wishes to offer the public a properly balanced program of exhibits and

information about nature. Out of this necessity arise, in turn, both the need and the opportunity to engage in original research. The material streaming in from the Museum's own expeditions is not known and classified in advance. It must be investigated and identified by the Museum's own staff, and the new discoveries must be made known to the world through the Museum's own publications.

It may have been fortuitous but is nevertheless symbolic of this relationship between independent collecting and original research that one of the very first zoological papers published by the Museum had to do with whales. Whales are generally not very numerous in private collections.

After the appearance of J. B. Holder's "The Atlantic Right Whales" in 1883, many years elapsed before the Museum again had opportunity to contribute to our knowledge of the leviathans of the seas. But during the period from 1908 to 1918 no fewer than twelve technical reports on whales appeared in the Museum's scientific publications, chiefly as a result of the interest and initiative taken by Roy Chapman Andrews, who also did a major portion of the research himself. Among others contributing to our knowledge of the whales through museum research and publications were J. A. Allen, J. T. Nichols, H. von W. Schulte, Henry C. Raven, and W. K. Gregory. The results of this work have not been confined within technical publications for other scientists but have also found expression in museum exhibits and in many articles and books for the general reader. The interesting and widely read record of a voyage with a whaling ship given in R. C. Murphy's "Logbook for Grace" may also be mentioned in this connection.

We have digressed to finish this account of the Museum's work on whales, because these animals are in a class by themselves in every sense except that of the systematic zoologist, and the work directed towards their study does not fit into

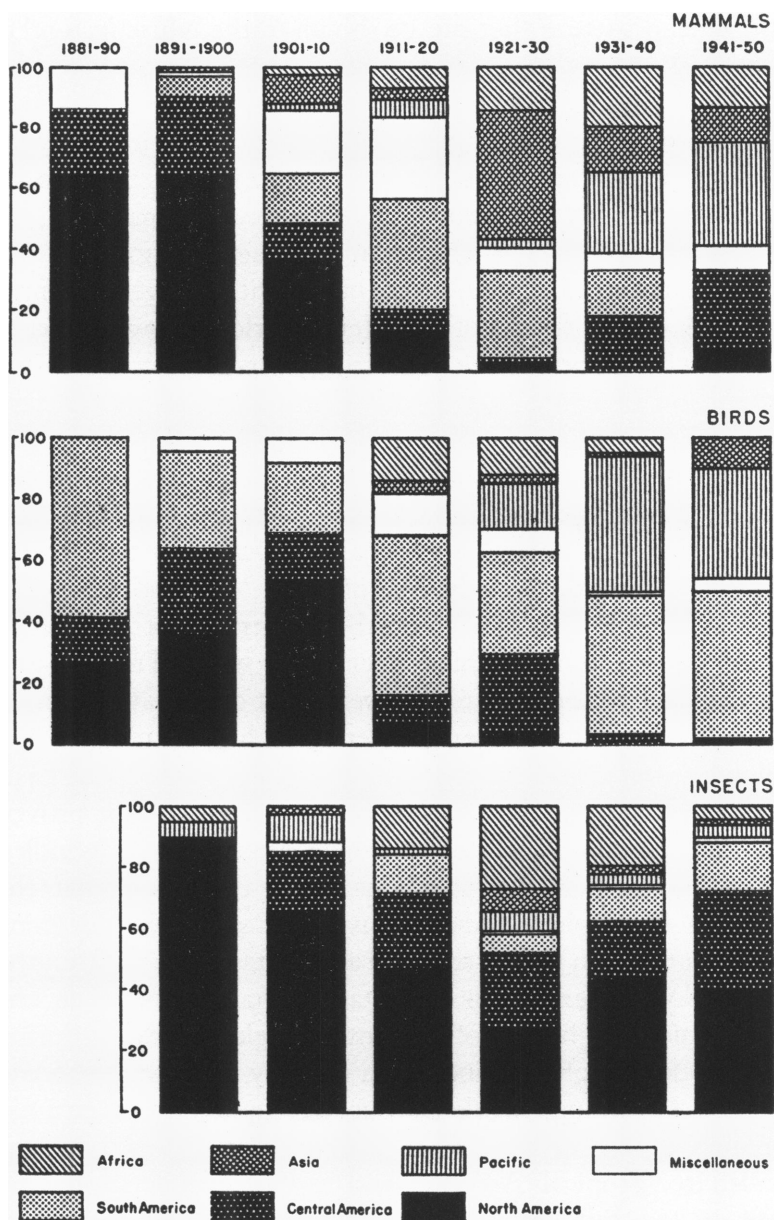


FIG. 1. Geographic distribution, by decades, of the subject matter in Museum publications.

any general pattern that can be shown in the Museum's other activities.

The historical development of our zoological research program and its variations from subject to subject may be illustrated by the geographical distribution of the species dealt with in the Museum's publications on mammals, on birds, and on insects, as shown in the diagram (fig. 1).

Research in all three subjects began with an overwhelming emphasis on the faunas of the New World, followed in each case, after the turn of the century, by a rapid increase in the proportion of effort devoted to the animals of the Eastern Hemisphere. In mammalogy and ornithology this interest in the Old World has persisted and become part of the permanent pattern, claiming the major share of our efforts in mammalogy and a share approximately equal to that devoted to the Western Hemisphere in the case of birds. For both birds and mammals published research on the faunas of North America dwindled to almost nothing after 1910, while Tropical and South America continue to receive a great deal of attention.

In entomology the development of Museum research has followed a very different course. Research devoted to the Eastern Hemisphere reached a peak during 1921-1930 but proved a temporary diversion of effort which subsequently dwindled again to very minor proportions, with the result that the Western Hemisphere today receives the same overwhelming share of attention that it received at the start. But within the New World there is an important difference between the geographic distribution of our entomological research during the last decade of the nineteenth century and that of today. At the beginning, work in our hemisphere was entirely confined to North America. During 1901-1910 it was extended to Tropical America, and to South America during 1911-1920. But publications dealing with the insects of North America have continued to form the largest geographical unit within the total output of research right down

to the present, contrary to what has happened in regard to mammals and birds.

These differences in the historical development of various zoological subjects embraced by the Museum are of course in part fortuitous or influenced by the personal interests of the scientific staff. But taken as a whole they reveal a logical pattern of progress, with a solid tradition behind it, through which our research program and policies of today have evolved. As we pursue the history of the Museum's research activities, this general pattern will gain further interest as its causes and significance are revealed.

In the early years of the Museum, mammals evidently held a predominant place among zoological subjects in the interest of the trustees as well as the general public, and the scientific staff was selected accordingly. The first Curator of Zoology, J. B. Holder, concerned himself chiefly with mammals in his own research, and when a separate Department of Mammals and Birds was established in 1885, it was also headed by a curator, J. A. Allen, who devoted a major part of his own research to this group.

Zoological research by the Museum thus started with a tremendous emphasis on mammals, with the result that by 1920, when the departments of Birds and of Mammals were separated, the Museum had published over 200 scientific reports on mammals as compared with only about 75 on birds and about 135 on insects. Since that time the great development of research in other branches of zoology has changed these relationships, with about 560 reports on insects, 260 on birds, and 160 on mammals published from 1921 to 1950.

Until the turn of the century the Museum maintained an extensive program in the collection and study of North American mammals, leading to the discovery of many species previously unknown or unrecognized by science, and contributing substantially to our knowledge of the mammals of

our own country at a time when the fauna was only poorly known. New sheep, caribou, bats, carnivores, squirrels, and chipmunks and numerous other rodents of North America became known for the first time through the many reports published by the Museum as a result of the studies made by Dr. Allen himself, and by E. A. Mearns, Frank M. Chapman, and others under Dr. Allen's leadership. Of particular importance was Dr. Allen's discussion of the geographical distribution of North American mammals (1892) which helped to establish many of the principles that still remain fundamental to our concepts of the geographical life zones of our continent.

Through these early researches our Museum did more than any other single institution to lay the foundations for the work of the United States Biological Survey which took up the systematic study of North American mammals in the late nineties. When this occurred it became obvious that the Federal agency, following a planned program of regional surveys over the years, would amass the greatest collection of the mammals of the United States and become the center of authority for this fauna. The Museum therefore began to turn its attention to the mammals of other regions in need of scientific investigation, while it continued its contribution to general knowledge of North American mammals through numerous articles and many widely used books, such as Harold E. Anthony's "Field Book of North American Mammals" and G. G. Goodwin's "The Mammals of Connecticut."

In the study of birds a major part of the effort had from the start been devoted to the birds of Central and South America. Many of the South American collections acquired by the joint Department of Mammals and Birds primarily for ornithological purposes also contained valuable and uninvestigated series of mammals. This was particularly true of some of the collections obtained from Herbert H. Smith. With birds and mammals still in the custody of the same department

it was therefore natural that the Museum's research on mammals should also, at first, turn towards the southern part of the Western Hemisphere, as the task in the northern part was taken over by the Biological Survey. At the time the world's knowledge of the Central and South American mammal fauna was very sporadic and superficial. While some of the more spectacular or common forms had become known through the writings of von Humboldt, Darwin, Hudson, and Bates, no comprehensive and systematic survey had been undertaken of any region south of Mexico or of any group inhabiting the southern half of our hemisphere. During the first two decades of our century the study of Central and South American mammals continued to receive an increasing share of the Museum's efforts in mammalogy, under the leadership of Dr. Allen and Harold E. Anthony.

Numerous publications have resulted from this work. Outstanding among them are Dr. Anthony's account of "The Indigenous Land Mammals of Porto Rico," issued as a *Museum Memoir* in 1918; Dr. Allen's comprehensive review of the South American squirrels; G. H. H. Tate's systematic revision of the marsupial genus *Marmosa* (mouse-opossums); and the important full-length accounts of the mammals of Guatemala, of Costa Rica, and of Honduras prepared by George G. Goodwin. These and many other contributions will remain standard references for a long time to come and have established a permanent and important place for the Museum in the history of our knowledge of Central and South American mammals.

In 1920 the Department of Mammals was set up separately under Dr. Anthony. While research on the South American fauna continued, a rapid expansion of work on the mammals of the Old World followed immediately upon the creation of the new department. During 1911-1920 about 56 per cent of the publications on mammals dealt with those of the New World, and over 50 per cent with those of South America

alone, with only 15 per cent devoted to those of the Eastern Hemisphere. During 1921-1930 only one-third of the reports concerned the faunas of the Americas, while more than 40 per cent had to do with those of Asia alone, and about 15 per cent with those of Africa. This new pattern, which has persisted down to the present, marked the beginning of the great program of overseas explorations embarked upon by the new Department of Mammals under the leadership of Harold E. Anthony, with the aid of many of the good friends of our Museum who have supported and participated in the work.

Outstanding in importance among the numerous expeditions to the Old World are the Lang-Chapin expeditions to the Belgian Congo (1909-1915), Roy Chapman Andrews' Asiatic expeditions (1916-1930), the many expeditions to Asia and Africa organized by Arthur S. Vernay between 1923 and 1946, and the Richard Archbold Expeditions to New Guinea and Australia that are still being continued. The results of these and many other expeditions have formed the basis for numerous new discoveries and much new information about the mammals previously known to inhabit the Eastern Hemisphere.

In Africa the Museum has played a major part in developing our knowledge of the mammal fauna of the rain forests, through a series of reports on the mammals of the Congo chiefly prepared by J. A. Allen and also by Robert T. Hatt and others. A complete account of "The Mammals of Angola" by John Eric Hill and T. Donald Carter was published in 1941 in volume 78 of the Museum's *Bulletin*.

The Museum's contributions to the mammalogy of the Asiatic continent began with an important report by J. A. Allen on the mammals collected in northeastern Siberia by the Jesup expeditions, published in 1903. A number of papers by Dr. Anthony and T. Donald Carter have substantially increased our knowledge of the mammals of Burma, and a massive account of "The Mammals of China and Mongolia" by

Glover M. Allen was issued in two parts in 1938 and 1940 as volume 11 of the "Natural History of Central Asia."

Northern Australia and the Indo-Australian Archipelago, particularly New Guinea, represent another region in which the Museum's work has been of outstanding importance. Through a long series of reports G. H. H. Tate probably did more than any other scientist in modern times to increase our knowledge and understanding of the mammalian faunas in this part of the world. Dr. Tate's many studies of bats and his monographic account of the rodents of Australia and New Guinea are particularly fine examples of the high quality of his work.

Apes and monkeys have received considerable special attention in our research on mammals, both in the Department of Mammals and in the Department of Comparative Anatomy. In 1913 the Museum published Daniel Giraud Elliot's three-volume review of the Primates of the world. At his untimely death in 1944 Henry C. Raven left behind his great but unfinished work on the anatomy of the gorilla. The manuscript was completed and supplemented with additional studies by Dr. Raven's friends and associates under the direction of Dr. Gregory and was published by Columbia University Press in 1950 as a memorial to Dr. Raven.

There is never any clear line of separation between biological and paleontological research, only a practical division of labor. Because we are now living in the age of mammals, even this practical division becomes harder to maintain in the study of mammalogy than in research on other groups, the great ages of which were in the past, with much of their history already a closed chapter. Two very important contributions combining paleontological and recent evidence must therefore also be mentioned here, in connection with the study of the living mammals. In 1910 the Museum published Dr. Gregory's great treatise, "The Orders of Mammals." In 1945 it issued "The Principles of Classification and a Classi-

fication of Mammals" by George Gaylord Simpson, Chairman of the Department of Geology and Paleontology. Each in its time marked a turning point in the progress of mammalogy, and by these works the Museum has probably done more than any other institution in this century for the advancement of our understanding of the systematic relationships of all mammals.

It was undoubtedly the rich representation of South American birds in the Maximilian collection that caused the initial concentration on South America in the Museum's ornithological research. With a large collection already at hand it was natural to strive for its completion and perfection before expanding heavily into other fields. Until 1910 this objective was approached almost exclusively through a continued program of purchases and similar arrangements with independent collectors, whose material was turned over to the Museum for study, without previous investigation, and became the basis for a long series of scientific contributions to our knowledge of South American birds, notably through the work of Frank M. Chapman.

During the nineteenth century and the early years of the twentieth there had appeared a number of books dealing with the birds of a particular country or geographic region of South America. Although some of these books were very good for their time, none of them expressed, or could have expressed, the modern point of view in regard to the relationships of the bird faunas of the southern half of our hemisphere. It remained for Dr. Chapman to undertake this task for the first time. Even before 1900 he had begun to extend the Museum's own ornithological field work into the northern part of Central America and the West Indies. In 1910 an intensive and ambitious zoological survey of South America was inaugurated under his leadership, with birds and mammals as the primary objects of study. This project has been continued, with modifications, down to the present

and forms the largest single sphere of activity in the current program of the Department of Birds. Among the results, Dr. Chapman's two monumental volumes on the distribution of bird life in Colombia (1917) and in Ecuador (1926) published in the *Bulletin* of the Museum are outstanding. In these volumes, Dr. Chapman particularly examined the effects on the distribution of birds brought about by the uplift in recent geological time of the vast mountain system of the Andes extending through the tropics from temperate zone to temperate zone, with its peaks reaching the eternal snow. The volumes also provide a wealth of other information based on thousands of miles of personal exploration by the author.

John T. Zimmer's "Studies of Peruvian Birds" represent an important extension and refinement of the aims and methods of Dr. Chapman's work in Colombia and Ecuador. These studies, of which 65 have already been published by the Museum, have set new standards of precision and completeness in the pursuit and presentation of systematic research on birds. Each species occurring within Peru has been studied throughout its range, whether it extends to Alaska or to Cape Horn. These reports are therefore not limited by the arbitrary boundaries traditionally accepted for faunistic accounts and check lists, but enrich our knowledge of the birds of all regions in so far as they have any relationship to the fauna of Peru. Dr. Zimmer's investigations have become widely recognized as models for future research.

Although greatly overshadowed at first by the Museum's ornithological research on the South American faunas, work on the birds of North America was not neglected even at the beginning and received an increasing share of the effort until about 1910.

Dr. Allen did early and important research on the question of the geographical origin of the North American bird fauna and published a monograph on the subject that is still a

standard reference. Dr. Chapman's "Handbook of Birds of Eastern North America" was first published in 1895, has been reissued in many subsequent editions, and remains in wide use today. This was actually the first practical handbook on American birds for the general reader and must be counted as a pioneering effort for a trend in book publishing that has since grown to huge proportions.

During the first decade of this century the study of North American ornithology by the Museum reached a culmination, with more than half of all the Museum's publication on birds concerned with those of the United States and Canada, and neighboring regions in the north. This period of culmination was followed by a sharp decline in the proportion of research effort devoted to the study of the birds of North America. Articles on this subject practically ceased to appear in the Museum's own publications, although a small, but steady flow of contributions by the staff has found outlet in other series, especially in *The Auk*. Meanwhile, the staff of the Museum has continued to contribute to the enjoyment of our native bird life through numerous popular articles and several popular books, among which the "Audubon Bird Guide" to the eastern land birds and to the water birds, both by Richard H. Pough, Chairman of Conservation and General Ecology, and "Land Birds of America" by Robert C. Murphy and Dean Amadon of the Department of Birds are particularly worthy of note. Allan D. Cruickshank's "Birds around New York City," a special publication of the Museum issued in 1942, is also still in demand.

The separation of the two Departments of Birds and of Mammals in 1920 resulted, as we have seen, in a sudden expansion of work on the mammals of the Old World. A similar but less abrupt change has also characterized the development of the ornithological research program. At the time of the separation, much of the combined field work that had been initiated in the joint department was still in the

early stages of development and had to be carried forward separately in each of the new departments which therefore showed a good deal of geographic parallellism in the history of their independent existence. This has been particularly true of work in Africa, where the Museum has contributed more than any other institution to our knowledge of the rich and varied bird life of the tropical rain forests.

When James P. Chapin began his studies in the Belgian Congo in 1909, the rain forests of Africa were almost virgin territory for ornithological research. The results of many years of study in the field are incorporated in Dr. Chapin's four-volume "Birds of the Belgian Congo" published by the Museum. This is one of the greatest regional monographs in all the literature on birds. In addition to the systematic treatment of the species it is unusually rich in information about their life histories, and there is scarcely a biological subject from embryology to behavior that does not receive consideration.

But as the ornithological program advanced, it also developed needs of its own which could be met only by exploration under the Bird Department's own leadership.

A fundamental difference in the orientation of interest in regard to the mammals and to the birds of the world concerns the island faunas. It takes a fairly substantial land mass to support a rich and interesting mammal fauna. But birds occur in abundance almost everywhere, and the species and varieties they develop in island isolation present the biological sciences with some of their most interesting problems. The islands of the Pacific therefore offer a special challenge to the ornithologists.

The new Department of Birds immediately set about meeting this challenge. Through the generous support of the late Harry Payne Whitney it was able to launch, in 1920, the most comprehensive survey ever undertaken of the bird life of the Pacific islands, known as the Whitney South Sea

Expedition, which has continued at intervals over many years. In 1932 the already extensive Whitney collection was rounded out by the gift of the Rothschild collection of birds, presented by Mrs. Harry Payne Whitney and her three children, and the Museum became a world center of ornithological research unexcelled anywhere, particularly with reference to the Pacific. On the basis of the Whitney collections R. C. Murphy, Ernst Mayr, and others have been able to prepare for publication by the Museum some 60 contributions to our knowledge of the birds of the smaller islands of the Pacific.

The Archbold expeditions of the 1930's under the sponsorship of the Department of Mammals also served to extend the work of the Bird Department into the Indo-Australian region and particularly to the vast island of New Guinea. More than 20 publications by A. L. Rand, Ernst Mayr, and Dean Amadon dealing with the birds of this region have resulted, including Dr. Mayr's comprehensive "List of New Guinea Birds," published by the Museum in 1941. Field work in New Guinea has been continued down to the present by Thomas Gilliard whose pictures and observations of the birds of paradise and on other subjects have delighted a wide audience through lectures and articles in *Natural History* and *The National Geographic Magazine*.

Mainly on the basis of the Rothschild collection, Dean Amadon extended the range of the department's systematic work on Pacific island birds to the east in his "The Hawaiian Honeycreepers," which is an outstanding example of completeness in the treatment of an ornithological subject, taking into full consideration the physical geography of the environment, feeding habits, song, nesting and other aspects of behavior, diseases and parasites, comparative anatomy, and the evolutionary processes that together determine the existence, relationships, and distribution of the species.

Taken as a whole, the Museum's contributions to modern

knowledge of the bird life of the Pacific islands exceed those of any other institution. Out of this work has also come a greatly increased understanding of the basic principles of systematics and evolution applicable to all living forms, particularly through the work of Ernst Mayr, leading ultimately to the preparation of his book "Systematics and the Origin of Species," which has been widely accepted as the modern synthesis of its subject and a standard reference for all systematic workers.

While there are no birds that are independent of land at all times, there are those we call sea birds that are more associated with the life of the sea itself than with the land faunas, as clearly brought out for the first time in Robert C. Murphy's two-volume "Oceanic Birds of South America." This pioneering work, which has been equally well received by scientists and general readers, represents a major advance in our knowledge of the birds of the oceans and is a model for future work. Dr. Murphy, who succeeded Dr. Chapman as Chairman of the Department of Birds, is now engaged on the preparation of a comprehensive account of the petrels of the world, of similar scope.

Among other contributions to the knowledge of marine bird life issued by the Museum, a complete review of the gulls of the world by Jonathan Dwight holds an important place.

The organizational history of the Museum's work on reptiles and amphibians is a very checkered one, although still much simpler than the history of our dealings with such a subject as living invertebrates. When zoology was first divided into several departments in 1885, amphibians and reptiles were, paradoxically, included in marine zoology, under J. B. Holder. In 1887 the title of Marine Zoology was changed to Invertebrate Zoology, Fishes, and Reptiles. In 1891 reptiles and amphibians were combined with mammalogy and ornithology in a Department of Vertebrate Zoology under

the curatorship of J. A. Allen. After 1901 there was another interlude, shared with the fishes, in the Department of Invertebrate Zoology, until a Department of Ichthyology and Herpetology, under Bashford Dean, was created in 1909. This combination was finally dissolved in 1919 when separate Departments of Herpetology and of Ichthyology were established, as we know them today.

With a subject that was pushed around in this manner it was naturally not possible to get off to an early start in research. By 1910 the Museum's own publications had only four scientific papers dealing with reptiles or amphibians, but between 1910 and 1950 more than 110 such reports were issued. Although a substantial number of specimens were acquired with the first collections purchased at the founding of the Museum, the first impetus for the development of the research program in herpetology, which has added so greatly to the prestige of the Museum, must be credited to Mary C. Dickerson, who was placed in charge of the Department of Woods and Forestry in 1909, with the duties of Assistant Curator of Herpetology added in 1910, thus keeping the records of our dealings with reptiles and amphibians running true to form. Before coming to the Museum, Miss Dickerson had distinguished herself by preparing her monumental popular work, "The Frog Book," which to this day remains in wide use.

When Miss Dickerson became Curator of the newly established Department of Herpetology in 1919 the collections had grown to more than 50,000 specimens, largely through her own efforts and initiative in taking advantage of the opportunities offered by expeditions sent out by other departments and other institutions. With Karl P. Schmidt, now Chief Curator of Zoology at the Chicago Natural History Museum, as her assistant, Miss Dickerson concentrated her own research on the reptiles of the Southwest, based particularly on the collections made in Baja California

by the "Albatross" expedition of 1911. Several important contributions on this subject were published by herself and by Dr. Schmidt.

Prior to the publication of Dr. Schmidt's report on the amphibians and reptiles of Baja California and the near-by islands, the literature consisted of a confusing assortment of descriptions and minor reports. Dr. Schmidt presented the first real analysis of the fauna. He showed that it contained numerous elements in common with the deserts to the north. However, the partial or complete isolation of stocks on the peninsula or on the islands had accelerated normal evolutionary processes, and as a direct result the fauna is composed of an unusually varied assemblage of populations. Some stocks have become completely differentiated from parental stocks, while others show only minor differences. The region is therefore one of exceptional interest, and Dr. Schmidt's report not only integrated the available information but demonstrated how the fauna fitted into the general distributional scheme that began to emerge for the Southwestern desert region. Dr. Schmidt's efforts laid a firm foundation for more detailed studies dealing with the evolutionary phenomena so beautifully exemplified in the faunas of this region.

Another exploration of fundamental importance to the department's activities was the American Museum Congo Expedition of 1909-1915. Sponsored by the Department of Mammals and Birds, this expedition also gathered large collections of amphibians and reptiles, providing much material and information entirely new to science and stimulating to research. As a result of this and of other expeditions such as the Ruwenzori-Kivu Expedition of 1926 and 1927, and the Vernay Angola Expedition of 1926 the Museum has been able to make a major contribution to the advancement of our knowledge of African reptiles and amphibians through the publication of a series of reports by Dr. Schmidt and by the

late G. Kingsley Noble, who joined the department in 1919 and became its head in 1923 on the death of Miss Dickerson.

Innumerable reports dealing with restricted portions of Africa or individual species or genera have been published by European students, but the reports emanating from the American Museum are virtually the only studies that deal with the continent as a whole. Beginning with the publication in 1919 of Karl P. Schmidt's report on the turtles, crocodilians, and lizards, the Museum has published four major contributions to our understanding of the fauna of the African continent. While the reports of Dr. Schmidt on the reptiles and the report of G. K. Noble on the Amphibia were based primarily on the collections from the Belgian Congo, each attempted to integrate information for the continent as a whole. Dr. Schmidt emphasized faunal areas and summarized the distributions of African reptiles. Dr. Noble not only summarized the available information concerning distributions of the Amphibia but ascertained their origins and affinities. He also provided a check list for the Amphibia of Africa that has not been supplanted after thirty years' use.

By 1940 the Museum had obtained material from many parts of Africa. Thus, when the snakes obtained by the Vernay Angola Expedition were studied it became possible to extend the investigation to encompass virtually all of the snake genera in Africa, and C. M. Bogert worked out the relationships of the various elements, finding that the most important and widely distributed family could be divided into three major groups, with seventeen sub-groups, each of which is composed of closely related genera. The studies of Drs. Schmidt, Noble, and Bogert, therefore, have paved the way for a comprehensive understanding of the amphibians and reptiles of Africa.

The Central Asiatic Expeditions under the leadership of Roy Chapman Andrews extended the herpetological activities of the Museum into another part of the world. Clifford H.

Pope, who was attached to these expeditions from 1921 to 1926, became a member of the Department of Amphibians and Reptiles in 1923. His researches resulted in a series of publications on Asiatic reptiles culminating in his monumental account of "The Reptiles of China," which appeared in 1935 as volume 10 of the "Natural History of Central Asia" issued by the Museum. Through this publication, and the collections behind it, the Museum has been established as the main source of information on the reptilian fauna of a large portion of the Asiatic continent. Representative collections from other parts of Asia have also been acquired, but little has been published on them.

The Department of Amphibians and Reptiles has benefited from field work done overseas by other departments but has had few expeditions of its own outside the Western Hemisphere. One notable exception was the Douglas Burden expedition of 1926 to the Komodo Islands in the Dutch East Indies in search of the famous giant lizards that reach a length of up to nine feet. The expedition succeeded in bringing back material for a unique and spectacular exhibit, and a fine research collection. A number of both popular and scientific articles on the giant lizards as well as other reptiles and amphibians of the East Indies were published by Mr. Burden and by Emmett Reid Dunn.

As a result of the Whitney South Sea Expedition, the Museum has been able to contribute more than any other single institution to our knowledge of the amphibians and reptiles of the Pacific islands, chiefly through the researches of Charles E. Burt and of Dr. Schmidt. During the Second World War this knowledge proved very helpful to our armed forces.

A number of collections obtained by the Archbold Expeditions to New Guinea and to Cape York have extended the Old World domain of the Department of Amphibians and Reptiles southward to include Australia in its collections and in its research.

While the department's activities have covered the world and have played a major role in the advancement of our systematic knowledge of the faunas of many regions in the Eastern Hemisphere, such as China, the East Indies, and the Pacific islands, extensive work has also been done on the reptiles and amphibians of the New World.

Collections from the Americas, including the West Indies, surpass those from other parts of the world. They include collections from every state in the United States as well as every country in Latin America. Beginning in 1907 with the report by Alexander G. Ruthven on a collection of amphibians and reptiles collected in southern New Mexico and Arizona, the department has devoted considerable attention to the fauna of the United States. The results of approximately twenty investigations have been published, including monographs of genera, and life-history, ecological, faunistic, and behavioral studies. South of the international border particular effort has been made to ascertain the nature and the extent of the interdigitation of tropical and temperate zone faunas, particularly along the Pacific coast in the Mexican state of Sonora. A study of the amphibian and reptile faunas of Sonora revealed an extensive interpenetration of the Middle North American fauna by tropical elements, especially in the *barranca* region in the southeast portion of the state.

Early in the century the Museum acquired representative collections from Nicaragua. While these are not exhaustive, they remain unsurpassed. Dr. G. K. Noble published an account of amphibians in this collection in 1916. Other portions of Central America are not so well represented, although extensive material from Honduras has been acquired, and Archie F. Carr, Jr., is preparing an account of the amphibians and reptiles from that country. His published report covering animal habitats in Honduras provides a sound ecological background for his forthcoming discussion of the fauna.

Collections from South America have been accumulating since the founding of the Museum. In 1931, Charles E. Burt made an extensive study of the lizards in the collection, the results of which appeared in the *Bulletin* in 1931. Previously Dr. Noble had described several of the frogs represented. Later Emmett R. Dunn monographed several of the obscure amphibian genera. James A. Oliver's monograph of the snakes of the genus *Thalerophis* is an outstanding contribution to our knowledge of herpetology in Latin America. The snakes included in the genus are widely distributed from Mexico southward throughout the New World tropics, so that his study provides an invaluable basis for an understanding of distributional patterns.

Collections have been obtained from a number of the West Indian islands, only a few of which have been subjected to intensive study. The most noteworthy are Karl Schmidt's investigations of the amphibian and reptile faunas of Navassa Island, published in 1921, and his work on the herpetology of Santo Domingo, which appeared the same year. Several papers dealing with the amphibians and reptiles of Beata and Hispaniola have also appeared, and Drs. Noble and Klinge provided an exhaustive account of the reptiles of Great Inagua Island.

In ornithology, the Museum's research on the systematics of the island faunas, in particular, raised problems of genetics in relation to the origin of species which led Dr. Mayr into a fruitful series of investigations of the laws of heredity in natural populations. The systematists' work in herpetology has also led into other fields in which the Museum has made important contributions of general significance.

Realizing that in order to understand the relationships, adaptations, and distributions of the species it is necessary to know and understand their life histories and their behavior, Dr. Noble broadened his researches to cover a wide variety of problems in amphibian biology and became one of the early

and foremost pioneers of modern systematics. He dealt with such diverse phenomena as the anatomical modifications correlated with the development of a respiratory function of the skin, and voice as a factor in the mating of amphibians, with zoogeographic problems, and with the habits of amphibians having specialized modes of reproduction, including the carrying of the developing eggs in special pouches on the back or in the vocal pouch. He experimented with blind cave salamanders, demonstrating that the genes for eye structures were present but required the action of light for their expressions. He showed that the castration of some salamanders resulted in modifications of the teeth, and he investigated the significance of secondary sexual characters in the courtship of tailed amphibians.

These extensive researches provided the foundations for a general work that summarized virtually all that was known concerning the structure, habits, behavior, life histories, distribution, and systematics of the moist-skinned land and water-dwelling vertebrates. Dr. Noble's book "The Biology of the Amphibia" was published in 1931, and after more than twenty years of use it remains unsurpassed as a source of general information, even though there have been extensive changes in the systematic arrangement that Dr. Noble adopted.

Meanwhile, Dr. Noble's increasing interest in the problems of experimental morphology and behavior led to a change in the name of his department, which became known as the Department of Herpetology and Experimental Biology in 1928. A few years later the Department of Experimental Biology was set up as a separate administrative unit, although Dr. Noble continued as Curator of both departments.

After the death of Dr. Noble, the two departments were completely separated, with Charles M. Bogert in charge of the Department of Amphibians and Reptiles which he had joined as a member of the staff in 1937. In his work on the reptiles of the United States and Mexico Mr. Bogert also ran

into problems that could be solved only by a study of physiology and behavior, a fact that has led him to undertake a long-continued study of the temperature tolerance of the various species and the variations in behavior by which these animals, without internal temperature controls, are able to adjust themselves to differences in climate and environment. Through these investigations we have gained a new insight into the complexities of distributions and relationships among our American amphibians and reptiles. Closely related species in a variety of environments and climates prove to maintain practically the same body temperature. The ability to maintain constant temperatures by adjustment of activities to circumstances relates not only to the heat of the sun but also to moisture and other factors, and the studies of the temperature sensitivity and responses of our amphibians and reptiles have opened up an entirely new field of research in which one may hope to find the answer to much that has seemed puzzling and contradictory in the occurrence, behavior, and relationships of these animals the world over.

Until 1920, when it was set up as a separate department headed by Bashford Dean, ichthyology kept company with herpetology through a complex organizational history already described. Until 1910 only a few scattered publications on fishes had been issued by the Museum, but between 1910 and 1920 there was a great increase in research activities which has been maintained down to the present. Dr. Dean, who had been a curator at the Museum since 1907, was himself particularly interested in the more primitive kinds of fishes, in which one might seek an understanding of the origins of vertebrate life and of the basic relationships between its higher forms. His contributions to our knowledge of the anatomy and development of hag fishes, bowfins, sturgeons, and primitive sharks remain among the most important sources of information of great significance for the study of vertebrate evolution.

Dr. Dean's occupation with evolutionary problems soon carried him from the study of primitive living forms into investigations of the armored fossil fishes. This in turn brought about an interest in the structure and functions of armor of all kinds and led him to become an expert on the historical development of human armor, and to transfer his duties to the Metropolitan Museum of Art in 1912 as Curator of Arms and Armor. This is an interesting story in itself, but its details do not properly belong here.

Dr. Dean left behind him a mass of notes and partially worked material. Various of his colleagues completed these studies, which under the editorship of Eugene W. Gudger were published as a tribute to Dr. Dean in a massive volume of enduring significance entitled "The Bashford Dean Memorial Volume—Archaic Fishes."

A very important undertaking launched by Dr. Dean was the preparation of "A Bibliography of Fishes." The first two volumes of the 2700-page work were edited by the late Charles Rochester Eastman; the last volume was edited by E. W. Gudger. Both worked directly with Dr. Dean. This great work of reference to the ichthyological literature remains in constant demand by all students of fishes, and the classification and indexing of the subsequent literature have since been continued by Dr. Gudger. Although no supplementary volume has yet been published, the progressive reference file is also of the greatest usefulness to the department and to all others who have need to consult it.

A large share of the Museum's work on the identification, description, and classification of fishes has over many years been borne by J. T. Nichols who joined the organization in 1909 and still continues actively as a curator emeritus. In his published investigations, Mr. Nichols has dealt with the fishes of many seas and several continents. Deep-sea fishes from the Pacific, shore fishes from the west coast of Central and South America, shallow-water fishes from the West

Indies to northwest Greenland, and the fresh-water fishes of China and the Congo have all come under his scrutiny and formed the basis for new contributions to our knowledge, among which one might mention as an outstanding example "The Fresh-water Fishes of China," published by the Museum in 1943 as volume 9 of the "Natural History of Central Asia." The interested public is also well acquainted with Mr. Nichols' book on "Representative North American Fresh-water Fishes" (1942).

Francesca LaMonte, in her early work, made many contributions to our knowledge of South American and African fresh-water fishes. Subsequently her efforts have been directed mainly to the study of the classification of the sword-fishes and sailfishes, with full consideration of their anatomy, ecology, and distribution. Her opportunities to pursue the investigation of these giant fishes, of which collections cannot easily be made and maintained by any Museum, have been greatly increased by the International Game Fish Association, founded in 1939 by Michael Lerner, with Miss LaMonte serving as its secretary. The value of having this association with its worldwide sources of information and material connected with the Museum has been immense and has enabled Miss LaMonte and the Department of Fishes and Aquatic Biology to reach a position of international authority on some of the most interesting fishes of all oceans. Apart from her many technical publications, Miss LaMonte has also served a wide public through her authorship of several books for general use, notably the "North American Game Fishes" (1946) and the "Marine Game Fishes of the World" (1952).

Among those who have exerted a major influence on the development of the Museum's work on fishes in particular and on vertebrates in general, William K. Gregory occupies a most important place. Dr. Gregory first came to the Museum in 1899 as an assistant to Professor Osborn in the study of vertebrate paleontology. His strong interest in the

functioning of the animal body and particularly in the mechanics and dynamics of the skeleton caused him to devote even more of his energy to the study of living species than of fossil remains. In 1920 a separate Department of Comparative Anatomy was established under Dr. Gregory's leadership. Much of the work of this department, which was discontinued after Dr. Gregory's retirement, has already been dealt with in the account of the Museum's work on mammals. From 1925 until his retirement in 1944, he was also in charge of the Department of Fishes. Among the many important contributions to our knowledge of fishes that we owe to Dr. Gregory is his great memoir on "Fish Skulls: a Study of the Evolution of Natural Mechanisms," which is indispensable to any student of ichthyology or general vertebrate anatomy. Dr. Gregory and his associates Henry C. Raven, G. Miles Conrad, and Francesca LaMonte also brought the comparative anatomical point of view to bear on many special investigations of particular groups of fishes such as swordfish, sailfish, ocean sunfishes, and others. Dr. Gregory's influence on the development of systematic ichthyology has been widely felt, both among his colleagues and among many others who were drawn to the subject through Dr. Gregory's enthusiasm. These include Michael Lerner whose appreciation of the sport of game fishing grew into a broad interest in and support of marine research, with the creation of the Lerner Marine Laboratory at Bimini as one of its many results of immense value to science and to the Museum.

Before joining the regular staff of the Museum when he became Chairman of the Department of Fishes in 1944, Charles M. Breder, Jr., had, as a Research Associate of the Museum and member of the staff of the New York Zoological Society, made numerous contributions to the systematic classification of the fishes of various regions and groups, particularly the marine fishes of the West Indies and the fresh-water fishes of Panama. He had also been the first

modern investigator to put our knowledge of the flying fishes into a usable order and had helped to advance general knowledge of our fishes by his very useful "Field Book of Marine Fishes of the Atlantic Coast."

Since assuming his duties at the Museum, Dr. Breder has been more concerned with the study of biological factors involved in our understanding of systematic relationships and with the investigation of ecological problems than with the direct study of classification itself.

Among the many problems related to systematics to which Dr. Breder has addressed himself is the question of the nature of the evolutionary processes whereby cave fishes become colorless and blind. Early in these investigations, it became evident that the endocrine glands play a role of tremendous importance, and a study of their functions and significance was taken up by Priscilla Rasquin and her associates under Dr. Breder's direction. The splendid facilities of the Lerner Marine Laboratory have given opportunity to supplement the study of fishes inhabiting the total darkness of caves with comparative investigations of those living in the strongest light of day. The results will contribute to our systematic knowledge of fishes as well as to our understanding of many physiological problems and aspects of animal behavior.

The history of the shifting assignments of living invertebrates within the Museum is so extraordinary as to offer a certain fascination of its own. When a separate Department of Ornithology and Mammalogy was established in 1885, a Department of Marine Zoology, under J. B. Holder, was also introduced. In spite of its title this department also included insects, and would seem to have been a catch-all for everything except mammals and birds. But not quite. The very definitely marine zoological subject of conchology turns up as the surprise ending to the title of the Department of Geology and Mineralogy, in which it remained until 1909. Meanwhile invertebrates other than mollusks enjoyed inde-

pendence for a couple of years, and the company of fishes and reptiles for a couple of years more until 1891, when insects were set up separately as a Department of Entomology, while the rest joined the mollusks in the Department of Geology for the next ten years. In 1901 the mollusks were again left behind in Geology, while a Department of Invertebrate Zoology was set up separately for the second time under Hermon C. Bumpus. From 1903 to 1909 this department was headed by a famous entomologist, William Morton Wheeler, although the Department of Insects continued its separate existence under William Beutenmüller until 1909. In 1909 there was a great reunion of insects, mollusks (from Geology), and the other invertebrates in a Department of Invertebrate Zoology under Henry E. Crampton. This union lasted until 1921, when the Department of Insects, which has remained independent since that time, was separated from a Department of Lower Invertebrates under Roy Waldo Miner. On the retirement of Dr. Miner and other staff members, the economic situation of the Museum made it necessary to leave positions unfilled, and the scientific staff concerned with lower invertebrates shrank to a single assistant curatorship. Because the work of the department was almost entirely concerned with aquatic invertebrates and requires the same kinds of field equipment and methods as are used in the study and collecting of fishes, the department was finally, in 1944, incorporated in the present Department of Fishes and Aquatic Biology, under Dr. Breder.

In a subject as broad as that of living invertebrates, other than insects, it is impossible for any institution to undertake to contribute to research on all groups. While the entire field must be represented in proper balance in our exhibits and in the information conveyed to the public by other means, the search for new knowledge must be limited to specific subjects.

Some of the earliest collections obtained by the Museum consisted of shells. The Jay collection, acquired in 1874,

contained some 50,000 specimens. In time other fine collections, such as those of Haines and of Constable, were added. The collection as a whole is now one of the best in this country and is becoming more valuable through the systematic revision of its parts currently carried on by William J. Clench of the Museum of Comparative Zoölogy of Harvard College.

In spite of the outstanding collection, the study of mollusks did not play a major role in research by the Museum's own staff until 1909, although a few contributions had been made from time to time, beginning with the first paper on living invertebrates published in the Museum's own series in 1882, and including L. P. Gratacap's catalogue of the Binney and Bland collection of land mollusks of the United States and territories published in 1901.

When Dr. Crampton took charge of the living invertebrate collections in 1909, he brought with him the rich material of land snails that he had previously collected in Polynesia and continued here at the Museum the pioneering investigations of evolution in process that resulted, in 1917, in the publication of the first report on systematic relationships in the genus *Partula*, which has become a landmark in the progress of our understanding of the origin of species. Dr. Crampton left the Museum in 1921, but since 1943 has again been pursuing his important studies here as a Research Associate of the Department of Fishes and Aquatic Biology.

The fact that the Museum has not had a specialist on mollusks on its staff for more than 30 years does not mean that the collections have been idle. On the contrary, the material has found a very active use in research. By arrangements with Henry A. Pilsbry of the Academy of Natural Sciences of Philadelphia and William J. Clench of the Museum of Comparative Zoölogy of Harvard College, several papers by these distinguished experts have appeared in the Museum's publications, including two major works in which Dr. Pilsbry,

and Drs. Pilsbry and J. Bequaert, render full account of the land and fresh-water mollusks of the Belgian Congo.

We owe to Willard G. Van Name an orderly and integrated knowledge of two very different groups of the invertebrates of our hemisphere, as well as the first discovery of a large number of the species. In 1936 the Museum published, as volume 71 of the *Bulletin*, Dr. Van Name's complete account of the American land and fresh-water isopod Crustacea, with two supplements issued in 1940 and 1942. In 1945 a similarly monographic treatment, "The North and South American Ascidians," appeared as volume 84 of the *Bulletin*. The ascidians, also called tunicates or sea squirts, are an extremely interesting group of aquatic invertebrates that conceal their high place on the evolutionary scale under a bag-like external appearance. Both works remain the final authoritative sources of information about the animals they deal with in the Western Hemisphere.

The Museum has also been able to contribute to our knowledge of many other groups of invertebrates investigated by associates of the staff. Notable among these contributions are series of reports on rotifers by Frank S. Meyers, on annelids (marine worms) by Aaron L. Treadwell, and on hydras and on Turbellaria (flatworms) by Libbie H. Hyman. Dr. Hyman's great treatise "The Invertebrates" is a contribution of major importance, of which three volumes have already been issued. No comparable publication has appeared in the English language since before 1910.

The organizational history of entomology at the Museum up to the time when the Department of Insects gained its final independence under Frank E. Lutz in 1921 has already been covered in our account of living invertebrates. After the death of Dr. Lutz, Herbert F. Schwarz generously served as chairman, without compensation, from 1943 until 1946 when Mont A. Cazier took over after his return from service with the armed forces.

The Museum did not begin publishing research on insects until after 1890. Since that time more than 650 publications have appeared in the Museum's own series, more than 560 of these after 1910. As in the case of all other subjects, a large number of contributions by the Museum's own staff have also been published elsewhere. From 1890 to 1910 about three-fourths of the total output had to do with North American insects. Since 1910, the insects of North America have received an average of two-fifths of the Museum's entomological efforts, and this proportion of attention would seem to have become fairly stable.

From 1892 to 1903 the Museum owed its contributions to entomology almost exclusively to William Beutenmüller whose special interests during this period were moths and butterflies. Numerous papers appeared in the *Bulletin*, and a complete account of the clear-wing moths (Sesiidae) of America north of Mexico, which was published in the *Museum Memoirs* in 1901, remains the basic reference for this group even today. Included among Mr. Beutenmüller's publications was a series of five descriptive catalogues of insects found within 50 miles of New York designed for general as well as scientific use.

From 1903 to 1909 William Morton Wheeler served as head of the Department of Invertebrate Zoology, and during this period the Museum's contributions to entomology sprang from two departments, with Mr. Beutenmüller in the Department of Entomology now concentrating his research upon the gall-forming insects and publishing many reports of lasting usefulness on this subject, while Dr. Wheeler brought great prestige to the Museum by his work on ants and other social insects.

Although Dr. Wheeler left for Harvard University in 1909, his association with the Museum continued for many years, and results of his research were published by the Museum as late as 1936. Dr. Wheeler's reports on the fungus-growing ants of North America and on the ants of the

Belgian Congo are classics of entomology, and his books "Ants: Their Structure, Development and Behavior" and "The Social Insects" are still basic and widely read sources of information about subjects on which Dr. Wheeler gained world-wide fame.

Shortly after 1900 the results of the work of Research Associates begin to appear in the Museum's publications on insects. All departments of the Museum have enjoyed the benefits of research by voluntary associates among university scientists and others who have examined our collections and participated in the research program. But in no other field of investigation of living forms have the associates been so numerous and their work so important for the total output as in the study of insects. Unfortunately it is not possible to mention all who have participated, but some have maintained their active association longer than others and have done more to increase the Museum's contributions to our systematic knowledge of the living world.

A report by a member of the Museum's own staff of outstanding importance for our understanding of bees and for the advancement of entomological research methods was Charles D. Michener's account of their comparative external morphology, phylogeny, and classification published in 1944. But apart from Dr. Michener's investigations, the Museum has depended largely upon its associates and collaborators for the study of bees.

From 1907 to 1940, T. D. A. Cockerell contributed to the Museum's publications a large number of papers on this subject. Work on the same group has been carried on by Herbert F. Schwarz since the 1920's, with Mr. Schwarz's monumental account of the stingless bees of the Western Hemisphere, published by the Museum in 1948, as one of the many invaluable results. The Museum is also deeply indebted to Mr. Schwarz for serving as temporary chairman of the department during the Second World War.

Interesting reports, particularly on parasitic insects, have been prepared by Charles T. Brues. A complete monograph on the cockroaches of the West Indies by James A. G. Rehn and Morgan Hebard was issued in the Museum's *Bulletin* in 1927, and remains the standard reference to this subject.

The rich collections brought back by the Belgian Congo expeditions attracted the cooperation of many experts outside the Museum's own staff. Among their many contributions W. J. Holland's systematic list of the moths and butterflies of the Congo, and Alfred E. Emerson's account of the termites of the Belgian Congo and the Cameroon are of particular importance.

After the death of Mr. Beutenmüller in 1934, the Museum's research on butterflies and moths was pursued mainly by associates and other collaborators until the appointment of Charles D. Michener to the staff in 1942. Among those who carried on in the meanwhile were W. J. Holland, already mentioned above, James H. McDunnough, Alexander B. Klots, and Cyril F. dos Passos. The work of these experts has resulted in many important publications offered by the Museum, including Dr. McDunnough's revision of the North American species of one of the major genera of inch-worm moths.

Since he came to the Museum in 1949, Frederick H. Rindge has also made several contributions to our knowledge of the inch-worm moths and, with Claude I. Smith, prepared a major revision of the beautiful day-flying moths of the genus *Annaphila* of western North America, which was published in 1952. Other Museum publications on moths include a monographic account of the saturniid moths of the Western Hemisphere (1952) by Dr. Michener, who has continued as an associate of the Museum after he left for the University of Kansas in 1948.

The work on butterflies has also benefited greatly from the efforts of the late Frank Johnson, who helped create the outstanding collection of tropical butterflies, and whose

support first enabled the Museum to secure the part-time services of William P. Comstock. Mr. Comstock's work has done much to increase our knowledge and understanding of West Indian butterfly faunas. He has recently finished a review of the butterflies of the American tropics of the genus *Anaea*, which the Museum hopes to obtain the means to publish with full color illustrations of the beautiful species.

Research on beetles began with the studies of Andrew J. Mutchler, who retired in 1938 after 42 years of service in the Museum. Mr. Mutchler was usually joined in his efforts by Charles W. Leng, and their list of the beetles of the West Indies (1914), account of the water beetles of Florida (1918), and descriptive catalogue of the West Indian tiger beetles (1916) still retain their usefulness. Although in no way connected, it is interesting to note that the tiger beetles of North America today form the subject of a long-continued and intensive investigation by the Chairman of the Department of Insects, Dr. Cazier. The purpose of this investigation is not merely to improve our knowledge of tiger beetles but also to deepen and refine the methods and concepts of systematic research generally. An "Introduction to Quantitative Systematics" by Dr. Cazier and Annette L. Bacon has already appeared in the Museum's publications as an important byproduct of these studies.

Among others who have in recent years been working on beetles is Patricia Vaurie whose revision of the Mexican and North American weevils, commonly called bill-bugs, of the genus *Calendra* is important.

The monumental catalog of the Coleoptera (or beetles) of North America north of Mexico was initiated by Charles W. Leng, Research Associate, and supplemented by Mr. Mutchler and Dr. Blackwelder of the Museum staff.

Little work on flies had been done by the Museum until C. H. Curran joined the staff in 1928. Since that time the Museum has attained a leading position on this important

subject mainly through Dr. Curran's numerous investigations and publications. These include a series of reports on the flies of Africa, a full-length account of the flies of Kartabo, British Guiana, and a complete review of the families and genera of North American flies, which is an indispensable standard reference for all who study the innumerable forms of this tremendous group of insects.

The subject of wasps has also received the Museum's attention from time to time, with two major contributions published in our series. A comprehensive revision of the Vespidae of the Belgian Congo by J. Bequaert of the Museum staff appeared in 1918; a similar revision of the tarantula-hawks, or giant wasps, of North America, by Paul David Hurd, Jr., of the University of California, was published in the Museum *Bulletin* in 1952.

To the scientific purists spiders are not insects, but to most people they are and in our Museum's organization they are placed together in the same department. The Museum's work on spiders was initiated by Alexander Petrunkevitch of Yale University, who served as Honorary Curator of Arachnida from 1909 to 1911 while preparing the 800-page index catalog of the spiders of the Western Hemisphere which was published as volume 29 of the Museum's *Bulletin* in 1911 and still remains a fundamental reference for all students of the spiders of the New World. A regular staff position for the subject of spiders was established in 1932 with the appointment of Willis J. Gertsch. Through Dr. Gertsch's efforts the Museum has become the center of research on spiders in the Western Hemisphere. His own research has included among many other studies a revision of the crab spiders of North America, and his activities have attracted the cooperation of many other experts whose papers have appeared in the Museum's series. His revision of J. H. Comstock's "The Spider Book" and his own book "American Spiders" have also found a wide circle of readers.

The interests of Dr. Frank E. Lutz who served as head of the Department of Insects and Spiders from 1921 to 1943 were not especially focused on the systematic investigation of any particular group but were broadly oriented towards the study of the life of all insects. His two books "Field Book of Insects" and "A Lot of Insects" have done much to increase the public's knowledge and enjoyment of the insect world around them.

THE YEAR 1953-1954

When museum activities are recorded separately for arbitrary twelve-month periods, the record seems very uneven from year to year. It is only in the historical perspective and in the context of long-range plans that the true picture of steady progress is revealed. This is one of the chief reasons for the form of presentation now adopted for the main body of these reports, such as the preceding review of the Museum's contributions to the advancement of systematic knowledge in the biological sciences.

The year 1953-1954 found an unusually large proportion of projects, and even entire departmental programs, in midstream. It is probably not pure coincidence that this state of affairs should have been so general throughout the Museum at this particular time. In the immediately preceding years the completion of activities interrupted or delayed by the Second World War and its aftermath in Korea had occupied a large share of our time both in exhibition and in research. As these tasks reached or approached their goals, with the final opening of such exhibits as the Felix Warburg Memorial Hall, the Whitney Memorial Hall, the Hall of North American Mammals, and in the publication of many major works based on Museum research, a new exhibition program was inaugurated and new research projects were launched. The initiation of most of these new undertakings has already been reported previously, but most of them are still of too recent origin to

enable us to add much about their results at this time. This is true of exhibition, exploration, and research.

The final dedication of the splendid Hall of North American Mammals, on May 18, 1954, with seven new habitat groups not previously open to the public, may be said to mark the end of the great backlog of deferred work of a major order. Now free to concentrate their efforts on the new program, curators, artists, and designers made great strides in the preparation of the Hall of Human Biology, the installation of the new Hall of American Forests, and the development of plans for other new halls called for in the program.

On April 7, 1954, a new alcove telling the story of "Fishes Through Time" was added to the series of fossil exhibits on the fourth floor, which trace the course of evolution through reconstructions of the life of the past. But it will be some time yet before any of the larger units of the new permanent exhibition program will be completed and ready for presentation.

In the meantime several temporary exhibitions of considerable interest have been placed before the public. The "Transparent Woman," a life-sized plastic model revealing the major organ systems of the female body, attracted much attention during the early months of 1954. Intended to become one of the features of the future Hall of Human Biology this exhibit was put on temporary display to mark the final transfer to this Museum of the collections of the American Museum of Health. In connection with the remodeling of the Seventy-seventh Street Foyer another temporary exhibition on "How Exhibits Are Made" has served the dual purposes of trying to satisfy a rather widespread curiosity among our visitors and of testing the use of new materials, forms, and color schemes in museum display.

Through the initiative of the grandchildren of Oscar S. Straus, a very significant feature was added to the Roosevelt Memorial Hall under the care of the Museum. On October 27 a permanent exhibition illustrating "The Life of Theodore

Roosevelt" was opened to the public. By means of photographs, letters, selected items from the contemporary press and periodicals, books, and personal articles, these exhibits attempt to create an understanding of Theodore Roosevelt as a well-rounded individual—devoted family man, author, naturalist, and explorer—as well as a statesman and leader of the nation. It is obvious from the interest shown by our visitors that these exhibits have added greatly to the message of the Roosevelt Memorial Hall. The physical appearance of this hall was also much improved by the installation of eight new American, state, and city flags presented by Mrs. William H. Good.

THE GUIDE-A-PHONE

An important development related to the exhibition program was the introduction of guide-a-phones for the use of our visitors in April, 1954.

Early in 1953 the Museum learned through W. Douglas Burden of experiments made in Holland with the use of individual hearing devices by which museum visitors could receive wireless lectures and guidance as they studied the exhibits, without interfering with the enjoyment of others who may prefer silent contemplation at their own pace, with information received by other means.

After much study and trial an instrument designed from parts readily available in this country was developed by the Museum's own technicians to meet the special requirements of an American institution and its public. Five exhibition halls were wired for the transmission of a carefully prepared lecture on the subject and exhibits of each, and 125 individual receiving units were built. These units are rented to the visitors for a modest fee to cover service, maintenance, and further development, and have been so enthusiastically received by the public that a great expansion of this operation is now contemplated.

FIELD WORK AND RESEARCH

Much of the field work completed during the year had already gotten under way before the year began, as mentioned in the last report.

Returning from the Admiralty Islands, Margaret Mead reported changes in the Manus society as dramatic as have ever occurred in any culture. She found that in the 25 years since her previous study was made these people have moved from the edge of the Stone Age and a war-like existence in ignorance of the outside world to a point where they are interested in the most complex ideas of our century and have attempted to remodel their society on what they think an American town is like. When completed, the results of her studies should contribute greatly to our understanding of the dynamics of human society.

Harry Tschopik, Jr., completed his survey of Indian tribes of the upper Amazon of Peru and returned in the late fall with 4500 feet of motion picture film of Indian life, in sound and color, among the valuable records and collections he brought back.

Through the support of President White the Department of Anthropology was able to take the first steps towards creating an archive of documentary films of native ways of life that are now disappearing or likely to be seriously altered by contact with Western civilization. Victor Jurgens was engaged to make two such films for the Museum, in north-western Guatemala and in the Xingu region of Brazil, as a pilot enterprise for the larger plans long cherished by Harry Shapiro, Chairman of the Department of Anthropology. The first of these two films is already completed, and the second is in preparation.

Two privately sponsored expeditions made collections and observations for the Anthropology Department. Mr. and Mrs. Claude Bernheim conducted an expedition across the Sahara from the Atlas Mountains to French Equatorial

Africa, making a documentary film record of the life of the Tuaregs and other tribes of the region.

On the American Museum Thailand Expedition, which left in the fall of 1953 and is still in the field, Robert W. Weaver and Thomas L. Goodman are making intensive studies of various native peoples, especially in the more remote areas, making collections of objects illustrating their culture, tape recordings of their speech and music, and film records of their ways of life. The material that has already come back to the Museum gives promise of a very successful completion of this investigation of an inadequately known region, which has previously been poorly represented in the collections of the Museum.

James A. Ford spent some months at Point Barrow, Alaska, at the invitation of the Peabody Museum of Harvard University studying archeological sites along the Arctic coast.

Mr. and Mrs. Carveth Wells brought back an important ethnographic collection from Formosa and a neighboring island, where they had made an expedition for the Museum.

The Fourth Archbold Expedition to New Guinea returned towards the end of 1953 with collections of tremendous value, particularly to the Department of Mammals with which these expeditions are associated. A total of 98,000 specimens of all kinds were brought back, including the first comprehensive mammal and plant collections from eastern Papua and one of the best collections of insects and spiders made in that area.

The Department of Mammals also received a very important collection of 541 specimens from the Morden African Expedition of 1953, and some very desirable material from Spain as a result of the First Van Alen Iberian Expedition. Both expeditions were initiated during the previous year and have already been mentioned in the last report.

A notable event for the Department of Birds was the Sepik River Expedition to New Guinea under the leadership

of E. Thomas Gilliard. This undertaking, sponsored jointly by the Museum, the National Geographic Society, and the Explorers Club, was attended by remarkable success under difficult circumstances complicated by native unrest. The party left in October, 1953, and returned in the beginning of July, 1954, after extensive field work on the Sepik River and in the unexplored Victor Emanuel and Hindenburg mountain ranges. More than 10,000 feet of color film of exceptionally good quality was obtained, particularly of the picturesque bird life of the region, and numerous specimens were collected.

Robert C. Murphy, Chairman of the Department of Birds, spent five weeks conducting a field investigation in Peru for the National Guano Administration.

Charles M. Bogert pursued his investigations of the temperature requirements and adjustments of reptiles and amphibians in Arizona, California, and Mexico. He also made recordings of natural sounds, particularly the voices of amphibians during their mating activities. An abstract of these recordings has been released as a documentary record entitled "Sounds of the American Southwest."

The Department of Fishes and Aquatic Biology concentrated its field work at the Lerner Marine Laboratory which had a very active and successful year, accommodating 36 workers engaged upon some 22 different research projects.

The Department of Insects had a very active season in the field during the summer and early fall of 1953. Mont A. Cazier, Chairman of the department, spent five weeks in western United States and in Mexico collecting fall broods of tiger beetles for the study of the variability of populations. Many insect species show great differences between their broods according to the season in which the broods are hatched, and the phenomenon is one of general biological interest.

Willis J. Gertsch spent more than two months in California and Baja California collecting spiders in a region from which

comparatively little has been known about these members of the fauna. Many new species were discovered. Frederick H. Rindge collected inch-worm moths in Wyoming, and Patricia Vaurie devoted nearly three months to the collecting of tiger beetles in central Mexico.

Lester R. Aronson, Chairman of the Department of Animal Behavior, returned in March, 1954, after nearly a year's field work in Nigeria, with a wealth of observations now being analyzed and prepared for publication.

Most of the members of the Department of Geology and Paleontology were again in the field at the end of the year here reported upon. A party under the direction of George Gaylord Simpson continued the collection and study of fossil mammal remains of the Huerfano formation in Colorado. During the summer of 1953 Edwin H. Colbert continued and extended his long-range program of field work on Triassic reptiles by explorations of the Chinle formation in Arizona and the Popo Agie formation of Wyoming. During the spring of 1954 he directed the excavation of a particularly fine skeleton of an aquatic reptile (mosasaur) discovered in Colorado in 1953 by a Museum party. In April, 1954, Bobb Schaeffer left to investigate the occurrence of fossil fishes in the Mesozoic of western United States.

Norman D. Newell organized and led an expedition to southern Peru during the latter part of 1953 for the purpose of studying Tertiary marine deposits associated with the Humboldt Current.

It is the intention to review the Museum's entire program and contributions in the geological sciences in the next annual report.

In most of the departments, research in the Museum's own laboratories was either in continuation of projects already previously inaugurated and described in our annual reports, or directly connected with the field work reported in the last report. Investigations not accounted for in either of

these ways are to be found chiefly in the activities of the Department of Animal Behavior.

A study of the role of the adrenal cortex in the sexual behavior of male cats was undertaken by Lester R. Aronson, Chairman of the Department of Animal Behavior, and his coworker Madeline Levy. There is an extensive clinical literature showing that the adrenal gland under pathological conditions produces male hormone. It has therefore been assumed that similar functions are also performed by these glands under normal conditions. Previous work in the Department of Animal Behavior had raised serious doubts about the justification of this assumption. The new investigation is designed to seek the answer to this question, which is of considerable importance both to medicine and to general biology. Another investigation, by Dr. Aronson and Jay Rosenblatt, examines the effects of the male hormone itself on the behavior of male cats.

These investigations by the Museum staff on the problems of sex have been generously supported by the National Research Council and the National Institutes of Health.

Among the various investigations taken up by T. C. Schneirla and his coworkers in the Department of Animal Behavior are a study of the factors governing the development of normal relations between mother and young in the cat and an investigation of the resistance of various strains of rats and mice to different kinds and degrees of what we would call mental or emotional stress in speaking about ourselves. It has been found that there are "emotional" as well as "unemotional" breeds of rats and mice, and the investigation attempts, among other things, to find ways of diagnosing the "character" of the animals and of predicting their behavior under stress from their behavior under other circumstances. The importance of anything that can be learned about these relationships extends far beyond the limited field of our knowledge about rats and mice, which are merely the "guinea

pigs" for the investigation of a problem affecting man himself in a high degree.

Publications by the staff and associates of the Museum were issued in such gratifying abundance that it is again possible to mention only a few works that might be of more general interest, among well over one hundred new contributions published during the year. Two long-continued series of scientific reports passed impressive milestones during the year with the seventieth number of the "Results of the Archbold Expeditions" and the sixty-fifth report of John T. Zimmer's "Studies of Peruvian Birds." The fourth and final volume of James P. Chapin's monumental treatise, "Birds of the Belgian Congo," was in press at the end of the year.

Robert Cushman Murphy and Dean Amadon wrote the text for "Land Birds of America," a quarto volume published by the McGraw-Hill Book Company, richly illustrated by color reproductions from photographs. The response to this publication is evidence of a real need and appreciation of its usefulness.

Among the many publications resulting from research done at the Lerner Marine Laboratory were an account of the endocrine control of molting in crabs by L. M. Passano, and a study of the histological basis of color patterns in three tropical marine fishes by H. B. Goodrich and Dorothy I. Biesinger.

Eugenie Clark, Lester R. Aronson, and Myron Gordon reported on the inheritance and significance of the mating behavior patterns by which closely related fishes living together maintain evolutionary isolation from each other.

PUBLIC INSTRUCTION

Using every tested educational device at hand—direct teaching, lectures, loan collections, motion pictures, slides, exhibits, field trips, recordings, radio, television, and printed matter—the Department of Public Instruction, under its

Chairman, John R. Saunders, reached a total audience of over seventeen million people.

The "World We Live In" program, now in operation for twelve years, has constantly been modified and improved and now offers much more personal participation by school children than before. Two new themes, "World Cultures" and "Prehistoric Life," have been added. Special attention has been given to visually and physically handicapped children as well as to those intellectually gifted. A marked decrease in cancellations has led to a more completely filled schedule of appointments, showing an increase of 13,756 student hours of attendance over last year.

The instructors have engaged in educational research under the direction of the Chairman and are constantly evaluating their subjects and methods. Studies have been made of program demonstrations, pre-visit preparation for groups coming to the Museum, children's exhibits, and ways to assist other museums in their work with both children and adults.

In addition to the regularly scheduled program for school children of New York City, the Department of Public Instruction has increased its services to a wide variety of educational and community organizations. These services include exhibition hall instruction, the high school science program, six different courses for teachers-in-service, nurses-in-training instruction, a series of field trips called "Natural Science for the Layman," the camp nature counselors' course, evening courses for new citizens, and film programs for the general public.

A room was set aside in 1952 equipped with living plants and animals to demonstrate to teachers and camp counselors the use and care of living material in class rooms and camp activities. During the past year, plans were made to create a permanent Nature Room in which young people can learn about the natural history of New York City, of its parks and undeveloped shore areas, and its general environs.

MUSEUM STAFF

The Museum suffered a great loss by the untimely death of George H. H. Tate, after 30 years as a member of the Department of Mammals. The high quality of Dr. Tate's scientific work has contributed greatly to the prestige of the Museum and to the value of its collections.

The death of Mrs. Elsie M. B. Naumburg, the senior Research Associate of the Department of Birds, brought to an end a long and happy association. Mrs. Naumburg had herself studied and published on tropical birds of the New World and always maintained a very active interest in the welfare of the department. With her husband, Mr. Walter W. Naumburg, she founded the Frank M. Chapman Memorial Fund which has become a great asset to the Museum for the encouragement of ornithological research.

At the end of the year Robert C. Murphy relinquished his administrative duties as Chairman of the Department of Birds in order to be able to concentrate on his writing and research as Lamont Curator of Birds. Dr. John T. Zimmer was appointed to succeed Dr. Murphy as Chairman of the department.

To meet a need for coördination extending beyond the Department of Exhibition itself, Miss Katharine Beneker was appointed assistant to the Director for exhibition, and Mr. Gordon R. Reekie was made manager of the combined departments of Art and Preparation.

Wm. D. Clarke was appointed to the staff of the Department of Fishes and Aquatic Biology to fill a vacancy as Assistant Curator of Invertebrates.

The duties of Membership Secretary were added to those of William A. Burns, Assistant to the Director.

THE PLANETARIUM

Attendance at the American Museum-Hayden Planetarium has exceeded a half a million persons for the second

year in succession. This steady increase is evidence of the fact that the public has continued to accept the Planetarium's efforts to provide sound topical astronomical information in an interesting form, under the leadership of Joseph M. Chamberlain, General Manager and Chief Astronomer. Without having to resort to the questionable or the fantastic, the programs have proved their worth in presenting authentic, accurate portrayals of natural effects and timely information.

Eight different programs were given during the year, upholding the Planetarium staff's contention that several show themes may be carried for more than one month. The result has been improved lectures, better special effects, and more careful staff planning, with an attendance increase during the second month's showing.

In addition to its Sky Shows, the Planetarium has offered courses in astronomy, navigation, and meteorology and has acted as a clearing house for astronomical information. The Third Space Symposium was held in May, bringing together representatives of the press, scientific societies, industrial organizations, and interested individuals.

An existing vacancy, that of Associate Astronomer, was filled by the appointment of Thomas D. Nicholson, formerly Assistant Professor of Nautical Science at the United States Merchant Marine Academy.

THE AMERICAN MUSEUM OF NATURAL HISTORY

Financial Statement

For the Fiscal Year ended June 30, 1954

THE AMERICAN MUSEUM BALANCE

June 30,

ASSETS:

Current funds:

General funds:

Cash	\$ 20,037.24	
Accounts receivable	202,085.61	
Inventories, principally publications	91,710.80	
Prepaid expenses and deferred charges	<u>34,895.23</u>	\$ 348,728.88

Special funds:

Cash	343,019.09	
U. S. Government bonds, at cost (at market quotations \$138,582.17)	136,500.00	
Accounts and note receivable	<u>13,254.53</u>	492,773.62

Exhibition halls funds:

Cash	343,644.18	
U. S. Government bonds, at cost (at market quotations \$466,055.31)	463,500.00	
Due from general fund	<u>67,113.37</u>	874,257.55
		<u>\$1,715,760.05</u>

Endowment funds:

Cash		7,467.40	
Investments (Notes 1 and 2):			
Marketable securities (at market quotations \$21,803,234.77):			
Bonds	\$ 7,580,777.97		
Preferred stocks	2,566,080.94		
Common stocks	<u>7,651,907.69</u>		
	17,798,766.60		
Real estate securities	32,392.50		
Promissory notes	<u>33,053.16</u>	17,864,212.26	17,871,679.66

Investment in The American Museum of Natural History Planetarium Authority, at cost (Note 3):

Bonds (\$570,000 face amount)	425,000.00	
Promissory notes	<u>25,000.00</u>	450,000.00

Pension funds:

Cash		66,185.63	
Investments:			
Marketable securities, at cost (at market quotations \$4,429,388.38):			
Bonds	2,926,827.40		
Preferred stocks	727,031.23		
Common stocks	<u>576,682.53</u>		
	4,230,541.16		
Real estate mortgages	<u>3,044.09</u>	4,233,585.25	
Loan receivable		30.00	4,299,800.88
			<u>\$24,337,240.59</u>

The accompanying notes are an integral part of this balance sheet.

OF NATURAL HISTORY SHEET

1954

FUNDS AND LIABILITIES:

Current funds:

General funds:

Accounts payable, payroll taxes withheld, etc.	\$	34,488.38	
Deferred income, principally unearned dues and subscriptions		192,409.04	
Due to exhibition halls funds		67,113.37	
Provision for outstanding claims		69,122.49	
Appropriations for outstanding commitments		23,311.00	
		<u>386,444.28</u>	
Deficit		37,715.40	\$ 348,728.88

Special funds:

Accounts payable		541.80	
Balances of funds available for special purposes, net of \$30,961.45 overdrafts (Note 5)		<u>492,231.82</u>	492,773.62

Exhibition halls funds:

Funds for exhibition halls rehabilitation, net of \$43,494.08 overdrafts (Note 5)			<u>874,257.55</u>
			1,715,760.05

Endowment funds:

Endowment funds, income available for:			
Restricted purposes	\$8,392,020.29		
Unrestricted purposes	<u>4,633,945.28</u>	13,025,965.57	
Funds functioning as endowment, both principal and income available for:			
Restricted purposes	444,254.33		
Unrestricted purposes (Notes 2 and 4)	<u>4,401,459.76</u>	<u>4,845,714.09</u>	17,871,679.66

Funds invested in the indebtedness of The American Museum of Natural History Planetarium Authority (Note 3)

450,000.00

Pension funds:

Pension fund balance	4,298,656.07		
Welfare fund balance	<u>1,144.81</u>		4,299,800.88
			<u>\$24,337,240.59</u>

STATEMENT OF GENERAL FUNDS

for the fiscal year ended June 30, 1954

Deficit, June 30, 1953	\$ 76,432.43
Less, Transfer from unrestricted funds functioning as endowment	<u>76,432.43</u>

Income:

Appropriations from the City of New York	\$1,232,280.50	
Income from endowment funds	810,162.48	
Income from Planetarium Authority (Note 3)	11,062.50	
Royalties from Mesabi mining properties (Note 2)	50,000.00	
Income from bequests pending settlement	10,626.30	
Income from outside trusts and foundations	62,961.80	
Income from temporary investments	13,750.00	
Gifts and grants	148,533.89	
Membership dues	44,570.00	
Sales, services and other income	<u>56,570.05</u>	2,440,517.52
Auxiliary activities:		
Natural History Magazine	310,405.15	
Junior Natural History Magazine	126,433.57	
Museum Shop	181,324.62	
Natural History Book Club	1,097.81	
Museum Cafeteria	14,774.17	
Museum television program	<u>15,000.00</u>	649,035.32
		<u>3,089,552.84</u>

Expenses:

Administrative and general	\$ 744,923.18	
Curatorial, research and publications	590,317.35	
Public instruction	139,525.18	
Exhibition and buildings	<u>1,093,124.70</u>	2,567,890.41
Auxiliary activities:		
Natural History Magazine	257,657.89	
Junior Natural History Magazine	118,096.43	
Museum Shop	<u>166,531.97</u>	542,286.29
		<u>3,110,176.70</u>
Add, Provision for outstanding claims		69,122.49
		<u>3,179,299.19</u>
Excess of expenses		89,746.35
Add, Appropriation for outstanding commitments		<u>23,311.00</u>
		<u>113,057.35</u>

Deduct:

Transfer from unrestricted funds functioning as endowment to cover certain expenses included above	50,250.96	
Appropriation for outstanding commitments at beginning of year	<u>25,090.99</u>	75,341.95
Deficit, June 30, 1954		<u>\$ 37,715.40</u>

The accompanying notes are an integral part of this statement.

STATEMENT OF SPECIAL FUNDS

for the fiscal year ended June 30, 1954

Balance, June 30, 1953, net of \$92,698.14 overdrafts (Note 5)	\$ 667,916.00
Less, Transfer to exhibition halls funds, net of \$61,837.30 overdrafts (Note 5)	170,305.87
	<u>497,610.13</u>

Income:

Income from endowment funds	\$ 75,621.80		
Income from temporary investments	2,274.13		
Gifts and grants	327,528.62		
Sales, services, and other income	49,477.31		
	<u>454,901.86</u>		
Auxiliary activities:			
Queeny educational film program	\$59,863.96		
Museum Guide-A-Phone program	2,798.60	62,662.56	517,564.42
			<u>1,015,174.55</u>

Expenditures:

Administrative and general	13,445.15		
Curatorial, research and publication	323,372.49		
Public instruction	2,300.45		
	<u>339,118.09</u>		

Auxiliary activities:

Queeny educational film program	69,448.47		
Anthropological documentary film program	16,625.00		
Museum Guide-A-Phone program	8,755.72	94,829.19	433,947.28
			<u>581,227.27</u>

Transfers to restricted funds functioning as endowment

Balance, June 30, 1954, net of \$30,961.45 overdrafts (Note 5)	<u>88,995.45</u>
	<u>\$ 492,231.82</u>

The accompanying notes are an integral part of this statement.

STATEMENT OF EXHIBITION HALLS FUNDS

for the fiscal year ended June 30, 1954

Balance, June 30, 1953, appropriation for exhibition hall rehabilitation	\$781,673.26	
Transfer from special funds, contributions, etc., for rehabilitation of specific groups and exhibits, net of \$61,837.30 overdrafts (Note 5)	<u>170,305.87</u>	\$ 951,979.13

Income:

Income from endowment funds	328.16	
Income from temporary investments	1,271.25	
Gifts and grants	52,175.29	
Sales, services and other income	<u>1,691.75</u>	<u>55,466.45</u>
		1,007,445.58

Expenditures:

Administrative and general	2,331.47	
Curatorial departments	<u>130,856.56</u>	<u>133,188.03</u>
Balance, June 30, 1954, consisting of:		
Funds appropriated by Trustees	725,615.21	
Contributions, etc., for specific groups and exhibits, net of \$43,494.08 overdrafts (Note 5)	<u>148,642.34</u>	<u>\$ 874,257.55</u>

The accompanying notes are an integral part of this statement.

STATEMENT OF ENDOWMENT FUNDS

for the fiscal year ended June 30, 1954

Balance, June 30, 1953, consisting of:

Endowment funds, income available for:

Restricted purposes	\$8,252,967.91		
Unrestricted purposes	<u>4,402,567.16</u>	\$12,655,535.07	

Funds functioning as endowment, principal and income available for:

Restricted purposes	345,363.76		
Unrestricted purposes (Note 2 and 4)	<u>4,187,452.42</u>	<u>4,532,816.18</u>	\$17,188,351.25

Additions:

Gifts and bequests		403,933.09	
Transfers from special funds		88,995.45	
Collection from Planetarium Authority on account of principal of promissory notes (Note 3)		25,000.00	
Net profit on sales of investments		<u>297,083.26</u>	815,011.80
			<u>18,003,363.05</u>

Deductions:

Expenditures, for custodian fee		5,000.00	
Transfer to general funds:			
For honorariums, consultant fees, etc.	50,250.96		
To dispose of operating deficit for the fiscal year ended June 30, 1953	<u>76,432.43</u>	<u>126,683.39</u>	131,683.39

Balance, June 30, 1954, consisting of:

Endowment funds, income available for:

Restricted purposes	8,392,020.29		
Unrestricted purposes	<u>4,633,945.28</u>	13,025,965.57	

Funds functioning as endowment, principal and income available for:

Restricted purposes	444,254.33		
Unrestricted purposes (Notes 2 and 4)	<u>4,401,459.76</u>	<u>4,845,714.09</u>	<u>\$17,871,679.66</u>

The accompanying notes are an integral part of this statement.

STATEMENT OF PENSION FUNDS

for the fiscal year ended June 30, 1954

Balance, June 30, 1953, consisting of:			
Pension fund	\$4,045,574.06		
Welfare fund	<u>1,153.81</u>		\$4,046,727.87
Income:			
Payments by subscribing members	125,498.87		
Payments by Museum	145,230.60		
Income from investments	149,740.52		
Net profit on sales of investments	<u>17,704.34</u>		<u>438,174.33</u>
			4,484,902.20
Expenditures:			
Payments to members and beneficiaries:			
Pension allowance	142,763.30		
Refunds of contributions and interest thereon	<u>37,889.78</u>		
	180,653.08		
Custodian fees, etc.	<u>4,448.24</u>		<u>185,101.32</u>
Balance, June 30, 1954, consisting of:			
Pension fund	4,298,656.07		
Welfare fund	<u>1,144.81</u>		<u>\$4,299,800.88</u>

NOTES TO FINANCIAL STATEMENT

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. Also, no valuation of exhibits, collections, library, etc., has been established for balance sheet purposes.

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

2. The Museum owns an interest in certain mining properties acquired through a bequest. No valuation has been recorded on the books for the interest in these properties and, therefore, it is not reflected in the balance sheet. However, the Museum receives royalties from this source and such royalties are recorded, when received, as additions to unrestricted funds functioning as endowment (as bequests) or to current general funds. During the current fiscal year royalties received aggregated \$142,956.77 of which \$50,000.00 was credited to general funds.
3. The Planetarium Authority is operated under the supervision of the Museum's management and its corporate charter continues only until all its liabilities, including all its bonds (\$570,000 face amount), have been paid in full or have otherwise been discharged. At that time, 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 and title to its personal property passes to the Museum for its corporate purposes. Its real property, including donated land carried at no value, is stated in the Planetarium Authority's balance sheet at a cost of \$569,209.64 (provision for depreciation is considered unnecessary because of the nature of the ownership of the property). At June 30, 1954, other net assets of the Authority, before consideration of its bonded debt and its liability on advances from the Museum, amounted to \$91,570.01, including \$25,572.00 equipment at cost, less depreciation. Its income for the fiscal year ended June 30, 1954, before interest on its bonds and debt to the Museum and before \$5,682.48 provision for depreciation on its equipment, amounted to \$47,791.96. During the fiscal year the Authority paid the Museum \$11,062.50 on account for interest on its bonds and advances. This amount was credited by the Museum to general fund income. The Authority also paid the Museum \$25,000.00 on account of principal on the advances.
4. Unrestricted funds in the amount of \$800,000 have been conditionally appropriated for the construction of additional buildings subject to appropriation of a like sum by the City of New York.
5. The overdrafts on special funds and exhibition halls funds represent advances in anticipation of gifts, grants and other income. To the extent such income is not received the amounts will be charged against appropriated or general funds.

LYBRAND, ROSS BROS. & MONTGOMERY

Certified Public Accountants

To 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, 1954 and the related statements of funds for the fiscal 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.

In our opinion, the accompanying balance sheet and related statements of funds present fairly the financial position of the Museum at June 30, 1954 and the results of its operations for the fiscal year then ended, on a basis consistent with that of the preceding fiscal year.

Lybrand, Ross Bros. & Montgomery

New York, September 14, 1954.

THE AMERICAN MUSEUM OF NATURAL HISTORY
PLANETARIUM AUTHORITY

Financial Statement

For the Fiscal Year ended June 30, 1954

THE AMERICAN MUSEUM
PLANETARIUM
BALANCE

June 30,

ASSETS:

Cash in bank and on hand	\$ 56,159.79
Accounts receivable	312.55
Inventory of publications	<u>11,647.40</u>
	68,119.74

Land, building and equipment at cost, less reserves
for depreciation:

	<u>Assets</u>	<u>Reserves</u>	
Land (donated by the City of New York)	—		
Building	\$569,209.64	(note)	
Plant equipment, machinery and tools	70,221.75	\$ 45,445.14	
Furniture and fixtures	38,870.07	38,076.68	
Zeiss planetarium instrument	126,433.73	126,432.73	
Copernican planetarium instrument	<u>30,435.54</u>	<u>30,434.54</u>	
	<u>\$835,170.73</u>	<u>\$240,389.09</u>	594,781.64

Prepaid expenses	<u>1,469.64</u>
------------------	-----------------

\$664,371.02

Note: 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 real property and to its personal property passes to the City of New York and to The American Museum of Natural History, respectively. Because of the nature of the ownership of the property, provision for depreciation of the building is considered unnecessary.

OF NATURAL HISTORY
AUTHORITY
SHEET

1954

LIABILITIES:

Accounts payable		\$ 3,591.37
4% Refunding Serial Revenue Bonds and interest thereon (held by The American Museum of Natural History):		
Interest:		
Unpaid coupons, past due	\$240,255.00	
Interest accrued on bonds not yet due	1,087.50	
Interest accrued on past-due unpaid bonds	134,857.50	
	<u>376,200.00</u>	
Less, Payments on account (\$10,125 per annum)	60,750.00	315,450.00
Principal:		
Past due	425,000.00	
Due May 1, 1955	29,000.00	
Due in annual instalments from May 1, 1956 to May 1, 1959	116,000.00	570,000.00
		<u>889,041.37</u>
Advances from The American Museum of Natural History (interest at 2½% per annum paid through June 30, 1954)		25,000.00
		<u>914,041.37</u>
Deferred income consisting principally of unearned subscriptions		5,514.04

CONTRIBUTED CAPITAL AND DEFICIT*:

Contributed capital, June 30, 1954:			
Charles Hayden	\$156,869.27		
Charles Hayden Foundation	<u>130,924.55</u>	287,793.82	
Deficit*, June 30, 1954, as annexed		<u>542,978.21*</u>	255,184.39*
			<u>\$664,371.02</u>

STATEMENT OF INCOME AND DEFICIT
for the fiscal year ended June 30, 1954

Income:

Admission fees less allowances and commissions	\$257,727.67	
Special lectures and courses	4,054.00	
Miscellaneous	<u>912.56</u>	\$262,694.23
Auxiliary activities:		
Sales booth	51,970.35	
Sky Reporter pamphlet	<u>836.46</u>	<u>52,806.81</u>
		<u>315,501.04</u>

Expenses:

Preparation, presentation and promotional:		
Salaries	\$74,406.31	
Supplies and expenses	<u>19,878.08</u>	94,284.39
Operation and maintenance:		
Salaries	60,039.98	
Supplies and expenses	23,893.25	
Special improvements, renovations, etc.	<u>18,693.20</u>	102,626.43
Administrative and general:		
Salaries	5,000.00	
Pension fund, social security and other employee benefits	9,682.47	
Miscellaneous	<u>11,403.15</u>	26,085.62
		<u>222,996.44</u>
Auxiliary activities:		
Sales booth	42,056.36	
Sky Reporter pamphlet	<u>2,656.28</u>	<u>44,712.64</u>
Income before interest and depreciation		<u>267,709.08</u>
		<u>47,791.96</u>

Interest expense:

On 4½% Refunding Serial Revenue Bonds, including \$18,037.50 on past-due bonds	25,650.00	
On advances from The American Museum of Natural History	<u>937.50</u>	26,587.50

Provision for depreciation (see note to accompanying balance sheet)	<u>5,682.48</u>	<u>32,269.98</u>
Net income for the fiscal year ended June 30, 1954		<u>15,521.98</u>

Deficit, June 30, 1953		<u>558,500.19</u>
Deficit, June 30, 1954		<u><u>\$542,978.21</u></u>

LYBRAND, ROSS BROS. & MONTGOMERY

Certified Public Accountants

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, 1954 and the related statement of income and deficit for the fiscal 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.

In our opinion, the accompanying balance sheet and related statement of income and deficit present fairly the financial position of the Authority at June 30, 1954 and the results of its operations for the fiscal year then ended, on a basis consistent with that of the preceding fiscal year.

Lybrand, Ross Bros. & Montgomery

New York, September 14, 1954.

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