AMERICAN MUSEUM OF NATURAL HISTORY

114th ANNUAL REPORT 1982/83

American Museum of Natural History
Central Park West at 79th Street
New York, NY 10024

The American Museum was founded on April 6, 1869, in an act of incorporation passed by the New York State Legislature.

Today, 114 years later, the Museum stands as a preeminent center of basic inquiry in anthropology, mineralogy and the zoological sciences. Imaginative, innovative and enjoyable programs of exhibition and education flow from its research projects.

The Museum complex occupies 22 interconnected buildings on 25 acres—four square blocks—on the upper west side of Manhattan across from Central Park. Public service areas comprise two-thirds of its total floor space. Some 2.5 million persons annually visit the Museum's 38 exhibition halls and also enjoy programs and performances.

Some 200 researchers—scientists and their assistants—share their findings with investigators around the world; the results of their studies often form the basis of continuing research and application in biological science, technological fields and industry.

The collections of the American Museum number some 35 million artifacts and specimens. Among them are eight million anthropological artifacts; more than 16 million insect specimens; 230,000 amphibians and reptiles; 600,000 fish; 8.5 million invertebrates; 250,000 mammals; 120,000 rocks, minerals, gems and meteorites; one million birds and 330,000 fossil vertebrates.

The American Museum receives substantial support for its facilities and programs from a number of major sources. We are particularly grateful to the City of New York which provides budgetary funds and owns the Museum buildings, and to the New York State Council on the Arts, National Science Foundation, National Endowment for the Arts, National Endowment for the Humanities, Institute for Museum Services, 300 corporations, 60 private foundations, 480,000 members and numerous individual contributors. Visitor contributions and fees for special services also provide a significant and growing source of revenue.

HIGHLIGHTS

1982/July

- "Aztec Mexico: Discovery of Templo Mayor," a special exhibition, opened. More than 253,700 persons saw it.

September

- A $250,000 challenge grant from the National Endowment for the Arts was announced. It will be used for four construction projects.

October

- A $1.5 million fund for research and exhibition on early fossil mammals was established by Mrs. James Walter Carter in memory of Mr. Carter.
- The Margaret Mead Film Festival was held.

December

- The Vincent Astor Foundation granted $1 million to the Museum to improve public facilities.
- "Star Gods of the Ancient Americas," a special exhibition designed and organized by the Museum of the American Indian, opened and was seen by more than 248,800 persons.
- A benefit dinner-dance with the "Star Gods" theme raised more than $235,000.
- A new fast food service, "Food Express," seating 400, opened.

1983/January

- Three special exhibitions on the Earth's last frontier—the ocean depths—opened.
- The Mack Lipkin Man and Nature Lectures began with talks by David A. Hamburg, President of the Carnegie Corporation of New York and President-elect of the American Association for the Advancement of Science.

April

- "A Flowering of Science: Plants from Captain Cook's First Voyage, 1768-1771," a special exhibition, opened.
- "Warhol's Animals: Species at Risk," a special exhibition of serigraphs by Andy Warhol, opened.
- The American Museum of Natural History and the Museum of the American Indian reached agreement in principle to combine their native American collections.

May

- The 150,000,114th birthday party for Stegosaurus was held.
- The Museum's new Education Center, the Charles A. Dana Education Wing, supported by grants totaling more than $1.3 million, was officially opened. The new wing includes the 300-seat Henry Kaufmann Theater and the 125-seat Harold F. Linder Theater.
- The "American Museum Restaurant," a glass enclosed dining facility seating 106, opened on the basement level.

June

- "African Textiles," a special exhibition on loan from the British Museum (Museum of Mankind), opened.

One hundred and fourteenth 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.

This institution is in every sense a living organism. And like all such entities, the Museum has undergone evolutionary change. A further evolutionary change would result from a proposed partnership between the Museum of the American Indian and the American Museum. I am pleased to report encouraging progress in discussions aiming toward combining the collections of the Museum of the American Indian with the Western Hemisphere collections of the American Museum. If this merger can be accomplished, it will bring about the creation of the largest and probably most comprehensive collection of New World enthnological and archeological material anywhere.

Separately, each museum's holdings are stellar. Combined, they will be unsurpassed. The collections complement and enrich one another. The Trustees of the two institutions have agreed in principle to work toward this goal, but major details of organizational structure, legal arrangements and the provision of necessary physical space still need to be resolved. The City of New York, through Mayor Edward I. Koch, has provided encouragement, and it is clear that the two institutions can count on the support of appropriate city departments in keeping the unique resources of the Museum of the American Indian in New York City.

To achieve this end, funding is critical. Housing for our own anthropological collections totaling eight million artifacts is tight enough. Room will need to be made for the roughly one million additional artifacts from the Museum of the American Indian. An endowment must be established to fund the creation of exhibitions to do justice to this material as well as to carry on research and curation.

I hope to be able to report further progress on this major venture in future annual reports.

Though the merger discussions have been ongoing for nearly three years, the great success of the exhibition "Star Gods of the Ancient Americas" helped cement the mutual determination to bring the two collections together.

Designed and organized by the Museum of the American Indian, "Star Gods" was the first exhibition on the archeoastronomy of indigenous Americans, stretching geographically from the Arctic Circle to Tierra del Fuego and encompassing more than 3000 years of cultural history. The exhibition began its national tour at the American Museum and during its four-month stay here was seen by approximately a quarter of a million persons.

During the past year, the American Museum of Natural History also provided the U.S. public with its only opportunity to see recently excavated artifacts from Mexico's Templo Mayor, discovered under the streets of Mexico City. This major temple was the Aztec Empire's main ceremonial center. "Aztec Mexico: Discovery of Templo Mayor" was on view in Gallery 3 from July 27 to Oct. 6.

Beginning June 15, "African Textiles," was the third anthropological exhibition of the year. Drawn primarily from the collections of the British Museum (Museum of Mankind), with additions from our collections, it demonstrated the striking diversity and beauty of woven materials created by African peoples.

Earth's last frontier—its ocean depths—was explored in three exhibitions last winter that ran from mid-January to May 15. "Exploring the Deep Frontier: The Adventure of Man in the Sea" from the California Academy of Sciences examined mankind's centuries-long quest to reach the ocean depths. The U.S. Navy brought in "Deep Ocean Photography to give Museum visitors a look at the stark ocean floor. "New Frontier of Life," created at the American Museum, presented the unique life forms around deep ocean rifts where no sun penetrates and where water temperatures can reach 700 degrees Fahrenheit. The latter two exhibitions were Arthur Ross Exhibits of the Month.

"A Flowering of Science," (April 26—July 8) from the British Museum (Natural History), showed detailed botanical engravings of plant life collected on Captain Cook's first voyage, from 1768-1771. This special exhibition underscored the Cook voyage as representing the birth of natural history as science. The wealth of information the expedition brought back served as a catalyst for other avenues of scientific inquiry.

In improving the permanent display of our own collections we made further progress in planning and the construction of several permanent exhibitions: the Margaret Mead Hall of Pacific Peoples (scheduled to open in 1984), the Hall of South American Peoples (1986) and the new Hall of Human Biology and Evolution (1986).

The Museum also announced the organization of what should prove to be one of its most important exhibitions of this century, "Ancestors: Four Million Years of Humanity." Organized by our staff with the assistance of an international steering committee, this exhibition will bring together for the first time the original fossils which have made possible the study of human evolution. The exhibition will be drawn from institutions throughout the world including this one. Never before have scientists or the public had the opportunity to see all of these critically important fossils in one place at one time. The scientific impact of this event should be long lasting. Special scientific and public symposia will complement the exhibition.

A significant event of the year was the opening of the Museum's new Education Center, the Charles A. Dana Education Wing. Created with gifts totaling more than $1.3 million, this multipurpose area greatly expands our educational capabilities and unifies the Museum's education facilities. The Wing includes four new areas—two theaters, a studio room and a lecture room—as well as the previously existing facilities of the Louis Calder Laboratory, the Frederick H. Leonhardt People Center

A mechanical mask, worn by Kwakiutl Indian dancers in British Columbia, opens to reveal different aspects of the sun, perhaps night and day. The seated, human-like figure represents the spirit of the sun. The mask was one of 140 artifacts in "Star Gods of the Ancient Americas," a major exhibition on early Indians' fascination with the heavens. It was organized by the Museum of the American Indian. The American Museum and the Museum of the American Indian have agreed in principle to combine their Native American collections.
Photo credit:
Museum of the American Indian.

and the Alexander M. White Natural Science Center.

Substantial donations from the Leonhardt Foundation and members of the Leonhardt family, the Henry Kaufmann Foundation, the Harold Linder Foundation, the Charles A. Dana Foundation and the Edith C. Blum Foundation created this facility for lectures, theater, dance and film for adults and children.

The first in a new lecture series, the Mack Lipkin Man and Nature Lectures, was given by David A. Hamburg, the new president of the Carnegie Corporation of New York and president elect of the American Association for the Advancement of Science. Dr. Hamburg's talks traced the evolutionary roots of human behavior and their effects on present day men and women. This series has been endowed with the assistance of Museum Vice President and Trustee William T. Golden in recognition of physician Mack Lipkin's contributions to the field of biomedical sciences.

Within the past year, the Museum received a $250,000 Challenge Grant from the National Endowment for the Arts. Increased support to help the Museum match these funds has been most encouraging.

The Museum received a generous grant of $1 million from the Vincent Astor Foundation to improve facilities for the public—in particular, visitor reception and food service.

Mrs. James Walter Carter gave $1.5 million in memory of Mr. Carter, making possible the creation of a fund. Initially, the income will support a research fellow to curate the collection of Cenozoic mammal fossils. It will make possible fieldwork in China and Mongolia by our scientists, with emphasis on establishing better stratigraphy for fossils from this area. The fund will enable Chinese vertebrate paleontologists to come to the Museum to study our extensive Chinese material; it will also support the planning and preparations for the renovation of the Hall of Early Fossil Mammals.

Mrs. Charles A. Dana, Jr., Arthur Ross and Mrs. Goelet were cochairmen of one of the most successful benefits in the Museum's history, a gala dinner-dance on Dec. 7 that netted more than $235,000. The party, planned around the theme of the exhibition "Star Gods of the Ancient Americas" which had just opened, glittered with stars, reflected light and guests.

A new membership organization, Friends of the American Museum, completed its first year. This group of Museum supporters, who give at least $1000 a year, were treated to special programs and parties, including a "Behind the Scenes Evening" on China. The informative and entertaining event focused on the Museum's remarkable expeditions, history and current work in China and Mongolia.

Over the generations, the Museum has helped shape children's interests, education and outlook. To further nurture a sense of the excitement of the natural sciences, and to show how much fun the Museum can be, the Children's Benefit Committee created the "150,000,114th birthday party for Stegosaurus." Oversubscribed almost immediately, the event captured the imaginations of hundreds of children and their parents. The committee now plans to offer children's benefits twice a year.

Trustee Donald C. Platten once again chaired a very successful corporate campaign. In his third year as the Museum's corporate campaign chairman, Mr. Platten focused his energy and leadership on opening new vistas in corporate unrestricted and restricted giving. The responsiveness of the corporate community is extremely heartening.

Under the guidance of Vice President and Trustee Plato Malozemoff, the Economic Mineralogy Fund has moved substantially closer to its $500,000 goal. With continued support from the nonferrous metals industry, almost 75 percent of the fund is now pledged or in hand. The fund will support research by the Department of Mineral Sciences on this nation's mineral resources and ore reserves.

Once again, Mobil gave $90,000 to the Museum to make it possible to remain open on Friday and Saturday evenings with free admission for all.

The decision of David D. Ryus to retire as of Aug. 1, 1983, after serving 11 years as Vice President was received with regret. Mr. Ryus came to the Museum in 1972, at a time of reduced financial support from the public sector. As publisher of *Natural History* magazine and guiding light in the fields of development, membership, public affairs and related areas, he helped generate creative strategies for improving the Museum's base of support.

Newly elected officers of the Board are Vice Presidents William T. Golden and Frederick A. Klingenstein, and Treasurer Charles H. Mott. Mr. Golden who had previously served as a Vice President for 10 years, relinquished the post for a year in 1982. Mr. Klingenstein, a Trustee since 1969, completed a 10-year term as Treasurer before his election as a Vice President. Charles H. Mott has been a Trustee for seven years.

I sadly report the deaths of two Trustees. Cleveland E. Dodge, who was elected a Trustee in 1923 and Honorary Trustee in 1958, died on Nov. 24. He followed his family's long tradition of service to the Museum; his father, Cleveland H. Dodge, himself a Trustee and Vice President, had supported expeditions, exhibitions and educational programs for almost 30 years.

John M. Olin, elected to the Board in 1952 and an Honorary Trustee since 1966, died on Sept. 8. A noted conservationist, philanthropist and inventor, Mr. Olin also gave generously of his time and resources.

Personally and on behalf of the Museum, I congratulate three Trustees who were accorded well deserved honors this year. Arthur Ross received the Gold Medal from the National Institute of Social Sciences for his outstanding contributions to humanity.

Frederick Seitz received the fourth Vannevar Bush Award from the National Science Board, the policy-making body of the National Science Foundation. The award acknowledges outstanding contributions in science and technology that have particular significance to the national welfare.

Mr. Golden was honored by the National Science Foundation, which bestowed upon him its Distinguished Public Service Award in recognition of remarkable civic virtue, great wisdom

and powerful influence in making the resources of scientists and engineers accessible for the public good.

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This Museum will continue to evolve. The goal of its founders was to create a great scientific institution devoted to the education of this city's diverse populations. Its main scientific thrust has been the collection and study of the diversity of life and human cultures on this planet. The Museum's influence in science and culture now has international scope and dimension. Its collection oriented research provides the grist for inquiring minds. There is much yet to be learned and there are no limits except those imposed by financial constraints.

Robert G Goelet

Robert G. Goelet,
President

Director's Message

During the past two years, the Museum substantially refined the collection of data concerning its visitors. Partly as a result, we are better able to assess how effectively we have realized the goal of the founding trustees that the American Museum of Natural History become the foremost scholarly institution for the natural sciences in the Americas. The data indicate clearly that the goal is being realized in membership, attendance and popularity. Other measurements must be applied to judging the diversity and representation of our collections and the quality of research and fieldwork. But it is gratifying to see that public perception of these assets is at the highest level; people visit the Museum because they assume that the collections, scientific research, and fieldwork are of a superior quality. They assume also that the exhibitions and public programs reflect the Museum's high standards.

The photographs chosen for the cover of this Annual Report illustrate the diversity of the Museum's current audience. They were taken of summer visitors, on the front steps of the Museum, casually and without previous selection. At first glance, one might assume that they represent a typical cross section of New Yorkers. But that isn't the case at all. They *are* a cross section of our visitors, however: Americans from all across the country, including New York, and visitors from other nations. These are the people we serve, and because of the accurate attendance statistics we accumulate and the periodic audience surveys we take, we have a fair idea of their numbers, origins, attitudes and preferences.

About 10 years ago we started to introduce accurate attendance counting devices at the entrances. Previously, attendance had been estimated by attendant guards at each entrance. They recorded their estimates of persons entering the Museum on hand held counters. We realized the limitations and inaccuracies inherent in such a practice, one that surely yielded over or underestimated attendance figures in earlier years. But the Museum was built in an era when it was not considered important to keep accurate data on attendance, so little attention was paid in its design to facilities that could make the practice possible and efficient. Our immediate task was to modify all our entrances to include attendance counting devices. We chose recording turnstiles as the most accurate and, while we had difficulty adapting them to some areas, by May, 1983, we had covered all six of our visitor entrances.

Since 1975, our visitor attendance statistics have been based principally on turnstile counts. We have considerably more confidence in the number we quote this year—2,412,448 visitors—than we have in the attendance estimates of our earlier years.

But we also know now a great deal more about our visitors than simply this number. In 1974-75, we carried out one of the most extensive studies ever taken of the visitors to a single cultural institution. The survey, published in 1977, brought us a wealth of data concerning the people who visit the Museum. On the basis of the information gained, we introduced new programs and made program changes and facilities improvements intended to meet visitor requirements and expectations. Our actions were designed to address visitor concerns and to influence what we observed to be imbalances in visitor populations relative to the community at large. From that earlier visitor study we also learned a great deal that proved to be helpful in increasing income from gifts and services, expanding and broadening our membership, and extending our visiting hours for the public. Partly as a result, we developed a new class of Museum membership, expanded the Development Office and the range of its activities, strengthened the promotional efforts that reach a national audience, planned and built two new auditoriums, increased and strengthened services reaching the immediate community of the Museum, and considerably broadened our recruitment and use of volunteer employees and the services they provide.

The first audience survey was planned and conducted with the assistance of the National Research Center on the Arts, Inc., an affiliate of Louis Harris and Associates, Inc. Its costs were generously supported by a grant from the New York State Council

on the Arts. Its results and their effects were so significant that a second study was planned by our Office of Public Affairs. It was carried out during the first six months of Fiscal Year 1981-1982. As with the 1974-1975 study, its goals included the acquisition and evaluation of visitor demographics, motives, preferences, attitudes, reactions, and sources of information regarding the Museum, its services and facilities. It was designed and carried out in a manner similar to the Museum's earlier study so that the results could be compared and contrasted, with the goal of identifying trends in visitor activities and preferences and the effects of changes introduced since the last survey.

The study conducted in 1981-1982 did show trends in attendance patterns as compared to six years earlier. It showed, for example, that our audience, while still a good deal younger than the general population, is comprised of increasing proportions of visitors at higher ages. While still a minority among our visitors, the number of persons 50 or older increased by 70 percent. We found also that the ratio of visitors from out of the commuting area increased sharply, while those from the commuting areas surrounding New York City decreased. This trend substantiates the concern we have long felt over the increasing difficulty our commuting visitors have in traveling to the Museum and in parking nearby, also documented by the comparison of results between the two studies.

We were very pleased to see a substantial increase in the proportion of ethnic minorities (Black, Hispanic and Oriental) among our visitors, though they are still underrepresented in relation to the general population. The proportion of our total attendance from these groups has increased 45 percent since 1974-1975, to now equal about 16.5 percent of our total attendance. Equally as significant, the proportion of frequent visitors to the Museum from minority groups has nearly doubled; three of 10 frequent visitors are from these ethnic minorities. These results encourage us to continue support for the community programs through which we encourage Black, Hispanic, Caribbean and Asian visitors from our area.

Visitor reactions identified in the new study persuaded us to undertake substantial improvements in our public food service facilities, including the construction of a new restaurant and the complete renovation of our cafeteria. Confirming other decisions we made following the 1974-1975 survey, the informational services we introduced (publications, closed circuit television, signs and more information desks) are having a positive impact on visitors; our more ambitious special exhibition program appears to be a strong incentive for attending the Museum more often; and our Highlights Tours for visitors are a positive factor in the satisfaction that visitors, especially those coming for the first time, derive from their Museum experience.

Our recent study confirms again that our visitors come from all parts of the United States and the world. Based on our adult survey, and assuming that the ratio of children accompanying adults (about one-third) is uniform across our visiting population in a typical year, one out of five lives in our home borough of Manhattan and one out of six commutes from one of the other four boroughs of New York City. Three out of 10 come to us from commuting areas around the City; two out of 10 from states beyond the commuting area, and one in 10 from other countries. In a typical year we welcome about 217,100 visitors from nearby counties in New York State, 263,000 persons cross the Hudson River to visit us from New Jersey, and 125,450 travel west from Connecticut. We also see about 50,660 Californians pass through our doors, 41,000 Pennsylvanians, 38,600 Floridians, 36,180 from Massachusetts, and 24,120 each from Texas and Missouri. Canada and the British Isles account for one in five of our foreign visitors, about 53,070 persons (that's more than 1000 per week!), while the rest of Europe sends 127,950 visitors annually. We even average 90 persons per week from Japan and also from Australia. Of course, we know from other data in the survey that the ratio of children among the visitors from suburban areas and from other states outside the commuting area is substantially higher than the ratio from New York City.

The visitors pictured on our cover range not only in their place of residence, but in many more personal ways, some obvious from their photographs, some not as evident. Our studies show that they are most likely to have attended or graduated from college (four out of five); be visiting with family or friends (five out of six); have visited us before within the past four years (three out of five); be employed in professional, executive or white-collar positions, or as students (three out of four). Their median family income is close to $30,000 per year, two-thirds spent more than two hours visiting the Museum (the median visit was two hours 18 minutes), the median expenditure at the Museum for respondents and their groups was about $5, and they generally consider the Museum to be an excellent recreational bargain.

Considering the nationwide distribution of our half-million members, a surprisingly high proportion of our visitors (one in 10) is a Museum member. As might be expected, visitors who live in the area are more likely to be members; 59 percent of all visiting members are New York City residents, for example. While most of our member visitors live in New York City and the surrounding suburbs, one in four comes from beyond that area. Translated into numbers, some 60,300 members living outside the New York commuting area visit the Museum annually. This suggests that members, even though they may live quite distant, view their relationship with the Museum closely enough to encourage a visit when they are in New York, an attitude we try to instill and maintain in our nationwide membership promotion.

Special, periodic surveys of our members, most recently in August, 1982, confirm that this part of our constituency is also broadly distributed geographically and diverse in character. While the data differ in some details, there are significant similarities between the people we attract as members and those we serve as visitors.

The geographic distribution of members' residences (as with those of visitors) is skewed toward the New York area, but not so greatly. About two-thirds of our visitors live in the states of New York, New Jersey and Pennsylvania but only about 38 percent of our members reside there. Members living in other parts of the country are distributed broadly, as are visitors, but they are somewhat more likely to be distributed proportionate to population ratios in the community. For example, while 15 percent of our members live in the populous Pacific states, only about three percent of our visitors do.

Museum members also represent a well-educated, relatively prosperous, younger and more socially active group of people, as do our visitors. Members are an older group (median age 46 years vs. 33 for visitors), and a more prosperous group (median household income about $40,200 vs. $29,700 for visitors). But members and visitors are about equally well educated (nearly 80 percent of both groups have attended college), are more likely to have no young children in their households, and are largely employed in professional, management, executive and whitecollar positions.

It is important that we study the demographics of our visitors and members and it is especially significant to monitor whether they show changes in response to changes in programs and facilities. It is equally important, of course, to identify visitor attitudes toward and preferences among Museum services as clues from which we can identify areas in which to improve services or add new ones.

Periodically repeated surveys are of special value in identifying changes in visitor choices and reactions, and in correlating those changes to factors in the management of the institution. Thus, from the two studies we completed in 1974-1975 and in 1981-1982, we found that the 1981-1982 visitor was less likely to be married or a parent. Probably as a result, we found important shifts in the motivation for coming to the Museum: visitors are now less likely to come for the purpose of showing the Museum to young persons or children. The motives that now dominate suggest that adult visitors in far greater numbers perceive the Museum, and events going on at the Museum, as attractive incentives in their own right, a perception we have tried to encourage over the past decade through programming and promotion.

When we compare visitor attitudes toward the Museum in 1981-1982 to those in 1974-1975, we find trends that are encouraging but by no means are grounds for complacency. In the earlier survey, more than two out of three visitors found our sources of visitor information to be good and our guards to be pleasant and helpful, and 90 percent said our exhibits were well displayed and easy to understand. The comparable figures in the 1981-1982 study are 70 percent, 75 percent, and 90 percent respectively expressing those attitudes. We were concerned in 1974-1975 when one-fifth of the visitors complained that the Museum was too noisy and two-fifths complained that the light level was too low. We have made improvements in the interim, and we are glad to see that unfavorable attitudes toward noise are now expressed by only 12 percent of our visitors, toward light level by 37 percent. The trend is positive, but the results still show a need for further improvement.

Our study shows that we have made some, but not a great deal of, headway in providing comfortable temperatures in the Museum. Since 1974-1975, we have installed air conditioning in substantially more exhibit areas, but nearly 50 percent of our visitors still found the Museum to be uncomfortably warm in summer months (vs. two-thirds in 1974-1975). As for winter heating, we have made little headway in finding and introducing effective controls. One-third of our visitors—virtually the same as in 1974-1975—still find the Museum uncomfortably warm during winter months, reflecting problems inherent in our aging physical plant, in which 90 percent of the space is more than 50 years old. On the other hand, while it is difficult and expensive to adapt these older buildings to modern standards of atmospheric comfort and energy-use efficiency, we are pleased with public perception of their appearance and maintenance. Ninety-six percent of the visitors surveyed agreed that "the Museum is kept clean and tidy."

Visitor studies are not a substitute, of course, for vigilant and responsible management. We who work here every day should be alert enough and concerned enough to see our strengths and weaknesses and to respond positively to the visitor reactions we encounter. Yet it is still important to carry out such studies for a number of reasons. They document what observation may suggest; they quantify the impressions and opinions we gain from our daily work; they furnish independent evidence about our constituents, service and facilities; they measure the effects of change, and they can and often do reveal surprises that we may overlook or misunderstand.

We expect to continue the periodic sampling of visitor demographics, attitudes and preferences, not only through in-depth studies such as those we have recently completed, but also through a computerized survey mechanism to look at selected visitor communities and Museum services and facilities. Audience testing has given us directions, persuaded us to adjust priorities and shown where we have succeeded and failed in our plans. The public response to them has been enthusiastic, and their benefits to both the Museum and its public have been well worth the effort expended.

Thomas D. Nicholson,
Director

Department of Anthropology

From the Comoro Islands to the Peruvian highlands, curators in Anthropology are studying both present-day peoples and ancient civilizations. Researchers are tracing the impact of urban influences in a traditional village in India, uncovering evidence of pre-Inca long-distance trade in the Andes, measuring glucose tolerance in free-ranging macaques to learn more about diabetes, and analyzing the economic roles of West African children. They are also investigating the evolution of chiefdoms in South America, modern developments in the rural areas of South Korea, and Spanish-American Indian interaction 400 years ago on St. Catherines Island, Ga.

To foster an understanding of human biological and cultural evolution, the Department is immersed in preparations for the opening of three new permanent halls and a special exhibition on mankind's fossil ancestors.

Robert L. Carneiro, Curator, and Craig Morris, Associate Curator (and Chairman, effective July 1, 1983), prepared ethnographic and archeological materials for the new Hall of South American Peoples. Enid Schildkrout, Curator, spent time working on "African Textiles," which opened June 15. Ian M. Tattersall, Curator, has been involved with planning and organizing the projected exhibition of human and pre-human fossils, entitled "Ancestors: Four Million Years of Humanity"; Dr. Tattersall is also redesigning the Hall of the Biology of Man. Philip Gifford, Senior Scientific Assistant Emeritus, prepared objects and label copy for the reinstallation of the Margaret Mead Hall of Pacific Peoples.

The Department renovated major storage facilities and inventoried collections, preparing for the movement of collections to its new fourth-floor storage area.

The Department of Anthropology maintained the Lounsbery-American Museum Fellowship program. Seven predoctoral grants-in-aid were provided in the field of North American archeology. Brian Shea was awarded the first Lounsbery-American Museum Postdoctoral Fellowship, and he is currently in residence.

A Bit of Spain in Georgia David Hurst Thomas, Curator and Chairman, continued his excavations at the Santa Catalina de Guale mission, located on St. Catherine s Island, Ga. Generously supported by the Edward John Noble Foundation, through the St. Catherine s Archeology Research Program, this long-term research project is now focusing on the late prehistoric/early historic interface between local aboriginal populations and the colonizing Spanish settlers.

At present, it appears that Santa Catalina mission could have been established as early as 1566, making it the earliest non-aboriginal settlement in the State of Georgia. The mission was probably abandoned in the early 1680s.

To date, the entire church building has been excavated, the mission well uncovered, and excavations have begun at the *convento* (Spanish period residential structure). Artifact recovery is high, and the structures were found to be in an extraordinary state of preservation.

Working at the mission cemetery, Clark Spencer Larsen, Research Associate, has excavated more than 120 historic period Guale Indian burials; he is in the process of conducting intensive studies of nutrition and health on this important skeletal series.

Alan May, Research Associate, has been conducting quantitative research on the shell trash heaps associated with Santa Catalina. This study should provide detailed information about diet, artifact manufacture and debris disposal habits of the 16th and 17th centuries.

Dr. Thomas has also carried on his 15-year study of human ecology in the American Desert West. This research is being published as a five-part series in the Anthropological Papers of the American Museum of Natural History, with significant support provided by the Richard Lounsbery Foundation. The first volume, entitled "Epistemology," appeared in early 1983. The second volume, dealing with the archeology of Gatecliff Shelter, is now in press. The third volume, on the regional prehistory of Monitor Valley, Nev., is nearing completion.

Complex Human Societies Dr. Carneiro added to his long-term research on the evolution of complexity in human societies, with emphasis on how this can best be expressed mathematically. He has also derived a new technique for simplifying the process of archeological seriation of surface sites. Research was carried out on the political evolution of chiefdoms in the Cauca Valley in Colombia, one of the best-documented areas of pre-contact chiefdoms in the world. An extensive manuscript was also prepared, attempting to show the role of natural selection in cultural evolution.

Curator Stanley A. Freed and Ruth S. Freed, Research Associate, analyzed data collected in India in 1977-1978 concerning modernization in Shanti Nagar, a village in North India first studied by the Freeds in 1958-1959. The earlier study was oriented around the impact of urban influences upon traditional village life. In the 19-year interim, considerable modernization had occurred in some aspects of culture, but many traditional values and customs were largely unaffected.

Two papers regarding changes in the Indian family were published during the year, and computer analysis of data for a paper on human fertility in Shanti Nagar has been completed. The first draft of a monograph dealing with the psychomedical case history of a 35-year-old low-caste woman of Shanti Nagar is nearing completion.

The Drs. Freed are well advanced on a research project on Clark Wissler, who was head of the Department of Anthropology from 1906 to 1942. Dr. Wissler was one of the best known cultural anthropologists and authorities on North American Indians in the first half of the 20th century.

South American Peoples Dr. Morris's major activity was preparation

Nigerian members of the Oshogbo secret society wear handwoven cloth in this photograph from the "African Textiles" exhibition, organized by the British Museum (Museum of Mankind). Among the approximately 300 textiles in the exhibition were Sudanese quilted horse armor, a Nigerian beaded elephant mask and intricate kente cloth. "African Textiles," which began in June, was one of three major anthropological exhibitions that opened at the Museum during the past year. Photo by William Fagg.

of the script for the new Hall of South American Peoples; a detailed plan to cover more than 5000 years of South American prehistory was developed.

Dr. Morris continued his writing and work with computerized data relating to excavations conducted over several years in the Inca city of Huanuco Pampa.

In addition, Dr. Morris began a major new research project on the pre-Inca kingdom of Chincha on the south central Peruvian coast. The project will study several different aspects of human ecology and long-distance trade in the Andes.

Dr. Schildkrout, with support from the National Science Foundation, analyzed data on the economic roles of West African children. She also completed studying data on the widows of Hausa society.

Dr. Tattersall conducted a resurvey of the lemur populations of the Comoro Islands and a study of glucose tolerance in the free-ranging macaques (*Macaca fascicularis*) of Mauritius. These macaques were expected to show a significant frequency of spontaneous diabetes mellitus, possibly due to their high carbohydrate diet.

Laurel Kendall, who joined the staff in January as Assistant Curator of Anthropology, prepared for a short field trip to Korea to assess the impact of women's wage work on marriage exchanges and to analyze the symbolic content of Korean "modern style" weddings.

Conservation of Artifacts Landis Smith, Scientific Assistant, conducted an in-depth study on conservation of objects currently on exhibit. The interaction between objects of various materials and environmental conditions within display cases was analyzed. Such factors as humidity, temperature, light and air acidity, as introduced by case construction materials, have been evaluated in terms of their possible destructive effects on certain kinds of artifacts.

Barbara Conklin, Collections Registrar and coordinator of the Department's Curatorial Services Program, supervised construction of major storage facilities. A comprehensive climate control system, recently installed in the new fourth floor storage area, is now being tested. Compact storage equipment has been selected and, upon its installation, the first collections—African ethnographic materials—will be transferred to this carefully planned environment.

John Hyslop, Research Fellow, is preparing the final report on the Huaca Prieta, a preceramic mound on the north coast of Peru. The mound was excavated in 1946-1947 by the late Junius Bird, Curator Emeritus, and the investigation there produced the first substantial information about the preceramic populations of coastal Peru, including South America's earliest textiles with figurative art. The Huaca Prieta also produced the materials upon which the first radiocarbon dates for South America were computed. The Huaca Prieta report will draw together Dr. Bird's published data, unpublished manuscripts and excavation information, with appendices by specialists.

Scientific Publications:

Bird, Junius B. (posthumous publication)
1983. A matched pair of archaeological looms from Peru. *In* Celebration of the curious mind—A festschrift to honor Anne Blinks on her 80th birthday, Loveland, Co., Interweave Press, Inc.

Carneiro, Robert L.
1983. The cultivation of manioc among the Kuikuru of the Upper Xingu. *In* Adaptive responses of native Amazonians, Raymond Hames and William T. Vickers, eds., Acad. Press, New York, pp. 65-111.

Eldredge, Niles and Ian Tattersall
1982. The myths of human evolution. Columbia Univ. Press, New York, pp. 1-197.

Freed, Stanley A. and Ruth S. Freed
1982. Changing family types in India. Ethnol., vol. XXI, no. 3, pp. 189-202.

1983. The domestic cycle in India: natural history of a will-o'-the-wisp. Amer. Ethnol., vol. 10, no. 2, pp. 312-327.

Hatoff, Brian W. and David Hurst Thomas
1982. The Hidden Cave Archaeological Project: a case study in creative funding. Contract Abstracts and CRM Archeol., vol. 2, no. 3, pp. 7-9.

Kendall, Laurel
1983. Death and taxes: a Korean approach to hell. *In* Concepts of Hell in Asia, Ruth-Inga Heinze, ed., Folklore Inst., Cupertino, Calif. (in press).

Larsen, Clark Spencer and David Hurst Thomas
1982. The anthropology of St. Catherines Island: 4. The St. Catherines period mortuary complex. Anthrop. Pap. Amer. Mus. Nat. Hist., vol. 57, no. 4, pp. 271-342.

Morris, Craig
1982. The infrastructure of Inka control in the Peruvian central highlands. *In* The Inca and Aztec states: 1400-1800, John Collier, Renato Rosaldo and George Wirth, eds., Acad. Press, New York, pp. 153-171.

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Pendleton, Lorann S. A., *Alvin R. McLane* and David Hurst Thomas
1982. Cultural resource overview: Carson City District, west central Nevada. Bureau of Land Management, Cultural Resource Series, no. 5, parts 1 and 2, pp. 1-685.

Schildkrout, Enid
1983. Dependence and autonomy: the economic activities of secluded Hausa women in Kano, Nigeria. *In* Female and male in West Africa, C. Oppong, ed., George Allen and Unwin Ltd., London, pp. 107-127.

Schwartz, Jeffrey H. and Ian Tattersall
1982. A note on the status of *"Adapis" priscus* (Stehlin, 1916.) Amer. Jour. Primatol., vol. 3, no. 3, pp. 295-298.

1982. Relationships of *Microadapis sciureus* (Stehlin, 1916), and two new primate genera from the Eocene of Switzerland. Folia Primat., vol. 39, no. 2 pp. 178-186.

1983. A review of the European primate genus *Anchomomys* and some allied forms. Anthrop. Pap. of the Amer. Mus. Nat. Hist., vol. 57, pt. 5, pp. 344-352.

Tattersall, Ian
1982. Comment on *Ramapithecus* and hominid origins. Curr. Anthrop., vol. 23, no. 5, p. 515.

Notes:

1. In the bibliographies, the names and members of the staff and Fellows of the American Museum of Natural History appear in regular type.
2. In the bibliographies, an asterisk appears beside the names of graduate students whose work is being sponsored by members of the staff of the American Museum of Natural History.

Tattersall, Ian and Jeffrey H. Schwartz
1983. A reappraisal of the European Eocene primate *Periconodon.* Palaeontology, vol. 26, pt. 1, pp. 227-230.

Thomas, David Hurst
1982. An overview of central Great Basin prehistory. *In* Man and environment in the Great Basin, David B. Madsen and James F. O'Connell, eds. Soc. Amer. Archeol. Pap., no. 2, pp. 156-171.

1983. The archaeology of Monitor Valley: 1. Epistemology. Anthrop. Pap. of the Amer. Mus. Nat. Hist., vol. 58, no. 1, pp. 1-194.

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Eldredge, Niles, and Ian Tattersall
1983. Future people. Science 83, vol. 4, no. 2, pp. 74-77.

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1983. [Review of] Korean shamanistic rituals, by Jung-young Lee. The Jour. of Asian Studies, vol. XLII, no. 3, pp. 687-689.

Schildkrout, Enid
1983. The Art and Artistry of African Textiles. *Museum,* June/July 1983, pp. 46-51.

Shapiro, Harry L.
1983. Evolution of Man. Colliers Encyl. #377-00, vol. 9, pp. 482-488.

Tattersall, Ian
1982. [Review of] Functional morphology of the hip and thigh of the Lorisiformes. Folia Primat., vol. 38, nos. 1-2, p. 138.

Thomas, David Hurst
1982. Archeology. Encycl. of Science and Technology, McGraw-Hill, New York, pp. 681-683.

1982. A colleague's tribute (to Dr. Junius B. Bird). Explorer's Jour., vol. 60, no. 4, p. 149.

1982. [Review of] The creative explosion. Early Man, vol. 4, no. 3, pp. 38-39.

Astronomy and the American Museum-Hayden Planetarium

Through its many programs and course offerings and the resources of the Richard S. Perkin Library, the American Museum-Hayden Planetarium holds a worldwide reputation as the place to turn for information on astronomy and space science. This year, with the installation of one of the most complex computer automation systems in any planetarium in the world, it also began a new phase of program development, offering more visually dynamic shows than ever before and introducing new kinds of programming for young persons.

Sky Shows During the fiscal year, four Sky Shows were presented in the Sky Theater. Through Aug. 4, the Planetarium continued "The Incredible Universe of Albert Einstein," which took an in-depth look at the life and ideas of the famous scientist and humanitarian. That was followed by "Wanderers in the Night...A Journey to the Planets," a timely offering which summarized much of the knowledge of the solar system gained in recent years through a host of complex and highly successful spacecraft.

At year's end, the Planetarium presented its traditional holiday show, "Star of Wonder," which tells the story of the first Christmas and considers a number of possible explanations for the famous "star" which led the wise men to Bethlehem. "Wanderers in the Night...A Journey to the Planets" then returned for a limited engagement in January and February and was followed on March 3 with the premiere of a new breed of Sky Show, "Is Anyone Out There?...The Search for Life in Space." This show was the first written and produced for the Planetarium's new computer automation system and incorporated far more special effects than any previous program. It also introduced an element of science fiction into standard documentary format. Also in the spring, writing and production was begun for the next attraction, "Cosmic Mysteries," which was scheduled to open in September.

During the year, a total of 345,403 persons attended public Sky Show performances in the Planetarium.

Special Shows This year saw the production and presentation of three special types of shows at the Planetarium. On March 15 and 16, the Planetarium, in conjunction with the Center for Inter-American Relations, staged "Music in Space," in the Sky Theater. The live concert featured American and Brazilian musicians.

The year also saw the introduction of live theater for children in the Planetarium. Singer, dancer and nutritionist, John Burstein, in a character he developed for national television, appeared during school vacation periods in midwinter, spring and the summer in "Slim Goodbody's Galactic Health Adventure." The program, primarily for children 5 through 10, covered topics in astronomy, biology and space science. In April, the Planetarium inaugurated its first show created especially for preschool children. "Wonderful Sky," produced in cooperation with Henson Associates, Inc., and the Children's Television Workshop, was designed as a "first experience" at the Planetarium for 3- to 5-year-olds. It introduced these children to many of the objects they can look for in the day and night sky—from rainbows to sunsets to the twinkling stars.

Courses During the three academic terms of the past year, the Planetarium continued its diverse teaching traditions by offering a total of 21 courses in areas ranging from astronomy and meteorology, to aviation and navigation. Total enrollment was 645.

Laser Programs In September, the laser programs presented at the Planetarium by Laser Images of Van Nuys, California, were discontinued because of poor attendance. After reviewing several other products, a new program created by Audio Visual Imagineering, Inc., of Springfield,

Virginia, was opened on Feb. 11. Attendance for the new production has been strong. Total attendance for laser programs for the year was 69,502.

Special Presentations As in the past, the Planetarium hosted a number of special presentations. This year, programs were created on behalf of The American Institute for Aeronautics and Astronautics, National Public Radio, CBS, Children's Computer Workshop, the Eastern Region of the Federal Aviation Administration, and the Port Authority of New York and New Jersey.

The Perkin Library Through the continuing generous support of the Perkin family, the Planetarium's Richard S. Perkin Library gained in stature as one of the best collections of astronomical and space science publications in the east. Of particular note this year were the acquisition of more than 100 new books and the use of the Library's print and photographic collections in projects ranging from the research and writing of scientific articles to the creation of stage productions at the Juilliard School.

Exhibitions and New Acquisitions A number of different exhibits were displayed on the Planetarium's Artwall. They included a collection of pen and ink drawings by William J. Numeroff of leading figures in the history of the American space program; images of Saturn and its satellites taken by the Voyager spacecraft; a series of prints by the Argentine artist Aldo Sessa from his book produced in collaboration with Ray Bradbury, "The Ghosts of Forever;" a selection of illustrations from *Omni* magazine on the theme, "Visions of the Future," and a collection of weavings on astronomical themes by California artist April May.

During the fall, the Hall of the Sun was cleaned and completely repainted. New captions were also added in all of its exhibit areas, and major work was completed on its fiber optics displays and hands-on exhibits. This work was funded in part by a grant from the New York State Council on the Arts and from an anonymous donor.

During October a 1/5 scale model of the Optical Telescope Assembly (part of a large telescope to be flown into space in the mid-1980s) was on display courtesy of the Perkin-Elmer Corporation. During October, an eight-foot replica of the Space Shuttle was placed in the first floor exhibit area on indefinite loan from the IBM Corporation.

New Automation System During July, August and September, the Planetarium's technical and production staffs, in conjunction with representatives of Audio Visual Associates of Storrs, Conn., completed installation of the Planetarium's new computer automation system. The Sky Theater was closed to the public from Sept. 7 through Sept. 30, and on Oct. 1, the first public Sky Show was run on the new system. It represents one of the most sophisticated and complex systems of its kind in any planetarium in the world and will allow for the creation and production of more visually dynamic shows.

Funding for Technical Improvements In the spring, William A. Gutsch, Jr., Planetarium Chairman, launched a fund raising effort for the Planetarium. Aimed at providing additional equipment and production facilities to supplement the new computer automation system and continue to bring the Planetarium, technically, into the 1980s, the goal is $250,000.

The project has four goals: additional special effects equipment to enhance the visual quality of all Planetarium programs, new sound playback equipment and better soundproofing for the Sky Theater, the construction of a modest but viable sound studio for in-house soundtrack productions, the equipping of the sound studio. Bankers Trust Company led off the campaign with a generous leadership pledge of $25,000, which was matched by a gift from the Perkin Fund. The Sidney, Milton and Leoma Simon Foundation contributed an additional $5,000.

Staff Activities Dr. Gutsch wrote and served as executive producer for "Is Anyone Out There?...The Search for Life in Space," "Cosmic Mysteries" and "Wonderful Sky." He delivered papers at the biannual meeting of The International Planetarium Society (IPS) in Vancouver in July, and at a joint meeting of the Middle Atlantic Planetarium Society (MAPS) and the Great Lakes Planetarium Association (GLPA) in Rochester, N.Y., in May. He also delivered a series of lectures on planetarium education and production at the University of Santiago, Chile, in August, and gave talks on space exploration at the Galileo Galilei Planetarium and the Pan American Transport Congress in Buenos Aires, in June. He also wrote and produced weekly astronomy and space science news reports and features for WABC-TV.

Kenneth L. Franklin, Astronomer, taught four evening courses for adults and was one of the Planetarium's principal media contacts, having done interviews for newspapers, radio and television stations in the United States and Canada. Dr. Franklin delivered an invited paper to the Jansky Symposium at the National Radio Astronomy Observatory in May.

Allen Seltzer served as the Planetarium's Education Coordinator and in addition took on a variety of extra duties including assisting Dr. Gutsch in much of the Planetarium's daily business operations and in the preparation of the Planetarium's annual budget. He also served as an instructor on an expedition to the South Pacific and the Far East to observe a total eclipse of the sun.

Thomas A. Lesser, Senior Lecturer, and Joseph Maddi, Senior Technician, oversaw the installation of the Planetarium's new computer automation system. In January, Mr. Lesser resigned to become Manager of Cash Control in the Museum.

Clarence A. Brown, Assistant Producer, wrote "Wanderers in the Night." Mr. Brown also served as producer on "Is Anyone Out There?...The Search for Life in Space," "Wonderful Sky" and "Cosmic Mysteries."

Internship Program Joseph Kelch continued in the second year of his internship program at the Planetarium, a position funded in part by a grant from the New York State Council on the Arts. Mr. Kelch was producer for the Planetarium on "Slim Goodbody's Galactic Health Adventure" and "Music in Space." He assisted in the production of "Is Anyone Out There?" and "Wonderful Sky," and

A Zeiss VI planetarium projector and state of the art computers have made the American Museum-Hayden Planetarium presentations more spectacular. Above the audience a galaxy spins, a black hole swirls, a spaceship lands on a distant planet. A 45-minute Sky Show can now include 50 or 60 such effects, 10 times as many as before. The system was installed with substantial support from The Charles Hayden Foundation. To enhance this highly sophisticated system, the Planetarium seeks to further update its production facilities with additional financial support from foundations and corporations.

also represented the Planetarium at the joint MAPS-GLPA meeting at which he presented a paper entitled, "Microcomputers in the Planetarium."

Consultation and Training In August, Dr. Gutsch traveled to the University of Santiago, Chile, to serve as a consultant on the building of the first major planetarium for that country. During January and February, the Planetarium's technical staff conducted a training program for Guillermo Diaz, Senior Technician for the planetarium in Santiago.

In addition, the Planetarium provided consultations for members of the staffs of the Hong Kong Planetarium, the Helsinki Science Project and the Parc de La Villette, a major new planetarium-science center being built in Paris.

Abstracts and Popular Publications:

Branley, Franklyn M.

1983. Halley: Comet 1986. E. P. Dutton. 84 pp.

1983. Saturn: the spectacular planet. T. Y. Crowell. 84 pp.

1982. [Review of] The sun shines bright, by Isaac Asimov. Science Books and Films, vol. 17, no. 5, p. 252.

1982. [Review of] Daytime star, by Simon Mitton. Science Teacher, vol. 49, no. 8, p. 85.

1982. [Review of] Fun astronomy, by Sondra Maie. Science Teacher, vol. 49, no. 8, p. 84.

1982. [Review of] The comet is coming, by Nigel Calder. Science Teacher, vol. 49, no. 9, p. 58.

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Department of Entomology

Remarkably diverse and widespread, insects and spiders provide a wealth of information about evolutionary history and animal behavior. Scientists in this Department may study the minute structural details of thousands of beetle species, sift leaf litter in South America to find spiders almost invisible to the unaided eye, rise before sunup to observe bees that fly only at dawn, or record the distribution of insects throughout the world.

For the Department of Entomology, the year was marked by the influx of new people contributing to and expanding its scientific activities.

Robert Raven, on leave from the Queensland Museum, Brisbane, Australia, joined the Department on a postdoctoral fellowship funded by Australia's Commonwealth Scientific and Industrial Research Organization. He worked on a higher classification of tarantula-like spiders, utilizing intensively the Museum's large spider collection and library.

Michael Schwartz, doctoral candidate in evolutionary biology at the City University of New York, joined the Department as a Curatorial Assistant funded by the National Science Foundation (NSF) to work with Randall T. Schuh, Department Chairman, and Curator. Bella Galil began as a Curatorial Assistant working on the preparation of catalogs of the taxonomic literature of insect groups under study by Dr. Schuh and Lee Herman, Curator.

James Miller, Ph.D. candidate in entomology from Cornell University, pursued his phylogenetic studies of swallowtail butterflies this year; his research relies heavily on the Museum's collections as a source of basic information.

Plant Bugs Dr. Schuh devoted most of the year to completing his studies of the phyline plant bug fauna of the Indo-Pacific region, a project in which he first became interested in 1970 while working on his Ph.D. at the University of Connecticut. The completed study, accepted for publication in the Museum's *Bulletin,* comprises 270 species, 187 of which are described as new, distributed in 46 genera, 21 of which are new; represented by about 10,000 specimens. There are keys for all genera and to species in large genera, diagnoses and/or descriptions of all taxa, and a phylogenetic analysis of the Indo-Pacific fauna at the generic level. Nearly 1500 figures are presented, including photographs, line drawings of male genitalia, distributional maps and scanning electron micrographs of a variety of structures. Most of the final illustrations were prepared by Scientific Assistant Kathleen Schmidt.

Assisted by Mr. Schwartz, Dr. Schuh advanced his NSF-supported study of phyline plant bugs from western North America. This work has three objectives: (1) to produce a hypothesis of phylogenetic relationships of the North American fauna, (2) to produce a hypothesis of historical biogeography for North America based on the phyline plant bug fauna, and (3) to develop a theory of host-plant evolution for this largely host-specific group.

Dr. Schuh and Mr. Schwartz sorted into genus group and species approximately 35,000 specimens from major museums and university collections. They dissected male genitalia and prepared drawings for about 20 species in the genus *Rhinacloa.* Fieldwork in 1983 produced additional host and distributional data for many species originally collected and described by H. H. Knight, the only

This new species of rove beetle, Bledius susae Herman, *was discovered by Lee H. Herman, Curator in the Department of Entomology. Dr. Herman also prepared these illustrations of the male's body and the female's head. His comprehensive investigation of the North American genus required 17 years of laboratory and field work during which he collected more than 20,000 specimens. Pursuing information about evolution and insect behavior, Museum scientists have gathered specimens from many parts of the world. The Department's collections number some 16 million specimens of insects and arachnids.*

person ever to have attempted a comprehensive study of North American Miridae.

42,000 Specimens Studied Lee H. Herman, Curator, worked on his revision of the rove beetle genus *Bledius.* The third part of this series, which completed his analysis of the nearly 100 North American species, was accepted for publication as a Museum *Bulletin.* To understand the North American species, 17 years of work in the laboratory and field and examination of more than 42,000 specimens were required. Even with that, not all of the taxonomic problems were resolved. Although the first three parts of Dr. Herman's revision concentrated on details of the recognition of species in North America, he also arranged the species into 10 species-groups, two of which were given generic status.

For a fourth part of his revision, Dr. Herman will extend his classification of the North American fauna to an analysis of the known *Bledius* species for all parts of the world. He will divide the 429 species of *Bledius* into monophyletic species groups, a process which is nearly complete for the New World species. In the Old World, a subgeneric classification exists, but most species have not been assigned to subgenera, many unrelated species have incorrectly been included in the same subgenus, and many species do not belong in any of the eight recognized subgenera.

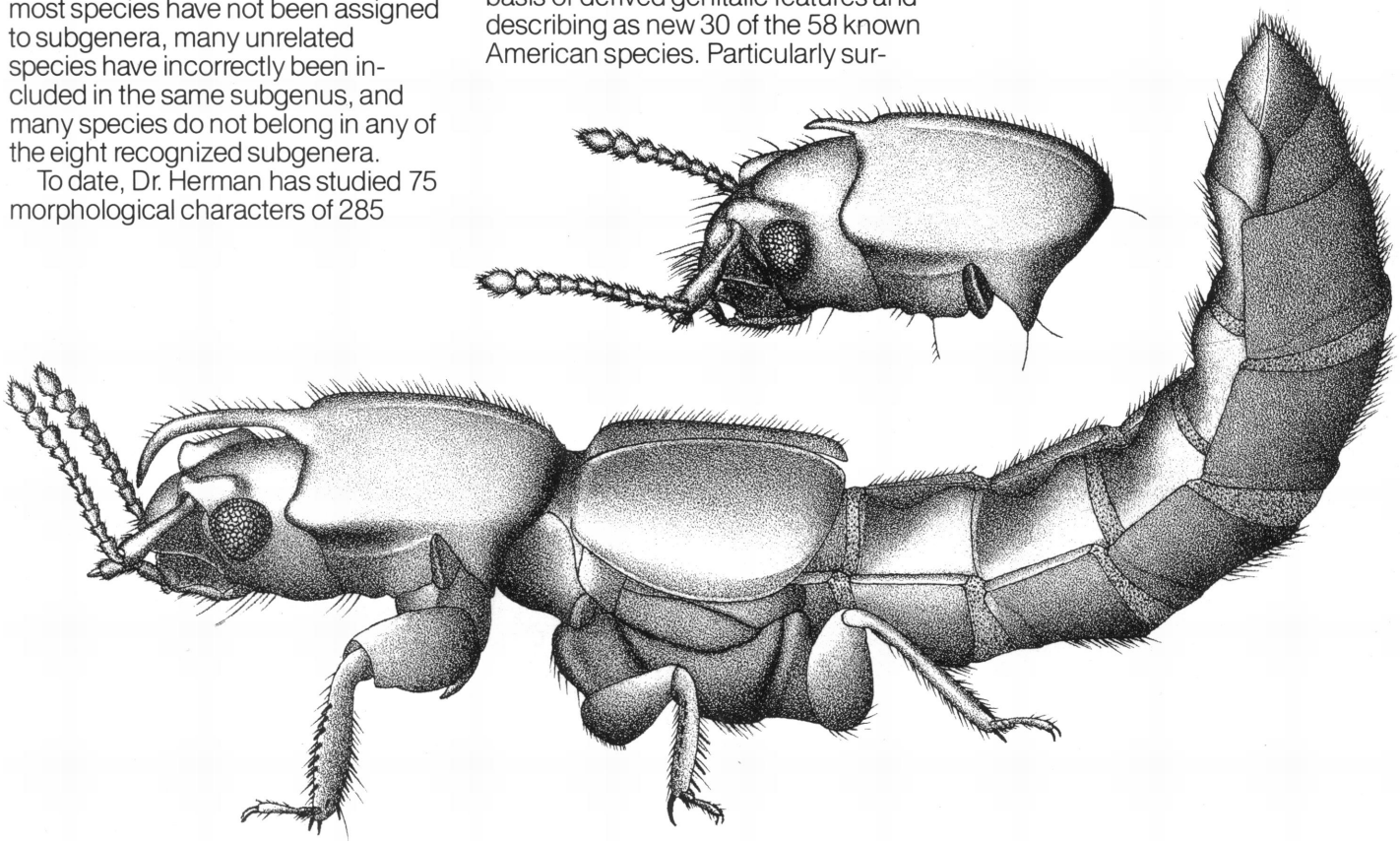
To date, Dr. Herman has studied 75 morphological characters of 285 species, dividing *Bledius* into 37 species groups that comprise from one to 54 species. On a trip to European museums, Dr. Herman examined most of the remaining 144 species. He expects that the majority will fall into the groups he has thus far recognized and that few new groups will be found. Initial work suggests that the 37 groups fall into three major lineages, but further study is needed.

In a separate article, Dr. Herman presented evidence that *Eppelsheimius* is the nearest relative of *Bledius.* The two known species of *Eppelsheimius* are found near saline water in arid regions, from Morocco across north Africa and Asia to China. The species of the two genera share a number of morphological characters, are similar in form and habitat and may have similar habits.

Spiders Norman I. Platnick, Curator, carried out research on systematics and biogeography. His taxonomic work, conducted with the artistic assistance of Mohammad Umar Shadab, Scientific Assistant, concentrated on the spider family Gnaphosidae. Dr. Platnick completed a revision of the New World species of *Zelotes,* redefining the genus on the basis of derived genitalic features and describing as new 30 of the 58 known American species. Particularly surprising was the diversity of the genus within California, with three groups of disjunctly distributed species being confined to that state and adjacent areas.

Dr. Platnick also began work on a series of projects involving Chilean spiders, including those collected on the 1981 expedition that he and Dr. Schuh made to Chile. This expedition was funded by the Eppley Foundation for Research. The *chilensis* group of the gnaphosid genus *Echemoides* was reviewed, with two new species and the previously unknown female of a third being described. He also completed a revision of *Apodrassodes,* transferring into that gnaphosid genus species previously misplaced in three other genera, and adding three new species (two of the types were collected on the Chilean trip) and the first known males of two others. With Raymond R. Forster, Research Associate from the Otago Museum, Dunedin, New Zealand, he began a review of the southern hemisphere spiders of the family Archaeidae and their relatives.

Willis J. Gertsch, Curator Emeritus, completed and had accepted for publication his review of the venomous



brown recluse spiders of North and Central America and the West Indies.

New World Moths Frederick H. Rindge, Curator, added to his long-range studies of the New World Ennominae, the largest subfamily of the Geometridae. Much of his time was spent completing a two-year study of the tribe Nacophorini. This group contains 40 genera, with species occurring from southern Canada to near the southern end of South America. A total of 19 new genera and seven new species was described. The manuscript was accepted for publication as a Museum *Bulletin.*

Dr. Rindge began a study of the relationships of the small genus *Acronyctodes*; its species are known from the mountains of central Mexico. *Acronyctodes* appears to belong in the Bistonini, and as such it represents the southernmost record of this tribe in the New World.

A major project started by Dr. Rindge was a generic revision of the tribe Lithinini. One portion of this taxon is the compact group of six genera that occurs in the United States and southern Canada. A number of species occur in Chile and Argentina but their generic placements are in doubt. As of now, the exact distributional limits of this tribe in the Neotropical Region are unknown. A great deal of dissection and character analysis is needed before definite results can be obtained.

Kurt Johnson, Research Associate, studied the hair-streak butterflies and the New World tropical genus *Agrias.*

Ground-Nesting Bees Jerome G. Rozen, Jr., Deputy Director for Research and Curator, investigated ground-nesting bee biology. During a field trip to the Museum's Southwestern Research Station in Portal, Ariz., Vincent Roth, Resident Director of the Station, led Dr. Rozen to a nesting site of the large ground-nesting bee *Ptiloglossa arizonensis.* This bee is crepuscular, flying only from just before dawn to shortly after sunup; it is therefore infrequently seen by entomologists and its nests had never been found. As a result of Mr. Roth's discovery, Dr. Rozen has drafted a paper on this bee's nesting behavior, foraging activities, and nest associates.

The study has developed into a larger investigation centered on the nesting biology of bees belonging to the subfamily Diphaglossinae, to which *Ptiloglossa* belongs. This is the only major bee group comprised almost exclusively of nocturnal and crepuscular forms; all are restricted to the New World tropics and adjacent warm temperate regions. Only one species is known to fly throughout the day, and that occurs in the high montane rain forests of Panama and Costa Rica where the ecological conditions are nearly constantly cool and damp, a twilight situation.

Four-Winged Flies Pedro Wygodzinsky, Curator, and Mrs. Schmidt studied the Enicocephalidae of the Western Hemisphere. During the year, new specimens came to hand, and new characters were found, thus widening the scope of the work. The Enicocephalidae, a group of seldom encountered and little studied true bugs, are sometimes euphemistically referred to as four-winged flies, because their wings are of uniform structure, unlike other hemipterans, and because they swarm periodically, as do many flies and gnats but not other true bugs. The family name, meaning unique-headed, derives from the peculiar structure of the head, which is unlike that of other bugs.

Dr. Wygodzinsky and Sarfraz Lodhi, Scientific Assistant, continued their study of the distribution of trichobothria on the second antennal segment of the Reduviidae, the only such structures known for the family. They have completed approximately 200 illustrations and a preliminary discussion.

Dr. Wygodzinsky, and Research Associate Sixto Coscaron of La Plata, Argentina, are near completion on a survey of the blackfly genus *Gigantodax,* a group which ranges from Central America to Tierra del Fuego. About 70 species are treated in the present revision, but Dr. Wygodzinsky believes that many more remain to be found. Where possible, Drs. Wygodzinsky and Coscaron have attempted to achieve the ideal in blackfly systematics: presenting a description and illustration of larvae, pupae, male and female, with a key for each lifestage.

Scientific Publications:

Herman, Lee H.
1983. *Pseudopsis:* two new species from India (Coleoptera, Staphylinidae, Pseudopsinae). Amer. Mus. Novitates, no. 2755, pp. 1-6, figs. 1-10.

Newton, Alfred F., Jr.
1982. Redefinition, revised phylogeny and relationships of Pseudopsinae (Coleoptera, Staphylinidae). Amer. Mus. Novitates, no. 2743, pp. 1-13, figs. 1-4, table 1.

1982. A new genus and species of Oxytelinae from Australia, with a description of its larva, systematic position, and phylogenetic relationships (Coleoptera, Staphylinidae). Amer. Mus. Novitates, no. 2744, pp. 1-24, figs. 1-41, table 1.

Platnick, Norman I.
1982. Defining characters and evolutionary groups. Syst. Zool., vol. 31, pp. 282-284.

1983. A review of the *chilensis* group of the spider genus *Echemoides* (Araneae, Gnaphosidae). Amer. Mus. Novitates, no. 2760, pp. 1-18, figs. 1-56.

Platnick, Norman I., and *Vicki A. Funk*, eds.
1983. Advances in cladistics, volume 2: Proceedings of the second meeting of the Willi Hennig Society. Columbia University Press, New York, x + 218 pp.

Platnick, Norman I., and Gareth Nelson
1982. The purposes of biological classification. *In* Proceedings of the 1978 biennial meeting of the Philosophy of Science Association, Peter D. Asquith, and Ian Hacking, eds., Philosophy of Science Association, East Lansing, PSA 1978, vol. 2, pp. 117-129.

Platnick, Norman I., and Mohammad U. Shadab
1982. A revision of the American spiders of the genus *Camillina* (Araneae, Gnaphosidae). Amer. Mus. Novitates, no. 2748, pp. 1-38, figs. 1-120.

1983. A revision of the American spiders of the genus *Zelotes* (Araneae, Gnaphosidae). Bull. Amer. Mus. Nat. Hist., vol. 174, pp. 97-191, figs. 1-272, maps 1-22.

1983. A revision of the Neotropical spider genus *Apodrassodes* (Araneae, Gnaphosidae). Amer. Mus. Novitates, no. 2763, pp. 1-14, figs. 1-39.

Shear, William A., and *Jurgen Gruber*
1983. The opilionid subfamily Ortholasmatinae (Opiliones, Troguloidea, Nemastomatidae). Amer. Mus. Novitates, no. 2757, pp. 1-65, figs. 1-210, tables 1-27, maps 1-3.

Slater, James A., and *T. E. Woodward*
1982. Lilliputocorini, a new tribe with six new species of *Lilliputocoris*, and a cladistic analysis of the Rhyparochrominae (Hemiptera, Lygaeidae). Amer. Mus. Novitates, no. 2754, pp. 1-23, figs. 1-24.

Vaurie, Patricia
1982. Revision of neotropical *Eurhin* (Coleoptera, Curculionidae, Baridinae). Amer. Mus. Novitates, no. 2753, pp. 1-44, figs. 1-55.

Abstracts and Popular Publications:

Platnick, Norman I.
1982. [Review of] Evolution: Genesis and revelations, with readings from Empedocles to Wilson, by C. L. Harris, Syst. Zool., vol. 31, pp. 104-105.

Schuh, Randall T.
1982. [Review of] Biogeography and ecology of New Guinea. Syst. Zool., vol. 31, no. 2, pp. 222-225.

Department of Herpetology

The Department is committed to increasing knowledge of the biology and diversity of the world's amphibians and reptiles. Current research follows a Departmental tradition of emphasizing both field and laboratory investigations. Members of the scientific staff are as at home in the desert or some remote jungle as in an air-conditioned laboratory. Despite a busy schedule of research and travel, service to the public and scientific communities continued unabated.

Cloud Forest and Poison Frog Studies Charles W. Myers, Chairman and Curator, explored a newly accessible area of tropical cloud forest during two trips to Panama. The first trip was made at the invitation of an environmental consulting firm, Estudios Ambientales, S.A., and fieldwork was conducted under the auspices of Petroterminal de Panamá, a company responsible for the recent construction of a 125-kilometer oil pipeline that connects port facilities on the Atlantic and Pacific coasts of western Panama.

The pipeline route transects diverse types of climate and vegetation, and Dr. Myers estimated that its fauna includes more than half the species of amphibians and reptiles known from Panama. The pipeline allows the unloading and loading of oil by tankers that are too large to traverse the Panama Canal. Its construction gave access to a previously uncollected strip of cloud forest that is narrowly confined to the continental divide along the central cordillera of western Panama.

Preliminary collecting in the cloud forest in June and July was so productive that Dr. Myers arranged to return to the area in January, in company with Field Associate Víctor Martínez from the University of Panama, and John Daly from the National Institutes of Health. Food and lodging for Dr. Myers's party were provided in the cloud forest construction camp of Constructora Urbana, S.A., a Panamanian company doing road building near the route of the now buried pipeline. Collecting the often secretive amphibians and reptiles was successful, with more than 60 species being found in this wet, montane forest. An unnamed, highly arboreal poison frog of the genus *Dendrobates* was among the rare species obtained.

In addition to support received from Panamanian sources, fieldwork during the year was financed by a grant from the Merck Sharp & Dohme Research Laboratories. A second annual grant was received from the Research and Development Laboratories of Astra Läkemedel AB, Sweden, to help defray expenses involved in Dr. Myers's collaborative work with Dr. Daly on South American poison frogs. A review of this ongoing work was published in *Scientific American*.

Lizard Genetics Curator Charles J. Cole spent a week in the laboratory of Research Associate Herbert C. Dessauer at the Louisiana State University Medical Center, New Orleans, working on biochemical genetics of unisexual (all-female) species of whiptail lizards in the genus *Cnemidophorus*. He spent the balance of the spring and summer in the Southwest, using the Museum's Southwestern Research Station as the base of operations. Various species of whiptail lizards were obtained for investigations in reproduction, genetics, origin and systematics of all-female species, and extensive experimental work was accomplished in the laboratory at the field station.

The first year's support of a five-year grant from the National Science Foundation for Dr. Cole's research on whiptail lizards was completed and funding for the second year was received. A major effort this year involved extensive renovation of the facilities for the lizard colonies instrumental to this work, and establishment of the lizards in new quarters. These colonies of individual lizards of known genealogy provide unique data for addressing issues concerning the origin of parthenogenesis, cloning and polyploidy in animals.

The unisexual species of *Cnemidophorus* that have been studied most intensively are known to have origi-

nated through hybridization (interbreeding between males and females of different species); the female hybrids apparently perpetuate themselves by cloning. Dr. Cole and Senior Scientific Assistant Carol R. Townsend also have been conducting studies on a tropical unisexual lizard from Trinidad and Surinam, *Gymnophthalmus underwoodi,* because preliminary data indicated it might be unusual or even unique among all-female species in having possibly had a nonhybrid origin. The most recent genetic data, compiled this year, however, strongly indicate that *G. underwoodi* did indeed have a hybrid origin after all. The National Geographic Society has awarded Dr. Cole a follow-up grant for conducting fieldwork in search of the bisexual ancestors of *G. underwoodi.*

Australasian Frogs Curator Richard G. Zweifel spent most of his research time on a systematic revision of the Australian microhylid frogs, a study based largely on his previous fieldwork. These frogs represent one of the fringe elements of the New Guinea rain forest fauna in the tropics of extreme northern Australia, and for this reason they are of more than passing zoogeographic interest. Analysis of the frogs' mating calls has played a large part in distinguishing among the 16 Australian species that Dr. Zweifel now recognizes (current literature lists only seven), but this evidence of specific differentiation has had to be backed up with extensive statistical comparisons of morphological traits. The Department's acquisition of a microcomputer with graphics plotter has made the statistical work much less time-consuming. Continuing his work on the New Guinea fauna, Dr. Zweifel drew upon collections he made in New Guinea in 1968 and 1969 in describing two new species of tree frogs in a paper published in *American Museum Novitates.*

Snake Genetics and Systematics Dr. Zweifel continued his work with the Department's breeding colony of kingsnakes, on which two papers were published during the year. One report deals with the distribution and evolution of color pattern morphs of kingsnakes in southern California, and the other describes a successful experiment proving that one brood of snakes can have two fathers.

Research Associate Janis A. Roze is continuing his studies of coral snakes. He and Assistant Cataloguer Grace M. Tilger published an account of the North American *Micrurus fulvius* in the *Catalogue of American Amphibians and Reptiles.* Dr. Cole coauthored several species accounts of the snake genus *Tantilla* in the same *Catalogue* series, and also advanced his research on the chromosomes of viperid snakes. Dr. Myers worked on the preliminary descriptions of two new genera and a new species of South American colubrid snakes.

Lizard Behavior Research Associate Carol A. Simon is conducting studies to examine several aspects of territoriality in juveniles of the spiny lizard, *Sceloporus jarrovi.* Questions being asked include, (1) How does habitat structure affect territory size? (2) At what time of life do territories form, and why? (3) How does the vomeronasal system operate efficiently enough to aid young lizards in territory formation? Answers to these questions will help behavioral ecologists better understand the nature of territory formation and the adaptiveness of territory choice. Dr. Simon published two reviews of lizard chemoreception during the year.

Departmental Outreach
Specimens were accessioned from 15 countries on five continents and from the islands of St. Lucia, Virgin Gorda, and New Guinea. About 70 percent of the 2100 new specimens derived from fieldwork by the staff. The research collection and other Departmental resources are heavily used by the scientific community. The Department received one professional visitor on the average of every four work days.

A total of 4929 specimens were lent to or returned by 99 researchers at other institutions in this country and abroad. In the last 25 years, nearly a quarter of the entire collection has been sent on loan to outside investigators. The reason for such heavy use lies in the global representation of the more than a quarter of a million catalogued specimens. This collection includes nearly 90 percent of the genera and about 60 percent of the world's living species of amphibians and reptiles.

This prodigious lending activity places a heavy burden on Museum resources, which is a principal reason why the Department has been receiving operating support, since 1975, from the National Science Foundation. The Department is completing the final year of its current NSF grant. A proposal for renewed support has been submitted.

Members of the Department staff answer phone calls and letters from the lay public and, time permitting, provide various services to outside organizations. As a recent example, Scientific Assistant Michael W. Klemens participated in a wildlife survey of Central Park at the request of the Central Park Conservancy. A frog and at least one kind of turtle are represented by breeding populations in this Manhattan park.

Scientific Publications:

Cole, Charles J., Herbert C. Dessauer, and Carol R. Townsend
1983. Isozymes reveal hybrid origin of Neotropical unisexual lizards. Isozyme Bull., vol. 16, p. 74.

Cole, Charles J., and *Laurence M. Hardy*
1983. *Tantilla atriceps* (Günther). Cat. Amer. Amphib. Rept., pp. 317.1-317.2.

1983. *Tantilla hobartsmithi* (Taylor). *Ibid.*, pp. 318.1-318.2.

1983. *Tantilla planiceps* (Blainville). *Ibid.*, pp. 319.1-319.2.

Myers, Charles W., and *John W. Daly*
1983. Dart-poison frogs. Sci. Amer., vol. 248, no. 2, pp. 120-133, 8 figs., 2 color pls.

Myers, Charles W., and *William E. Duellman*
1982. A new species of *Hyla* from Cerro Colorado, and other tree frog records and geographical notes from western Panama. Amer. Mus. Novitates, no. 2752, pp. 1-32, figs. 1-25, tables 1-2.

Roze, Janis A., and Grace M. Tilger
1983. *Micrurus fulvius* (Linnaeus). Cat. Amer. Amphib. Rept., pp. 316.1-316.4.

Simon, Carol A.
1983. A review of lizard chemoreception. *In* Lizard ecology, R. Huey, E. Pianka, and T. Schoener, eds. Cambridge, Harvard Univ. Press, pp. 119-133.

Charles W. Myers, Chairman and Curator in the Department of Herpetology, obtained scientifically valuable collections of reptiles and amphibians, including previously undescribed species, along the route of this oil pipeline across the Isthmus of Panama. The pipeline, laid through biologically unexplored cloud forest, opened up this area and afforded an opportunity for biologists to learn more about the region's fauna. Dr. Myers participated in an environmental impact study in the area.

Zweifel, Richard G.
"1981" [1982]. Color pattern morphs of the kingsnake (*Lampropeltis getulus*) in southern California; distribution and evolutionary status. Bull. So. Calif. Acad. Sci., vol. 80, pp. 70-81, figs. 1-2.

1983. Two new hylid frogs from Papua New Guinea and a discussion of the *Nyctimystes papua* species group. Amer. Mus. Novitates, no. 2759, pp. 1-21, figs. 1-18.

Zweifel, Richard G., and Herbert C. Dessauer
1983. Multiple insemination demonstrated experimentally in the kingsnake (*Lampropeltis getulus*). Experientia, vol. 39, pp. 317-319, figs. 1-2.

Abstracts and Popular Publications:

Simon, Carol A.
1982. Masters of the tongue flick. Nat. Hist., vol. 91, no. 9, pp. 58-67.

Department of Ichthyology

Ichthyology in the Museum centers on the collection, its maintenance, rational growth, practical use and scientific study. The Department's collection dates from the last century, is worldwide in scope and reflects the history of the Museum's principal expeditions. During the last 20 years, the collection has proven a valuable resource for comparative study, mainly by the Department's staff and students, of the interrelationships of the major groups of fishes.

Rehabilitation and expansion of the collection, begun in the early 1960s by Curator Donn E. Rosen, then Department chairman, entered a new phase this year. Major collections of fishes from the eastern United States, particularly New York and the southeast, were acquired. The New York collection consists of approximately 5000 specimens and some 20,000 specimens of larval fishes from the Power Authority of the State of New York.

Comprising 200,000 specimens, the southeastern collection was transferred to the Museum in September from the Virginia Polytechnic Institute and State University in Blacksburg. At the same time, a curatorial support grant was received from the National Science Foundation. With additional space and renovation provided by the Museum, the grant will, for the first time in the Department's history, permit modern storage of the entire fish collection and render it totally accessible.

As a result, the Department will have increasing responsibilities to the scientific community and will become better integrated with it. In doing so, the Department will have achieved the basic goals of rehabilitation formulated two decades ago and will be well prepared for the demands of the future.

During the year there were 54 accessions, including 250,000 specimens. Cataloging was completed for 2500 lots, including 40,000 specimens. Nearly 75 loans were sent to investigators throughout the world.

Dories and Puffers Supported over the last two years by an NSF research grant, Dr. Rosen has continued a long-term study of the interrelationships of spiny-finned teleosts. This group includes 10,000 species and 250 families. The study has required that extensive skeletal material be processed with modern techniques. This material has been accumulated during recent years and, as a permanent part of the skeleton collection, will remain as probably the most extensive of its kind in the world.

One outstanding result of Dr. Rosen's recent studies is the apparent relationship of zeiform fishes (which include john dories and boarfishes) with tetraodontiform fishes (triggerfishes and puffers). Traditionally, the former group was believed to be a primitive offshoot of the line leading to perciform fishes (perches and their allies). The latter group was believed to be secondary derivatives of the perciforms. If Dr. Rosen is correct in his assessment, his will be a pioneering work, apt to lead to a breakthrough in the understanding of the interrelationships and, consequently, evolution of this, the largest group of living fishes.

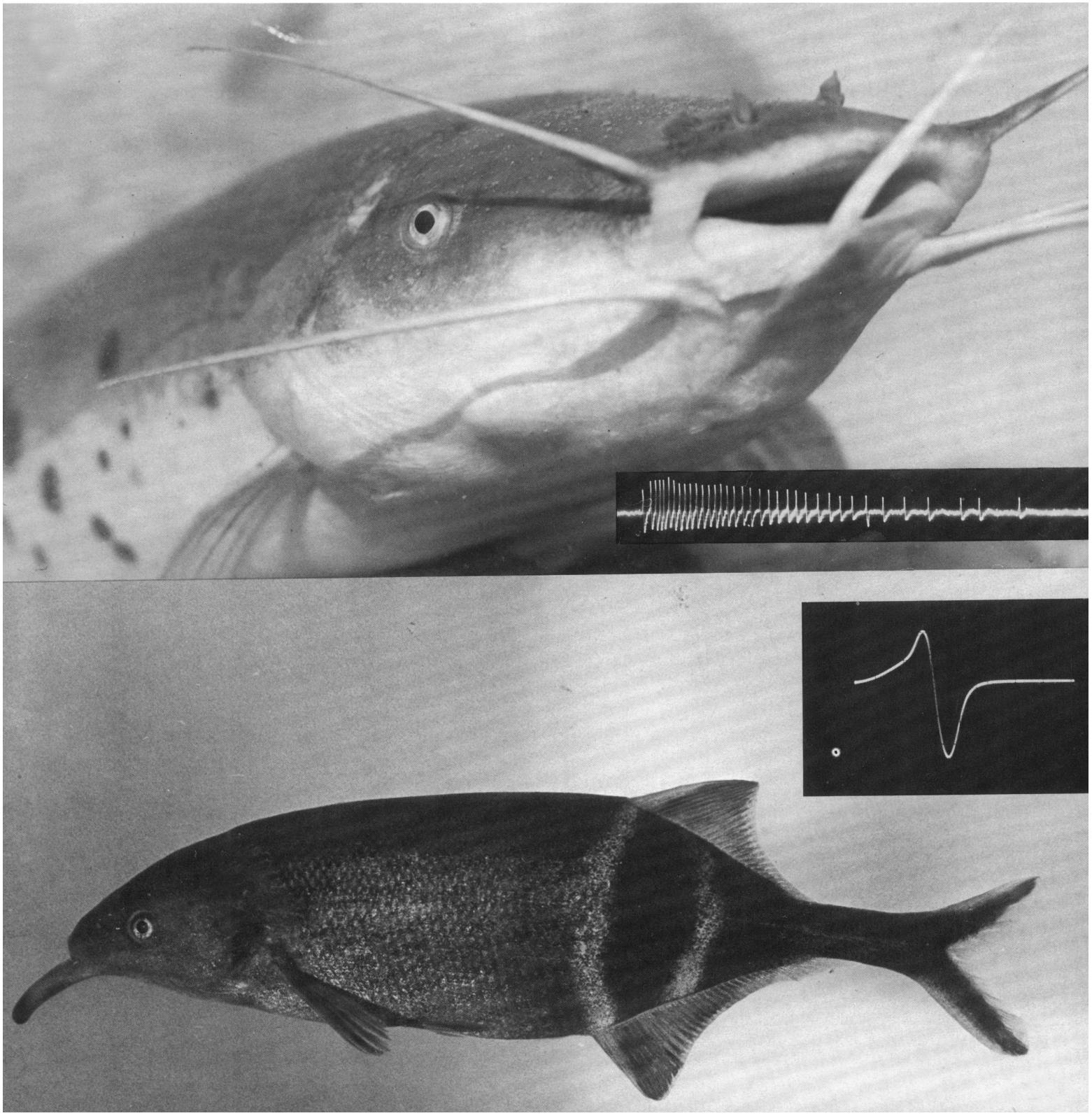
Freshwater Fishes of New York Supported through several years by grants from the New York State Department of Environmental Conservation, C. Lavett Smith, Curator, has completed an extensive survey of New York State's freshwater fishes. Having collected throughout the state over the past 10 years, Dr. Smith has been able to assess both the long-term and the short-term dynamic aspects of fish distribution.

The long-term aspects in this case mean the gradual changes in fish distribution accompanying the advance and retreat of glaciers, erosion and stream capture. The short-term aspects mean the changes in fish distribution caused by human alteration of the environment through canal and dam building, introduction and habitat destruction. With the publication of Dr. Smith's now complete book-length manuscript, the freshwater fishes of New York State, numbering approximately 250 species, will become in these respects as well known as any others in a comparable area of the world. During the year, Dr. Smith was elected a fellow of the American Association for the Advancement of Science.

Anchovies Having completed a book on the history and present status of systematics and biogeography, Gareth Nelson, Chairman and Curator, has returned to systematics of fishes. Intrigued over several years by distributions of plants and animals in and around the Pacific Basin, he believes that anchovies exemplify the basic distribution patterns that reflect the main events of the history of the Pacific. He hopes that increased knowledge of anchovy interrelationships will expose some of the lesser events.

As a first step toward the larger problems of biogeography, Dr. Nelson has reviewed virtually all of the 150 species, many of which are difficult to identify and which include a number of newly discovered miniature species native to the freshwater of South America. For several months of the past year he studied an 11,000-specimen collection of tropical American anchovies sent to the Museum on loan by the Gulf Coast Research Laboratory in Ocean Springs, Miss. About 10 percent of this well preserved and

An electric catfish, Malapterurus electricus, *can discharge a volley of strong pulses, shown in the inset, to stun prey. In contrast, the elephant nose fish,* Gnathonemus petersii, *uses weak electric pulses to recognize others of its species and to locate objects in its environment. Peter Moller, Research Associate in the Department of Ichthyology, and Susan Cobert and Cathy Rankin, Ph.D. candidates, have been studying these inhabitants of African fresh water.*



well documented collection will remain in the Department's permanent collection in exchange for accurate identification provided by the Department.

Electric Fishes In his continuing studies of the behavior of electric fishes Peter Moller, Research Associate, in collaboration with Cathy Rankin, Ph.D. candidate, has found that electricity is usually the means by which these fishes recognize other individuals of the same species. Such is apparently true for all of the weakly electric elephant fishes (family Mormyridae) of Africa. But the strongly electric catfish, *Malapterurus electricus*, also of Africa, learns the identity of intruders by means presently unknown. It responds with high-voltage discharges only to intruders of species other than its own.

Killifishes and Hakes Lynne R. Parenti, Research Associate, has finished a two-year systematic study of the killifish genus *Orestias*, known primarily through its many species endemic to Lake Titicaca in the Andes on the border of Bolivia and Peru.

Joseph W. Rachlin, Research Associate, is currently studying the ecology and resource partitioning of two very similar hakes (genus *Urophycis*) of the New York area.

Evolutionary Theory During the past year, application of evolutionary theory was explored in two different areas: animal behavior by Lester R. Aronson, Curator Emeritus, and comparative endocrinology by James W. Atz, Curator Emeritus.

Scientific Publications:

Aronson, Lester
1981. Evolution of telecephalic function in lower vertebrates. P. Laming ed., Brain Mechanisms of Behavior in Lower Vertebrates. Cambridge University Press, pp. 33-58.

Teyssedre, Claudine, and P. Moller
1982. The optomotor response in weak-electric mormyrid fish: can they see? Z. Tierpsychologie, vol. 60, pp. 306-312.

Moller, Peter, *J. Serrier, A. Squire*, and *M. Boudinot*
1982. Social spacing in the mormyrid fish *Gnathonemus petersii* (Pisces): a multidisciplinary approach. Anim. Behav., vol. 30, pp. 641-650.

Nelson, Gareth
1982. Cladistique et biogéographie. *Compte Rendu des Séances de la Société de Biogéographie,* (Paris), vol. 58, pp. 75-94.
1982. A second Indo-Pacific species of *Thrissina*. Japan. Jour. Ichthyol., vol. 29, pp. 99-101.
1983. *Anchoa argentivittata*, with notes on other Eastern Pacific anchovies and the Indo-Pacific genus *Encrasicholina. Copeia* 1983, pp. 48-54.
1983. Vicariance and cladistics: an historical perspective with implications for the future. R.W. Sims et al. eds., Evolution, Time and Space. Academic Press, London, pp. 469-492.
1983. Reticulation in cladograms. N. Platnick and V. Fink eds., Advances in Cladistics, Columbia Univ. Press, New York, vol. 2, pp. 105-111.

Parenti, Lynne R.
1982. Relationship of the African killifish genus *Foerschichthys* (Teleostei: Cyprinodontiformes: Aplocheilidae). *Proceedings of the Biological Society of Washington*, vol. 95, no. 3, pp. 449-455.

O'Conner, J.M., and Joseph W. Rachlin
1982. Perspectives on metals in New York Bight organisms: factors controlling accumulation and body burden. G.F. Mayer ed., Ecological stress and the New York Bight, pp. 655-673. Estuarine Research Federation, Columbia, S.C.

Abstracts and Popular Publications:

Nelson, Gareth
1982. Darwiniana. [Reviews of] The origin: Biographical novel of Charles Darwin, by I. Stone; The delicate arrangement: The strange case of Charles Darwin and Alfred Russel Wallace, by A.C. Brackman; and Charles Darwin and the problem of creation, by N.C. Gillespie. Syst. Zool., vol. 31, pp. 105-106.
1982. [Review of] Tendences actuelles de la biogeographie. Syst. Zool., vol. 31, pp. 217-218.
1982. [Review of] Alternative hypotheses in biogeography. Syst. Zool., vol. 31, pp. 329-330.

Parenti, Lynne R.
1983. The refuge theory: A critique. [Review of] Biological diversification in the tropics, G.T. Prance, ed., Syst. Zool., vol. 31, no. 4, pp. 527-529.

Department of Invertebrates

Invertebrates have always constituted an overwhelming majority of the fauna. At least since the Cambrian, their fossil remains dominate the biological portion of every continent's geologic record. The departmental collections of fossil and Recent invertebrates, comprising more than 8.5 million specimens and covering all phyla of the animal kingdom, give tangible evidence of the enormous richness of invertebrate structure and form which has evolved during the past 700 million years. To study, maintain, improve and expand this invaluable systematic resource is the foremost objective of the Department.

Ribbon Worms Ernst Kirsteuer, Chairman and Curator, has been completing descriptions of several new species for a monograph of the genus *Ototyphlonemertes*, minute ribbon worms inhabiting marine beaches and shallow-water sand bottoms. He compiled data for a reclassification of the phylum Nemertina, to which ribbon worms belong. He also provided scientific supervision of the exhibition, "New Frontier of Life," which dealt with the recently discovered communities of bacteria and animals that flourish at hot water vents in the eastern Pacific.

Roger L. Batten, Curator, completed an investigation of the calcitic shell structure of the widely distributed Paleozoic gastropod groups, Euomphalacea and Platyceratacea, and submitted a manuscript on the results to the *Journal of Paleontology.* He also finished the descriptions of primitive mesogastropods of the Permian of Malaysia, completed a preliminary analysis of the Triassic Seven Devils fauna of Idaho, and initiated a study of Late-Permian gastropods recently discovered in Greece.

Evolutionary Theory Niles Eldredge, Curator, explored various aspects of biological hierarchies and their con-

nection with evolutionary theory in two manuscripts, one with Stanley N. Salthe of Brooklyn College, and the other with Elizabeth S. Vrba of the Transvaal Museum. He began work on a book examining the logical structure of prevailing evolutionary theory and the possibilities of its augmentation by adopting a formally hierarchical approach. Dr. Eldredge also carried forward his research on trilobites of the Southern Hemisphere, beginning an analysis and descriptions of four newly discovered species from the Silurian of Bolivia. In addition, he made progress in his collaboration with several scientists at Lamont-Doherty Geological Observatory on patterns of evolution in the Miocene-Recent radiolarian genus *Pterocanium*.

Rediscovered Snail William K. Emerson, Curator, studied the systematics and zoogeography of marine mollusks. With Barry Roth of the California Academy of Sciences, Dr. Emerson reported the rediscovery on the Pacific coast of Panama of the marginellid snail, *Persicula tessellata*. The French naturalist Jean Baptiste Lamarck originally described this species from an unknown locality in 1822. Live-collected specimens received from James Ernest of Balboa, Panama, were found, however, to agree well with the type specimens of Lamarck's species. Previously, Lamarck's species was thought to be referable to an earlier known species living in the Caribbean. It had remained unrecognized in the eastern Pacific waters for the past 160 years.

Pearly Nautilus Neil H. Landman, Assistant Curator, advanced his studies on life history, systematics and evolution of ammonoids and nautiloids, externally shelled cephalopods common in ancient seas but represented today by only the pearly nautilus. He is interpreting the early life history of ammonoids and has documented the first mass occurrence of preserved embryonic shells of ammonoids in North America. With Karl M. Waage of the Yale Peabody Museum, he is also examining the evolution of this group as it approached its extinction 60 million years ago. Because *Nautilus* is the only living analog for extinct ammonoids, Dr. Landman, in collaboration with J. Kirk Cochran of the Woods Hole Oceanographic Institute, is investigating the growth rate and early life history of *Nautilus* based on the record of morphologic and biochemical change in its shell. Study of the comparative life histories of *Nautilus* and ammonoids may provide clues as to why ammonoids became extinct but *Nautilus* survives to the present day.

Judith E. Winston, Assistant Curator, studied bryozoans from Caribbean and Antarctic localities. She applied knowledge gained from studies on life histories of encrusting forms to learn about growth, reproduction and mortality in some erect branching species from the Ross Sea, Antarctica. A project on a third major type of life history strategy is being carried out in Florida where she and Eckart Hakansson of the University of Copenhagen, are studying population biology of lunulitiform species—bryozoans with conical colonies capable of moving freely about in subtidal sand-bottom environments. In July, Dr. Winston presented a paper at the Second International Meeting on Biogeography and Evolution in the Pacific held in Sidney, Australia. Subsequently, she conducted field work along the coast of Queensland.

Dorothy E. Bliss, Curator Emerita, served as editor in chief of the treatise, "The Biology of Crustacea," published by Academic Press. During the year, the first seven volumes appeared in print. Volumes 8 and 9 of this treatise are in press, and volume 10 is soon to be submitted for publication. Also published was Dr. Bliss's book for the general reader and naturalist, "Shrimps, Lobsters, and Crabs: Their Fascinating Life Story."

Biotic Revolution Norman D. Newell, Curator Emeritus, and Donald W. Boyd, Research Associate, worked on their long-term studies of the Permian-Triassic biological crisis. Focusing on marine bivalves, they are bringing to light numerous examples of evolutionary convergence and extinction which are themselves significant problems. The studies are corroborating a general biotic revolution, but the changes were not as abrupt as frequently interpreted. Instead of a sudden global catastrophe, the event was spread over tens of millions of years, suggesting climatic and geographic causes. The research involves extensive use of the scanning electron microscope, the computer and new optical photography techniques in an effort to analyze fine details of shell ultrastructure not previously evaluated in comparable fossils.

Howard R. Feldman, Research Associate, progressed in his studies on the systematic, morphologic variation and biostratigraphy of Middle Devonian brachiopods of New York. A manuscript dealing with brachiopods of the Onondaga Limestone will be submitted for publication shortly. Dr. Feldman advanced his work on the systematics and paleoecology of the brachiopod faunas of northern Sinai, in collaboration with Francis Hirsch of the Geological Survey of Israel and Ellis F. Owen of the British Museum (Natural History).

John J. Lee, Research Associate, and his collaborators have obtained new evidence from collections from the Red Sea, Hawaii and the Great Barrier Reef that diatom endosymbiosis in certain species of larger Foraminifera (Protozoa) has some unusual characteristics not yet known in other marine invertebrate groups. The same host species seem to be able to harbor more than one diatom species. Although each protozoan is usually host to only one diatom species at a time, the endosymbionts can be replaced by other species. Studies are in progress to evaluate the potential for recruiting new symbionts from free-living diatom assemblages.

Pollutant Effects On Crabs Linda H. Mantel, Research Associate, continued her studies of the effects of the pollutants benzene and naphthalene on the growth rate, regeneration, and salt and water balance in the commercially important crab, *Callinectes sapidus*.

Leslie F. Marcus, Research Associate, collaborated with François Vuilleumier of the Department of Ornithology in a project concerned with ecomorphological convergence of birds in Mediterranean habitats. He also worked with Kenneth Campbell of the Los Angeles County Museum in a study of allometry of bird skeletons.

Horace W. Stunkard, Research Associate, pursued his investigation on

life cycles and systematics of parasitic flatworms. He submitted for publication a major revision of the marine Cercariae of the Woods Hole region, and he also contributed a chapter on evolution and systematics to the two-volume treatise, "Biology of the Cestoda," to be published by Academic Press.

Micropaleontology Press John A. Van Couvering, Editor in Chief; Norman Hillman, Associate Editor, and Susan Carroll, Assistant Editor, report that the *Catalogue of Foraminifera* was expanded by more than 700 pages, and the *Catalogue of Ostracoda* by more than 1400 pages. Three volumes of the popular *Catalogue of Planktonic Foraminifera*, with a total of more than 1000 pages, were reprinted. The research quarterly *Micropaleontology* and the monthly information service *Bibliography and Index of Micropaleontology* were published on schedule in their 29th and 11th years, respectively. Micropaleontology Special Paper 5, " Paleocene-Eocene Bathyal and Abyssal Benthic Foraminifera from the Atlantic Ocean," by R. C. Tjalsma and G. P. Lohmann, appeared in April.

Developmental work continued on new publications, including a microfiche edition of the 96,000 pages of the catalogs with a computer-generated index of the more than 50,000 species and genera whose types are illustrated and described. The Press also announced a new *Catalogue of Diatoms*, with publication supported by major oil companies, and a comprehensive "Handbook of Calcareous Nannoplankton" for laboratory workers by M. P. Aubry.

Industrial advisers to Micropaleontology Press sponsored a modernization program that equipped the editors and researchers with word processors linked directly to the computerized photo-typesetter acquired in the previous year. The capability of the typesetter was expanded to improve productivity for the coming publications.

Dr. Van Couvering, in collaboration with William A. Berggren, Research Associate, and Dennis Kent of Columbia University, completed a contribution to the Cenozoic time scale to be published by the London Geological Society. Dr. Van Couvering participated in a conference on the Pliocene-Pleistocene Boundary in Madrid, and a symposium in Karachi on the oceanography of the Indian Ocean. He researched Miocene vertebrate fossil beds in South West Africa, the characterization and dating of mammalian faunal ages for the Tertiary of Africa, and new radiometric age determinations in the Early Miocene in westen Kenya.

Research Outreach Over the year, 76 loans of types and non-typological materials were made to researchers at other institutions in this country and abroad, and more than 100 collection-related inquiries were processed. The Department also accommodated 61 visiting scientists who studied specimens from the collection. Fifty-four appointments by amateur collectors, artists, writers and other interested persons were made to use the reference collections. In addition, 12 computer reports on the fossil type collections were generated for colleagues at the Museum and other institutions.

The Department continued to develop its staff and research capabilities. Neil H. Landman was appointed Assistant Curator, coming to the Museum after receiving his doctorate from Yale University. Scientific Assistants Harold Feinberg and Sidney Horenstein were promoted to Senior Scientific Assistants, and Beverly Heimberg joined the Department as Curatorial Assistant. Major renovation work is under way to establish a new laboratory for fossil and hard tissue preparation, and Technician Bonnie Burns joined the Department to operate the facility.

We sadly report the death in December of Senior Scientific Assistant William E. Old, Jr. He had served with dedication as collection manager of Recent mollusks for 22 years. During that time the holdings nearly tripled in size. As a memorial to Mr. Old, the Museum established the William E. Old Malacology Fund.

Scientific Publications:

Batten, Roger Lyman
1982. The Origin of Gastropod Shell Structure. Third North American Paleontological Convention, Proceedings, vol. 1, pp. 35-39, figs. 1-8.

Bliss, Dorothy E. (series ed.)
1982- The biology of Crustacea, vols. 1-7.
1983 Academic Press, New York, 2664 pp.

Cantelmo, Angela C., Linda H. Mantel, *Robert Lazell, Edward Flynn* and *Stephen Goldberg*
1982. The effects of benzene and dimethylnaphthalene on physiological processes in the blue crab, *Callinectes sapidus*. *In* Physiological mechanisms of marine pollutant toxicity, W. B. Vernberg, A. Calabrese, F. P. Thurberg and F. J. Vernberg, eds. Academic Press, New York, pp. 349-390.

Eldredge, Niles
1982. Phenomenological levels and evolutionary rates. Syst. Zool., vol. 31, pp. 338-347.
1982. La macroevolution. La Recherche, vol. 13, pp. 616-626.

Feldman, Howard R., *Francis Hirsch* and *Ellis F. Owen*
1982. A comparison of Jurassic and Devonian brachiopod communities: trophic structure, diversity, substrate relations and niche replacement. Third North American Paleontological Convention, Proceedings, vol. 1, pp. 169-174.

Jackson, Jeremy B. C. and Judith E. Winston
1982. Ecology of cryptic coral reef communities. I. Distribution and abundance of major groups of encrusting organisms. J. Exp. Mar. Biol. Ecol., vol. 57, pp. 135-147.

Landman, Neil H.
1982. Embryonic shells of *Baculites*. Jour. Paleontol., vol. 56, no. 5, pp. 1235-1241.

Landman, Neil H. and *Karl M. Waage*
1982. Terminology of structure in embryonic shells of Mesozoic ammonites. Jour. Paleontol., vol. 56, no. 5, pp. 1293-1295.

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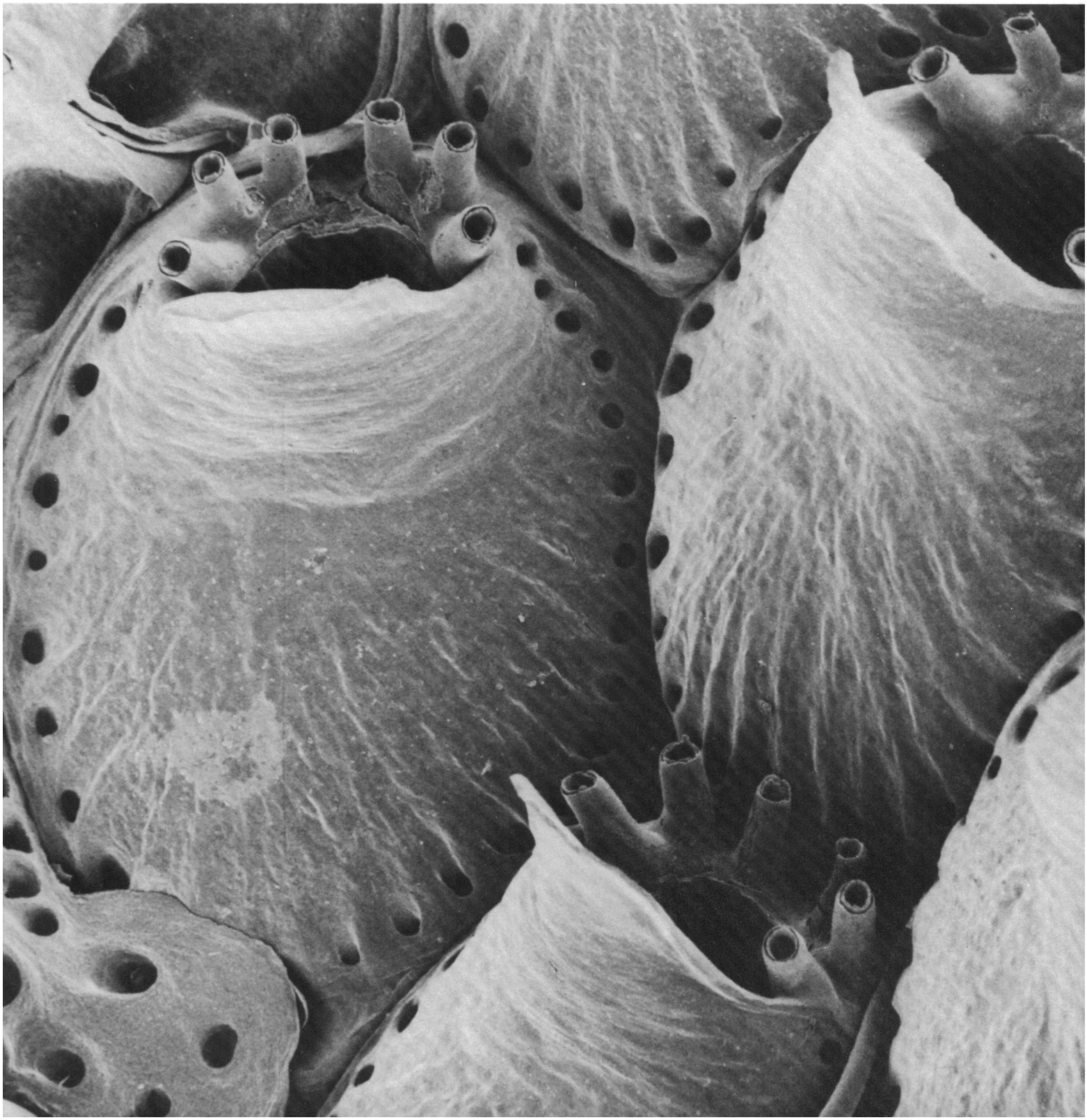
The American Museum's scanning electron microscope photographed the bryozoan Escharoides tridens *from the Ross Sea in Antarctica at 75 times magnification. Judith E. Winston, Assistant Curator in the Department of Invertebrates, is studying pieces of Antarctic bryozoans that had 25-year life spans. She expects to find others may have lived hundreds of years because the extreme cold slowed their metabolisms. In other environments, most bryozoans live a year while some may live as long as 10. With magnification powers up to 300,000 times, the Museum's SEM is also used on an interdepartmental basis to study not only invertebrates, but mammals, birds, fish, archeological specimens and minerals.*



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Department of Mammalogy

Large mammal skeletons which had been housed in storage areas throughout the Museum have been transferred to one, spacious area where they can be easily compared and studied. Departmental researchers have worked on a variety of projects, from preparing the first checklist in 75 years of New Jersey mammals to studying the social/emotional behavior of rats. Not even the giant rat of Sumatra has escaped one curator's detective work.

The complimentary themes of curation, service to the scientific community and research continue to define the responsibilities of curators and supporting staff in the Department of Mammalogy. Over the years, through the tenures of three Chairmen, different parts of the collection have been reorganized and expanded to provide safer and more efficient storage of specimens, as well as better access by staff, visiting scientists and qualified students.

This year the Department began the reorganization of large mammal skeletons that were stored in small attic rooms where for decades they remained crowded and difficult to study. Skulls and skeletons of rhinoceroses, horses and tapirs were transferred to spacious new quarters on the third floor of Section 17 where they are now safely stored and easily accessible. Large mounted skeletons of horses, bison, rhinoceroses and the elephant Jumbo that were once shown in exhibition halls, but then transferred to storerooms scattered throughout the Museum, are the responsibility of the Department. These beautiful and elegant specimens, some famous, have been saved from deterioration by moving them to an area in Section 17 where they can be properly cared for, studied by scientists and viewed by visitors.

The proper care and storage of the collection is an important responsibility of staff members. The collection is heavily used by visitors and borrowers. For example, by the end of April, the Department had 253 loans outstanding, including 2886 specimens; and 217 visitors spent 1096 days studying in the Department.

Mammals of Bolivia Research was a principal task of staff members in the Department. Curator Sydney Anderson worked on his long-term survey of the mammals of Bolivia. Combining research in the laboratory with that in the field, Dr. Anderson is discovering the number of species occurring in Bolivia and their geographic distributions in that ecologically and physiographically diverse country. He is also learning more about the nature of their habitats and habits, and about aspects of their taxonomy, phylogenetic relationships and biogeography.

Studies of geographic ranges of North American vertebrates also occupy Dr. Anderson's research time. One major parameter in the data or phenomena commonly of interest to biogeographers is size of the geographic range occupied by a species. However, the pattern or frequency distribution based on sizes of such ranges of the different species in a fauna is rarely considered and is the focus of Dr. Anderson's inquiries. A report on the geographic ranges of North American terrestrial mammals was published in 1977 as the first in a series; a paper on bird ranges was finished recently and data on reptiles and amphibians have been gathered and compiled.

Evolution and Biogeography of Bats The worldwide collections of mammal specimens in the American Museum of Natural History and several other large museums in the United States and Europe constitute priceless resources in the study of geographic distribution and systematics of mammalian species.

Intensively using this important resource at various institutions, Curator Karl F. Koopman studied the evolution and biogeography of bats. For example, sequestered in the collection at the Field Museum of Natural History are specimens of *Philetor* from Nepal, a genus of bats heretofore unknown from the region west of Malaya. New information about geographic distribution, faunal associations and morphological variation has been added to knowledge of the Asian fauna by Dr. Koopman's discovery and study of this material.

On a larger scale, Dr. Koopman has been studying taxonomy and distribution of the tropical Australian bat fauna, utilizing data extracted from museum collections, particularly those in the Department.

Study of the specimens is allowing Dr. Koopman to answer these primary questions: What species occur in the tropical parts of Australia and what are their ranges? What are their phylogenetic and biogeographic relationships with species and faunas elsewhere, especially those in New Guinea and the Indo-Malayan region? Is the Australian tropical bat fauna old or recently developed relative to the ancient endemic Australian marsupial fauna? Answers and discussion will be the subjects of Dr. Koopman's report, soon to be submitted for publication.

Report on Rodents from China Scientific Assistant Marie A. Lawrence recently published a report on the arvicoline rodents from western China documenting the species collected by members of the Sage Expedition during the 1930s. The report reflects her curatorial work in which she has been identifying and describing specimens that have never been studied. A similar project is the curation and study of a large collection of the New Guinea bat *Syconycteris*, in collaboration with Dr. Koopman; eventually, the published results will provide new information about the geographic distributions and systematic relationships among populations of nectar-feeding bats in this genus. Ms. Lawrence also devoted time to a long term, systematic review of *Myospalax*, a burrowing Chinese rodent. The study will be based partly on Chinese fossils loaned to her by Richard H. Tedford, Curator in the Department of Vertebrate Paleontology, and partly by investigation of recent material in the collection of the Department of Mammalogy.

The Giant Rat of Sumatra "The giant rat of Sumatra, a story for which the world is not yet prepared," said Sherlock Holmes to Dr. Watson in the

beginning of *The Adventure of the Sussex Vampire*. Sir Arthur Conan Doyle never had Holmes recount the tale, and the giant rat of Sumatra became part of that fictional bestiary formed in the imagination, but based on suspicions and a bit of fact.

Life reflects art and there is a giant rat on Sumatra. It lives in tropical forests along the mountain backbone of that elongate Sunda island. So little was known about the animal that it might as well have been an abstraction of Conan Doyle's mind.

In a recent publication, Chairman and Archbold Curator Guy G. Musser, along with Cameron Newcomb, Curatorial Intern, have retrieved the giant rat from anonymity and discovered that the same species also lives in mountain forests of northern Borneo. The animal, *Sundamys infraluteus*, is one of 40 species of rats native to the Sunda Shelf, one of the most extensive shelves in the world. The Shelf lies under the southern part of the South China Sea and under the Java Sea in Southeast Asia. It covers an area of 1,850,000 square kilometers and, with the land areas of Malaya, Borneo, Sumatra, Java, Bali and smaller islands is known as Sunda Land. That name denotes a biogeographical and physiographic region where past geological and climatic events, combined with evolutionary histories of native rats and mice, today form a rich tapestry of species and phylogenetic patterns. The giant rat of Sumatra and Borneo is part of that species diversity. Relating it to other rats on the Sunda Shelf partly describes those patterns of relationships. Defining the 40 species of rats native to the Sunda Shelf, noting some possible relationships among them and outlining the patterns of those relationships has been a segment of Dr. Musser's research efforts. That task is part of a larger project devoted to answering questions about the systematics and biogeography of rats and mice native to mainland Asia and the Indo-Australian region.

Social/Emotional Behavior An understanding of the evolution of social/emotional behavior requires analysis of the sensory processes which are involved in the animal's relationship with the biotic environment, the members of its own species and members of other species. Analysis must also be made of the abiotic aspects of the animal's environment such as photic, chemical and other forms of energy. Accordingly, the following projects were undertaken by Curator Ethel Tobach and assistants during the year.

The spiny mouse, *Acomys cahirinus*, lives in an environment rich in patterned visual stimuli. From studies of the behavior in its natural habitat, researchers have found that the mouse organizes its life space using visual cues. Active at dusk, through the night and at dawn, *A. cahirinus* feeds into daylight on snails, insects and seeds. This nocturnal mouse has well-developed discrimination of visual patterns. One of its primary food sources is a snail with a white shell visible to the human eye under the prevailing light in the desert on most nights. In addition, *A. cahirinus* is an active jumper and climber, using its long guard hairs. The animal also makes motor adjustments relative to the visual characteristics of the base on which it stands and the surface to which it jumps. In the laboratory, the illusion of distance is provided by a difference in the size of the pattern on which the animal is placed and the pattern ahead of the animal, so that to the rat it appears as though it is on the edge of a cliff.

The eyes of *A. cahirinus* are opened shortly after birth and the response of the neonates to this type of visual cliff was studied by Dr. Tobach, Scientific Assistant Joseph DeSantis, and graduate student Elizabeth Pinkhasov. They gave adult female and male mice an opportunity to discriminate between two differently sized patterns that mimicked the natural environment in order to obtain a meal worm. The type of response made (that is, going through a swinging door or going into a hole) as well as the size of the chamber from which they leave to get to the worm, affect their performance of the discriminatory task. Having chosen the appropriate response and stimulus, researchers are continuing work with the neonate discriminatory performance.

Reactions to Light and Dark The response of many mammals to different durations of light and dark during any day is apparently related to the pineal organ and its elaboration of melatonin and serotonin. Dr. Tobach has been studying the Fawnhooded (DAB) rat stock with the collaboration of volunteer employee Betty Silver; Betty Rosoff, professor at Stern College for Women, Marjorie Zucker, professor at New York University School of Medicine, and Dr. DeSantis. Fawnhooded rats have a known peripheral serotonin dysfunction (a deficiency in the blood platelets). To determine whether there is central neural and endocrine dysfunction as well, Fawnhooded, Long-Evans and Wistar male rats were maintained in either continuous light, continuous dark, or typical 12-hour light/12-hour dark conditions. The Long-Evans and Wistar stocks are presumed to be the ancestors of the mutant Fawnhooded rat, which arose in their random crossbreeding.

Analysis of the incomplete data indicates that the effects of continuous dark on the male gonads and accessory organs is not seen in the Fawnhooded stock but is evident in their putative ancestors which have no peripheral serotonin deficiency. In addition to effects on the reproductive system, different schedules of photic stimulation affect the activity of rodents; these effects can be seen in their daily rhythms. Hiroshi Yamashita, of Koyoto University, is comparing the three stocks insofar as their daily activity patterns are concerned by recording the amount of running they do in activity wheels and their activity in unfamiliar environments.

The significance of the response of animals to chemical and photic stimulation in fish is being studied by Marjorie Goldman, visiting scientist, Dr. DeSantis and Dr. Tobach. When released into light or dark starting boxes, *Sarotherodon melanotheron* fry enter the light arm of a Y-maze with one light and one dark arm. They make this response no matter whether the ends of the maze are empty or contain fish of different or the same age. This response will be studied under a variety of conditions to clarify the behavior in the typical social situations of developing fry.

The hermaphroditic sea hare, *Aplysia,* is known to be differentially responsive in its natural habitat to the presence of large numbers of its own

The "giant rat of Sumatra," mentioned by Sherlock Holmes in "The Adventure of the Sussex Vampire," comes out of hiding in the June, 1983, issue of the Bulletin of the American Museum of Natural History. *Guy G. Musser, Curator and Chairman of the Department of Mammalogy, and Cameron Newcomb, Curatorial Intern, studied specimens of the two-pound* Sundamys infraluteus *as part of their research on murids on the Sunda Shelf in Southeast Asia. Once thought to be a rare, isolated mammal, it is the same species as a rat in northern Borneo, the researchers found. The illustration is by artist Fran Stiles. As does research in many of the Museum's departments, this work focuses on the geographic and evolutionary relationships among species. Other members of the Mammalogy Department, for example, studied the biogeography and systematics of bats, Chinese rats, and African and Bolivian mammals.*

kind. In the Museum laboratory, a population of sea hares collected in Puerto Rico was studied in regard to their response to chemical stimuli from food, body secretions and eggs of their own kind. It was found that the sea hare most reliably approached a food source of stimulation when it was highly concentrated. There were also striking differences in any one animal's response to individual conspecifics which was not dependent on their respective reproductive status. Andrea Zafares, a student from the Bronx High School of Science, received honorable mention in the Westinghouse Science Talent Search for her work with Dr. Tobach and Dr. DeSantis on this aspect of *Aplysia* biology.

Mammals of New Jersey For Curator Richard G. Van Gelder, the major research concern over the year was the preparation of the first annotated checklist in 75 years of the mammals of New Jersey. He prepared a list of all the mammals that have ever been reported to occur in the state in historic times, a review of the literature concerning New Jersey mammals, a search for documentation by actual specimens and a preliminary evaluation of the current status of the species in the state. A manuscript has been prepared and is scheduled to be submitted for publication during the forthcoming year.

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Department of Mineral Sciences

Departmental researchers are delving into the tiny particles of amphibole minerals that impart biological activity, helping to bridge the gap in scientific knowledge between mineralogy and environmental medicine. Study of the growth of minerals and the structure of natural melts which form at high temperatures has important industrial applications. Highly primitive materials in meteorites reveal the earliest history of the solar system, while the mineral jadeite offers clues to major Earth processes, like plate tectonics.

Mineral Particles and Biological Activity A major research program designed to determine those mineralogical properties of fine particles that may ultimately cause organ injury or disease in humans and animals has been undertaken by George E. Harlow, Associate Curator, with Eric Dowty and Martha E. Kimball, Research Fellows. The project, funded by the National Institute of Occupational Safety and Health (NIOSH), is determining the chemical composition, crystal habit, crystallinity, and surface properties that are correlated with biological activities such as cell lysis, cytotoxicity, and mutagenicity. This research team is helping to bridge the gap in scientific knowledge between mineralogy and environmental medicine by using the mineral collections of amphiboles and related minerals to help understand the nature of the interaction. A major portion of the study is aimed at developing a better understanding of their mineralogy. This is accomplished by measuring properties not ordinarily studied in detail by mineralogists attempting to clarify geological problems. The work is being carried out in collaboration with colleagues in the Department of Environmental Sciences at the Mount Sinai Medical Center.

Jade and Plate Tectonics Precious jade is really a rock containing mainly the mineral jadeite, a sodium-aluminum-rich member of the pyroxene group of minerals, known to occur in only four localities. All have generally similar geological relationships. They are enclosed in large bodies of a dark green rock type called serpentinite and are associated with major fault zones involving ocean-floor spreading and mountain building. There is much that is still not understood about the origin of the high-pressure mineral jadeite and what it tells us about major Earth processes, like plate tectonics. Dr. Harlow, in collaboration with E. Peter Olds, a graduate student at Columbia University, has undertaken a major study of the jadeite problem.

They have discovered that bright green jade, from the famous locality in Burma, contains extensive amounts of the extremely rare chromium analogue of jadeite. This mineral component is called ureyite, named after the Nobel-prize winning chemist and planetologist Harold C. Urey. It has not previously been described from Earth and is a very rare constituent of some meteorites. Results of this study were presented at the American Geophysical Union meeting in Baltimore, Md., and further investigations involving field and experimental work, as well as intensive sample study, are planned in order to determine the relationship of jadeite to plate tectonics.

Crystal Growth and Silicate Structures Dr. Dowty has completed a study of the nucleation and growth of crystals in experiments which simulate molten basaltic rock. As theories are generated to explain why and how crystals grow in natural melts, it is important to test and refine these ideas by actually carrying out experiments under known and controlled conditions to see what the results are. This invariably results in some modification of ideas and points up new problems. One of the important problems dealt with in Dr. Dowty's experiments is that of the diffusion of elements between molten liquid and growing crystals. By better understanding this phenomenon, the origin, diversity and history recorded in common rock types can be determined.

A related research program to study the atomic structures within natural melts and glasses has been undertaken by Dr. Dowty. Knowledge of the structures within melts is important in understanding the properties of their crystalline products, minerals and rocks. Melts are not merely randomly arranged atoms, but go through various stages of molecular building as they become crystalline. Sometimes melts are frozen before they can crystallize, and they become glasses. At other times solid rocks are heated up by natural processes and then cooled quickly to glasses. These frozen melts have a structure which can be determined by measuring or calculating waves passing through them. Dr. Dowty has been carrying out extensive calculations to help interpret the meaning of the measured patterns. The research also has important industrial applications. Results were presented at meetings of the Geological Society of America and the American Geophysical Union.

The crystal chemistry of the mineral rutile, a titanium oxide, is a new research area for Dr. Dowty. Using the mineral collections, which contain rutiles formed under varying temperatures and oxidation conditions, he is planning to determine the kind of information locked into these crystals which may reveal the conditions at its birth. Other minerals help us determine the conditions under which the rutile-bearing rocks form. If rutile can also reveal something about its own origins, it will join the team of minerals which provide these kinds of data. Investigations will include spectral studies of the mineral and electron microprobe analysis which will reveal the trace element content.

Antarctica and the Origin of Planets Antarctica has become the poor man's space program. Since samples are no longer being brought back from space, scientists must wait for them to arrive here on their own. Antarctica has turned out to be a treasure chest of new meteorites, and each year tens, sometimes hundreds, of new meteorite samples are brought back by U.S. and Japanese teams. Samples are treated as carefully as moon rocks and distributed to qualified researchers for study. Martin Prinz, Curator, and his research team of Jeremy S. Delaney, Research Fellow, C.E. Nehru, Research Associate, and two graduate students, have been avidly pursuing a wide variety of studies using these newly found meteorites. Their work is funded by the National Aeronautics and Space Administration (NASA). With those in the collection, these samples provide a wealth of information about a variety of small planets and their origins. The research team often collaborates with one or more other teams in the U.S. and abroad to form consortia which use a variety of research approaches to get at the significance of the samples.

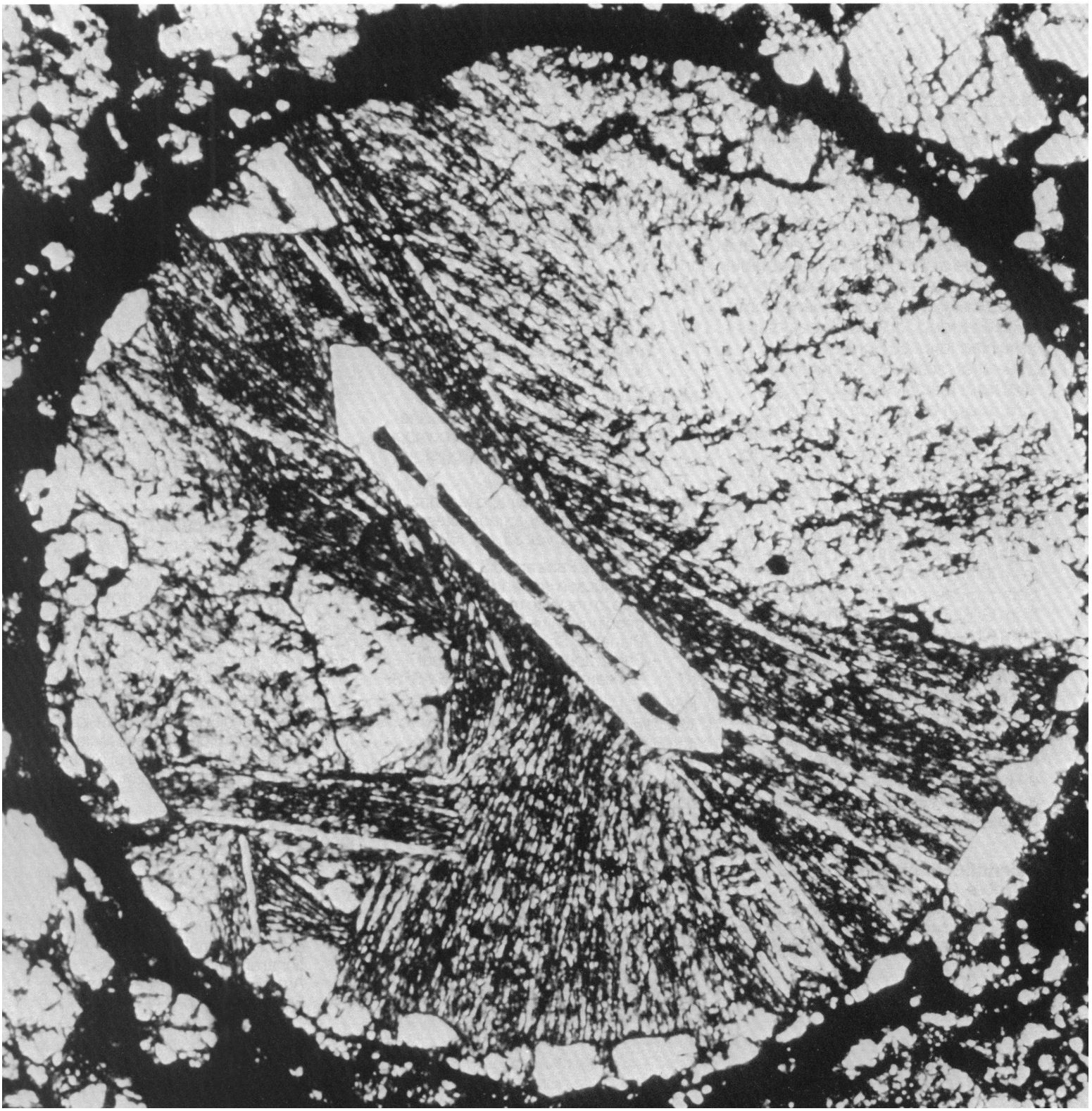
One of the major research thrusts led by Dr. Delaney has been on a group of meteorites first recognized in Antarctic samples and called polymict eucrites. Eucrites are analogous to basalts on Earth, and the term polymict means that the samples contain a variety of different but related basalt types. By piecing together the relationships of the basalts it is possible to determine the interior of the planet which produced them. Samples have been found in the Allan Hills region of the United States sector in Antarctica, and 3000 miles away in the Yamato Mountains of the Japanese sector. This year, for the first time, collaborative study was undertaken with Hiroshi Takeda, of the University of Tokyo, to compare U.S. and Japanese polymict eucrites in detail. Some important differences not previously recognized were found. A better understanding of the origin of the complex basaltic achondrite planet from which the eucrites are derived also resulted. Findings were presented at the Eighth Symposium on Antarctica Meteorites in Tokyo, and the Fourteenth Lunar and Planetary Science Conference in Houston.

Primitive Meteorites Some meteorites are pieces of planets which have formed after they melted from original primitive materials. The Earth, Moon, and Mars, and the basaltic achondrite planets are examples of melted planets. However, some meteorites are actually pieces of the original primitive material, even though they are often somewhat modified and sometimes hard to recognize. This year, the meteorite research group completed a major project on primitive silicate inclusions found in some iron meteorites and began new research on the primitive chondritic meteorites. Chondritic meteorites are so called because they contain tiny (about one millimeter) round objects called chondrules. They are rapidly cooled and crystalized molten droplets that were first recognized more than 100 years ago, but are still incompletely understood. Nevertheless, they are nearly always associated with the primitive materials brought to us from space, and understanding of their origin is intimately interwoven with the deciphering of the earliest processes in the formation of the solar system and its planets. The research involves detailed study of the mineralogy of the chondrules and associated fragments and matrix in a variety of chondritic types. Cooperation with other research groups is particularly important in this study, and has included collaboration with Heinrich Wänke of the Max-Planck-Institut für Chemie in Mainz, West Germany, for trace element studies, and Robert N. Clayton of the Enrico Fermi Institute of the University of Chicago. Studies on selected individual chonrules, which has only become possible in recent years, will be emphasized.

Exhibition and Education A wide variety of exhibition and educational programs were carried out during the past year. A number of exhibits were presented at important mineral and gem shows. Joseph J. Peters, Scientific Assistant, arranged these shows and presented lectures on the minerals. In addition, he and Thomas A. Peters, Associate, wrote a paper on cavity minerals from the Franklin-Sterling area in New Jersey. Thomas Peters has also written a paper on the scanning electron microscope as a powerful tool of the mineralogist. Joseph Peters has described the mineral collections at the Museum for the popular journal *Rocks and Minerals* and is working on a series of papers on classic mineral localities.

Dr. Prinz has negotiated the loan of the meteorite which crashed through a house in Wethersfield, Conn. in 1982 for exhibition in the Arthur Ross Hall of Meteorites. Dr. Harlow is in the process of negotiating the loan of a superb 17-carat Burmese ruby, an

A piece of original material from another planet, this one-millimeter chondrule was a molten droplet that was rapidly cooled and crystallized. It came to earth as part of a meteorite. A team from the Department of Mineral Sciences headed by Chairman and Curator Martin Prinz, is studying chondrules which date from the beginning of the solar system to help decipher the formation of planets. In addition to their studies of meteorites, Department scientists are engaged in a wide variety of other investigations, including research on the relationship of jade to plate tectonics, the formation of crystals in natural melts, and the structure of fine mineral particles that may be involved in organ injury and disease.



engraved Mogul emerald and a large emerald crystal from Allan Caplan of New York for possible exhibition in the Morgan Hall of Gems.

Dr. Prinz spoke on "Differentiated Meteorites and the Origin of Planets" at Boston University. Dr. Harlow lectured on the "Riches of the Earth" to the New York Mineralogical Club, of which he was also president. Dr. Delaney discussed "What are Meteorites?" with the New York, Philadelphia and Bergen County Mineral Clubs.

Dr. Harlow was a visiting lecturer at Princeton University and gave a semester course in advanced mineralogy to graduate students. He also taught a course on identifying minerals and rocks as part of the Museum's education program.

Collections During the year 2595 mineral specimens were donated, at a total value of $516,650. Some notable additions are: a superb microcline (amazonite) with smoky quartz from Lake George, Col., 2407 specimens from Namibia and South Africa; a 260-carat oval-cut spodumene (kunzite) from Minas Gerais, Brazil; a 226.3 carat beryl (morganite) from Madagascar. Twenty-five specimens, valued at $42,200, were acquired by exchange. Notable additions are: a quartz (amethyst) scepter from Nuristan, Afghanistan; a large yellow spodumene, showing etching, from Afghanistan; a beautiful cerussite twin from Milbladen, Morocco; a superb beryl (aquamarine) crystal in matrix from Gilgit, Pakistan; a fine stibnite from China; a purple adamite crystal group from Mapimi, Mexico, and a scorodite from Zacatecas, Mexico.

Forty-eight minerals and 60 micromount specimens were purchased at a cost of $8,800. Notable additions are: a dioptase from Siberia; a malachite from Shaba Province, Zaire; and an elbaite crystal group from Minas Gerais, Brazil.

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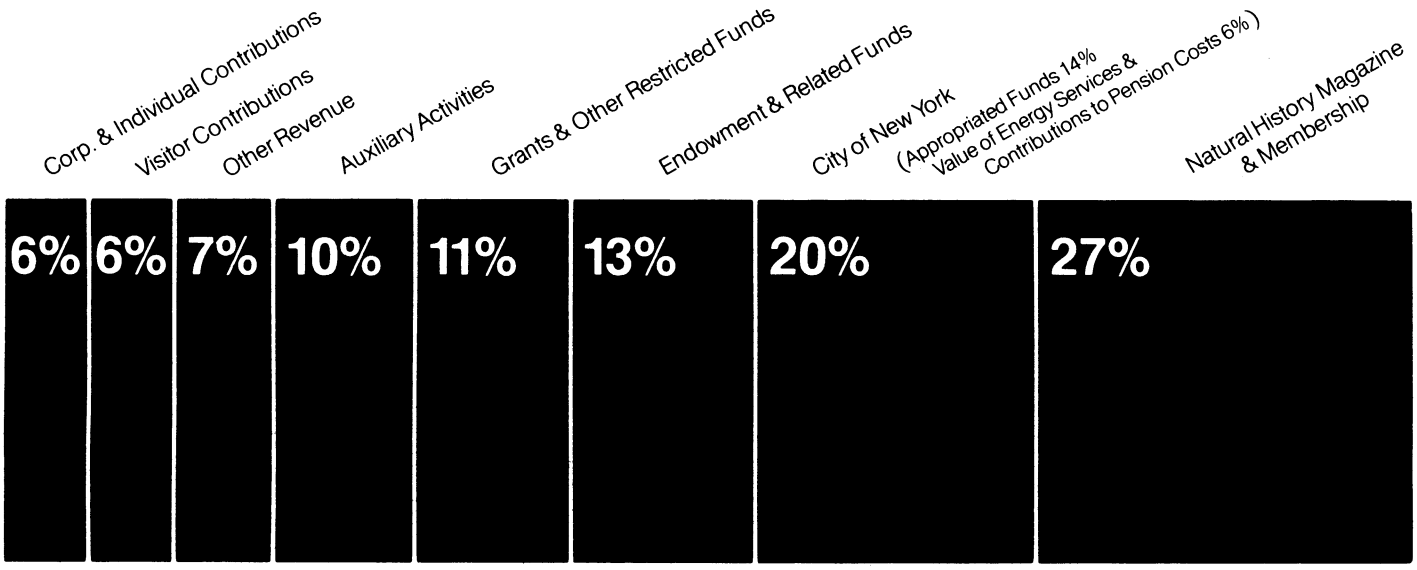
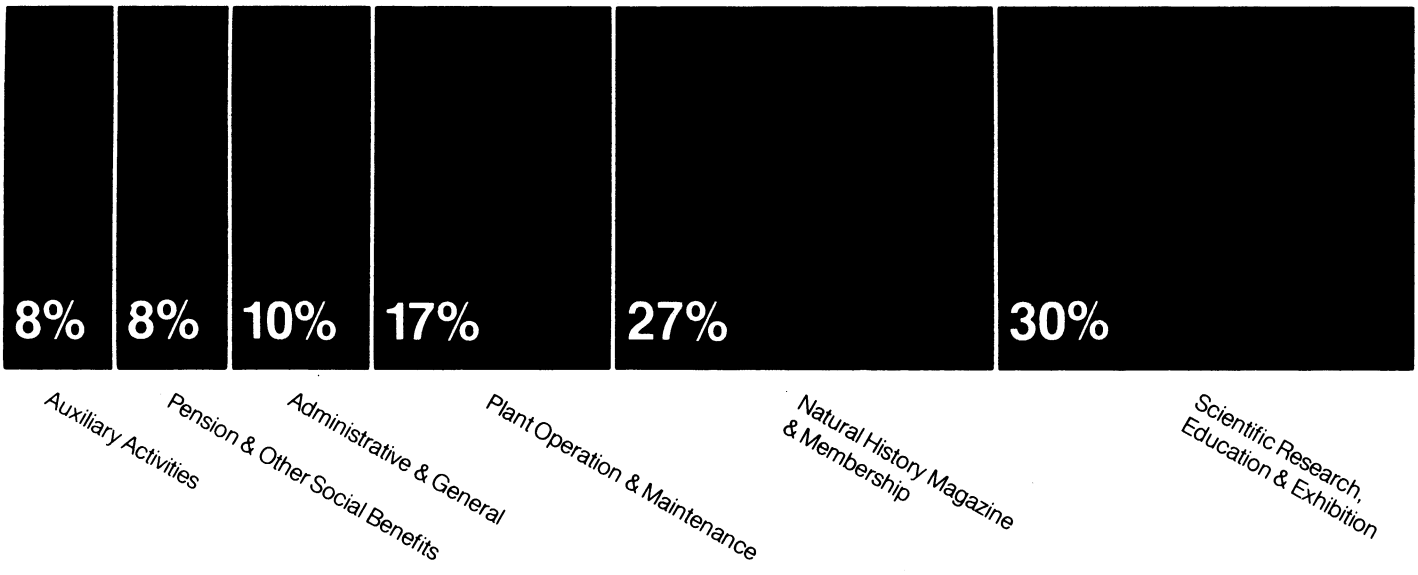
1983. Aluminum tetrahedra in silicate glasses: normal-coordinate vibrational analysis. Transactions, American Geophysical Union, EOS, vol. 64, pp. 344-345.

Financial Statements

Revenue
$31,252,475



Expenses
$30,200,512



Treasurer's Report

The statements reflecting the financial condition of the American Museum of Natural History appear on the following pages. These statements, consisting of the Balance Sheet, Statement of Revenue and Expenses of Current Funds, and Statement of Changes in Fund Balances and the related notes on pages A8 and A12 have been audited by Coopers & Lybrand.

It should be noted on the Balance Sheet that investments in marketable securities which are recorded at a cost of $85,800,332, consist of the General Fund of $6,160,607, Special Funds of $7,650,364 and Endowment Funds of $71,989,361. The total market value of these securities on June 30, 1983, amounted to $107,228,144; an increase of $36,896,542 over the prior year as detailed in Note 1 to the financial statements.

Thanks to favorable financial markets and effective management by our three investment managers, the market value of endowment funds alone increased from $60,240,427 to $93,492,307.

The General Fund investments of $6,160,607 largely represent advance payments by Museum members for benefits due them in future years. This is an asset offsetting the liability for unearned membership income amounting to $6,187,270.

Special Funds investments of $7,650,364 consist of funds received as grants from government agencies, private foundations, corporations and individuals, and Museum funds that have been reserved for special programs and projects to be completed in future years.

The Statement of Revenue and Expenses of Current Funds, which consists of General and Special Funds, appears on page A6, summarizing the Museum's operations for the year. The total revenue of these funds for fiscal 1982-1983 amounted to $31,252,475, the total expenses amounted to $30,200,512. After adjusting for support grants of $638,500, as detailed in Note 11, revenue exceeded the expenses by $1,690,463.

Although the combined operations of these funds show an excess of revenue over expenses, the excess resulted from Special Funds operations which cover programs that are restricted in nature and may take several years to complete. The ongoing operations of the Museum are supported by the General Fund.

For fiscal 1982-1983, General Fund revenue amounted to $23,636,917, an increase of $1,759,617 over the preceding year. The excess of expenses over revenue in the General Fund was $1,129,781 before support grants.

After deducting the support grants of $638,500, the net operating deficit of the General Fund amounted to $491,281 compared to $867,107 in the preceding year.

In comparing the revenue for fiscal 1983 with fiscal 1982, the appropriated funds received from the City of New York increased about $200,000. This increase covered payments for negotiated increases in salaries of about $350,000 and a reduction in the level of funding of about $150,000. Gifts, bequests and grants increased by $150,000.

The increase of $200,000 in the distribution of endowment resulted from the growth of the Endowment Funds and was based on the policy adopted on July 1, 1980, which provided for Endowment Funds support to be fixed annually at a percentage of the average market value of the Endowment Funds as of March 31 for the preceding three years. The distribution for both 1983 and 1982 was 5 percent.

The increase of $620,000 in Natural History magazine and membership revenue is largely attributed to increased advertising and advertising-related income.

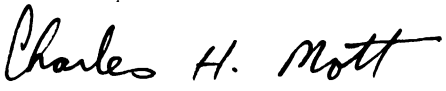
Net income from auxiliary activities increased by $176,000 as summarized in Note 8.

General Fund expenses for fiscal 1982-1983 amounted to $24,766,698 compared to $23,378,867, an increase of about $1,388,000 or 6 percent over the preceding year.

The increase in General Fund expenses included cost of living increases and promotions to employees, and increased costs for personal services and supplies purchased by the Museum from outside sources. There was also a substantial increase in pension, health and other social benefit costs.

Visitor contributions, accounted for under Special Funds, increased to $1,957,463 from $1,884,309 in fiscal 1982, based on higher Museum attendance than in the previous year and a somewhat higher level of per capita contributions.

It is gratifying to note that in spite of the economic conditions that prevailed most of the year, the Museum administration, with the support of corporations, foundations, government agencies and trustees, has been able, in fiscal 1983, to increase its revenue significantly and lower its General Fund operating deficit substantially. The administration looks forward to continued support from these sectors so that existing programs and projects can be maintained and expanded, enabling this institution to remain one of the outstanding museums of natural history in the world.



Charles H. Mott
Treasurer

Auditors' Report

To the Board of Trustees of
the American Museum of Natural History
New York, New York:

We have examined the balance sheets of the AMERICAN MUSEUM of NATURAL HISTORY as of June 30, 1983 and 1982 and the related statements of revenue and expenses of current funds and changes in fund balances for the years then ended. Our examinations were 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 financial statements referred to above present fairly the financial position of the American Museum of Natural History as of June 30, 1983 and 1982 and the results of its operations for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

Coopers & Lybrand

1251 Avenue of the Americas
New York, New York 10020
September 30, 1983.

American Museum of Natural History Balance Sheets, June 30, 1983 and 1982

Assets:

Cash
Receivable for securities sold
Accrued interest and dividends receivable
Accounts receivable, less allowance for doubtful accounts of $209,000 in 1983 and $112,000 in 1982
Investments in marketable securities (Note 1)
Temporary investment of collateral received for securities loaned
Planetarium Authority bonds (Note 2)
Inventories (Note 3)
Prepaid expenses and other assets

Liabilities and Funds:

Accounts payable and accrued liabilities
Accrued employee benefit costs
Payable for securities purchased
Collateral deposited for securities loaned (Note 1)
Unearned membership income
Funds:
- General Fund (deficit)
- Special Funds (Notes 4 and 5)
- Endowment Funds (Notes 6 and 7)

The accompanying statement of significant accounting policies and notes are an integral part of these financial statements.

1983				1982			
Current Funds				Current Funds			
General Fund	Special Funds	Endowment Funds	Total	General Fund	Special Funds	Endowment Funds	Total
$ 123,348	$ 1,212	$ 299,462	$ 424,022	$ 368,107		$ 262,527	$ 630,634
		292,129	292,129			149,859	149,859
89,090	110,631	538,949	738,670	163,805	$ 208,480	532,595	904,880
1,342,349	594,904	55,861	1,993,114	851,401	250,103		1,101,504
6,160,607	7,650,364	71,989,361	85,800,332	4,777,660	5,808,220	59,215,713	69,801,593
		4,493,837	4,493,837			4,478,500	4,478,500
	425,000		425,000		425,000		425,000
752,519			752,519	690,044			690,044
1,170,619	86,910		1,257,529	865,691	52,544		918,235
$9,638,532	$8,869,021	$77,669,599	$96,177,152	$7,716,708	$6,744,347	$64,639,194	$79,100,249
$1,864,233	$ 481,455	$ 95,555	$ 2,441,243	$1,198,487	$ 184,575	$ 68,776	$ 1,451,838
1,884,041			1,884,041	1,659,334			1,659,334
		118,025	118,025			295,933	295,933
		4,493,837	4,493,837			4,478,500	4,478,500
6,187,270			6,187,270	5,125,291			5,125,291
(297,012)			(297,012)	(266,404)			(266,404)
	8,387,566		8,387,566		6,559,772		6,559,772
		72,962,182	72,962,182			59,795,985	59,795,985
$9,638,532	$8,869,021	$77,669,599	$96,177,152	$7,716,708	$6,744,347	$64,639,194	$79,100,249

Statements of Revenue and Expenses of Current Funds for the years ended June 30, 1983 and 1982

	General Fund		Special Fund		Total	
Revenue:	1983	1982	1983	1982	1983	1982
The City of New York:						
Appropriated funds	$ 4,493,588	$ 4,294,176			$ 4,493,588	$ 4,294,176
Value of energy services and contributions to pension costs (Notes 9 and 10)	2,041,175	1,965,928			2,041,175	1,965,928
Gifts, bequests and grants	1,741,696	1,590,928	$3,405,415	$2,738,568	5,147,111	4,329,496
Distribution from Endowment Funds (Note 7)	2,135,736	1,933,000	617,611	569,124	2,753,347	2,502,124
Interest on other investments	930,741	962,360	342,733	436,313	1,273,474	1,398,673
Visitors' contributions			1,957,463	1,884,309	1,957,463	1,884,309
Natural History magazine and membership	8,306,915	7,688,653			8,306,915	7,688,653
Other revenue	835,499	788,033	1,292,336	1,028,477	2,127,835	1,816,510
Auxiliary activities (Note 8)	3,151,567	2,654,222			3,151,567	2,654,222
Total revenue	23,636,917	21,877,300	7,615,558	6,656,791	31,252,475	28,534,091
Expenses:						
Scientific and educational activities	4,191,602	3,851,212			4,191,602	3,851,212
Exhibition halls and exhibits			1,097,284	1,082,678	1,097,284	1,082,678
Other special purpose programs and projects			3,860,548	4,139,361	3,860,548	4,139,361
Administrative and general	2,576,887	2,437,062	322,880	332,557	2,899,767	2,769,619
Plant operating and maintenance (Note 9)	5,075,505	4,804,277			5,075,505	4,804,277
Pension and other social benefits (Note 10)	2,341,765	2,042,999	153,102	176,089	2,494,867	2,219,088
Natural History magazine and membership	8,234,063	8,216,982			8,234,063	8,216,982
Auxiliary activities (Note 8)	2,346,876	2,026,335			2,346,876	2,026,335
Total expenses	24,766,698	23,378,867	5,433,814	5,730,685	30,200,512	29,109,552
Excess of revenue over expenses (expenses over revenue) before support grant	(1,129,781)	(1,501,567)	2,181,744	926,106	1,051,963	(575,461)
Support grant (Note 11)	638,500	634,460			638,500	634,460
Excess of revenue over expenses (expenses over revenue)	($ 491,281)	($867,107)	$2,181,744	$ 926,106	$ 1,690,463	$ 58,999

The accompanying statement of significant accounting policies and notes are an integral part of these financial statements.

Statements of Changes in Fund Balances for the years ended June 30, 1983 and 1982

	Current Funds					
	General Fund		Special Funds		Endowment Funds	
	1983	1982	1983	1982	1983	1982
Balance (deficit), beginning of year	($266,404)	($287,509)	$6,559,772	$6,385,158	$59,795,985	$54,778,742
Additions:						
Gifts, bequests and grants					3,039,061	1,472,969
Interest and dividend income (Note 7)					2,109,756	2,479,493
Net gain on sale of investments					8,652,699	1,661,361
Excess of revenue over expenses			2,181,744	926,106		
Total additions			2,181,744	926,106	13,801,516	5,613,823
Deductions:						
Excess of expenses over revenue	491,281	867,107				
Administrative and general expenses					382,899	321,789
Prior service contributions to CIRS (Note 10)					145,697	138,071
Total deductions	491,281	867,107			528,596	459,860
Transfers between funds:						
Financing of: 1982 and 1981 General Fund deficits	266,404	287,509	(197,004)	(150,789)	(69,400)	(136,720)
Special Funds activities	76,505	43,893	(39,182)	(43,893)	(37,323)	
Other (Note 12)	117,764	556,810	(117,764)	(556,810)		
Total transfers	460,673	888,212	(353,950)	(751,492)	(106,723)	(136,720)
Balance (deficit), end of year	($297,012)	($266,404)	$8,387,566	$6,559,772	$72,962,182	$59,795,985

The accompanying statement of significant accounting policies and notes are an integral part of these financial statements.

Statement of Significant Accounting Policies

The American Museum of Natural History ("Museum") maintains its accounts principally on the accrual basis.

The land and buildings utilized by the Museum (most of which are owned by the City of New York), fixed assets (which are charged off at time of purchase), exhibits, collections and the Library are not reflected in the balance sheets.

To ensure observance of limitations and restrictions placed on the use of the resources available to the Museum, the accounts of the Museum are maintained in accordance with the principles of "fund accounting." This is the procedure by which resources for various purposes are classified for accounting and financial reporting purposes into funds that are in accordance with activities and objectives specified. Separate accounts are maintained for each fund; however, in the accompanying financial statements, funds that have similar characteristics have been combined into fund groups.

Within current funds, fund balances restricted by outside sources or by the Board of Trustees ("Trustees") are so indicated (Special Funds) and are segregated from the General Fund. These Special Funds may be utilized only in accordance with the purposes established for them as contrasted with the General Fund over which the Trustees retain full control to use for the general operation of the Museum.

Endowment Funds include (a) funds subject to restrictions established by the donor requiring that the original principal be invested in perpetuity, and (b) funds established by donors or Trustees (funds functioning as endowments) where the principal may be expended with the approval of the donor or the Trustees.

Interest and dividend income derived from investments of Endowment Funds is distributed to the current funds on a unit basis which reflects the ratio of the related funds invested in the pooled portfolio to total market value (see Note 7).

Investments are stated at cost (average cost method) or, if acquired by gift, at fair value at date of acquisition. Non-marketable securities are valued by the Finance Committee of the Museum and approved by the Trustees.

Inventories are stated at the lower of cost (first-in, first-out method) or market.

Membership income is recognized as income ratably over the membership term.

The Museum accrues and funds annually the normal cost for eligible employees participating in the Cultural Institutions Pension Plan ("CIRS Plan") administered by the Cultural Institutions Retirement System ("CIRS"). The unfunded prior service cost, with interest, is being funded over 30 years ending in fiscal 2004.

Notes to Financial Statements

1. Cost and market quotations of investments at June 30 are as follows:	1983 Cost	1983 Market	1982 Cost	1982 Market
General Fund	$ 6,160,607	$ 6,127,090	$ 4,777,660	$ 4,554,349
Special Funds	7,650,364	7,608,747	5,808,220	5,536,826
Endowment Funds	71,989,361	93,492,307	59,215,713	60,240,427
	$85,800,332	$107,228,144	$69,801,593	$70,331,602
The Museum's investments consist of the following:				
Short-term obligations	$18,584,027	$ 18,694,469	$19,699,885	$19,822,700
Bonds	17,992,377	19,024,757	16,602,239	15,352,250
Common stocks	49,223,928	69,508,918	33,499,469	35,156,652
	$85,800,332	$107,228,144	$69,801,593	$70,331,602

On April 1, 1982, the Museum entered into a securities lending program with United States Trust Company of New York (custodian), whereby certain Endowment Fund investments were temporarily loaned to brokerage firms. The Museum receives in return cash or securities as collateral in an amount equal to the value of securities loaned. Cash received is reinvested in short-term investments. The income derived from these investments is included in other revenue of the General Fund. The Museum retains all rights of ownership to the securities loaned and, accordingly, receives all related interest and dividend income. Periodically, the collateral received is adjusted to maintain approximately a 100 per cent market value relationship to securities loaned. Under the terms of the lending agreement, the custodian has agreed to indemnify the Museum against any loss resulting from the borrower's failure to return securities or a deficiency in collateral.

2. The American Museum of Natural History and the American Museum of Natural History Planetarium Authority ("Planetarium") are separate legal entities which share the same Board of Trustees and Officers. The Museum has an investment in bonds ($570,000 principal amount) of the Planetarium and carries this investment at cost. For the year ended June 30, 1983 and 1982, interest income on these bonds of $25,650 is included in the General Fund.

3. Inventories comprise:	1983	1982
Paper for Natural History magazine	$528,915	$413,152
Merchandise	223,604	276,892
	$752,519	$690,044

4. Included at June 30, 1983 in Special Funds (funds which are received or appropriated for specific purposes) is approximately $3,194,000 of funds restricted by the donor as to use.

5. The balances at June 30, 1983 and 1982 of Special Funds are net of overdrafts of certain of these funds of approximately $2,538,000 and $1,442,000, respectively. These overdrafts represent expenditures in anticipation of transfers from Endowment Funds and/or General Fund, receipt of gifts and grants, or the sale of property and equipment utilized by the Special Funds.

6. Endowment Funds (including funds functioning as endowment) are summarized as follows:

	June 30, 1983	June 30, 1982
Endowment Funds, income available for:		
Restricted purposes	$32,950,399	$26,315,141
Unrestricted purposes	10,805,799	9,379,755
Funds functioning as endowment, principal and income available for:		
Restricted purposes	12,295,872	9,445,297
Unrestricted purposes	16,910,112	14,655,792
	$72,962,182	$59,795,985

7. Total interest and dividend income for the Endowment Funds for fiscal 1983 and 1982 was $4,863,103 and $4,981,617, respectively. In accordance with the policy adopted by the Board of Trustees, distributions to the General Fund and Special Funds and funding of pension support were fixed at 5 per cent of the average of the market value of the Endowment Funds for the three preceding years. The distributions were as follows:

	1983	1982
General Fund	$2,135,736	$1,933,000
Special Funds	617,611	569,124
	$2,753,347	$2,502,124

The excess of income over the distributions was retained in the Endowment Funds. This amount includes $144,653 and $136,876 for pension support in 1983 and 1982, respectively, which offsets in part prior service cost contributions to CIRS.

8. The revenue and expenses for auxiliary activities in fiscal 1983 and 1982 are as follows:

	1983		1982	
	Revenue	Expenses	Revenue	Expenses
Museum shops	$1,229,690	$1,052,399	$1,181,059	$1,007,819
Discovery tours	346,005	340,127	497,742	292,349
Naturemax (3 months in 1982)	704,902	672,815	279,675	275,964
Other auxiliary activities	870,970	281,535	695,746	450,203
	$3,151,567	$2,346,876	$2,654,222	$2,026,335

9. Plant operating and maintenance expenses in fiscal 1983 and 1982 include the value of energy services supplied by the City of New York of $1,617,348 and $1,576,504, respectively.

10. The pension plan of the Museum is administered by the Cultural Institution Retirement System (CIRS). Total pension costs amounted to approximately $1,187,000 in fiscal 1983 and $1,092,000 in fiscal 1982. Of these costs, $423,827 in fiscal 1983 and $389,424 in fiscal 1982 were paid directly by the City of New York (City) to CIRS. Approximately $763,000 and $703,000, respectively, were paid by the Museum, of which $145,697 in fiscal 1983 and $138,071 in fiscal 1982 were funded through Pension Support Endowment Funds. The balance of approximately $617,000 in fiscal 1983 and $565,000 in fiscal 1982 (representing normal service cost and amortization of unfunded prior service cost over 20-year period) was charged to current funds. The CIRS Plan is a multiemployer plan and, as such, its actuarial present value of vested and non-vested accumulated plan benefits and net assets available for benefits are not determinable on an individual institution basis.

11. In fiscal 1983 and 1982, support grants were received from New York State Council on the Arts and the Institute of Museum Services as follows:

	1983	1982
New York State Council on the Arts	$603,500	$601,000
Institute of Museum Services	35,000	33,460
	$638,500	$634,460

12. In fiscal 1983, there were transfers from Special Funds of $117,764 to the General Fund. Such amounts were transferred in accordance with authorization of the donor, grantor or Trustees.

13. The Museum provides certain services, including accounting, security and maintenance services for which the Planetarium was charged an aggregate amount of $188,235 in fiscal 1983 and $181,200 in fiscal 1982.

14. The buildings occupied by the Museum are owned by the City and the City appropriates funds for their renovation, improvement and alteration. Actual cash expenditures for these capital projects in fiscal 1983 and in fiscal 1982 amounted to $553,000 and $1,324,000, respectively.

15. Certain amounts in the fiscal 1982 financial statements have been reclassified to conform to the fiscal 1983 presentation.

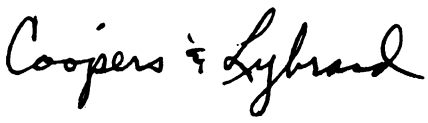
16. The Museum is a nonprofit organization exempt from income tax under Section 501(c)(3) of the Internal Revenue Code.

Auditors' Report

To the Board of Directors of
the American Museum of
Natural History Planetarium Authority,
New York, New York:

We have examined the balance sheets of the AMERICAN MUSEUM of NATURAL HISTORY PLANETARIUM AUTHORITY as of June 30, 1983 and 1982, and the related statements of income and expenses and changes in fund balances for the years then ended. Our examinations were 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 financial statements referred to above present fairly the financial position of the American Museum of Natural History Planetarium Authority at June 30, 1983 and 1982 and the results of its operations for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.



1251 Avenue of the Americas
New York, New York 10020
September 30, 1983.

American Museum of Natural History Planetarium Authority Balance Sheets, June 30, 1983 and 1982

Assets:

Cash
Short-term investments
Accounts receivable
Planetarium shop inventory

Equipment, fixtures, etc.:
  Zeiss planetarium instrument, at cost
  Building improvements, at cost

    Less, Allowance for depreciation (Note 5)

  Furniture, fixtures and equipment

Buildings, at cost

Liabilities:

Accounts payable
Accrued employee benefit costs
4½% Refunding Serial Revenue bonds, past due (Note 1)
Accrued interest, past due

Contributed Capital and Funds:

Contributed capital:
  Charles Hayden
  Charles Hayden Foundation
  The Perkin Fund

Funds:
  Unrestricted fund (deficit)
  Restricted funds

The accompanying statement of significant accounting policies and notes are an integral part of these financial statements.

Statements of Income and Expenses of Unrestricted Funds for the years ended June 30, 1983 and 1982

1983	1982
$ 165,297	$ 21,822
200,000	545,688
7,970	78,920
39,894	48,760
413,161	695,190
221,928	221,928
662,289	316,681
884,217	538,609
(397,520)	(335,141)
486,697	203,468
1	1
486,698	203,469
1,019,210	1,019,210
$1,919,069	$1,917,869
$ 37,794	$ 105,211
93,316	78,983
570,000	570,000
315,450	315,450
1,016,560	1,069,644
156,869	156,869
429,455	429,455
400,000	400,000
986,324	986,324
(870,981)	(792,311)
787,166	654,212
902,509	848,225
$1,919,069	$1,917,869

	1983	1982
Income:		
Admission fees, less allowances and commissions	$659,051	$721,692
Auxiliary activity, sales booth	159,743	167,605
Special lectures and courses	48,606	47,988
Other income and grants	34,882	17,691
Total income	902,282	954,976
Expenses:		
Preparation, presentation and promotional	411,802	395,499
Operation and maintenance	208,406	207,255
Auxiliary activity, sales booth	139,622	150,976
Administrative and general	62,793	108,908
Pension and other social benefits (Note 3)	90,738	63,884
Special lectures and courses	30,835	30,376
Total expenses	944,196	956,898
Loss before interest and depreciation	(41,914)	(1,922)
Interest on past-due 4½% Refunding Serial Revenue bonds	(25,650)	(25,650)
Provision for depreciation	(62,379)	(52,568)
Net loss	($129,943)	($ 80,140)

The accompanying statement of significant accounting policies and notes are an integral part of these financial statements.

Statements of Changes in Fund Balances for the years ended June 30, 1983 and 1982

	Unrestricted Fund		Restricted Funds	
	1983	1982	1983	1982
Balance (deficit), beginning of year	($792,311)	($753,633)	$654,212	$524,278
Additions:				
Contributions			165,349	174,050
Proceeds from special presentations (Note 2)			108,540	130,026
Income from investments			23,690	62,990
Expenditures:				
Special purpose programs and projects			(31,299)	(48,921)
Special presentation expenses (Note 2)			(82,053)	(146,749)
Transfers between funds (Note 5)	51,273	41,462	(51,273)	(41,462)
Net loss, as annexed	(129,943)	(80,140)		
Balance (deficit), end of year	($870,981)	($792,311)	$787,166	$654,212

The accompanying statement of significant accounting policies and notes are an integral part of these financial statements.

Statement of Significant Accounting Policies

The American Museum of Natural History Planetarium Authority's ("Planetarium") corporate charter terminates when all its liabilities, including bonds, have been paid in full or otherwise discharged. At that time, its personal property passes to the American Museum of Natural History ("Museum") and real property to the City of New York to be maintained and operated in the same manner as other city property occupied by the Museum. The land utilized by the Planetarium was donated by the City of New York.

The policy of the Planetarium is to capitalize only major plant additions and replacements of equipment, machinery and other items and to depreciate such items on the straight-line method over their useful lives. Fully depreciated assets are carried at nominal value. Because of the nature of the ownership of the property, provision for depreciation of the buildings is considered unnecessary.

Short-term investments are stated at cost, which approximates market value.

Inventories are stated at the lower of cost (first-in, first-out method) or market.

Fund balances restricted by outside sources or by the Board of Trustees are so indicated (restricted funds). These restricted funds may only be utilized in accordance with the purposes established by the source of such funds.

The Planetarium and its employees participate in the Cultural Institutions Pension Plan ("CIRS Plan") administered by the Cultural Institutions Retirement System ("CIRS"). The Planetarium's policy is to fund pension expense accrued.

Notes to Financial Statements

1. The Planetarium Authority bonds were purchased by the Museum in 1948. The Charles Hayden Foundation contributed $200,000 to the Museum toward the purchase of such bonds.
2. The Board of Trustees of the Planetarium has designated that the net income from special presentations be set aside in a board designated restricted fund to finance current and future improvements and renovations.
3. Pension expense for fiscal 1983 and 1982 was $34,947 and $30,450, respectively. The CIRS Plan is a multi-employer plan and as such its actuarial present value of vested and nonvested accumulated plan benefits and net assets available for benefits are not determinable on an individual institution basis.
4. The Planetarium receives certain services, including accounting, security and maintenance services, from the Museum. The aggregate charges for such services in fiscal 1983 and 1982 aggregated $188,235 and $181,200, respectively.
5. Depreciation on major plant additions and replacements which have been financed from cash generated by restricted funds is being funded by transfers from restricted funds.

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Department of Ornithology

The Department's ornithological collection, the largest and most actively used in the Americas, if not the world, was enhanced by new, specially prepared and treated specimens. Field trips took staff researchers to Africa, Asia, South America and western North America. Much of the year's activity focused on preparations for the Centennial Meeting of the American Ornithologists' Union, to be held in the Museum in late September, 1983. The stream of visitors from as far away as New Zealand, Africa and South America provided stimulation while the generosity of Research Associate William H. Phelps, Jr., enabled the Department and other departments of the Museum to undertake plans for expeditionary research in Venezuela in cooperation with the Venezuelan government.

Projects Culminated Lester L. Short, Chairman and Curator, continued research on African, Australian and South American projects. Field studies from November to January were conducted in Kenya with Jennifer F. M. Horne, research associate of the National Museums of Kenya, and involved investigations of barbets, honeyguides and woodpeckers. The Leonard C. Sanford and Ritter-Eisenmann funds provided support. Arizona studies in May at the Southwestern Research Station focused on woodpeckers. African research resulted in a paper documenting use by honeyguides (*Indicatoridae*) of barbets (*Capitonidae*) as determinants of honeyguide territories. Another report appeared on hybridization and vocal behavior of Australian pardalotes (*Pardalotus*), co-authored with Ms. Horne and Richard Schodde of Australia's Commonwealth Scientific and Industrial Research Organization. Other technical papers were published, and Museum studies continued on barbets and honeyguides for a handbook of African birds. Dr. Short fulfilled eight years of research and writing as one of the committee of eight taxonomists preparing the Sixth Edition of the "Check-list of North American Birds," which went to press this year.

Publication of "Woodpeckers of the World" in 1982 culminated nearly 20 years of Dr. Short's research. This monographic book treats and illustrates in color all 198 species of woodpeckers, many of them studied by Dr. Short on five continents. It deals with major forms (megasubspecies) and superspecies, and highlights concern for such possibly extinct species as the Imperial Woodpecker and the nearly extinct Ivory-billed Woodpecker.

Lamont Curator Wesley E. Lanyon carried on his investigation of the nasal septum of the skull and supporting elements of the syrinx, the sound-producing organ, in an effort to elucidate relationships among genera of the New World flycatchers (Tyrannidae). Museum studies here and elsewhere, along with specimen loans, enabled him to study most of the 90 genera involved. Papers relating to these studies have been submitted for publication and include a major report on the six genera of myiarchine flycatchers that share a unique derived state of the nasal capsule and a derived habit of hole-nesting in trees. Another submitted paper on the systematic status of the Cocos Island Flycatcher (*Nesotrichus*) shows that this bird, formerly allied with one subfamily and recently placed in another subfamily, actually represents a third subfamily (Elaeniinae).

Exhibition Renovation Dr. Lanyon directed the program of renovating the Museum's exhibition halls on birds, begun two years ago. Two sections, newly readied, of the Sanford Memorial Hall of the Biology of Birds have opened to the public. Work continues on the synoptic series of birds of the world in that hall, as well as on the Hall of Birds of the New York City Area. The plan is to complete the program of renovation for the Centennial Meeting of the American Ornithologists' Union in September, 1983.

Curator François Vuilleumier continued his studies of South American

birds and birds of Mediterranean bioclimates. A report was completed with Jaques Blondel of France's Centre National de la Recherche Scientifique in Montpellier, France; Leslie Marcus, Research Associate in the Museum's Department of Invertebrates, and Eric Terouanne, of Paul Valéry University in France. The study involved a statistical comparison of the ecomorphological convergence of bird communities in France, California and Chile. A major paper on the biogeography of Patagonian forest birds was finished, as was an analysis of geographical variation in the South American honeycreeper *Oreomanes fraseri*. Turnover rates in South American and also North American fossil avifaunas were the focus of another study presented at several meetings, including the International Ornithological Congress in Moscow.

Dr. Vuilleumier collaborated with Ernst Mayr, Curator Emeritus, to assess the status of all the species of birds newly described between 1966 and 1975. They also worked on a manuscript treating new birds described throughout the world between 1976 and 1980. Birds are usually thought of as being very well known, but the yearly discovery of new species indicates how much remains to be learned, especially in tropical regions where habitats are being eliminated. Two of the Department's curators, one curator emeritus and four research associates are actively involved with bird conservation organizations.

Junco Studies Assistant Curator George F. Barrowclough conducted field work in Costa Rica during August, supported by the Eppley Fund, to collect major series of skeletons, skins and tissue samples from *Junco vulcani*. These, from the southernmost species in the genus *Junco*, complement material already at hand for genetic and morphological studies of that genus. Other studies of juncos in May and June took place near the Southwestern Research Station. In addition to genetic and morphological research, material was obtained for analyses of ontogeny and development of size and shape in passerine birds. A hybrid zone between the distinct races *Junco hyemalis caniceps* and *J. h. thurberi* was analyzed with the help of computers. Directional changes in phenotypes of birds in the hybrid zone have occurred in the past 40 years.

A project was completed by Dr. Barrowclough and Gerald F. Shields, of the University of Alaska, involving use of observed rates of chromosome evolution of birds to estimate long term, effective deme (local population) sizes of wild bird populations. Deme sizes in birds seem to have averaged on the order of 100 individuals over the past 100 million years. With Dr. Marcus, Research Associate in the Department of Invertebrates, a project was started to develop computer programs that separate size and shape components in the skeletal variation of avian populations. Applied to the major groups of juncos, preliminary results suggest that the direction of evolution *among* populations involved different characters than did evolution *within* populations, a surprising effect not previously observed in analyses of skeletal variation in birds.

Birds of Prey Lamont Curator Emeritus Dean Amadon continued long-term investigations of the biology of birds of prey in Florida, Arizona and New Mexico, as well as in the Museum. He pursued projects on the significance of color phases in hawks and owls, monotypic bird genera, size constraints on eagles and vultures and, with Field Associate John Bull, a reference list of raptors of the world. Mr. Bull continued his installation of the world reference series of birds, both as scientific assistant, and, after his retirement this year, as field associate. Scientific Assistant Mary LeCroy worked on diverse aspects of collection management, supervised many of the Department's volunteers, and continued her research on birds of paradise and bowerbirds.

Research Associate Walter Bock assisted with the renovation of exhibits, helped to supervise the Department's anatomical collections and continued his research on the anatomy of passerine birds. Jean Delacour, Research Associate, and the world's senior ornithologist, reviewed several articles. Associate Ruth DeLynn organized and prepared anatomical acquisitions, including some 500 obtained by Dr. Barrowclough.

Research Associate Jared M. Diamond conducted research on the biogeography and evolution of New Guinea birds in collaboration with Ms. LeCroy, and conducted joint research with Dr. Mayr on the biogeography and evolution of Bismarck archipelago and Solomon Island birds. Robert W. Dickerman, Research Associate, continued research on Neotropical birds, including the relationships between the orioles *Icterus spurius* and *I. fuertesi*, and on variation in plumage of young Common Nighthawks (*Chordeiles minor*). Research Associate James C. Greenway, Jr., continued to compile the list of types in the Department's collections.

Hormones and Social Behavior Research Associate Cheryl Harding investigated hormonal control of social behavior in male and female birds, and received a grant from the National Institutes of Health to enable minority students to gain research experience in her laboratory. G. Stuart Keith, Research Associate, completed his authored sections of "The Birds of Africa," a five-volume work of which he also is coeditor. Mr. Phelps planned and contributed toward a Museum-wide expedition to the Cerro de la Neblina, a little known Venezuelan mountain. The expedition will involve Dr. Barrowclough and Dr. Dickerman.

The precise mechanisms controlling jaw opening during grasping behavior of the Rock Dove (Common Pigeon) are the subject of investigation by Research Associate H. Philip Zeigler. Studies so far show important

David J. Schwendeman, Senior Principal Preparator, colors a heron's bill. Painting and touching up mounts is part of the work of the Department of Exhibition and Graphics. Over the year, all of the Museum's bird halls were refurbished in preparation for the September, 1983, Centennial Meeting of the American Ornithologists' Union which was founded at the American Museum in 1883.

similarities between the pecking-grasping system of pigeons and the reaching-grasping system in humans.

The Frank M. Chapman Memorial Fund Committee awarded 93 grants totaling $48,630 mainly to young researchers, and two fellowships to Robert E. Bleiweiss of Harvard University and Robert M. Zink of the University of California at Berkeley.

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1983. The trigeminal system and ingestive behavior. *In* Handbook of Behavioral Neurobiology, E. Satinoff and P. Teitelbaum, eds. Plenum Press, New York.

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Department of Vertebrate Paleontology

Collection-oriented research is the intellectual core of museum work. But even carefully documented collections will lose scientific value if information about them is not readily available, if they are not adequately maintained, or if collections are not made at opportune times to provide additional materials for specific research programs. The Department's collection policy is guided by these goals.

For the second consecutive year, the Department has had support from the National Science Foundation to relocate, inventory and curate much of the dinosaur collection. The fossils have been moved into new cabinets and onto racks in special storage areas of the Museum basement.

The Department's curatorial staff was augmented this year by the arrival of Michael J. Novacek, Assistant Curator. Dr. Novacek is no stranger to the Museum, having previously held a National Science Foundation fellowship in the Department. He is known for his imaginative work on the phylogenetic relationships of small placental mammals such as the extinct leptictid insectivores, that are so well represented in the Frick Collection. He has also worked extensively with living mammals, notably bats, and has studied the history of their ability at echolocation. Before joining the Museum, Dr. Novacek was Associate Professor of Biology at San Diego State University in California.

Exploration During the past year, the Department has taken important steps to expand its holdings in a carefully conceived plan of exploration. The components of this plan are the research programs of the Department's curators. In the field, they have concentrated on long-term projects in Australia and North America.

On the Australian mainland, Richard H. Tedford, Curator and Chairman, investigated late Cenozoic deposits to integrate the geological

history and the occurrence of fossil marsupials in the arid core of the continent. This year's fieldwork, in collaboration with R. T. Wells of Flinders University, was supported by the National Geographic Society and the Australian Research Grants Committee. Drs. Tedford and Wells tested geological interpretations based on their 1980 work in the vicinity of Lake Eyre. Of particular interest was the failure to find stratigraphic evidence for the giant Ice Age lake in the center of the continent long postulated in textbooks on Australian geology. Previously unknown fossil vertebrate faunas were obtained from this region.

On Lord Howe Island in the Tasman Sea near Australia, Curator Eugene S. Gaffney recovered additional horned turtle material from the Pleistocene deposits. *Meiolania platyceps* vanished just 40,000 years ago, yet it belongs to a group that originated in the Age of the Dinosaurs, about 200 million years ago. Study of this primitive turtle with a nonretractile head may contribute to an understanding of continental drift.

In North America, Curator Malcolm C. McKenna and Dr. Novacek have been seeking to extend the knowledge of the earliest placental mammals by working late Cretaceous and early Cenozoic deposits in Wyoming.

Dr. Novacek, in a cooperative program with the Instituto de Geología in Mexico City, discovered new early Eocene vertebrate fossils in Baja California that demonstrate strong zoogeographic ties with similar remains in the northern Rocky Mountains.

Research The Department curators' research has ranged over many areas of inquiry. Dr. McKenna published a review of the problem of land bridge connections 56 million years ago at the north end of the North Atlantic Ocean. At that time, Iceland's ancient subaerial expression completely filled the much narrower gap between central Greenland and the British Isles. A second bridge, farther north, connected Norway and Sweden with the north end of Greenland.

Dr. Tedford has three main projects, Australian Cenozoic marsupial faunas, Late Cenozoic biostratigraphy of the fossil mammals of North America, and carnivore evolutionary studies.

Dr. Gaffney devoted much time to the earliest known turtles, from the Triassic of Germany. His study of the unique horned turtles from Lord Howe Island has resulted in new understanding of the peculiar geographic distribution of horned turtles in the Southern Hemisphere.

Assistant Curator John G. Maisey's research has centered around Paleozoic and Mesozoic sharks. He has described for the first time a well preserved Early Cretaceous hybodont braincase, which is also the first Mesozoic shark braincase to be described, and has also worked extensively with shark teeth and spines of various kinds, straightening out taxonomic problems that have long been confusing. Dr. Maisey's comprehensive program of research into the anatomy of hybodont sharks from the Mesozoic of Europe and the late Paleozoic of North America has been approved for funding by the National Science Foundation for two years beginning October, 1983.

Since he joined the scientific staff, Dr. Novacek has been working extensively with fossil insectivores, the systematics and evolution of the living elephant-shrews of Africa, and the auditory apparatus of living bats.

The Curators Emeriti continued their productive professional work. Edwin H. Colbert wrote scientific articles on vertebrates from Pangea and the Transantarctic Mountains and contributed to several books for students and general readers. George Simpson described a new genus of fossil penguin from Patagonia. Bobb Schaeffer summarized current work in morphogenesis, the formation and differentiation of tissues and organs, while Morris Skinner worked on horse evolution and stratigraphy.

Research Associates have also contributed to the intellectual life of the Department and to the field of vertebrate paleontology. Donald Baird has been studying Paleozoic fishes and tetrapods, Robert J. Emry has focused on pangolin-like mammals, Max K. Hecht is tracing the origins of birds, as has John Ostrom. Eric Delson helped to formulate plans for the exhibition, "Ancestors: Four Million Years of Mankind," scheduled for April, 1984. He carried forward his work on fossil primates. Bruce J. MacFadden's research focused on horse evolution and paleomagnetic stratigraphy, Leonard B. Radinsky worked on skull shape in carnivores and ungulates, and John Wahlert focused on rodent interrelationships. Frederick S. Szalay described a new giant fossil tree kangaroo.

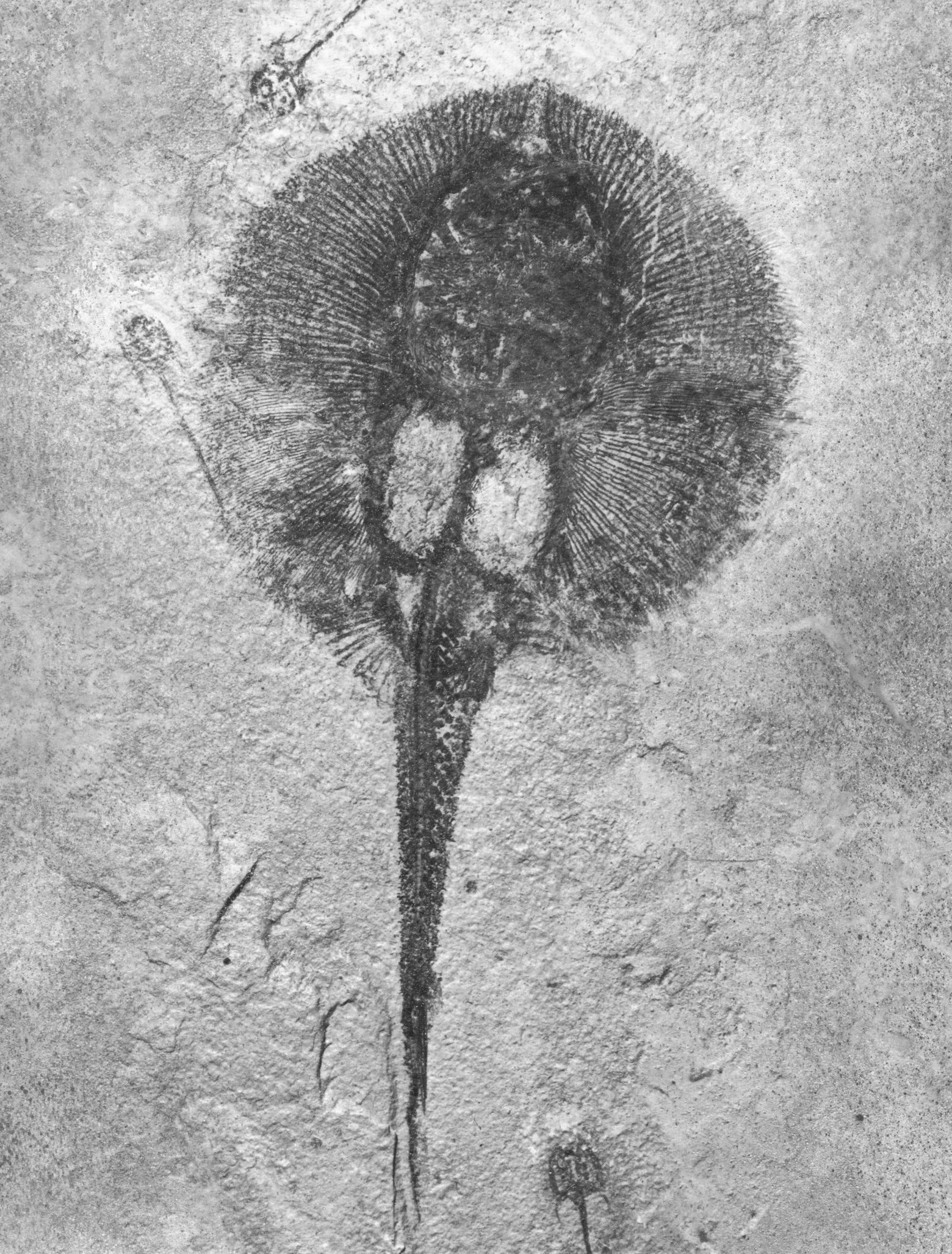
Increasing Public Knowledge
Through special, temporary exhibitions, the Department was able to contribute to public knowledge of the natural sciences.

In the exhibition, "New Frontier of Life," Dr. McKenna helped explain the plate tectonic phenomena resulting in deep-sea, ore-bearing, hot springs. The unusual animal life thriving in this sunless environment—six-foot tube worms, giant crabs, spaghetti worms —was described by Curators in the Department of Invertebrates. "New Frontier of Life" was an Arthur Ross Exhibit of the Month.

Dr. Gaffney presented casts of the great horned turtle to the Lord Howe Island Museum and the Australian Museum in Sydney. Near the ancient home of this turtle, these museums had never reconstructed a complete skeleton of this remarkable reptile. A third cast was exhibited at the American Museum last summer as an Arthur Ross Exhibit of the Month.

Four graduate students from Columbia University and the City University of New York conducted their doctoral research under the supervision of Departmental curators. Drs. McKenna and Gaffney serve on Columbia's graduate faculty in an institutional relationship that has endured since the turn of the century.

Three stingray offspring surround a parent in this 50-million-year-old group of fossils from Wyoming's Green River Formation. These stingrays are a new, unnamed species of Heliobatis. *A private collector donated this unique fossil group—only one other specimen with young has ever been found—to the Department of Vertebrate Paleontology. In its fossil fish collections, the Department has specimens more than 500 million years old from all parts of the world. Its collection of chondrichthyans, the group of cartilaginous fish including stingrays and sharks, contains some of the first fossil sharks ever described as well as some of the oldest, dating back some 350 million years.*



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Research Station Programs

Observing animal behavior in natural settings, collecting specimens to aid in taxonomic studies, digging for archeological remains or searching for fossils of prehistoric animals are a few variations of the fieldwork important in the research programs of the Museum's scientific staff. To aid in their research and serve other investigators as well, the Museum operates or is associated with research stations in the United States. These stations offer varied environments and research facilities to scientists from around the world.

St. Catherines Island Situated off the Georgia coast, St. Catherines is a barrier island owned by the Edward J. Noble Foundation. With the Foundation's support, the American Museum carries out a visiting investigator research program in the areas of zoology, geology and archeology. In an effort to expand the program next year, botany will be among the disciplines studied on the Island. The New York Botanical Garden will aid in the review of the botanical proposals.

Currently, research is emphasized that is pertinent to the Island's environment. Projects are encouraged that involve the training of doctoral students for careers in the sciences.

Forty-five researchers used the Island's facilities over the year, with many making several visits. The projects are quite diverse, ranging in topic from skinks to the Island's prehistoric human residents.

James Oliver, Director of the Institute of Arthropodology and Parasitology and Head of Biology at Georgia Southern College, completed the first part of a two-year study involving ticks endemic to Georgia and their association with warm-blooded animals. His research team included two senior scientists, one postdoctoral student and two undergraduates.

Ticks are serious pests and vectors of diseases of man, domestic animals and wildlife along the eastern coast of North America. Significant progress was made in determining the tick species present on the Island, recording the seasonal variation in the tick populations, correlating this variation in tick densities with physical factors (temperature, rainfall, host abundance), and surveying the tick hosts (rodents, deer, raccoons) for the presence of protozoan blood parasites.

Jerome G. Rozen, Jr., Deputy Director for Research and Curator at the Museum, examined the nesting behavior of the solitary bee, *Colletes brimleyi*. Unlike the social honeybee and bumblebee, most bees are solitary, nesting alone. In the species *C. brimleyi*, the female bee burrows into the ground and creates branching tunnels that end in brood chambers. Dr. Rozen found two of these nests in early stages of excavation. The parasitic bee, *Epeolus ilicis*, was beginning to emerge from winter hibernation at the time and preparing to lay its eggs in the *C. brimleyi* nests.

In a general survey of the Island's bee fauna, Dr. Rozen located two species previously not found on the Island, *C. thoracicus* and *Perdita bradleyi*. Just five millimeters long, *P. bradleyi* may be the Island's smallest bee.

Robert W. Frey, Professor of Geology at the University of Georgia in Athens, has worked on the Island for more than three years with graduate students and a colleague. They have been conducting a series of studies that analyze the physical and biological properties of various sedimentary deposits on the Island's north beach.

This year, they focused on sediments which are former salt marshes and compared their findings to modern marshes. Graduate student James Tripp studied the life modes and population distributions of the organisms that burrow in the mud, such as crabs and bivalves. Kent Sprague, also a graduate student, investigated the sediment's geochemistry. Their work will further describe the relationships between relict environments and modern biological habitats.

Joshua Laerm, Director of the University of Georgia Museum of Natural History in Athens, initiated a particularly timely study on the Anastasea Island cotton mouse, *Peromyscus gossypinus anastasae*. This mouse has a very limited distribution and is being considered for protection under the endangered species programs of Florida and Georgia.

Dr. Laerm is investigating the systematics of *P.g. anastasae* to determine whether it is a true subspecies. The mouse is known only from its type locality, Anastasea Island, Fla., and Cumberland and Little Cumberland Islands, Ga. Populations of similar light-colored cotton mice occur on a few other coastal Georgia Islands, but their subspecific identification has not been adequately determined. While *anastasae* has been recognized since its description in the late 1890s, its taxonomic validity is uncertain.

David Hurst Thomas, Curator and Chairman of the Museum's Department of Anthropology, continued his excavations of the Santa Catalina de Guale mission on the Island. So far, his team has unearthed three buildings and a well associated with the mission. This long-term research project is presently focusing on the late prehistoric/early historic interface between local aboriginal populations and the colonizing Spanish settlers. Preliminary analysis seems to indicate that the Santa Catalina mission may have been established as early as 1566. This would make it the earliest non-native settlement in Georgia.

Southwestern Research Station The Southwestern Research Station is located near Portal, Ariz., in the Chiricahua Mountains, which rise from broad valleys to heights of nearly 9800 feet. Extremes of terrain—mountain peaks, desert, canyons and grassy plains—foster an unusually wide variety of habitats. With a setting near five life zones, the Station offers the opportunity for fieldwork under controlled conditions in an unspoiled natural habitat with access to laboratory facilities.

Visitors to the Station numbered 1152 this year, a seven percent decline from the record year of 1981-1982.

The tightening of research grants and the nation's poor economic condition may have contributed to the drop.

Of the visitors, 126 were researchers, 153 were students in 13 science classes, 413 were members of 22 naturalist tours, and the remainder were naturalists and the families of visiting scientists. Eighteen seminars and 10 slide programs were presented to scientists and visitors.

The researchers came from 60 organizations representing many parts of the United States and Canada as well as England, Australia and West Germany. Eight scientists associated with the American Museum also used the Station's facilities. Fifteen papers were published this year on work previously conducted at the Station.

More than 110 projects were conducted at the Station over the year, including 28 in herpetology, 21 in entomology, 15 in ornithology, 15 in arachnology, 9 in mammalogy, 7 in botany, 6 in ecology and 4 in geology.

Behavioral ecology and social organization of the southern grasshopper mouse, *Onychomys torridus,* was one of the projects completed this year at the Station. Dennie Frank, Ph. D. student at Cornell University, trapped all adult mice on a five-hectare plot, fitted them with miniature radio transmitters and returned them to the field. After tracking the location of eight mice for four weeks, she found that males' home ranges averaged 3.36 hectares, three times larger than females' home ranges. Adult females are territorial, maintaining adjacent yet exclusive home ranges, while males' ranges overlapped those of several females and of each other to varying degrees. The males may also be territorial, however. Since their home ranges are quite large, constant surveillance and defense by a single male is difficult, making the male-male overlap functional.

Robert Droual, doctoral student at the City University of New York, compared the behavior of two species of ants, *Pheidole desertorum* and *P. hyatti*, when attacked by the army ant, *Neivamyrmex nigrescens*. These ants use an alarm-evacuation defense. Though their organization and alarm communication is similar, important differences in the social organization of defense appear to be correlated with ecological and behavioral factors. In a second study, he found that a number of prey ants use different tactics for different attackers. The very small species, *P. tusconico*, remains in its nest when attacked by *N. nigrescens*, but evacuates its nest when attacked by a smaller species, *N. fallax*.

In studies of the lizard *Sceleoporus jarrovi* at the Station, Barbara Bissinger, doctoral candidate at City University of New York, found that the parietal eye plays a vital role in the animals' homing behavior and sun-compass orientation. The parietal eye is an eye-like structure on top of the lizard's head used to sense light and radiation. When this eye is covered, lizards displaced from their home ranges are unable to return home within two days. All control lizards, however, returned home in this period.

In a second study, Ms. Bissinger found that the parietal eye, not the lateral eyes, perceives celestial cues and allows the lizard to use an internal suncompass for navigation. After altering the light-dark cycles of the lizards, she found that those lizards with covered parietal eyes were unable to find their home ranges, while those with uncovered eyes were able to reorient themselves to the sun and return home.

Vincent Roth, the Station's Resident Director, finished the first complete "Handbook for Spider Identification in North America." It is a guide to the important catalogs, recent family and generic revisions with supraspecific keys. With Barbara Roth, he is examining the occurrence and causes of leg breakage among spiders.

Archbold Biological Station

Located in south-central Florida, the Archbold Biological Station, supported by Archbold Expeditions, is a center for research on the distinctive biota of the southern end of the Lake Wales Ridge. Much of the research by the resident staff and visiting investigators is focused on the 4139-acre Station, which contains examples of most of the habitats and geological features characteristic of the ridge and thus constitutes a valuable natural reserve in its own right. In addition to its research program, the Station is involved in a wide range of educational activities. During the past year two new members joined the research staff, and land was acquired.

New Assistant Research Biologists this year are Mark A. Deyrup and Ronald L. Myers, representing the fields of invertebrate ecology and plant ecology, respectively. Dr. Deyrup received his Ph.D. in forest entomology from the University of Washington and came to the Station from Purdue University, where he had been assistant professor in the Department of Entomology. Dr. Myers received his doctorate in botany at the University of Florida, where he held the post of post-doctoral associate in the Department of Botany.

Staff members and associates carried on 36 research projects during the year. James N. Layne, Executive Director and Museum Research Associate, continued a series of long-term investigations on the ecology and life histories of mammals and other vertebrates of the Station and environs with the aid of Scientific Assistants Fred E. Lohrer and Chester E. Winegarner.

Working under Dr. Layne's direction, Douglas A. Wassmer completed a master's thesis study of the population trends, movements, activity and social organizations of bobcats. With David R. Smith, graduate student at the University of South Florida, Dr. Layne continued to study the small resident population of American Kestrels on and in the Station's vicinity and the feeding behavior and habitat selection of wintering Northern Kestrels. Dr. Layne was voted President-elect of the Florida Academy of Sciences.

Research at the Station ranges from Dr. Deyrup's investigation of ants, with emphasis on habitat preferences in relation to vegetative association and microhabitat features, to Dr. Myers's studies of the factors that control the zonation of vegetation in seasonal ponds.

Other research examined the influence of natural and prescribed burning on the station's vegetative associations. Warren G. Abrahamson, Station Research Associate from Bucknell University, has documented relatively rapid recovery of vegetation after fire in all associations and virtually no change in vascular plant species composition before and after fire.

Thomas Eisner, Station Research

Associate from Cornell University, extended his studies on the courtship of the moth *Utetheisa ornatrix*, identifying and synthesizing two new components of the female pheromone. He has found a surprising result: striking geographic and temporal variation in the composition and ratio of the components of the female pheromone. It appears that present populations at the Station use different pheromones than those of several years ago.

Numerous visiting investigators and college and university groups utilized the Station's facilities, and many additional groups and individuals visited for tours and lectures on the Station's program and the ecology of the region. The Florida Scrub Workshop, jointly sponsored by the Station and the Nature Conservancy, was held at the Station in April.

After years of effort, the Station was successful in acquiring a 239-acre tract containing Lake Annie, an addition that greatly increases the natural value and research potential of the Station property. Lake Annie is notable for its pristine water quality and the presence of several rare invertebrate species. It also has great geological interest as the southernmost of the unique chain of lakes occupying the valley of the Lake Wales Ridge. In addition, the lake's sediments provide the most complete record of the vegetational and paleoclimatic history of the past 40,000 years of any site in the southeastern United States. The lands around the lake also provide additional representation of important habitat types and added populations of a number of the endemic plant and animal species of the region.

In recognition of the vital role played in the acquisition of the property by Frances A. Hufty, President of Archbold Expeditions, and Mr. Page Hufty, Treasurer, the area has been designated by the Board of Directors of Archbold Expeditions as the "Frances and Page Hufty Tract."

Great Gull Island In 1982, more than 1000 new pairs of Common Terns nested on Great Gull Island, the Museum field station at the eastern end of Long Island. This dramatic increase accompanied the population explosion of the reintroduced meadow vole, *Microtus pennsylvanicus*. At the suggestion of Karl F. Koopman, Curator in the Department of Mammalogy, and with the help of Robert W. Dickerman, Research Associate in the Department of Ornithology, 36 of these small grass-eating mammals were released on Great Gull Island in 1981. It was hoped that the voles would thin the grass enough so that Roseate Terns would be able to use the overgrown edge sites they had formerly occupied.

Following their introduction, the voles increased in number and by the spring of 1982 they had cleared large areas on the island. The terns moved into these areas and nested. Most of the sites were occupied by Common Terns, but a few pairs of Roseate Terns moved in as well. A number of the terns that came in had been banded in nearby colonies where flooding earlier in the season had washed out their nests.

Robert Tamarin, of Boston University, and a student, Gregg Adler, visited Great Gull Island in April to trap and tag meadow voles and assess the size of the population. Dr. Tamarin and Mr. Adler will return in September to continue the project.

It is with sadness that the Great Gull Island Project learned of the death of Baldwin Gerretson in August. Mr. Gerretson had volunteered and worked in the Museum on the Project.

Helen Hays, Chairwoman, showed the Great Gull Island film, "Ternwatch," by Michael Male to the following organizations: the Ferguson Museum on Fisher's Island; East Lyme Conservation Trust; Goucher College Biology Club; Western Connecticut Bird Club; Audubon Naturalists' Society, Chevy Chase, Md.; Guilford Audubon Society; Prince George Audubon Society; and at the annual meeting of the Eastern Bird Banding Association. The film was also shown during the year at Dartmouth and Williams Colleges, and at Lake Mohonk.

In 1982 the Great Gull Island Birdathon brought in $14,000—$2,000 more than in 1981.

Department of Education

A vital part of the Museum's mission, part of its very fiber, is its educational role. A primary goal for the Department of Education is to add to public understanding of the collections on exhibit and the subjects they represent. Through the efforts of a staff of skilled teachers and programmers, concepts and principles embodied in the objects and specimens on display are brought to life.

Official innauguration of the Charles A. Dana Education Wing this spring brought into focus the growth and development of interpretive facilities and education programs at the Museum. The Dana Wing's two floors encompass the Frederick H. Leonhardt People Center, the Alexander M. White Natural Science Center, the Louis Calder Laboratory, the Harold F. Linder Theater and the Henry Kaufmann Theater. Soon to be added are a new studio classroom and the Edith C. Blum Lecture Hall, now under construction in a two-story structure which will become part of the Dana Wing. These facilities add enormously to the potential for programming and interpretation.

A primary goal is always to add to visitors' understanding of collections on exhibit and to bring into clearer outline the theories and concepts implicit in them. This is achieved through different formats. A subject may be covered in a lecture series over a period of weeks, an intensive one-day symposium or a demonstration taking only minutes. It may be done with a group on a botanical field trip or in a laboratory course introducing young people to functions of the microscope. Whatever the format, it involves active teaching and learning. The Department's extensive collection of teaching materials and specimens is often used with adults as well as children to add a tactile dimension to the experience.

Adult Programming Over the past decade there has been strong growth

Youngsters stare curiously as a tiny, two-year-old alligator snapping turtle performs in the hand of David A. Brody, Senior Technician in the Department of Entomology and Instructor for the Saturday workshop, "The World of Reptiles." The four-ounce turtle, which may grow to 125 pounds, is wriggling its "fishing lure," a wormlike protrusion in its mouth used to attract fish. With support from the Louis Calder Foundation for scholarships and programming, the Department of Education offers 20 Saturday programs a year for about 500 children. Annually, some 35,000 youngsters register for various instructional courses at the Museum.

in the amount and variety of programming for adults. The number of evening lecture series were expanded, afternoon lecture series were introduced, new weekend field study tours were developed and summer programming for adults was established as a pattern. The use of film and video as important components of interpretive programming continues to grow.

A good deal of adult programming is offered to visitors at no cost beyond entry to the Museum, thanks to support from an array of private sources. For some events, tickets are sold at moderate cost. The quality of the activities is consistently high; altogether some 60,000 adults this year experienced continued learning through one of these avenues.

The Helena Rubinstein Foundation and Vincent Astor Foundation were a mainstay for many of the free activites, as were generous gifts from the William Randolph Hearst Foundation, the Evelyn Sharp Foundation and the Henry Nias Foundation.

Visitors often discovered that in addition to magnificent exhibitions, they could experience a festival of Audubon Society films, a videotape program of Native American cultures, a performance by the Dinizulu troupe or the Ron Roach Caribbean Ensemble, a lecture on the origins of gospel music, or a talk on dolphins and porpoises. There was hardly a Wednesday evening or a weekend afternoon throughout the year when a special event and/or community program was not taking place somewhere in the Museum's theater spaces.

The number of ticketed programs sold this year was unprecedented. Some 10,000 persons enrolled in lecture series, weekend field trips, or for performances or special lectures. The subjects of a sample of these offerings reflect the richness and variety of the Museum as a whole: archeoastronomy, human evolution, historic museum expeditions, mammals, primates, anthropological film, wetland plants, insects, gems and underwater archeology.

College-accredited courses for teachers, given in cooperation with the Graduate School of Education at the College of the City of New York is a special adult service. The semester-length courses, taught by Department of Education staff members, carry the same requirements of examination and written work as classes taught on campus. However, subjects reflect special areas of expertise at the Museum. A distinguishing feature of these courses is that instructors draw extensively on the collections and exhibitions for material and examples. More than 350 teachers enrolled in 16 courses this year.

Weekend Visitors Another direction taken over the past decade has focused on making educational services increasingly available to weekend visitors, though the majority of the Department's activities continue to occur on weekdays. The compelling reason for this development is that the largest number of visitors come on Saturday and Sunday. The Frederick H. Leonhardt People Center and the Discovery Room, developed early in the 1970s, reflect attempts to serve weekend visitors; the former facility is aimed at family audiences, the latter at younger children. The Alexander M. White Natural Science Center, supported this year by a grant from the Barker Welfare Foundation, likewise serves an important weekend educational function. During the week, these facilities are used as classrooms, but on weekends they become areas of special learning and are open to all. Approximately 150,000 weekend visitors take advantage of these facilities annually.

Since one of the goals of community programming is to draw new audiences as well as to serve regular visitors, performance activities play a strong role. Afro-Brazilian music, reggae, and performances by the Ballet Folklorico Nacional de Chile and the Bloomingdale Chamber Orchestra were part of this year's thrust. A film festival for families, lectures and demonstrations in conjunction with the special exhibition, "African Textiles," and two academic symposiums on archeology were likewise part of this effort.

Young People More than a quarter-million children in registered school classes came to the Museum with their teachers during the school year. Of that number, more than 100,000 made reservations through the Education Department. An additional 80,000 registered through the Nature-max Office for a film program, and some 96,000 came for Planetarium programs often followed by a visit to other parts of the Museum.

The Museum continues the tradition of being the most open and accessible cultural institution for school classes in New York City, and apparently the most popular one with teachers. Many classes visit under the guidance of their own teachers and do not reserve a special program. However, a devoted group of volunteers who work under Department of Education staff supervision provides informal learning opportunities for many of these classes. On every school day, teaching volunteers from the Department are stationed in key exhibition areas where they encounter such classes and conduct short sessions related to exhibits around them.

Some 35,000 students participated in special programs taught by staff members. Their teachers had preselected and reserved a subject from a list of a dozen topics in natural science or anthropology. Well over 2,200 students in special education groups, such as the hearing or visually impaired, were among the 35,000, thanks to a gift from the Charles E. Culpeper Foundation which supported an instructor trained to work with the handicapped. Also included were 8700 pupils in junior and senior high schools who benefited from an ecology program brought to their school assemblies by a staff member. This program, like those held in the Museum for individual classes, is on a topic selected by a teacher to complement the school curriculum.

Working with young people, however, goes beyond programming for school classes. Individual youngsters may enroll in weekend workshops which are held in the Louis Calder Laboratory. Thanks to ongoing gifts from the Louis Calder Foundation, those workshops are offered at modest cost and scholarship seats are distributed so as to afford access for all youngsters.

Staff Activities An important development in the Department's international activities has been a growing relationship with the National Museum of Natural History in New

Delhi. Through the Joint Museum Committee of the Indo-U.S. Subcommission on Education and Culture, four members of the Department have made extended visits to Indian museums in the past several years. Following journeys made by Malcolm Arth, Chairman, and Catherine Pessino, Assistant Chairwoman, Nathaniel Johnson and Paul Sanfacon, Senior Museum Instructors, traveled to India under an exchange program that brought their counterparts from India for comparable stays at the Museum.

Miss Pessino served as chairperson of the Education Committee for the Northeast Museums Conference and also as a member of the Steering Committee for the New York City Museum Educators Roundtable. Ismael Calderon, Caribbean Programming Coordinator, and Juanita Munoz, Museum Instructor, were invited to conduct workshops for teachers at the Pocono Environmental Education Center in Pennsylvania. Marcia White, African-American Programming Coordinator, taught several workshops for the graduate Museum Studies Program at the Bank Street College of Education in New York.

Florence Stone, Special Programming Coordinator, has overseen the Margaret Mead Film Festival from its inception six years ago, and plays a pivotal role in its continuing success. Approximately 8000 persons attended the 1982 film festival, making it the most heavily attended single public program presented at the Museum. Dr. Arth was invited to deliver the keynote address at the 1983 annual meeting of the Canadian Museums Association.

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Department of Exhibition and Graphics

Cooperation with other museums, foreign governments and institutions in this country during the past year provided the American Museum with rich material for special exhibitions. These exhibitions drew large numbers of visitors to the Museum. During the year, work progressed on permanent halls. Renovations continued on three major halls, and work on a fourth hall advanced from the planning to the installation phase.

Special Exhibitions Two impressive exhibitions on Native American cultures and one on the textiles of African cultures were featured in Gallery 3. Continuing an ambitious program of special exhibitions at the American Museum, the department staged "Aztec Mexico: Discovery of Templo Mayor" with the cooperation of the National Institute of Anthropology and History and the Mexican Ministry of Foreign Affairs.

The second special exhibition opened in Gallery 3 in December. Entitled "Star Gods of the Ancient Americas," it was curated and designed by the Museum of the American Indian and mounted at the American Museum as a cooperative project. In its three months on view, this major offering drew a quarter of a million visitors eager to learn about Native American views of cosmology and how these peoples looked to the skies to create a series of imaginative myths.

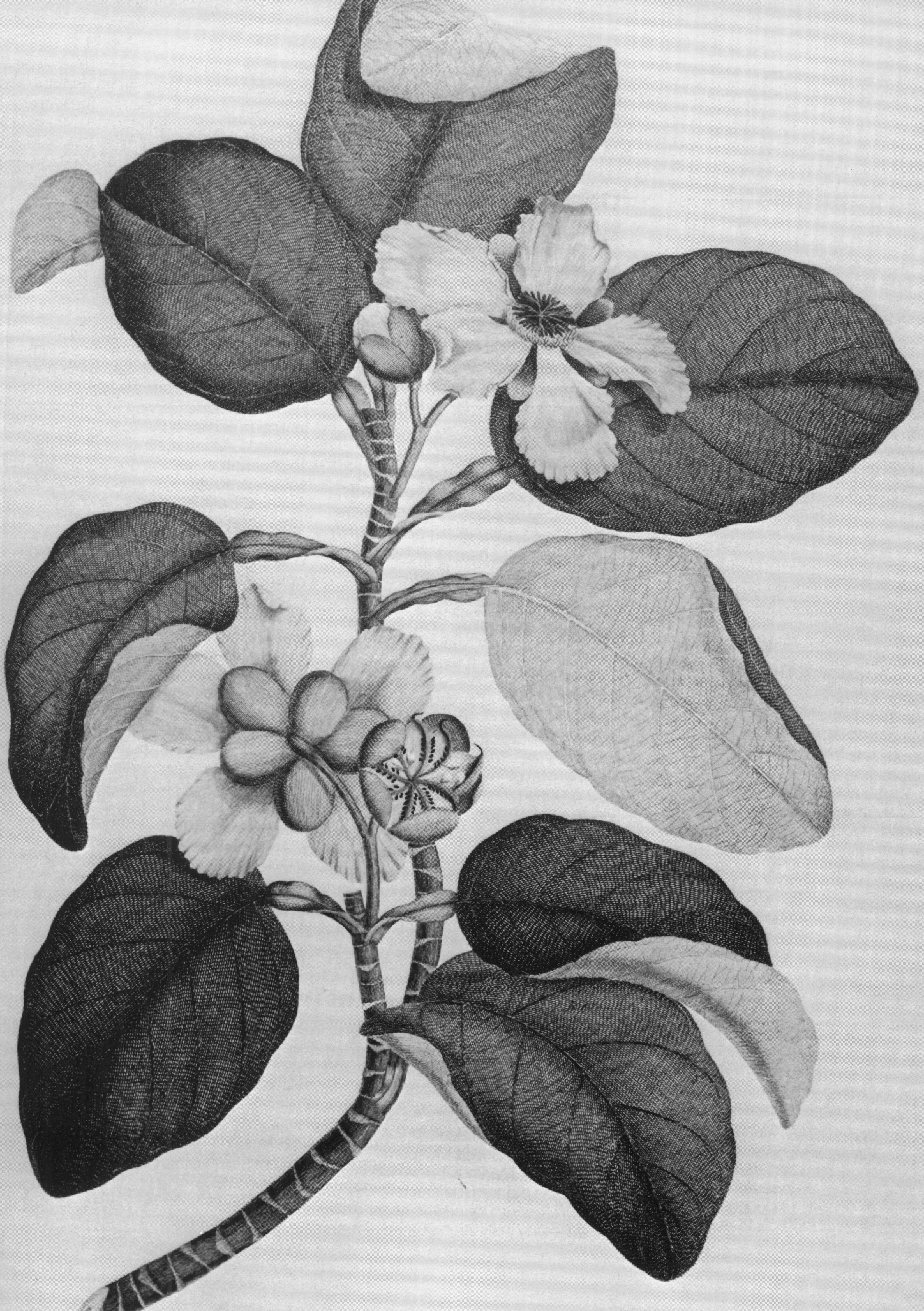
In June another major exhibition, "African Textiles," based on collections from the British Museum (Museum of Mankind), was opened. This show marked the first time the British Museum loaned an entire exhibition to any institution abroad. It featured a broad range of colorful, traditional fabrics from Africa and illustrated their cultural uses and the technology that produced them.

The Arthur Ross Exhibit of the Month program, partially funded by the Arthur Ross Foundation, brought many noteworthy exhibitions to the attention of Museum visitors. These included: "New Frontier of Life," "Deep Ocean Photography," "People of the Xingu," the Natural History Photo Contest winners and the Origami Holiday Tree.

The intriguing story of how skins, ivory and other materials from endangered species of mammals, birds and reptiles are confiscated by the U.S. Fish and Wildlife Service was the subject of an exhibition called "Confiscated." An interesting exhibition of short duration, also on the subject of endangered species, was "Warhol's Animals: Species at Risk" and featured large serigraphic prints of animals as interpreted by Andy Warhol. "Exploring the Deep Frontier" was another example of cooperation on special exhibitions among sister institutions. In this case, the California Academy of Sciences, created a traveling exhibition on the history of undersea exploration which was installed in Roosevelt Memorial Hall for viewing by American Museum visitors.

The British Museum (Natural History) also cooperated in assembling a special exhibition entitled "A Flowering of Science," staged in the newly-created Naturemax Gallery. It featured prints of copper engravings made from notes and sketches of botanical specimens collected on Captain Cook's first round-the-world voyage (1768-1771).

Permanent Halls The continuing work on the renovation of permanent halls includes: a complete reinstallation of the Margaret Mead Hall of the Peoples of the Pacific (scheduled to reopen in 1984); renovation of a major part of the Sanford Memorial Hall of the Biology of Birds (to be completed in September, 1983); redesign of the Hall of Biology of Man (to reopen in 1985); and finally, installation of the Hall of South American Peoples (to open in 1986).



Department of Library Services

The Museum Library is one of the great natural history libraries in the world. Its holdings include 400,000 volumes, a million photographic images, 850 reels of historic films, 1000 linear feet of archives, and extensive manuscript, rare book, and memorabilia collections. The Library serves an international body of scientists, historic researchers, students and lay public. Since the Museum Library is a major research facility, the Library Services staff is aware of the necessity for making the collections easily accessible.

The Library's vast Photographic Collection was the focus of the Department's activities this year. A year of planning culminated in a five week round-the-world fund-raising trip, "Rediscover the Great Expeditions." The October tour, sponsored by *American Photographer*, a CBS publication, was conceived to raise funds for the preservation of the unique Photographic Collection. Nina Root, Chairwoman, and Pamela Haas, Assistant Librarian for Archives and Photographic Collection, planned the itinerary in the footsteps of some of the Museum's great expeditions. The unique west to east circumnavigation via a chartered jet, attracted approximately 50 people, each of whom paid $25,000; $100,000 was raised, and much needed modern images were added to the collection. Director Thomas D. Nicholson, Richard Van Gelder, Curator, Department of Mammalogy, David Hurst Thomas, Curator and then Chairman of the Department of Anthropology, and Ms. Root accompanied the group and gave lectures, slide presentations and showed films from the Library's collection pertinent to the areas visited.

Captain Cook's around-the-world voyage in the 1700s yielded exquisite watercolors and 738 botanical engravings of some of the collected plants, such as this branch of an elephant-apple tree, Dillenia alata. *The American Museum showed 40 of them in the exhibition, "A Flowering of Science: Plants from Captain Cook's First Voyage 1768-1771." Cook's journey was said to be the first organized and thoroughly equipped voyage of biological exploration and a precursor to other influential expeditions, including that of Charles Darwin on the* Beagle.

New System Established
Inventorying, cataloging and preserving the Photographic Collection continued under grants from the U.S. Department of Education's Title II-C program, the New York State Council on the Arts, and the Exxon Foundation. A system of cataloging photographs to serve the specific needs of researchers in the natural sciences, while still adhering to national standards, was established and an automated program for cataloging and retrieval was written. A draft *Photographic Cataloging Manual* was published and distributed to institutions with similar collections in North America and England. It is hoped that this system will serve as the basis for a national standard for the cataloging and control of natural history photographs.

Editing a computer-produced guide to the Museum's anthropological photographs continued, and a 1984 publication of the guide is scheduled by G. K. Hall and Co. Similar guides to zoological and earth sciences collections are planned for the future.

Since subject headings in current use nationally are not suitable for subject analysis of scientific literature and collections, the Library is developing and testing a thesaurus suitable to the natural sciences. The photographic images being cataloged under the U.S. Department of Education grant are being cataloged by subject under established scientific terms used to catalog specimen and artifact collections. Once fully developed and tested, these scientific terms will be used in addition to Library of Congress subject headings to catalog published scientific literature.

The conversion of deteriorating, highly combustible nitrate negatives to safety film continued under a grant from the New York State Council on the Arts; funds from the Exxon Foundation provided much needed preservation quality boxes, sleeves and folders to properly store the negatives.

Approximately 750 reels of historic and theatrical natural history films were transferred to the Library. These will be reviewed, cataloged into the new automated system, added as a supplement to the existing *Catalog of the Special Film Collection*, 1974, and made available to researchers.

Grants Preservation of collections is an important aspect of the Library's responsibilities. A grant from the National Endowment for the Humanities has permitted the continuing program of preserving works of art on paper, such as the Titian Ramsey Peale and Joseph Wolfe collections. In addition, a conservation survey of the entire collection was done by John Dean of Johns Hopkins University under a Mellon Foundation grant. The report will serve as a guide for preserving the collections over the next decade.

Publications *Recent Publications in Natural History* (*RPINH*), formerly published in *Curator*, is, as of 1983, being published as an independent journal. Using the Museum's Wang VS-80 computer system, *RPINH* is being computer typeset, a much simplified and more economical system than the manual system used previously.

Services The Library continued its principal function of serving the Museum's scientific staff and other users. Added to the collection were 1485 monographs and 81 new journal titles; 42,923 issues of Museum scientific publications were distributed; more than 7000 people used the Library's resources; 38,261 items were circulated to the staff; nearly 13,000 reference questions were answered; 23 scientific data base searches were done; inter-library loan requests totaled 2000; and 5375 requests for photographic images were filled.

Exhibitions Two exhibitions were mounted in the Library Gallery: "North American Indians" and "Victorian Book Design." The Library's

1981/82 exhibit, "Maria Sybilla Meriam" was borrowed by Rutgers University for two months.

Staff Activities Nina Root was elected to the Council of the American Library Association (ALA) for a four-year term. The Council is the governing body of the Association. Mary Genett, Assistant Librarian for Reference Services and Conservation, was appointed to a two-year term on ALA's Preservation of Library Materials Section (PLMS) Education Committee. Ms. Root and Ms. Genett were instrumental in organizing PLMS.

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1983. Photographic cataloging manual. Draft edition.

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Haas, Pamela and Lori Gross
1982. [Review of] The American daguerreotype. American Archivist, vol. 45, no. 4, pp. 333-334.

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Root, Nina J.
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Interdepartmental Facilities

The Interdepartmental Laboratory moved to its new location in December, 1982. The completely renovated lab complex consists of a scanning electron microscope (S.E.M.) room, a separate area for S.E.M. support equipment, a preparation lab and a spectrophotometer room. The S.E.M. is used by Museum Curators, Research Associates and visiting scientists to obtain high quality micrographs of materials as diverse as fossil teeth, marine algae and laser etched semiconductors at magnifications ranging from 4 to 50,000 times normal size.

A new Wang VS-80 computer system was installed in the Museum in May, 1982, in rooms adjacent to the Interdepartmental Laboratory. The original configuration included a central processing unit with 256 kilobytes of main memory, two 75 megabyte disk drives, (a megabyte is approximately a million bytes; a byte represents eight bits, or binary pieces of information) one floppy diskette drive, six terminals and three printers. By April, 1983, the system had been upgraded to 512 kilobytes of main memory, with four printers and 18 terminals. Since printers and terminals are located at sites throughout the Museum, more than two miles of computer cable had to be installed by Museum electricians to connect the central processor with those devices.

Work done on the computer includes both word processing and data base management. Word processing is used for the preparation of scientific manuscripts for publication and the creation of documents for dissemination to the general public, as well as general correspondence. Data processing applications encompass projects as diverse as management of photographic collections, grants administration and cataloging of specimen types.

Publications

Scientific Publications The Office of Scientific Publications published a total of 36 articles, ranging in subject matter from anthropology to vertebrate paleontology. A majority of the papers were written and illustrated by Museum scientists; a few, however, represented the work of researchers from other institutions. Seven of the 36 articles were printed in the *Bulletin of the American Museum*, 26 in *American Museum Novitates* and three in *Anthropological Papers*. A total of 1889 pages was printed during the fiscal year. There are, in addition, 3665 pages in press.

Curator published five issues during the fiscal year, 25/2 through 26/2 inclusive, for a total of 384 editorial pages. This year *Curator* celebrated 25 years of publication with issue 25/4 (December 1982) which was a lifetime index to the journal. Also with that issue, *Curator* returned to a normal publication schedule after being behind for a number of years. Manuscript submissions increased during the year, allowing for greater selectivity, while circulation is at an all-time high.

Recent Publications in Natural History, which had been a section in *Curator* for several years, was launched as a separate journal in 1982 under the Department of Library Services. *RPINH* will be sent to all domestic *Curator* subscribers free of charge for one year, after which it will be available by paid subscription only.

Special Publications This year marked the inauguration of the Members' Book Program, designed to bring high quality books in natural history, anthropology, and related areas at reduced cost to members of the Museum. Revenues from the program will supplement the Museum's publishing efforts.

The Office of Special Publications received a generous grant from the General Electric Foundation to produce the first Museum Guide in the Museum Guide Series, a general guide to the exhibits. Guides focusing on individual areas of the Museum will be produced at regular intervals.

Special Publications entered into publishing arrangements with Universe Books to create a 1984 Members' Calendar entitled *Indian Arts: The Spirit World* and a travel log called the *Naturalists' Journal.*

Publication of the Mack Lipkin Man and Nature Lectures was arranged with Charles Scribner's Sons. The first book will be written by Dr. David Hamburg, who gave the first lectures in early 1983, and his colleague, Dr. Barbara Smuts. One volume a year is planned for the series.

In addition to these projects, the Publications Office has developed a number of other publishing ventures and laid the foundation for an expanded book publishing and marketing program in the years ahead.

Administration

Building Services Maintaining and upgrading the Museum's security is a major responsibility of this Department. Substantial gains were made this year in the protection of the Museum's collections with the installation of a variety of new locks, gates and alarm systems, and with the improvement of communications systems.

Building Services also maintains the Museum's cleanliness, both on a routine basis and for special events, and operates visitor and employee parking facilities.

General Services Each of the five offices of this department—Mail Room, Photography Studio, Print Shop, Shipping and Receiving, and the Telephone Switchboard—made changes during the year to smooth their operations.

A major cost-cutting measure for the Department, and consequently for the Museum, was the installation of a discounted, long distance phone system. The system, which became operational on May 1, is expected to result in significant savings on long distance bills.

Previously, switchboard operators placed most long distance calls for Museum personnel. Under the new system they are freed of this burden and can respond more quickly to the heavy load of incoming calls.

Museum Shop To reflect the Museum's diverse activities and visitors' interests, the Museum Shop offered a more varied selection of merchandise this year. With exhibitions such as "Warhol's Animals: Species at Risk" and "African Textiles," both pop art and handwoven clothing could be purchased in the shop.

While the main Museum Shop features items relating to all exhibitions, a specialized satellite shop in Gallery 3 contains merchandise focused specifically on the exhibition in that gallery. Over the year, the shop changed completely three times to offer items related to "Aztec Mexico: Discovery of Templo Mayor," "Star Gods of the Ancient Americas" and "African Textiles."

The number of items developed exclusively for the Museum is also increasing. The logo for the Discovery Tours program—a stylized lion—is being adapted for a new line of merchandise ranging from glassware to belts.

With a fall, 1983, opening scheduled for the balcony addition to the main Museum Shop, buyers have been searching for choice items to increase the shop's depth. Since the new balcony will focus on books, stationery, records and posters, space in the downstairs shopping area will be opened to a greater selection of unique clothing, accessories and gift items. The balcony will increase selling space more than 50 percent and should substantially bolster sales.

Plant Operations, Construction and Maintenance Highlighting the year was the construction of the Charles A. Dana Education Wing which was inaugurated in April. Built by Department personnel, the Dana Wing houses both new and redesigned existing facilities, enhancing the Museum's ability to reach adults and children with a broader range of programming.

Its new two theaters add performance flexibility. The Henry Kaufmann Theater, with 300 seats, is the first Museum facility to feature a full stage and is the equal of any similarly sized theater in New York City. It offers a deep formal stage area behind a proscenium arch and the potential for a broad range of stagelighting effects and audio presentations. The 150-seat Harold F. Linder Theater, also has full lighting and audiovisual capabilities, without the proscenium arch and curtain.

Also in the Dana Wing, the Department redesigned the Frederick H. Leonhardt People Center and progressed on such other important components as the Edith C. Blum Lecture Hall and an activities room.

Important to the maintenance of the Museum's collection was the completion of new storage facilities for the Department of Anthropology. Located on the Museum's fourth floor and fourth-floor mezzanine, the facility features controlled humidity, light and temperature. A movable, compact storage system will be installed in the coming year. Storage and office facilities for the Department of Ichthyology were also partially renovated this year.

To add to the Museum's exhibition potential, Department crews worked on the Margaret Mead Hall of Pacific Peoples, scheduled to open in 1984, and the Hall of South American Peoples, expected to open in 1986. A gallery for special exhibitions, the Naturemax Gallery, was built on the first floor with an entrance from the Hall of Northwest Coast Indians. Transparent wall panels enable persons waiting for screenings in the Naturemax Theater to view the exhibitions.

With every incoming exhibition, galleries must be redesigned, walls painted and often moved, lighting installed and structures built. This Department effects these changes under the guidance of the exhibition designer. For "Aztec Mexico: Discovery of Templo Mayor," for example, an elevated walkway was built to suggest the ambiance of a temple.

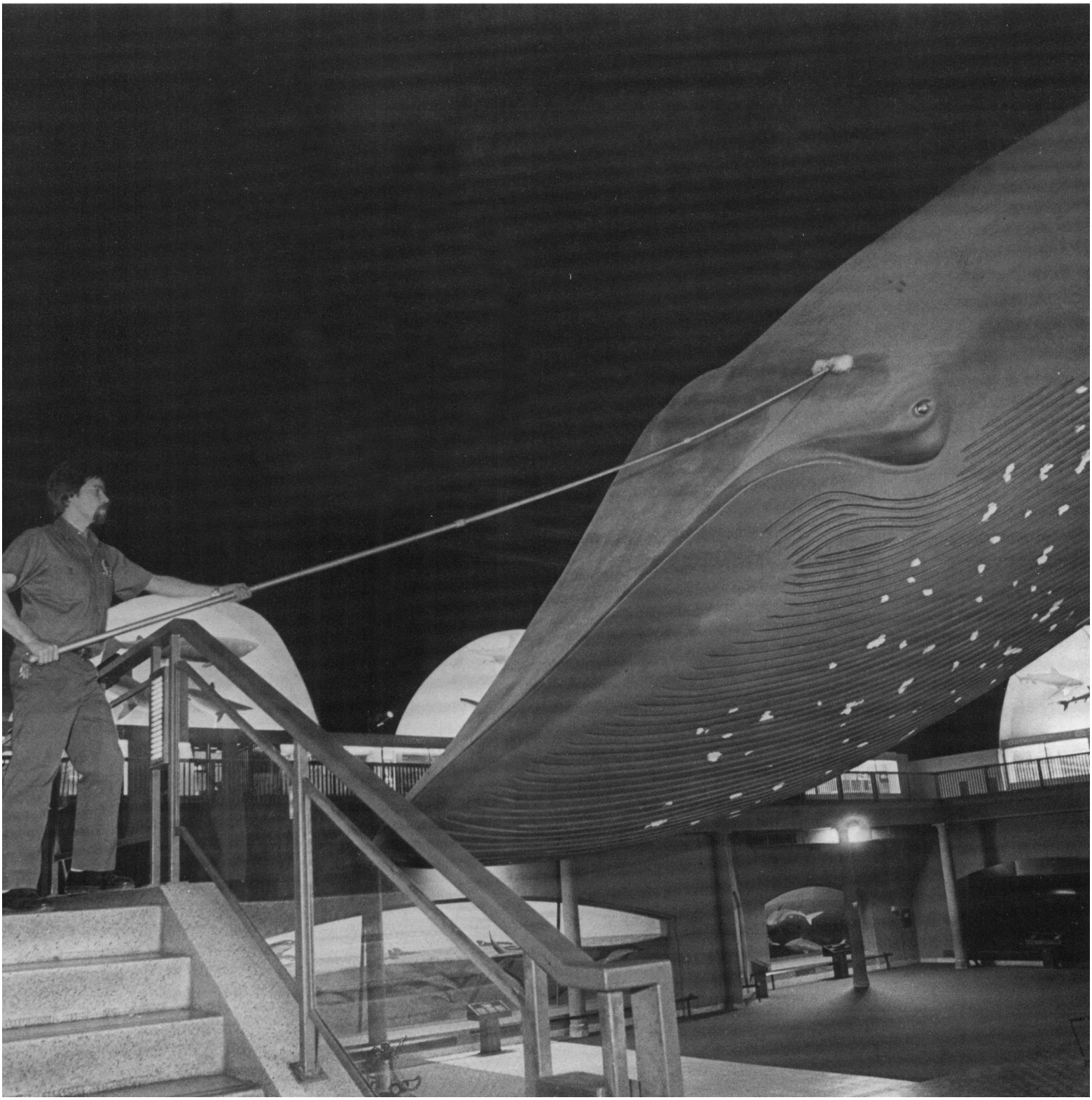
In addition to construction, this Department is responsible for all mechanical and structural maintenance of the Museum buildings and machinery as well as for the operation of the electrical, heating and ventilating systems.

After 27 years with the Museum, Walter F. Koenig retired in April as Manager of Construction and Maintenance. With the Museum during a period of expansion, Mr. Koenig worked on the design and construction of three buildings, 19 halls and hundreds of laboratories, offices and other facilities.

Norene L. Brooks was appointed Plant Manager, a newly created post having jurisdiction over the Department of Plant Operations, Construction and Maintenance and the Department of Building Services. Each of these departments is headed by a manager.

Attendance Every visitor to the Museum is automatically counted to help track attendance trends. In the 1982-1983 fiscal year, visitors to the American Museum and the Hayden Planetarium totaled 2,412,448. This figure includes 1,991,616 to the Museum and 420,832 to the Planetarium.

Edward Garcia, Supervising Museum Attendant-Guard, cleans the 94-foot-long replica of a blue whale in the Hall of Ocean Life. Three men worked on it for six hours with scaffolding, an electric lift, vacuum, mops, and soap and water. The Building Services Department is responsible for the moving, security and cleaning of everything outside the cases, including approximately 270,000 square feet of glass. While some cases are cleaned daily, each case is cleaned at least once a week.



Development and Communications

Natural History One of the year's best selling and most widely distributed issues was a special one entitled, "Hawaii: Showcase of Evolution." It contained 10 articles on Hawaii's unique biology and history, written by noted scientists from around the country. The Hawaii state Department of Education bought 1000 copies for its school system.

The April issue featured Stephen Jay Gould's 100th consecutive column and a biography of the essayist. Since Gould, a Harvard professor, began writing for the magazine in 1974, his columns have been collected in three acclaimed books, one of which won the American Book Award. He continues to turn out lively and provocative work as he works toward his 200th column.

Two Museum scientists wrote feature articles for the magazine this year. Carol A. Simon, Research Associate in the Department of Herpetology, wrote on the many functions of a lizard's tongue in the September issue. Her article was based partly on research she did at the Museum's Southwestern Research Station. C. Lavett Smith, Curator in the Department of Ichthyology, described in the March, 1983, issue how the history of glaciation and other geological changes brought about the present distribution of fresh-water fishes in New York State.

Maintaining its record of visual excellence, *Natural History* won four awards from the Society of Publication Designers for its covers this year.

According to industry sources, advertising sales for *Natural History* increased from 400 pages to 417 pages and revenue generated from advertising reached $3.4 million—up 8.5 percent from the prior fiscal year.

In addition to outside advertisers, some of the Museum's own operations continue to use *Natural History* as an advertising medium. For example, Discovery Tours, the Museum Shop and the Members Book Program were regular advertisers during the year.

Although non-profit postage rates stabilized somewhat, the threat remains that another large increase in postage will be imposed next year. Non-profit postage rates are linked to funds provided to the U.S. Postal Service from the Federal budget. Therefore, budget cutting pressures on the Federal government may result in high costs for *Natural History.*

At the close of the year, Ruth D. McCrea, Jr., was appointed Business Manager for *Natural History.* Ms. McCrea came to *Natural History* from *Newsweek*, where she was senior financial analyst.

Net paid circulation, as measured by the Audit Bureau of Circulation, reached 472,599. This represents copies sent to members as well as single copies sold to non-members. Reflecting increased costs of operation, the basic price for Associate Membership was scheduled to increase from $15 to $18 effective July, 1983.

The Participating and Donor membership categories grew steadily throughout the year, and by fiscal year's end the combined total for the two categories had reached 20,000, its highest point ever. Among the new promotion efforts introduced this year were a telephone renewal campaign and a Membership Discount voucher given to visitors to the Naturemax Theater. Two part-time staff members were hired to sell memberships and handle membership services on weekends.

The combination of the voucher program and weekend staffing helped to double the number of memberships sold within the Museum. Also introduced was a new upgrade package designed to encourage Associates to raise their membership level to the Participating category. This generated double the response rate of the previous one.

Through the member newsletter, "Rotunda" and special members' programs, members were given an inside view of the Museum's myriad activities. "Rotunda" carried feature articles on the collections of the Department of Ichthyology, the artists who painted the Museum's spectacular dioramas, and research by Enid Schildkrout, Curator in the Department of Anthropology, on Hausa Households.

Program highlights included behind the scenes tours of the Departments of Vertebrate Paleontology and Entomology, the fifth annual Origami Workshop, a lecture by Sylvia Earle to mark the opening of the exhibition, "Exploring the Deep Frontier," and a program in which Department of Anthropology Chairman David H. Thomas announced recent findings from his work on St. Catherines Island. Some 20,000 members attended the various membership programs.

Development The year was an important one in terms of expansion and further conceptual development of the fundraising campaign. Guided by the Trustees and the steering committee, the Museum drew increased support from new contributors and strengthened ties with constituents at all levels. Individuals, foundations and corporations responded with genuine interest and generous contributions.

A challenge grant from the National Endowment for the Arts stimulated the strong individual and corporate campaigns. The NEA pledge: to match any increased gifts or new money on a four-to-one basis. The funds will be applied to four new construction projects.

The Museum is grateful to the New York State Council on the Arts which allocated $644,500 in general operating and special project support to the Museum, and to the City of New York which allocated a total of $7,087,763. Of the City funding, $4,493,588 was in direct contributions, $2,041,175 for energy use and pension fund payments, and $553,000 in cash expenditures for capital improvements authorized in this and previous years.

Presided over by Museum Trustee and National Chairman, Donald C. Platten, the corporate campaign raised $881,012 from 278 companies. More than a third of the corporate contributors increased their gifts. Eleven new companies joined the Employee Admissions Program. By choosing to participate, a total of 50 companies have now made their employees and families eligible to receive free admission and other program benefits.

A number of corporations made significant restricted gifts, as well. Funding from Mobil allowed the Museum to continue to be open on an admission-free basis on Friday and Saturday evenings. General Electric

Foundation provided financial support for the introductory volume in a series of soon-to-be-issued Museum guides.

Additional corporate support came to the Economic Mineralogy Fund (chaired by Trustee Plato Malezomoff), the Micropaleontology Press Modernization Fund and the Planetarium Technical Improvements program. These, plus other corporate special gifts, totaled $282,660.

The campaign generated new gifts for special projects from foundations and individuals and saw funding brought to fruition for projects planned in the past. Numerous gifts, large and small, provided for projects ranging from community outreach programs to library cataloging systems.

Capital improvement gifts for visitors' services programs helped to finance installation of the new American Museum Restaurant and the Food Express, as well as the new Charles A. Dana Education Wing.

The individual gift program, in particular, was sparked by the energies and devotion of museum President and Mrs. Robert G. Goelet.

Chaired by Mrs. Charles A. Dana, Mrs. Goelet and Trustee Arthur Ross, the Star Gods Dinner Dance, attended by 740 persons, was a stunning achievement. Taking its theme from the special exhibition, "Star Gods of the Ancient Americas," the benefit generated more than $235,000.

The newly formed Friends of the American Museum, a group of contributors giving $1000 or more annually, were invited to receptions and behind-the-scenes evenings. Notable were the evenings focusing on the anthropological and natural science collections from China, and the publication reception for the book by Jane Safer, "Spirals From the Sea," inspired by the Museum's Hall of Mollusks and Mankind. The party was hosted by Walter and Betsy Cronkite. Previews were also held for the exhibitions on the Templo Mayor, Andy Warhol's Animals, and African textiles.

With an eye toward the support of future generations, Mrs. Goelet headed a new committee of parents in staging a fun-filled children's event, a celebration of the "150,000,114th birthday of Stegosaurus." The benefit drew 500 youngsters and 300 adults and earned income through ticket sales while encouraging the growth of a new contributor constituency.

Plans are now in place for new contributor categories of membership. The program with categories ranging from $100 to $2500 annual contributions, provides a number of benefits to introduce and enhance understanding of the Museum.

Public Affairs The Office carried out a new program of quarterly full-page "menu" advertisements in The New York Times. These were created by the Ogilvy & Mather advertising agency, of which the Museum is a public service client. The advertisements featured a variety of Museum exhibitions and educational programs, and each included a membership offer. A program of print and radio advertising for the Naturemax Theater, created with Ash-LeDonne, Inc., was also continued.

Much of the Office's attention was devoted to promotion of the exhibitions which were on display during the year or are upcoming. The Templo Mayor exhibition received a two-page story in *Time*, coverage on the CBS network's "Morning News" and four wire service stories. "Star Gods of the Ancient Americas" also was received favorably by the media, particularly by *Newsweek* which covered the exhibition and the Museum's archeological dig at St. Catherines Island in the same issue.

The findings at St. Catherines Island are a prime example of the Museum's scientific research which is brought to the attention of the mass media. The findings were also presented in a major New York Times article, on ABC network news and throughout the country by the Associated Press and United Press International. The involvement of Museum scientists in a faunal survey of Central Park, in the discovery of invertebrate "hitchhikers" on the ocean's garbage and in the identification of a unique new species of spider all received major media attention.

Scientific research is also brought to public attention by promotion of newsworthy articles in *Natural History*. The Office's efforts in this regard were greatly expanded this year and included a press conference at which a *Natural History* author presented his evidence indicating that acid rain is killing coniferous trees in certain areas of the Northeast. News of his findings was carried by the media nationwide, as well as in Canada and Europe.

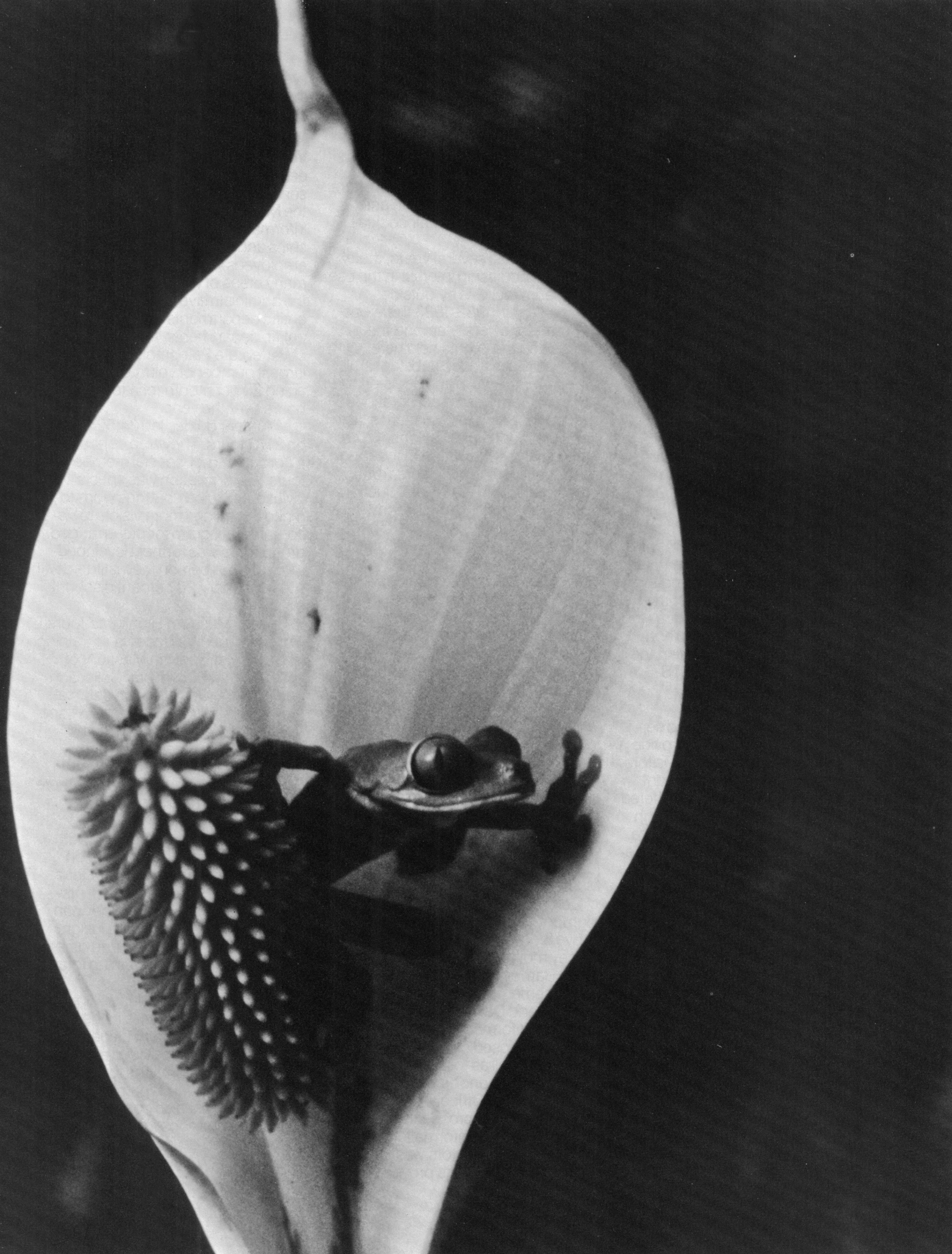
The Office's nationally-distributed radio series—12 to 15, three-minute discussions between the Director and Museum scientists—was requested this year by 414 stations, including stations in 42 of the top 50 radio markets in the country.

Analysis, publication and dissemination of the 1981 Museum Visitor Survey, was completed. Results of the survey, which was designed and administered by Public Affairs, show that the profile of Museum visitors and their needs have undergone changes. Responses to these changes will guide the Museum's course over the coming years.

More than 180 news releases were issued this year, including 83 updated staff biographies. Television coverage of the Museum rose significantly from 45 items last year to 81 this year, including network coverage on 11 separate occasions. There were hundreds of print media articles and photo features, and more than 40 radio pieces, including 18 on various radio networks.

Naturemax July saw the introduction of an advanced group reservation system. Day camps and school groups began to attend Naturemax in large numbers and by the end of the fiscal year more than 65,000 children visited the theater under the group admission program. A portion of Museum lunchroom space was made available for

This photograph of a red-eyed tree frog peering from a spathe won the Cover Award in Natural History *magazine's 1983 photographic competition. Elizabeth E. Lyons, a graduate student in botany at Duke University, took the photo while on a field course in tropical ecology in Costa Rica's La Selva Reserve. A photographic delight and itself the winner of several awards for covers,* Natural History, *has a circulation of 462,000. The magazine is a benefit of Museum membership.*



Naturemax groups from schools.

At the start of the fiscal year, the IMAX film "Hail Columbia!" joined the Naturemax program of "To Fly" and "Living Planet." This highly successful salute to the United States space shuttle program was followed by the addition to the schedule of the film, "Man Belongs to the Earth," an exploration of the fragility of the earth's resources.

To bolster visitorship in slow periods, Naturemax developed a strategy of aggressive promotion surrounding unique events. The first of these—"Thank You Cab Driver Week"—was staged March 21-27. Taxidrivers were admitted free with one guest. Leaders of the taxi industry assembled in the theater for a special thank you from Dr. Nicholson.

A promotional effort centering on the United States space program featured the film, "Hail Columbia!" On the afternoon of June 8, an audience of invited guests, Museum members and staff, media, and school groups, gathered in the Naturemax Theater for a screening of the film. Following the showing, Astronaut Story Musgrave presented a unique view of space travel. Dr. Musgrave recounted and showed his slides of his recent space walk during his flight aboard STS-6 "Challenger."

Guest Services Two new food service facilities were opened to provide improved accommodations to visitors. The American Museum Restaurant served its first meal in May and offered visitors an opportunity to obtain high quality food in a relaxing atmosphere. The dining area was created in an interior courtyard adjacent to the existing kitchen and cafeteria. Imaginative use of glass, lighting and colors created a garden-like atmosphere and many Museum visitors expressed their satisfaction with the new service. In December, the Food Express, a fast food facility, was opened on the site of the former cafeteria. Plans are being made to increase seating there; at the close of the fiscal year the restaurant could accommodate 106 people and the Food Express 400. This office will actively market the restaurant to visitors and groups of tourists.

The Office serves as liaison with the Museum's food service management company. In December, a change in this management was made. Restaurant Associates Industries, Inc., assumed responsibility for the operation of all food service facilities, as well as for all of the Museum's catering requirements. Other food areas include the Terrace Cafe, which offers a pleasant al fresco luncheon and snacks, and the Lion's Lair cocktail lounge.

Over the past several years, there has been increasing interest in the use of Museum facilities by outside groups. And in 1982-1983 there was even greater diversity among the groups and the events held here. These activities added substantial support for the work and goals of the Museum. Some of the corporations and groups using the Museum's facilities were: John Wiley & Sons, 175th Anniversary; Association of Independent Commercial Producers, 10th Anniversary; WABC-TV, introduction of Fall programming; J.C. Penny/Halston III, fashion presentation; Chemical New York Corporation, annual stockholders meeting; Restaurant Associates Industries, Inc., annual stockholders meeting; the New York Fashion Council; IBM; Goldman Sachs; Metro Chapter, Young Presidents Organization; NASA; the Manhattan Guild; the Boone and Crockett Club; the Port Authority of New York and New Jersey; and the Federal Aviation Administration.

All Museum sponsored social events, as well as routinely programmed meetings, lectures, classes and screenings are handled by the Office of Guest Services. Among the social events, receptions and dinners were several scheduled in conjunction with the opening of the Museum's special exhibitions.

Commercial filming and/or photography projects included a pilot for "Love Sidney," a scene for the Walt Disney motion picture "Splash," a Smith Barney advertisement, and advertisements for the Chrysler Corporation and Dannon Yogurt.

Topical information for the Museum's closed circuit television system, as well as for the general information telephone message, was provided by the Office. The latter reached 184,458 prospective visitors. In addition, a pilot information audio tape for public elevators was prepared and tested. The results proved positive, and plans are underway to make these tapes permanent aids for informing and guiding visitors.

Volunteer Office Volunteer employees contributed 104,981 hours of service over the year. They conduct the Museum Highlights Tours, staff the information desks and sell memberships and gifts. In addition, volunteer employees work behind the scenes in many areas of the Museum, including the administrative offices and the scientific departments. Among the scientific departments, the Department of Vertebrate Paleontology had the largest number of volunteers, averaging 20 per month for a total of 9300 hours over the year.

Volunteer guides led 34,525 visitors on 2173 tours. They also conducted 47 group and 51 special membership tours. An innovation was special "Museum Guide" buttons worn to make the guides more visible to visitors. The program for pre-arranged group tours was further developed with a $4 per person fee instituted with a discretionary 20 percent discount available.

Special Museum Highlights Tours were arranged for docents-in-training from the Metropolitan Museum of Art's Michael Rockefeller Collection and from the University Museum at the University of Pennsylvania. A special tour of the Hall of Mexico and Central America was taken by docents from the Bergen County Community Museum. Currently there are 45 Museum guides in the tour program.

Those volunteers who work with the public—including information service volunteers, Highlights Tour Guides, and Planetarium docents—receive special training so they can represent the Museum with insight and authority. Classroom and other formalized orientation training totaled 4078 hours.

In addition, some volunteers are trained in special classes in the ancient Japanese art of Origami. These volunteers provided more than 3000 folded decorations for the Museum's annual Origami Holiday Tree. Volunteers also conducted Origami workshops for Museum members and gave Origami demonstrations for Museum visitors.

Sales of postcards, souvenir mer-

chandise, and memberships again produced significant revenue. In addition to those who staff the first and second floor information desks and the fourth floor "Dino Cart," volunteers also established temporary sales areas for special exhibitions. Sales and memberships by volunteers grossed $150,000.

Efforts to involve the business community continued. Another aspect is recruitment of business corporation employees for weekend and evening events. In addition to staffing information desks and other public contact points on weekends, such volunteers increasingly are hosts at receptions and other special events. Over the year they assisted at 86 events.

Discovery Tours The Museum's travel program took 511 passengers on 11 trips to 26 countries. Among areas visited by Discovery Tours travelers were Alaska, the Bahamas, Spain, Italy, Greece, Tunisia, Sicily, Crete, Egypt, Great Britain, Kenya, Tanzania, India, Sri Lanka, Burma, Thailand, Malaysia, Singapore, Indonesia, Hong Kong, Morocco and Mexico.

The Museum contracts professional tour operators to handle the logistical operations of each trip. Fourteen different tour operators bid for the 11 Museum trips. Six companies were chosen.

Discovery Tours develops and promotes each itinerary through advertising in *Natural History* magazine and direct mailings to selected readers.

During the tours, lectures and informal discussions were given by 19 Museum staff members from 12 Museum departments and offices: Anthropology, Ichthyology, Entomology, Planetarium, Mammalogy, Invertebrates, Vertebrate Paleontology, Ornithology, Education, Exhibition, and the Office of the Director.

The luxury vessel, *m.v. Illiria,* was chartered by Discovery Tours for two cruises. The *Illiria* is under Museum charter for four cruises in the coming year.

A highlight of the past year was the Indian Ocean Adventure led by Museum Director Thomas D. Nicholson and four other lecturers: Malcolm C. McKenna, Frick Curator in the Department of Vertebrate Paleontology; Lester L. Short, Chairman and Curator in the Department of Ornithology; and two guest lecturers, Ronald Bernier of the University of Colorado and Peter Becker of the University of Michigan. During the tour's stay in Bangkok, participants were met by Her Majesty Queen Sirikit of Thailand.

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Home Life Insurance Company
International Flavors and Fragrances, Inc.
Irving One Wall Street Foundation
Joyce Beverages/New York
Kliklok Corporation
Lasker, Stone and Stern
Bernard J. Lasker
Leon Lowenstein Foundation, Inc.
R. H. Macy and Company, Inc.
Marine Midland Bank
McKinsey and Company, Inc.
Merck and Company, Inc.
Mobil Foundation, Inc.
The NL Industries Foundation, Inc.
North American Philips Corporation
Ogilvy & Mather
RKO General Foundation, Inc.
Sony Corporation of America Foundation, Inc.
The Sperry and Hutchinson Company
Squibb Corporation
J. Walter Thompson Fund, Inc.
The Travelers Insurance Company
Unilever United States, Inc.
United Industrial Corporation
F. Weiler Charity Fund
The Widder Foundation, Inc.
Lawrence A. Wien Foundation
The H. W. Wilson Foundation, Inc.

$1000
Allied Stores Foundation
Amerace Corporation
American Broadcasting Company, Inc.
American International Group, Inc.
Arthur Andersen & Company
Atlantic Bank of New York
AVNET, Inc.
A. G. Becker-Warburg Paribas Becker Foundation
Booz-Allen & Hamilton, Inc.
Bowne and Company, Inc.
D'Agostino Supermarkets
Discount Corporation of New York
Esquire, Inc.
Fribourg Foundation, Inc.
General Reinsurance Corporation
General Signal Corporation
Getty Oil Company
The Howard Gilman Foundation
Grumman Corporation
Jaros, Baum and Bolles
The Johnson's Wax Fund
Lebenthal and Company, Inc.
Marsh and McLennan Companies
McCann-Erickson, Inc.
Melville Corporation
Mitsubishi International Corp.
Olin Corporation Charitable Trust
J. C. Penney Company, Inc.
Reliance Group, Inc.
Revlon Foundation, Inc.
Royal Insurance Company
Scientific American
Scovill Foundation, Inc.
Scudder, Stevens and Clark
The Smith Barney Foundation
Sprague Electric Company
St. Regis Paper Company
J. P. Stevens & Company
Thomas and Betts Charitable Trust
The Oakleigh L. Thorne Foundation
Tudor Foundation, Inc.
United Brands Foundation
U.S. Industries, Inc.
United States Life Corporation
United States Trust Company
The Wheelabrator Foundation, Inc.
Harry Winston, Inc.
Xerox Corporation

$500 and over
Amstar Corporation
Arthur Young and Company
BP North America, Inc.
Chicago Pneumatic Tool Company
Continental Bank International
Louise B. and Edgar M. Cullman Foundation
Dun and Bradstreet Corporation
Ethan Allen, Inc.
Gannett Newspaper Foundation
Goldfarb and Fleece
Grow Tunneling Corporation
The Guardian Life Insurance Company of America
Handy and Harman
Hoffmann-LaRoche, Inc.
Israel Discount Bank of New York
Eleanor Lebenthal Bissinger
Lord and Taylor
Mitsui and Company (U.S.A.)
National Bank of N.A.
North American Reinsurance Corp.
OSG Foundation
Occidental Exploration and Production
The Pren-Hall Foundation, Inc.
Harold Raisler Foundation
Robert Raisler Foundation
Reading and Bates Offshore Drilling Company
R. J. Reynolds and Company
Maurice R. Robinson Foundation
Rollins Burdick Hunter of New York, Inc.
Roure Bertrand Dupont, Inc.
The Rouse Company
Saudi International Bank
Sotheby Parke Bernet Inc.
Standard Motor Products, Inc.
Sugar Foods Corporation
Swiss American Securities, Inc.
Teachers Insurance and Annuity Association of America
Ticor Foundation
Union Bank of Switzerland
Waring and LaRosa, Inc.
The Raymond John Wean Foundation
Pierre J. Wertheimer Foundation
Westinghouse Electric Fund
Wyssmont Company, Inc.
Young and Rubicam, Inc.
Carl Zeiss, Inc.
William Zinsser and Company

SPECIAL CORPORATE GIFTS
Association of Independent Commercial Producers
CBS, Inc.
International Business Machines Corp.
Manhattan Guild, Inc.
J. C. Penney Company
The Port Authority of New York and New Jersey
Warner Amex Satellite Entertainment Company
White and Case
John Wiley and Sons, Inc.
Young Presidents Organization

GOVERNMENTAL GRANTS

Source
Amount/Purpose

City of New York
$4,493,588/General Operating Support plus payments for energy and pension costs
$144,000/Capital Improvements
Institute of Museum Sciences
$35,000/General Operating Support
National Aeronautics & Space Agency
$77,405/Petrologic Studies of Meteorites
National Endowment for the Arts
$250,000/Challenge Grant
$11,000/Library Services
National Science Foundation
$234,450/Expansion and Renovation of Ichthyology Collections
$104,481/Curatorial Support of Entomology Collections
$52,089/Support for Fossil Amphibian, Reptile and Bird Collection
$27,823/Unisexual Species of Reptiles
$19,800/Ammonites—Invertebrates
$19,548/Operational Support for Mammalogy Collections
New York State Council on the Arts
$603,500/General Operating Support
$10,000/Mineral Sciences Catalog
$7,500/Ancestors: Four Million Years of Humanity
$7,500/Special Exhibition and Recent Acquisitions
$6,000/Research Fellow, Department of Ichthyology
$5,000/African Textiles
$5,000/Textile Conservation
$4,900/Sky Shows for Young Audiences, Planetarium
$1,000/Space Probe Exhibition, Planetarium
United States Department of Education
$125,979/Strengthening Research Library Resources
United States Department of Health and Human Resources
$60,806/Activity of amosite asbestos and grunerite fiber

GIFTS IN KIND

Department of Anthropology:

Headrest, flute stop, bowl and ladle, Papua New Guinea (Palambai, Yuat River, Krambit).
Mr. and Mrs. Emanuel Bernstein
Three Pre-Columbian gold objects.
Mrs. Junius B. Bird
Eight carved-wood, West African masks from the Tikar, Baule, Dan, Bamileke and Dogon tribes.
J. Gordon Douglas
Twenty Pre-Columbian ceramics, Peru.
Frederick E. Landmann
Nine Pre-Columbian gold ornaments.
Pauline Marshall
Eight anthropological artifacts, Sierra Leone.
K. P. Mosley
Three Burmese marionettes.
Oswald Nagler
Twelve wood carvings, Papua New Guinea (East Sepik province).
Douglas Newton
Two wood printing blocks, cotton jacket, cotton table cover, and a collection of books and scripts in Persian or Arabic from Iran, as well as two books in Rejan script from Indonesia (South Sumatra).
Eileen Page
Collection of archaeological pottery, and an ethnographic pot, with lid, Philippines.
Maria Theresa Escoda Rojas
"Malwana" ceiling disk; wood, paint, Suriname (Wayana Indians of Lawa River).
Jan Rubinowitz
Huari polychrome ceramic man vessel and a carved and painted wooden post, Peru.
Louis Slavitz
Three Pre-Columbian ceramics, Panama and Honduras.
Marion Tschopik

Department of Education

Collection of African artifacts.
Gerald and Pearl Goldstein

Department of Entomology

Collection of 72,410 insect specimens.
Mont A. Cazier
Collection of fly specimens (*Apiocera*); 31 holotypes, 22 allotypes, 851 paratypes and 258 other specimens of *Apiocera* (Diptera).
Mont A. Cazier and Frank S. Hasbrouck
Collection of rove beetle specimens (Staphylinidae); 120 paratypes and 600 specimens.
David H. Kistner
Collection of 1620 butterfly specimens (Lepidoptera).
Bryant Mather
Collection of 25,045 butterfly specimens (Lepidoptera).
Estate of Joseph Muller
Collection of 10,000 rove beetle specimens (Staphylinidae); Australia and New Zealand.
Alfred F. Newton, Jr.
Collection of 4085 aquatic and semi-aquatic bug specimens.
John T. Polhemus
Collection of 11,633 beetles (Coleoptera) specimens.
Mrs. Josephine Schuh

Department of Ichthyology

Collection of 200,000 freshwater fish specimens, from southeastern United States.
Virginia Polytechnic Institute and State University, Blacksburg

Department of Invertebrates

One prototype cavitron.
Michael Balamuth
Collection of marine snail specimens (Terebridae); 404 lots totaling approximately 2000 specimens.
Mrs. John Q. Burch

Department of Library Services

Prints and artists proofs relating to Mammalogy.
Robert L. Lewin
One hundred nine photographs and other documents relating to Carl Akeley and Martha Miller.
Mark A. Pollak
A collection of photographs (Hawaii *circa* 1880-1890) and two groups of small snapshots from the 1920's.
Jack Lord
Glass slides.
William T. Hornaday Conservation Trust, Inc.

Department of Mineral Sciences

Twenty-six cut stones totaling 411.39 carats and one rough fragment of pale citrine-colored labradorite; Mexico (Chihuahua).
Arnold J. Arem, M.D.
A collection of 132 mineral specimens.
Pierre L. Bastien
A collection of mineral specimens from Africa and the Americas including an Amazonite and smoky quartz crystal cluster from Colorado.
Allan Caplan
One emerald-cut bicolor elbaite, 20.66 carats, and three elbaite crystals (variety rubellite from California).
Charles DeBoer
Opal carving of "Deer and Quail", 129 carats; Australia.
Peter A. and Patricia H. Fehn
One oval-cut spodumene (variety kunzite), 260 carats.
Alexander J. and Edith Fuller
One Byzantine-cut smoky quartz "egg", 2,406.60 carats; Brazil.
James A. and Goolcher Grazier
Platinum necklace-choker set with 185 baguette diamonds and 47 round, full cut diamonds, 38.75 and 21.30 carats respectively.
Mrs. Zoe B. Larimer
Specimen of beryl (variety emerald) in carbonate matrix; Colombia.
Shiro Matsunaga
510-carat deep pink red-colored fancy shield-cut elbaite (variety rubellite) from the Queen Mine, Pala, California.
Paul J. Peltier
Opal carving of pintail ducks, 284.8 carats; Australia (Coober Pedy).
Matthew E. and Sura Clare Sandekian
Collection of 2407 mineral specimens; Namibia and South Africa.
Charles B. Schwarz
One peach-colored, emerald-cut beryl, 226.3 carats (variety morganite); Brazil (Minas Gerais).
Thomas E. Whiteley

Department of Ornithology

Collection of books and reprints.
Estate of Eugene Eisenmann
Les Oiseaux de Chine, David and Oustalet.
James C. Greenway, Jr.
Collection of books and paintings.
Frank B. Smithe
Collection of specimens.
Novaks Aviary

Photography Studio

One simplex print dryer.
Christie, Manson and Woods, Inc.

Department of Vertebrate Paleontology

Three hundred fifty fossil fish specimens; Brazil.
Herbert Axelrod
New species of fossil Stingray; Wyoming (Greenriver Formation).
Thomas H. and Hilda M. Maloney

SPECIAL GIFTS-IN-KIND

"Living Planet" film for Naturemax Theater.
Johnson Wax
Precision thermometer for the Department of Ichthyology.
Pacific Transducer Corp.
Air time.
WABC-TV
Advertising production
Ogilvy & Mather Advertising

BEQUESTS AND CHARITABLE TRUSTS

You may establish a gift that will perpetuate your memory and help assure that the fruits of the American Museum's research, education and exhibition programs are handed down to future generations.

If you wish to support the American Museum of the future, you may make a grant through a charitable trust or through a bequest in your will.

To discuss opportunities for support of the Museum and its programs, contact Robert G. Goelet, President, or Kate Bennett-Mendez, Manager for Development, American Museum of Natural History, Central Park West at 79th Street, New York, N.Y. 10024. Telephone: (212) 873-5927.

COVER: American Museum goers. On a hot, summer afternoon, a photographer stationed himself on the steps leading up to the Museum's main entrance on Central Park West at 79th Street. Some of the faces his shutter caught are the subjects of this year's cover of the Annual Report. They reflect the breadth and diversity of this Museum's visitorship which totaled 2,412,448, including 420,832 to the American Museum Hayden Planetarium. A major visitor survey showed that the Museum's audience has changed somewhat over the past decade. It now includes larger percentages of adults, out-of-town visitors and members of racial and ethnic minorities. (See the Director's Message.)