1987/1988 AMERICAN MUSEUM OF NATURAL HISTORY 119TH ANNUAL REPORT

American Museum of Natural History

Central Park West at 79th Street, New York, NY 10024-5192

"I would keep some book of natural history always by me as a sort of elixir, the reading of which would restore the tone of my system."

Henry David Thoreau

Founded 119 years ago, the American Museum of Natural History is the largest natural history museum in the world and a preeminent research institution. The American Museum conducts basic investigations in anthropology, zoology and mineral sciences.

A staff of 200 scientists and their assistants are involved in studies ranging from the origins of meteorites to the ecology of bees. Their findings are shared with other scientific and cultural institutions and the public through symposia, articles, books, lectures and exhibitions. Research is focused on the Museum's collections which total 36 million artifacts and specimens. The collections are managed under technologically advanced conservation procedures to insure their stability and perpetuation.

The Museum has 22 interconnected buildings that house 40 exhibition halls, eight scientific departments, five theaters, laboratories, classrooms, food service facilities and the largest natural history library in the Western Hemisphere.

A private institution, the American Museum receives support from the City of New York, New York State Council on the Arts, National Endowment for the Humanities, National Endowment for the Arts, National Science Foundation, Institute of Museum Services, 300 corporations, 100 private foundations, numerous individual contributors, and membership fees and visitor contributions. Membership has grown to 520,000.

HIGHLIGHTS

1987 July

- "Grand Canyon: The Hidden Secrets," and "Chronos," opened in the Naturemax theater. The theater broke attendance records with more than 500,000 people during fiscal 1987-88.
- Museum scientists found a close correlation between the population explosion and increases in atmospheric carbon dioxide.

August

- The Lila Acheson Wallace / American Museum of Natural History Fund granted $136,980 for restoration of the Theodore Roosevelt Memorial Hall.
- Research here found that dating by Carbon-14 generated during Pacific atom bomb tests may be used to estimate the growth rate of the chambered nautilus.

September

- The Margaret Mead Film Festival, the nation's leading showcase for anthropological films, celebrated its 11th season.

October

- The Board of Trustees named George D. Langdon, Jr., the ninth president of the American Museum, effective July 1, 1988.
- The exhibition, "Ancient Eskimo Ivories of the Bering Strait," began its run in the Naturemax Gallery.
- "Dinosaurs Past and Present," an exhibition of dinosaur art, opened in Gallery 1.

November

- Caribbean Month was celebrated with weekend performances, talks and demonstrations.
- Celestial Plaza, a sidewalk sculpture of more than 200 cast bronze pieces representing astronomical bodies, was installed in front of the American Museum-Hayden Planetarium.
- The Department of Invertebrates acquired a worldwide collection of 2447 lots of marine and terrestrial mollusks from Morton L. Goodfriend.
- The oldest known fossil bee was found in amber from New Jersey by Museum scientists.
- The Department of Anthropology acquired a collection of 108 pre-Columbian artifacts from Frederick E. Landmann.

December

- The New York State Council on the Arts awarded the Museum a grant of $596,000 for general operating support.
- "Carthage: A Mosaic of Ancient Tunisia," began in Gallery 3. Tunisian cultural and government dignitaries attended the opening.
- The Department of Entomology acquired a collection of 15,228 butterflies from Paul R. Ehrlich.

1988 January

- During the fourth annual Legislators Night, the Museum played host to members of the New York State Senate and Assembly, the New York City Council, and their families.
- "In Time of Plague," an exhibition presenting human responses to contagious diseases, opened in the Akeley Gallery.

February

- Black History Month was celebrated with lectures, demonstrations, music and dance performances.
- The estate of Arthur O. Choate, Jr., awarded the Museum a grant of $250,000.

March

- "Tiffany: 150 Years of Gems and Jewelry," opened in Gallery 1. An elegant dinner-dance was staged to benefit the Museum.
- Mobil Corporation continued to support free admission on Friday and Saturday evenings.

April

- "The Once and Future Korea," an exhibition showing Korea's transformation from a peasant society to industrialized nation, opened in the Akeley Gallery.
- The estate of Charles H. Ettl awarded the Museum a grant of $817,000.

May

- "Carthage: A Mosaic of Ancient Tunisia" began a two-year tour of other U.S. museums.

June

- "Pre-Columbian Art from the Ernest Erickson Collection," opened in a specially created exhibition space on the second floor. The collection, which had been on long-term loan here, was formally presented to the Museum.
- The United States Department of Education provided a grant of nearly $200,000 for the development of library resources.
- Total Museum attendance reached more than three million, a record for the past 10 years.

119th ANNUAL REPORT 1987/88
AMERICAN MUSEUM OF NATURAL HISTORY

A Message from George D. Langdon, Jr.

I am honored to be the ninth President of the American Museum of Natural History.

New York City and its cultural community have been generous in their welcome. To arrive from outside New York and immerse oneself in the life of this complex city is an extraordinary experience. I am particularly grateful to the Trustees, Chairman Robert G. Goelet, Director Thomas D. Nicholson and the Museum's staff, all of whom have been unfailingly helpful and welcoming. I am greatly impressed with their collective pride in this institution, coupled with eagerness to move ahead.

George D. Langdon, Jr.

The Museum, which is entering its 120th year, has a distinguished history. The intrepid men and women who explored the Earth on its behalf in the early days are to be admired, as are those who stayed home and, through their financial support and far-reaching vision, encouraged the field expeditions. Museum explorers seized opportunities, traveled the world and searched for the unknown. Many understood that human cultures and biological systems would soon be altered or lost. Their foresight led to the collections that are the Museum's heritage today.

During this century, civilization has brought wrenching changes to the natural world, affecting the Earth's atmosphere, the ocean and fresh waters, and the climates which had always seemed so removed from human influence. Other changes have caused massive natural habitats to vanish, and more to be threatened. Some animal and plant species that existed 100 years ago are now extinct; others are fast disappearing.

As such species join the trilobites and dinosaurs in the collections of natural history museums, society will turn increasingly to institutions such as this to study what can no longer be found in the natural world. Preserved specimens will constitute the only record of what has been lost. Moreover, they may provide rare evidence of what is — or was — the norm. The Museum's collections, which are still growing, will be the material for research projects for many years to come.

As society comes increasingly to understand what has happened, the perception of the future is changing. For many generations, people believed the future would be better; they viewed it as an improvement over the past. Today's generations are not so sure. They question whether progress can be controlled. They wonder whether the technological advances they depend on may lead to the destruction of crucial environments and indeed the world we know.

These significant issues have a link to the American Museum of Natural History. The basic research performed here provides an academic framework for the concerns raised by contemporary society. In their studies of systematic zoology and geology, Museum scientists give continuing attention to the origin of the universe, the rise and fall of biological populations, massive changes in the atmosphere and the shifting of continents.

The answers to many profound questions may well lie in the collections and research of the Museum. The collections, together with an intellectually productive scientific staff, are unmatched. The professional staff is experienced in interpreting scientific ideas for the education of the general public. In a world of complex scientific thought, the successful translation of science for the public is a talent that must be cherished and nurtured. The fact that the Museum attracted three million visitors and saw its roster of national members grow to 520,000 last year attests to the public's eagerness to use our resources in understanding the natural world.

The American Museum of Natural History is well positioned to address the concerns of the next century. Among its assets is a strong and long-standing relationship with the City of New York which is a source of important vitality. With the Trustees and curatorial staff, I intend to find ways to advance the work of the Museum. The opportunities are extensive, and we will be limited only by the support rendered by our constituents and society at large. I anticipate their vigorous participation in our progress.

I believe the American Museum of Natural History must move ahead to strengthen itself for the future. I look forward to meeting and working with all who will be involved in this great enterprise.

George D. Langdon, Jr.,
President

One hundred and nineteenth 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

In my message last year, I expressed pleasure in announcing that the Museum's Trustees had, after a two-year search, selected a full-time professional President. This year, as I write this message, the new President, George D. Langdon, Jr., takes office as the Museum's chief executive officer, effective July 1, 1988. As you read these words, he will have begun his work here.

For me, then, this is a final report as President of the American Museum to our many loyal and supportive constituencies. I was honored to have held that post for 13 years; as of July 1, I will be serving as Chairman of the Board of Trustees.

Along with the entire American Museum community, I extend a warm welcome to Mr. Langdon, who comes to us from the presidency of Colgate University and who brings to us his invaluable experience and stature as an educator and a leader in academic administration.

Before Mr. Langdon's arrival, I had named as a Trustee Transition Committee the members of the Search Committee whose efforts resulted in the selection of our new President. They were charged with responsibility for paving the way for an orderly changeover in the administration of this venerable, 120-year-old institution. They have carried out their charge well, and a deep and heartfelt expression of appreciation goes to the committee members: Trustees Donald C. Platten, Chairman, and William T. Golden, Caryl P. Haskins, Frank Y. Larkin, William F. May, Charles H. Mott, Mrs. Constantine Sidamon-Eristoff, Carroll L. Wainwright, Jr., and Henry G. Walter, Jr.

The new President will set new directions and author changes in the way goals are reached and how support for these goals is mustered. Yet, the basic commitment of the founders in 1869 — that the American Museum of Natural History serve as a fountainhead of basic research in the natural sciences, and that it be a great center of exhibition and education — will doubtless remain unchanged.

Mr. Langdon comes to the Museum with the perspectives of an educator and a historian, and with an impeccable reputation as one who can inspire the kind of support from individuals, businesses, foundations and government that we will need as we reach for our goals in the coming century.

With degrees from Harvard and Amherst, and from Yale, where he earned his Ph.D., Mr. Langdon has focused his scholarly work on the politics and economic development of the colonial period in America.

Before becoming President of Colgate in 1978, Mr. Langdon was at Yale University where he was deputy provost of the university and lecturer in history. Prior to that he was a member of the Vassar College History Department where he also served as special assistant to the president.

Mr. Langdon is not the first educator to have moved from Colgate University to what has become the world's largest natural history museum; the Colgate/American Museum tie has other roots in the history of both institutions. The naturalist and educator Albert S. Bickmore was professor of natural history at Madison University (now Colgate University) before becoming executive secretary of the society formed in 1869 to organize a museum of natural history in New York City. Mr. Bickmore was in charge of the Museum's department of public instruction for 20 years. In 1905, he was awarded the honorary degree of Doctor of Laws by Colgate.

So it is with pride in our past and confidence in our future that we warmly greet George D. Langdon, Jr. We will look to him to carry this institution into a new era and to chart new courses along the way. We are confident that he will muster and maintain the support, both in terms of ideas and funding, so necessary if the American Museum is to lead in basic science, be a showplace for exhibitions that demonstrate new thinking, and move forward as a great educational and cultural resource.

Support for this institution comes in many forms. I have mentioned two: new thinking and funding. There is a third, the gifts of the objects that help to form and expand our vast collections in the fields of anthropology, and the zoological and mineral sciences. Such gifts-in-kind broaden the scope of the Museum's exhibition and research programs.

An outstanding gift this year was the collection of Mesoamerican artifacts assembled by the late Ernest Erickson, a prominent New York art collector born in Finland who created collections for museums throughout his lifetime. Mr. Erickson's pre-Columbian collection formed the core of the Museum's permanent exhibition, the Hall of Mexico and Central America, which opened in 1970. The collection had been on long-term loan since that time. This year it was given to the Museum as a gift by the Ernest Erickson Foundation, with the assistance of its President, Abraham S. Guterman, and became the subject of a two-month special exhibition which

drew some 160,000 viewers.

The collection is distinguished by its sculptures which depict the human face and human form. It is particularly rich in ceramics and in stone sculptures from west Mexico and Veracruz.

Another outstanding assemblage of artifacts will be displayed in the new Hall of South American Peoples, scheduled to open to the public early in 1989. I refer to the vast array of pre-Columbian objects given to the Museum by Mr. and Mrs. Frederick E. Landmann. More than 100 pieces were donated by them this year, joining the more than 800 they had given to the Museum over a period of years.

Other notable gifts-in-kind expanded the Museum's collections, which now total more than 36 million artifacts and specimens. These included a collection of 2447 lots of marine and terrestrial mollusks from throughout the world for the Department of Invertebrates from Morton L. Goodfriend. The Department of Mineral Sciences received 11 faceted topaz gems, weighing a total of 140.39 carats, from Vincent Kosuga. The Department of Entomology is grateful to Paul R. Ehrlich for a collection of 15,228 butterflies from areas such as Africa, Malaysia and New Guinea.

The Museum's goals are strengthened through bequests. We are particularly grateful for generous gifts from the estates of James Madison Andrews, Arthur O. Choate, Jr., and Charles H. Ettl. The funds were added to the Museum's endowment. Income from the endowment fund supports our programs.

Major grants from foundations and corporations remain essential for funding Museum operations and programs. Among these were very generous grants from the Samuel and May Rudin Foundation for community programming and the undergraduate and graduate research program; the Howard Phipps Foundation for general support to the scientific departments, Library and Planetarium; the Charles Hayden Foundation for Planetarium improvement; the Clark Foundation for compact storage in the Library; Mobil Corporation which supports the Friday and Saturday evening free-admission program, and Bankers Trust for the new elevator in the Hall of Ocean Life.

The Howard Phipps Foundation also provided support for renovations in the Theodore Roosevelt Memorial Hall as did the Wallace Funds (established by the founders of Reader's Digest). The Museum just completed the second year of a conservation project on our anthropology collections supported by a grant from The Andrew W. Mellon Foundation.

We are grateful to Trustee Platten, Chairman of the Corporate Campaign, for continuing to lead the Museum's corporate program. Contributions from some 250 companies surpassed $1 million this year. Leadership gifts were provided by Chemical Bank, IBM Corporation, Exxon Corporation and Bristol-Myers Company.

Gifts from corporations matching the contributions of their employees continued to increase, as did the number of companies whose level of support provides free admission to the Museum for employees and their families. We are pleased as well that major corporations continue to select the Museum as the site of their special events.

The Museum's scientific staff received important support for research. The Edward John Noble Foundation continued to underwrite the St. Catherines Archaeological Program under the direction of David Hurst Thomas, Curator in the Department of Anthropology. It also supported the St. Catherines Island Research Program. The Eppley Foundation for Research provided ongoing support of expeditions to Chile by Michael J. Novacek, Chairman and Associate Curator in the Department of Vertebrate Paleontology.

Our special exhibitions this year broadened the perspective on natural history and anthropology for our visitors. In Gallery 3, "Carthage: A Mosaic of Ancient Tunisia," presented the most comprehensive view of ancient Tunisian culture ever shown in the United States. Spectacular mosaics and bronzes illustrated the complexity and creativity of Carthaginian life. In Gallery 1, "Tiffany: 150 Years of Gems and Jewelry" focused on the evolution of Tiffany's jewelry design in the United States. An elegant dinner-dance marking the opening of the Tiffany exhibition was held to benefit the Museum.

Other special exhibitions included "Dinosaurs Past and Present," documenting the collaboration between scientists and artists and presenting their best guesses about what dinosaurs looked like and how they lived. Also presented was "Ancient Eskimo Ivories of the Bering Strait," which highlighted more than 160 historic ivories of outstanding sculptural quality.

"Celestial Plaza," a sidewalk sculpture made of cast bronze pieces, was installed in front of the American Museum-Hayden Planetarium. The Museum received support for the project from the Helena Rubinstein Foundation and the Reed Foundation.

To reach new audiences, the Museum's Education Department and Membership Office designed effective programs based upon exhibitions. And events which highlighted ethnic and cultural diversity were held in the Department of Education's facilities.

Among the outstanding lecturers at the Museum this year were Stephen Jay Gould, distinguished biologist, geologist and science historian, and Richard E. Leakey, the noted paleontologist. Dr. Gould delivered the James Arthur Lecture on the Evolution of the Human Brain, and Dr. Leakey spoke on the significance of the humanlike fossil skull, discovered in 1985 that is estimated to be 2.5 million years old.

The 1987 Margaret Mead Film Festival was supported by a grant from the New York State Council on the Arts. The Festival continues to build on its established reputation as the nation's most prominent anthropological film event.

In January, the Museum hosted the fourth annual "Legislators Night" for local and state lawmakers and their families. Some 500 guests became better acquainted with what the Museum has to offer.

During the past year, total City support for the Museum's operations amounted to $8.7 million. The Trustees are grateful to Mayor Edward I. Koch, Controller Harrison J. Goldin, City Council President Andrew J. Stein, Borough President David N. Dinkins, and members of the City Council for their support.

The New York State Council on the Arts awarded $650,000 for general operating support and special projects. The Museum thanks Governor Mario M. Cuomo, members of the New York State Legislature, and Kitty Carlisle Hart, Chairman of the New York State Council on the Arts, for this crucial funding. We are also grateful to State Senator Roy M. Goodman, who again secured a grant from the Natural Heritage Trust for improving the curation of ethnographic collections in the Department of Anthropology.

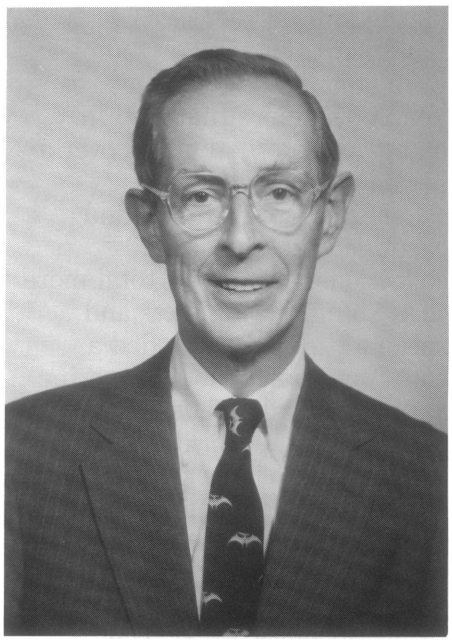
The Federal government provides significant funding to support specific projects. The National Science Foundation awarded several grants totaling close to $500,000. The Institute of Museum Services provided $75,000 toward Museum operations, the maximum amount awarded in this category. The National Endowment for the Humanities awarded $550,000 to support the Museum's exhibition, "African Reflections: Art from Northeastern Zaire," which is scheduled to open in 1990.

I want to take this opportunity to welcome Edward H. Meyer to the Board of Trustees. Mr. Meyer is President, Chairman of the Board and Chief Executive Officer of Grey Advertising.

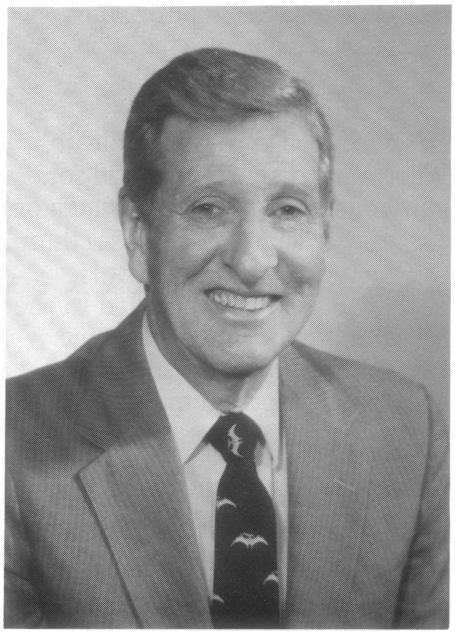
It is with deep regret that I report the death of Gordon F. Ekholm, Curator Emeritus in the Department of Anthropology and one of the world's foremost authorities on the archeology of pre-Columbian Mesoamerica.

The Museum continues to build upon its accomplishments, define new goals and strengthen its mission. The years ahead will present many challenges and the need for efficient and creative strategies that will enable the American Museum to continue to pursue its commitment to excellence and to growth.

Robert G. Goelet,
President



Robert G. Goelet



Thomas D. Nicholson

Director's Message

I escorted a group of public officials through our Section of Meteorites, Minerals and Gems recently, and took great pride in showing them the spectacular gems, elegant little mineral crystals, and huge 34-ton Ahnighito meteorite. Then I paused among the cases in the systematic mineral display, where we show the diversity of the world's minerals and explain their chemical organization.

I wanted to illustrate why our collections are so large and still growing, even though only a small part of them are on exhibition. I pointed out malachite, one of my favorites. There were a dozen or so samples of malachite, all chemically identical, but varying widely in their crystalline structure because of differences in temperature and pressure in the rocks within which they were formed.

Here was an example of the reasons for having large and representative collections. Malachite is malachite, chemically, but all malachite is by no means the same. If we were willing to settle for having only one sample of malachite in our collection, we could illustrate neither the diversity in which this mineral is formed nor the meaning of that diversity.

Less than two percent of our meteorite, mineral and gem collection is exhibited, but without the more than 100,000 specimens in the collection to choose from, we could never have created the exhibits that make our section on earth materials so significant.

Of all the 36 million specimens in zoology, anthropology and earth materials less than one percent is on public view and that will always be so. The goal of the Museum in gathering and maintaining those objects is to embrace the diversity of the world's fauna, the materials of the earth and the artifacts of human culture, past and present, and to use this resource in creating exhibits, in teaching, and in conducting scientific research. How large such a collection should be is difficult to say because we cannot predict future demands and uses for such material.

The American Museum is one of very few institutions of its kind that serves as a national and international resource for research and education in the natural sciences. Its collections must be adequate for that responsibility. They are the foundation for research by our own scientific staff, they support the training of hundreds of students and visiting scholars and serve the educational, cultural and scientific needs of institutions worldwide through thousands of loans each year. Finally, of course, the collections provide cultural and educational enrichment for New Yorkers and visitors in the millions from the world over.

We cannot wait for tomorrow's needs to surface before we acquire the collections that may be needed to address them. Our predecessors built collections they would never have the time or need to study themselves. Much of the material they gathered can no longer be obtained, but we find it essential for research and exhibition today. Similarly, unless we collect what we can now, it may not be available when tomorrow's needs become apparent.

Natural history collections are often compared to libraries, not of books but of objects. The goal for such collections is not size but rather how representative they should be. Obviously, one sample of malachite is not enough, but how many are sufficient is more difficult to say. Should we aim at having a sample from every mineral locality in the world, or should it be several samples, to represent possible differences within each locality? For some purposes the first is enough; for others it isn't. The same question can be asked about thousands of minerals, crystals and rocks, about hundreds of thousands of individual animal species. What could we know or tell others with authority about the dinosaurs if we had only one sample?

Science and learning suggest certain directions in which collecting should go. Only a few decades ago, we believed there were probably three million different plant and animal species in the world. Inspired by the all-too-rapid destruction of rain forests and other habitats in recent years, scientists began sampling little known areas, and the estimate jumped to five million; some say it may be as great as 50 million. The destruction of habitats in response to growing human needs threatens to eliminate diverse life forms before we ever get to know them. However representative our zoology collections may now be, they will have to grow if we are to identify and preserve the record of life we suspect may be out there awaiting discovery.

The increasing concentration of large natural history collections in fewer institutions also influences growth in ours. Within the past few years, collections from six institutions and dozens of individual scholars have been added to ours. Sometimes, because of changing priorities, institutional owners cannot guarantee that the collections will be preserved and continue to be studied. This despite a growing renaissance in evolutionary biology, focused in and led by organizations such as this museum. Future scholars working in collection-oriented science will be increasingly dependent on collections in institutions such as ours.

Only a few decades ago, competent ornithologists relied almost exclusively on skin collections in studying relationships among different groups of birds. Museum collections had to grow

when the significance of skeletal comparisons was perceived, and they grew again to support studies of the relationships between birds and other forms of animal life. These were the kind of studies that recently suggested birds are the closest living relatives of the dinosaurs. Many zoologists today are trained to work with tissue samples, using biochemical analysis of preserved cells to supplement information from the study of skins and skeletons. Others study vocalization in seeking differences and relationships.

If the Museum is to carry out its purposes in a world of increasing scientific and technological complexity, sophistication in public taste and education, specialization in institutional function, and demands from society for information on the condition and trends in the environment around us, it is imperative that our collections be capable of responding to such pressures. Our data-processing systems are already inadequate, and we are under pressure to introduce large automated data-management systems capable of producing quickly the complex information about the world's fauna that our collections can yield.

We have already accomplished a great deal in carrying out our mission. In the past 20 years, we have more than doubled the space allocated to collections management in some departments. We have substantially improved the quality of the storage equipment and environmental conditions in which collections are housed. And we have increased the size of the cataloged collections by a third or more. Today we have better collections inventories, and better equipment for managing inventory and catalog data. We possess sophisticated analytical equipment to aid in identification and classification. Access to our collections by students and scholars, by other museums for exhibition and universities for research, has more than doubled, assisted by substantial grants from the National Science Foundation. In the field of anthropology, we have instituted new programs of security, registration and conservation for materials increasingly recognized as more fragile, more scarce, more valuable, and in more demand than ever before.

But as has been said so often in human affairs, the past is only prologue to the future. The factors I have identified exist partly because continued growth, increasing use, and long-term conservation require more storage space and better storage quality. They also reflect the fact that our science and educational services are changing. We must prepare also for the new technologies, new methodologies, new inventories of yet unsampled habitats, new questions that society will surely ask.

More than a century ago, the founders of the Museum reflected their assessment of our needs in collections management by allocating the whole fifth floor to the storage and study of collections. How far short they fell is all too obvious to us today. Within recent decades, where the structure permitted, we constructed mezzanines throughout the fifth floor. Then we moved materials up into the sixth floor attic spaces never intended for storage purposes. We built storage behind exhibits, in unused stair landings, along the fifth floor corridors, in a vacated generator room, in every storeroom or alcove that could be converted to the purpose. Where possible, we even surrounded the curators with cases in their offices and laboratories, leaving precious little area for their work. Eventually, we surveyed high-ceilinged exhibit areas on the fourth floor, and doubled their usable space by constructing mezzanines. Storage conditions in some of these areas are by no means ideal, but they have allowed us to accommodate expanding collections and the facilities necessary to use them effectively.

There are still huge and important bodies of material kept in areas without environmental control, in storage furniture that should be replaced, and under conditions of overcrowding that limit their accessibility to staff, students and visiting colleagues. The huge inventory of material — including new acquisitions and scientifically critical type specimens — and the enormous body of data associated with it need far more sophisticated data storage and management equipment than we have thus far been able to provide.

We believe we have exceeded the dreams of our predecessors and of the founding trustees and their partners in New York City government. The task ahead is even greater than the work behind, but we face it with the same confidence they did, dismayed not the least by knowing that it is unending, but imbued as strongly as they with the courage to face it confidently.

Thomas D. Nicholson,
Director

The head of Medusa, whose gaze, Homer wrote, turned humans to stone, was one of the outstanding mosaics in the exhibition, "Carthage: A Mosaic of Ancient Tunisia." There are two small wings on her forehead and five pairs of snakes in her thick and wavy hair. The head is framed by a circular medallion. In

Greek and Roman times, Medusa was a powerful apotropaic, or protector from evil spirits, and was very popular for this reason. The presentation of "Carthage: A Mosaic of Ancient Tunisia," in Gallery 3 from December to May, broadened the parameters of natural history and anthropology for the Museum's visitors.

Department of Anthropology

While devoting considerable effort to the areas of research, conservation and collections management, the Department of Anthropology continued to focus on exhibitions. The department coordinated several special exhibitions and was also intensively involved in permanent exhibitions. The special exhibitions included "Carthage: A Mosaic of Ancient Tunisia," "The Once and Future Korea," "Objects of Bright Pride" and "Pre-Columbian Art from the Ernest Erickson Collection." The Hall of South American Peoples is scheduled to open to the public in early 1989. The new Hall of Human Biology and Evolution is in the planning stage and is scheduled to open in 1991. Work is also in progress for several other special exhibitions.

South American Archeology Craig Morris, Chairman and Curator, worked on the completion of the new Hall of South American Peoples, scheduled to open in January. The selection of final objects and preparation of label copy for several sections of ancient South American cultures was completed. Dr. Morris was also involved in planning for the exhibition, "Pre-Columbian Art from the Ernest Erickson Collection." Christopher Couch, visiting professor of art history at Columbia University, served as its Exhibition Coordinator.

Dr. Morris' research in the Chincha valley on the southern coast of Peru continued in collaboration with several Peruvian archeologists. Excavations were carried out in one of the 12 pyramid complexes that comprised the site of La Centinela, capital of the Chincha kingdom conquered by the Inka empire during the final decade before the Spanish conquest. His research in the Chincha valley is supported by the Tinker Foundation, the National Geographic Society and the Institute for Andean Research. Dr. Morris also completed papers on the economic organization of the Inka state and the nature of Inka frontiers. He participated in two international symposia and lectured at Harvard University and the University of Chicago. In May, he went to Peru at the request of the Peruvian Government to evaluate plans for the new National Museum of Anthropology and Archeology.

Origins of Chiefdoms Robert L. Carneiro, Curator, continued his research on the origin and evolution of chiefdoms and states. The research material being assembled by Dr. Carneiro will be used in the book "From Autonomous Villages to the State: The Evolution of Complex Societies."

Dr. Carneiro continued to work on the Hall of South American Peoples. He completed the Amazonian section of the hall. Preparations were made on other cases including a mural of the rain forest designed to illustrate how native groups utilize rainforest products for their material culture. Work continued on four additional cases dealing with the native cultures of Gran Chaco, Patagonia and Tierra del Fuego.

Life in Northern India The chief activity of Stanley A. Freed, Curator, in collaboration with Research Associate Ruth S. Freed, was the analysis of data collected in 1958-59, 1977-78, 1983 and 1986 concerning village life in northern India. One project covers the factual and legal analysis of two familial murders which involve illicit sexual relations, questions of legitimacy of heirs and land inheritance. The second project probes the relation of *karma*, the sum of the soul's actions in past lives, to the soul becoming a ghost. Dr. Freed received support for research from the Ogden Mills Fund.

He is also collaborating with Aldona Jonaitis, Research Associate and Exhibition Coordinator, on a temporary exhibition on the Kwakiutl Indian potlatch. The exhibition will open at the Museum in the fall of 1991 and travel to other museums.

African Art Enid Schildkrout, Curator, continues research associated primarily with the collection from the Congo. An article on the history of the African collection was published in a catalog of the exhibition "Art/Artifact," shown at the Center for African Art. She is also editing the fieldnotes of Herbert Lang which document his explorations of the Congo. In conjunction with this project, she presented a paper on the pottery of northeastern Zaire at the African Studies Association's annual meeting. The paper was written with Curtis A. Keim, Research Associate, and exhibition assistant Jill Hellman, and is published in the journal *African Art.*

With a grant from the National Endowment for the Humanities, she edited a volume in the *Anthropological Papers* series entitled "The Golden Stool: Studies on the Asante Center and Periphery." Dr. Schildkrout was also awarded a grant by the National Endowment for the Humanities of $550,000 to curate "African Reflections: Art from Northeastern Zaire" as well as to prepare the catalog and a film for the exhibition. She is also working on two other upcoming special exhibitions: "Madagascar: Island of the Ancestors" and "In Splendor and Seclusion." She continues as Senior Scientific Editor of *Faces* magazine, an anthropology magazine for children.

Physical Anthropology Ian Tattersall, Curator, conducted research in Madagascar, supported by the Richard Lounsbery

Foundation. He also continued his studies of the systematics of extant and subfossil primate fauna of the island. He carried out research on lemur ecologies and distributions, and undertook the curation of the collections of lemur specimens belonging to the Parc Botanique et Zoologique de Tsimbazaza, Antananarivo. Dr. Tattersall was involved with preparations for the new Hall of Human Biology and Evolution, for which the overall design was completed and approved.

With the help of the American Institute for Yemen Studies, the sponsorship of the government of the Yemen Arab Republic was obtained for preliminary vertebrate paleontological explorations in the country. A grant of $12,150 for the research was obtained from the National Geographic Society.

Using the facilities of the Duke University Primate Center, and in collaboration with Dr. Andrea Dunaif of the Mount Sinai Medical Center, Dr. Tattersall also resumed his investigations of the endocrinology of the strepsirhine primate reproductive system. In collaboration with Eric Delson, Research Associate in the Department of Vertebrate Paleontology, and John Van Couvering, Editor of Micropaleontology Press, Dr. Tattersall edited the major work "Encyclopedia of Human Evolution and Prehistory," the first book of its kind ever to be prepared.

St. Catherines Island David Hurst Thomas, Curator, continued to direct intensive archeological excavations on St. Catherines Island, Georgia, focusing on Mission de Santa Catalina de Guale. The Edward John Noble and St. Catherines Island Foundations continued their support of his research. Having spent several years excavating the church ruins and the cemetery at Santa Catalina, the research team led by Dr. Thomas recently discovered that the *convento* (friary) actually consists of three buildings, each built on the remains of the previous one. Painstaking excavation of the hundreds of architectural features is used to distinguish the three building episodes. Other sophisticated archeological techniques are being employed by Dr. Thomas and his team, and the emerging picture suggests a need to rethink the economics and nature of subsistence during the early Hispanic colonization of the United States.

This matched pair of owl-figure ornaments from Peru is among the more than 900 pre-Columbian objects dontated to the Museum by Mr. and Mrs. Frederick E. Landmann. Almost 300 of these objects, including the owl-figure ornaments, were reserved for display in the new Hall of South American Peoples and constitute the single biggest private donation of objects for use in the hall. Scientists in the Department of Anthropology have been active in working on the hall, reflecting their research in South American cultures. These interests include studies of Andean archeology, the origins of chiefdoms in Amazonia and Amazonian archeology.

Dr. Thomas also completed the third volume in the "Archaeology of Monitor Valley" series published in the *Anthropological Papers*. Support was provided by the Richard Lounsbery Fund, the James Ruel Smith Fund, the National Science Foundation, the Frederick G. Voss Fund, Earthwatch, the Sander and Ray Epstein Charitable Foundation and the General William Mayer Foundation. He also organized three "Spanish Borderlands" symposia at the meeting of the Society of American Archeology held in Phoenix.

Korean Matchmakers Laurel Kendall, Assistant Curator, returned to Korea to interview professional and amateur matchmakers, and men and women who use their services. Most matchmakers are women, and while their activities are valued as "good works," tales of greedy and deceitful matchmakers are a part of modern urban Korean folklore. Dr. Kendall explored why matchmakers are regarded with ambivalence in Korean society. The project is a part of her continuing investigation of contemporary marriage customs, providing a perspective on contemporary Korean life and the changing experiences of those who marry.

Dr. Kendall curated the temporary exhibition "The Once and Future Korea" in the Akeley Gallery. She also organized a workshop that brought together scholars of Korea representing various disciplines who are using forms of personal testimony in their research. Personal testimony includes diaries, memoirs, oral history and ethno-biography. The workshop was funded by the Social Science Research Council.

Biographical Research Harry L. Shapiro, Curator Emeritus, is continuing his research on a forthcoming biography of E.A. Hooton, a distinguished Physical Anthropologist.

Amazonian Archeology Anna Roosevelt, Research Associate, served as Director of the Lower Amazon Interdisciplinary Archeological Project, a collaboration between the American Museum, Museu Paulista of the University of São

These Korean girls are fetching water, one of a range of tasks performed within a traditional Korean household. Roy Chapman Andrews, explorer and naturalist, took this picture on an expedition to Korea from 1911-1912. The photograph was presented in the exhibition "The Once and Future Korea" along with other images of

traditional Korea. High tech objects showed the dynamic and industrial side of the country. Other special exhibitions by the Department of Anthropology included "Carthage: A Mosaic of Ancient Tunisia," "Objects of Bright Pride" and "Pre-Columbian Art from the Ernest Erickson Collection."

Paulo, and the Museu Paraense Emilio Goeldi (Belem). The project is an investigation of prehistoric cultural evolution in the tropical lowlands of South America. Fieldwork involves ecological and geophysical surveys and excavations at ancient settlements at Santarem and on Marajó Island, Brazil.

Her research project is funded by grants from the National Science Foundation Anthropology Program and the National Endowment for the Humanities. In addition, Dr. Roosevelt is a consultant for the Hall of South American Peoples.

The Ernest Erickson Foundation pledged to donate the objects of the Ernest Erickson collection, which had been on long-term loan as part of the Hall of Mexico and Central America. Following the close of a special exhibition of the artifacts, they were to be returned to permanent display.

Mr. and Mrs. Frederick E. Landmann donated more than 100 pre-Columbian objects to the museum's collection. These pieces will join the over 800 additional pieces previously donated. Many will be displayed in the new Hall of South American Peoples.

The department lost two staff members who had given long and valuable service. Gordon F. Ekholm, Curator Emeritus, died in December. He was responsible for the collections of Middle American archeology for more than 30 years. Nicholas Amorosi, Senior Technician, died suddenly in April. He was the departmental scientific illustrator.

Scientific Publications:

Carneiro, R. L.
1987. Further reflections on resource concentration and its role in the rise of the state. *In* L. Manzanilla (ed.), Studies in the neolithic and urban revolutions, the V. Gordon Childe colloquium. Br. Archaeol. Rep. Int. Ser. Oxford 349: 245-260.

1987. Cross-currents in the theory of state formation. Am. Ethnol. 14: 756-770.

1987. Village splitting as a function of population size. *In* L. Donald (ed.), Themes in ethnology and culture history, essays in honor of David F. Aberle, 94-124. Folklore Inst. Meerut, India: Archana Publ.

1987. Leslie A. White, ethnological essays. B. Dillingham and R. L. Carneiro (eds.), Albuquerque: Univ. of New Mexico Press.

1988. The circumscription theory: challenge and response. Am. Behav. Sci. 31: 497-511.

1988. Indians of the Amazonian forest. *In* J. S. Denslow and C. Padoch (eds.), People of the tropical rainforest, 73-86. Berkeley: Univ. of Ca. Press.

Collar, N., and I. Tattersall
1987. J. T. Last and the type-locality of Benson's Rockthrush, *Monticola bensoni*. Bull. Br. Ornithol. Clb. 107(2): 55-59.

Delson, E., and I. Tattersall
1987. Primates. Encyclopedia of science and technology. 7th ed. 12: 259-265. New York: McGraw-Hill.

Dunaif, A., and I. Tattersall
1987. Prevalence of glucose intolerance in free-ranging *Macaca fascicularis* of Mauritius. Am. J. Primatol. 13(4): 435-442.

Freed, S.A., R.S. Freed, and L. Williamson
1988. Capitalist philanthropy and Russian revolutionaries: the Jesup North Pacific Expedition (1897-1902). Am. Anthrop. 90(1): 7-24.

Grayson, D. K.
1988. Danger Cave, Last Supper Cave, Hanging Rock Shelter: the faunas. Anthrop. Pap. Am. Mus. Nat. Hist. 66(1): 1-131.

Hutchinson, D. L., and C. S. Larsen
1988. Determination of stress episode duration from linear enamel hypoplasias: a case study from St. Catherines Island, Georgia. Hum. Biol. 60(1): 93-110.

Jonaitis, A.
1988. From the land of the totem poles: the Northwest Coast Indian art collection at the American Museum of Natural History. New York City and Seattle: Am. Mus. of Nat. Hist. and the Univ. of Washington Press. [Br. Edition: London: Br. Mus. Publ. Ltd.]

Kendall, L.
1987. Supernatural investments: women and shamans in contemporary Korea. *In* R. Morse (ed.), Wild asters: explorations in Korean thought, culture and society, 35-44. Lanham, Md: Asia Program/ Woodrow Wilson International Center, Univ. Press of America.

1987. Cold wombs in balmy Honolulu: ethnogynecology among Korean immigrants. Soc. Sci. Med. 25(4): 367-376.

1988. The life and hard times of a Korean shaman: of tales and the telling of tales. Honolulu: Univ. of Hawaii Press.

1988. Korea, 1912: photographs from the Roy Chapman Andrews Expedition. Korean Cult. 9(1): 17-27.

Kvietok, P.
1987. Digging sticks or daggerboards? A functional analysis of wooden boards from the Inca region. *In* D. H. Sandweiss, (ed.), Andean past. Ithaca: Latin American Studies Program, Cornell University.

Lutkehaus, N., and P. B. Roscoe
1987. Sepik culture history: variation, innovation, and synthesis. Curr. Anthrop. 28(4): 577-581.

Morris, C.
1988. *Fronteras del estado Inca. In* T. D. Dillehay and P.J. Netherly (eds.), B.A.R. International Series, 151-152. Oxford: Oxford Univ. Press.

Roosevelt, A.
1987. The evolution of human diets. *In* M. Harris and E. Ross (eds.), Food and evolution: toward a theory of human food habits. Philadelphia: Temple Univ. Press.

1987. Chiefdoms in the Amazon and Orinoco. *In* R.D. Drennan and C. Uribe (eds.), Chiefdoms in the Americas, 153-185. Lanham, Md.: Univ. Press of America.

Notes:
1. In the bibliographies, the names of members of the staff and Fellows of the American Museum of Natural History appear in roman 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.

Roscoe, P. B.
1987. Of canoes and castaways: reassessing the population of Tongareva (Penrhyn Island) at contact. Pac. Stud. 11(1): 43-61.

1988. From big-men to the state: a processual approach to circumscription theory. *In* P. B. Roscoe, and R. B. Graber (eds.), Circumscription and the evolution of society. Am. Behav. Scientist 31(4): 472-483.

Schildkrout, E.
1987. Ed. and Introduction. The golden stool: studies of the Asante center and periphery. Anthrop. Pap. of the Am. Mus. of Nat. Hist. 65(1): 1-331.

1988. Art as evidence: a history of the American Museum of Natural History African ethnology collection. *In* Danto, Schildkrout, [et al.], Art/Artifact, 153-160. New York: The Center for African Art.

Schwartz, J., and I. Tattersall
1987. Tarsiers, adapids and the integrity of Strepsirhini. J. Hum. Evol. 16: 23-40.

Tattersall, I.
1987. Itampolo: two subfossil sites in Madagascar. J. Vert. Paleontol. 7(3): 342-343.

Thomas, D. H.
1987. [Preface] *In* J. A. Bennyhoff and R. E. Hughes, Shell bead and ornament exchange networks between California and the western Great Basin. Anthrop. Pap. of the Am. Mus. of Nat. Hist. 64(2): 82.

1988. Saints and soldiers at Santa Catalina: Hispanic designs for colonial America. *In* M. P. Leone and P. B. Potter, Jr. (eds.), The recovery of meaning in historical archaeology, pp.73-140. Washington: Smithsonian Inst. Press.

Abstracts, Reviews and Popular Publications

Beelitz, P.
1988. Desert traders: the Tuareg. Faces 4(6): 8-10.

1987. Harnessing the horse: horseback riding throughout history. Faces 3(7): 9-12.

Carniero, R. L.
1988. [Review of] George W. Stocking, Jr., Victorian anthropology. Am. Anthrop. 90: 232-233.

Fisher, H. E.
1987. The four-year itch. Nat. Hist. 96: 22-28.

1987. [Review of] Signs of the flesh. *In* D. Rancour-Laferriere (ed.), J. of Hum. Evol. 15(5): 413-414.

1987. [Response to] Jankowiak's review of the sex contract: the evolution of human behavior. High Plains Appl. Anthrop. 7(2): 82-84

Freed, S. A.
1986. Hands only, Plains Indian sign language. Faces 3(1): 16-21.

1987. American Indians: Many ways to marry. Faces 3(9): 24-27.

1988. [Review of] Determinants of social status in India. S. C. Malik, (ed.), Am. Anthrop. 90(1): 207-208.

Freed, S. A., R.S. Freed, and L. Williamson
1988. Scholars amid squalor. Nat. Hist. 97(3): 60-68.

Hellman, J.
1987. Ceremonial masks: Faces 3(10): 4-7.

Kaminitz, M.
1988. Amazonian ethnographic rubber artifacts. *In* Modern organic materials, pp. 143-150. Edinburgh: Scottish Soc. for Conservation and Restoration.

Kendall, L.
1986. Grandmother Kim's sixtieth birthday party. Faces (4): 26-29.

1987. Korea: all kinds of wedding gifts. Faces (6): 30-34.

1988. The devil fish and the tiger. Nat. Hist. 97(5): 72-75.

Kvietok, P.
1986. Inca stonework. Faces 3(2): 10-15

1986. Quipa counting. Faces 3(2): 21-23

1986. With strings attached. Faces 3(2): 18-20

1987. Ancient harvests. Faces 4(2): 18-24.

1988. Chilean Museums: today and tomorrow. Rotunda 13 (3): Mar. 1988.

Santoro, G., and S. A. Freed
1988. Desert people: the Papago Indians. Faces 4(6): 4-7.

Schildkrout, E.
1986. Talking drums and talking gongs. Faces 2(10): 22-26.

1987. Africa: migrants to the strangers' quarters. Faces 3(5): 13-17.

1988. Changing childhood. Faces 4(5): 18-23.

1988. Nigeria: getting married. Faces 4(5): 30-33.

Tattersall, I.
1987. Putting humanity in context. Nature 238 (6126): 121.

Thomas, D. H.
1987. Ten chapters *In* Preistoria e civilta' delle Americhe, The history of man and ancient peoples, vol. 6. Milan: Jaca Book.

1988. Introduction. *In* J. Anderson, From map to museum: uncovering mysteries of the past, 5-6. New York: Morrow.

1988. St. Catherines: an island in time. Atlanta: Georgia Endowment for the Humanities. History and Culture Series.

Williamson, L.
1986. Summoning spirits in Siberia. Faces 2(10): 12-15.

1987. Games to grow up by. Faces 3(8): 21-24.

1987. An Indian wedding. Faces 3(9): 23.

Astronomy and the American Museum-Hayden Planetarium

The American Museum-Hayden Planetarium educates and entertains the public with its wide variety of Sky Shows, programs and courses on astronomical themes. Visitors who come to learn about the stars and planets are also able to view the "Celestial Plaza," newly installed in front of the Planetarium. Composed of more than 200 cast bronze pieces representing astronomical bodies, the plaza is part of an ongoing program of restoration and renovation at the Planetarium.

Sky Shows Through the summer, the Planetarium continued its presentation of "The Seven Wonders of the Universe," narrated by Burt Lancaster. Beginning with a look at the seven wonders of the ancient world, the show took audiences on a search for the greatest natural wonders in the universe, from the grand canyon of Mars to supernovae and black holes.

From late November through early January, the Planetarium again recreated the skies, as they appeared 2000 years ago over Bethlehem, in its annual holiday program, "The Star of Christmas." Using the Zeiss star projector and auxiliary special effects, the program speculates on the true nature of the "star" that served as a guide to the Wise Men.

Beginning in January and continuing through late June, the Planetarium offered a special double feature of Sky Shows. First was "Cosmic Illusions," a look at the many ways nature and our imaginations can create illusions in the day and night sky. The program was narrated by the famous magician, Harry Blackstone, Jr. Cofeatured with "Cosmic Illusions" was "The Space Telescope: New Eyes on the Universe," a program about a new super telescope to be sent into orbit on a future space shuttle flight. "Space Telescope" was narrated by Kirk Douglas.

For preschoolers, the Planetarium continued to present its very popular program "Wonderful Sky," featuring the Sesame Street Muppets©.* Also continuing was the program, "The Secret of the Cardboard Rocket," for children 6 to 9. The program tells the story of two children's magical trip across the solar system. During July and August, day campers and the general public were treated to "The Skies of Summer," a live program about the many things to see in the summer season, from constellations to planets to showers of meteors.

Laser light programs on Friday and Saturday nights continued this year, featuring music by Genesis and various groups from the 1960s.

Public Sky Show attendance for the year was 329,848, the highest in years. Overall attendance was 602,228, the highest in a decade.

Courses The Planetarium offered a wide range of courses for children and adults. Subjects ranged from astronomy and space science to navigation and meteorology. One course, "Stars, Constellations, and Legends," which is taught entirely in the Planetarium's Sky Theater, attracted 270 students, and overall course attendance for the year reached 994.

Live Concerts The Planetarium continued its increasingly popular series of "Live Concerts under the Stars." In October, Michel Deneuve of Paris performed a selection of original compositions, plus works by Mozart, Bach and Satie. In creating visuals for the concert, the Planetarium worked in conjunction with the Corning Museum of Glass.

In December, the fourth annual holiday concerts were performed by the Ensemble for Early Music. Using a wide variety of original instruments, the Ensemble performed works from the 13th through the 16th centuries. In cooperation with the Metropolitan Museum of Art and the Musée Condé in Chantilly, France, the Planetarium created a large number of visual environments to accompany the musicians.

In March, the Paul Winter Consort returned for two sell-out performances of works combining elements of jazz, symphonic and folk music with the rhythms of Brazil and Africa. Visual environments, from whales in the ocean depths to a wolf pack in a snowstorm, were created using the Planetarium's extensive special effects capabilities.

Special Lectures In July, William A. Gutsch, Jr., Chairman and Associate Astronomer, gave a special lecture on "The Search for Extraterrestrial Life" to Museum members and the general public. In August, Canadian science writer Terence Dickinson gave an illustrated talk entitled "The Universe and Beyond."

In January and February, the Planetarium, in conjunction with the Museum's Membership Office and the American Institute of Aeronautics and Astronautics, presented a special lecture series, "Space Futures." Tobias Owen of the State University of New York at Stony Brook spoke on "The Exploration of the Solar System: Past Triumphs, Future Prospects." Ray Villard of the Space Telescope Science Institute at John Hopkins University gave an in-depth look at the Hubble Space Telescope. In the last of the three-part series, Robert L. Forward, formerly of Hughes Research Laboratories and a well-known visionary in the field of space exploration, lectured on "Interstellar Space Flight."

*©Children's Television Workshop; Muppets, Inc., 1988

The newly installed Celestial Plaza represents one part of a renovation program primarily designed to restore the 1930s art deco architecture of the American Museum-Hayden Planetarium. Designed and executed by artist Michele Oka Doner, the plaza

is composed of more than 200 cast bronze pieces embedded in concrete and representing stars, planets and galaxies. The Planetarium educates and entertains more than 600,000 visitors with a wide variety of Sky Shows, programs and courses on astronomical themes.

Art Exhibitions During the course of the year, the Planetarium presented exhibits of original artwork by Kim Poor and Vincent Di Fate, plus a selection of paintings and photographic illustrations by Planetarium artists Helmut K. Wimmer, Brian Sullivan and Dennis Davidson.

Corporate Special Events
Utilizing its varied audiovisual and dining facilities, the Planetarium hosted special events for NCR Corporation, Sun Microsystems, Inc., Chemical Bank and Ciba-Geigy Corporation.

Restoration and Renovation
For the third consecutive year, extensive work continued on the Planetarium building: new carpeting was put in the Guggenheim Space Theater, a new roof was installed; brickwork on the Planetarium's front was cleaned and repointed, and the letters and grillwork on the front of the building were repainted. This work was all done using earned income.

In addition, a new "Celestial Plaza" was installed in front of the Planetarium's Eighty-first Street entrance. Conceived and executed by artist Michele Oka Doner, the 3900 square feet of pavement is composed of more than 200 cast bronze objects. Representing stars, planets and galaxies, the bronze pieces are embedded in concrete. Funding for the "Celestial Plaza" was made available through generous grants from the Helena Rubinstein Foundation and the Reed Foundation, as well as the New York State Council on the Arts.

Hayden Foundation Grant
The Charles Hayden Foundation awarded a grant of $260,000 to the Planetarium for projects in three areas. These include a partial renovation of the Hall of the Sun, the purchase and installation of new sound equipment for the Sky Theater, and renovation of the classrooms. The latter project will include the installation of video projectors and laser disk and videotape players, as well as the purchase of an extensive laser disk library of hundreds of thousands of astronomy and space-related visuals and color computer animations for use in the Planetarium's course offerings and special lectures.

Artwork and Show Sales
The Planetarium continued to make its Sky Shows and related astronomical artwork available. During the past year, sales of these educational materials were made to planetariums across the United States and in Germany, Greece, Finland, Australia and Hong Kong.

Planetarium Show Network
This year, the Planetarium joined 10 other major planetariums across the United States and Canada in the formation of a network that will work in conjunction with professional audiovisual production companies to create future sky shows, which will be presented in all network facilities. The first such production is scheduled for release in the summer of 1989.

The Perkin Library Through the continued generosity of the Richard S. Perkin family, the Library again served an ever-increasing number of people. In addition to the Planetarium staff, the Library was used this year by outside researchers, artists and illustrators.

Librarian Sandra Kitt was elected Vice President/Chairman-Elect for the Museums, Arts and Humanities Division of the Special Libraries Association, New York Chapter. She attended an 11-day working meeting of art and museum librarians in the Soviet Union sponsored by the International Research and Exchange Group of Princeton, N.J.

Abstracts and Popular Publications:

Branley, F. M.
1988. The beginning of the earth (rev. ed.). New York: Thomas Y. Crowell. Illus. Giulio Maestro.

1988. Eclipse: darkness in daytime (rev. ed.). New York: Thomas Y. Crowell. Illus. Giulio Maestro.

1988. The sun: our nearest star (rev. ed.). New York: Thomas Y. Crowell. Illus. Don Madden.

Gutsch, W. A.
1987. Increasing attendance and income through new programs and strategies. Publications of the IX International Planetarium Directors Conference, Moscow, USSR.

1987. Sky Watch [daily column on astronomy, space science, and meteorology]. The Westchester-Rockland Gannett Newspapers, White Plains, N. Y.

Hatchett, C. W.
1988. The glow-in-the-dark night sky book. New York: Random House. Illus. Stephen Marchesi.

Kitt, S.
1987. Tricks of the trade. OPL Newsletter 4(4).

1987. Necessity is also the mother of innovation: a review of small libraries programs at SLA. OPL Newsletter 4(6).

1987. Illustrations *In* I. Asimov, Beginnings: the story of origins of mankind, life, the earth, the universe, 24-25, 78-79, 98-99, 114-115, 164-165, 256. New York: Walker & Co.

Department of Entomology

From the oldest known bee, recently described from late Cretaceous New Jersey amber (65-95 million years old), to the first discovery in Africa and Australia of members of a spider genus previously known only from southern South America, the research conducted in the Department of Entomology spans an enormous range, covering the entire planet and at least 75 percent of its animal species.

New Collections With total holdings of over 16 million specimens, the entomological and arachnological collections of the Museum form one of the world's most important resources for research into the evolution of life. This year, significant new acquisitions strengthened those holdings in several areas. Most notable is the purchase of a collection of Heteroptera and Homoptera—true bugs and their allies—formed by the Finnish entomologist Rauno Linnavuori. During the year, about 65,000 specimens were received, mostly collected in the Middle East and North Africa, and a further 85,000 are anticipated. Included in the received material are over 1500 holotypes (specimens on which the scientific names of species are based). Nearly all of the species included in the Linnavuori material are new to the Museum's collections.

The department also received an important collection of over 15,000 butterflies formed by Paul Ehrlich of Stanford University. Over 10,000 specimens of spiders and insects collected during Dr. Platnick's 1987 fieldwork in New Caledonia and Tasmania were also processed.

Spiders Chairman and Curator Norman I. Platnick worked on three book-length projects. The first, "Advances in Spider Taxonomy 1981-1987," to be published by Manchester University Press in association with the British Arachnological Society, will provide detailed coverage of the literature on spider systematics published over the last seven years. The 800-page volume will include original taxonomic information and help publicize much recent Chinese literature not previously known in the West. The second project, "The Spider Guide," a two-volume work to be published by Cornell University Press, is being co-authored with Research Associate R. R. Forster. That work will provide a family-by-family analysis of the diversity, morphology and natural history of spiders, on a worldwide basis; chapters on most of the mygalomorph families (tarantulas and their relatives) were completed during the year. The third project is a volume for the "Insects and Arachnids of Canada" series being published by the Biosystematics Research Centre of Ottawa. Co-authored with Charles Dondale of that institution, the volume will provide a manual for identification of the 100 species of ground spiders (family Gnaphosidae) found in Canada and the northern United States. That volume will rely in part on a revision, completed this year by Dr. Platnick and Scientific Assistant Mohammad U. Shadab, of the 43 American species of the ant-mimicking genus *Micaria*, several of which were shown to be found in Eurasia as well as North America. Many names described from only one sex were synonymized, missing males or females of other species were described for the first time, and 14 new species were described. The *Micaria* revision completes a project, begun in 1974, providing taxonomic coverage of the entire North American gnaphosid fauna, which now totals 30 genera and 330 species.

In addition to these book projects, revisionary efforts continued on a wide variety of spider families, including several studies on south temperate faunas funded by the National Science Foundation. The rapid advances in our knowledge of these faunas are illustrated by a short paper on the zodariid genus *Cyrioctea*, co-authored with Eryn Griffin of the State Museum, Windhoek, Namibia. When Dr. Platnick revised this genus just two years ago, it was known only from Chile and Argentina; the new paper presents the first records of the group in both Africa (three new species from the Namib desert) and Australia (one new species from an arid area in Queensland).

Curator Emeritus Willis J. Gertsch collaborated with Dr. Platnick on a study of the trapdoor spider genus *Ummidia*, found from the southern United States to northern South America. Preliminary analysis indicates that there may be as many as 50 species in the group.

Kalbfleisch Research Fellow Charles E. Griswold completed his revision of the spider subfamily Phyxelidinae, a group centered in South African forests and providing much information about the historical biogeography of those habitats.

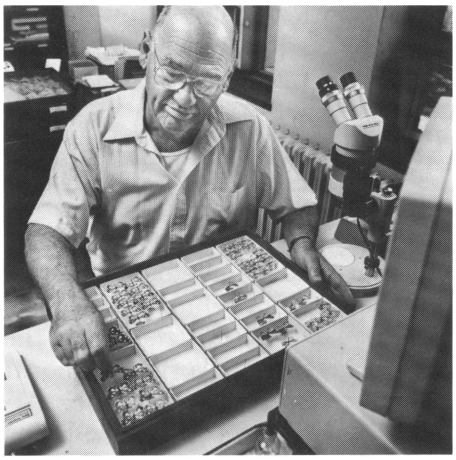
Flies and Fossils Assistant Curator David A. Grimaldi completed several studies on the natural history of fruit flies (family Drosophilidae), and continued his revision of the drosophilid genera of the world. He also collaborated with several investigators on various aspects of amber and its insect inclusions.

In a paper written with Gene Fenster of Queens College, Dr. Grimaldi described the repeated convergence, allometry and behavioral features associated with bizarre male drosophilids that

have their head and eyes distended outward. The trait arose at least 15 times in the family; most of these broad-headed taxa have recently been discovered by Dr. Grimaldi. Another paper demonstrated that most of the drosophilids endemic to the Caribbean islands have their closest relatives in Central America, which is the most common distributional pattern shown by Caribbean plants and animals. However, the genus *Mayagueza*, from Puerto Rico, is most closely related to *Acletoxenus*, which occurs natively from Australia to India. The presence of some drosophilids in Oligocene-Miocene amber from Chiapas, Mexico, and the Dominican Republic confirms that some genera are old enough to have been affected by seafloor spreading in the Caribbean.

Toward the goal of revising the drosophilid genera of the world, Dr. Grimaldi dissected and studied microscopically 163 species in 80 genera and subgenera. Some 120 structural features of the adult flies have been found, so far, that link groups of two or more species. More than 500 drawings and 270 scanning electron micrographs have been prepared for this study. The results of this work will provide a basis from which Dr. Grimaldi will approach species-level revisions of particular drosophilid genera.

A study on amber from New Jersey was carried out with Curt Beck of Vassar College. The amber is late Cretaceous in age, and was formed mostly by a type of araucariaceous tree now occurring only in the Indo-Pacific. This conclusion is partly based on Fourier transform infrared diffraction patterns of the amber and recent resins, obtained in Dr. Beck's amber laboratory. Several insect inclusions were found in the amber; among them are the oldest known scuttle fly (family Phoridae), higher fly (infraorder Muscomorpha) and bee (superfamily Apoidea). The bee, *Trigona prisca*, was described by Research Associate C. D. Michener and Dr. Grimaldi, and belongs to a relatively recently derived group, the stingless bees (subfamily Meliponinae). An origin of the bees in at least the earliest Cretaceous must be inferred from this specimen, which has implications as well for the age of the earliest advanced angiosperm plants, thought by most botanists to be much younger.



Frederick H. Rindge, George Willett Curator in the Department of Entomology, examines part of a collection of a New World tribe of geometrid moths that he is studying. As a result of his research, a number of species and genera new to science are being described. A major portion of the scientific work conducted at the Museum consists of studies of the systematics and evolution of animal groups.

Rove Beetles Lee H. Herman, Curator, continued his generic revision of the large staphylinid subfamily Paederinae, a project begun two years ago. The goal of the project is to revise the current classification and determine the phylogenetic relationships of the 215 genera and 14 subtribes.

Dr. Herman devoted his efforts to work on a catalog of the names, original citations, major subsequent references and a summary of the published distributions for each taxon. Thus far, references to the original descriptions (published in nearly 1200 articles) and original locality information for all but 47 of the more than 6000 named species have been entered.

Moths Frederick H. Rindge, George Willett Curator, continued his long-range systematic studies of the moth family Geometridae in the New World. Under study is the tribe Melanolophiini, which belongs to the very large subfamily Ennominae. The members of this group occur from southern Canada to southern South America, with the two greatest concentrations of species located in the southern Mexico-Guatemala area and in the Andes. The problem of speciation in the former area is proving to be more complex than originally suspected. A number of species new to science, as well as four new genera, are being described as a result of this study, thus bringing the total number of genera in the tribe to 14.

James S. Miller, Kalbfleisch Curatorial Fellow, continued his research, begun the previous year during a Smithsonian Postdoctoral Fellowship, on the systematics of the moth families Dioptidae and Notodontidae. Dioptids, a Neotropical group of diurnal, brightly colored moths comprising 400 species, appear to have evolved from within the Notodontidae, a nocturnal and drab-colored group comprising 2500 species. Understanding the evolution of day-flying behavior in these moths is a major focus of the research.

Another aspect of his project is the study of generic and species relationships within the Dioptidae. Larvae of many species feed on toxic plants, such as passion vines (*Passiflora*) and pipevines (*Aristolochia*). The systematic studies will serve as a framework for investigating the evolution of dioptid host-plant associations. During April, 1988, Dr. Miller visited the Humboldt Museum in Berlin and the British Museum (Natural History) in London in order to study their important collections of Dioptidae.

Bees Jerome G. Rozen, Jr., Curator, has devoted a considerable part of his professional career to broadening the character base of bee systematics beyond comparative adult morphology. He has used behavioral and ecological features, internal anatomy, and features of mature larvae and pupae. His main laboratory effort this year addressed yet another untapped source of taxonomic characters—the anatomy of first instars (larvae just after they emerge from the egg). He prepared a detailed description of the first instar of a new species of the cleptoparasitic anthophorid bee genus *Triepeolus*. This first instar is remarkably modified, being equipped with an elongate, darkly pigmented head capsule and huge, sickle-shaped mandibles with which it kills the host larva. Cleptoparasitic females deposit their eggs in nests of other bees, and their larvae generally feed on the provisions that had been supplied by the host bees for their own offspring. Through Dr. Rozen's field investigations, the Museum now has a substantial collection of first instars of many bee groups. Because of their extreme anatomical modifications, first instars may be more revealing of the evolutionary relationships of cleptoparasitic taxa than mature larvae or even adults.

The panurgine bee genus *Perdita* contains 769 species and subspecies found from southern Canada to Guatemala. The largest number of species occurs in the arid southwestern United States and presumably northern Mexico. Ninety-five species are reported from the vicinity of the Museum's Southwestern Research Station near Portal, Arizona, and Dr. Rozen undertook two field trips in 1987 to survey the species of *Perdita* in that region. As a result, five additional species are now known to occur there. The diversity and confined distribution of the genus identify it as a continental "species-flock," possibly the result of explosive speciation. A long-range investigation, together with colleagues from the National Museum of Natural History, Cornell University, and the University of Kansas, is planned into the systematic and phylogenetic relationships of *Perdita*. The study will survey incompletely explored areas of northern Mexico and will attempt to identify the features of the bees and their habitats that permit so many species to have evolved, and coexist, in a limited geographic area.

Plant Bugs Randall T. Schuh, Curator, continued his National Science Foundation-supported work on the plant bugs of North America and completed a paper for the *Bulletin of the American Museum of Natural History* on the 53 species of New World Pilophorini in cooperation with Scientific Assistant Michael Schwartz. Using this study as a source of data, in conjunction with information gathered from taxa from other parts of the world, Dr. Schuh began phylogenetic analysis for a paper dealing with the generic classification of Pilophorini of the world, a group of 13 genera and about 140 species. He also assembled approximately 10,000 specimens for a revision of the wormwood-feeding (*Artemisia*) genus *Europiella*, sorted the material to species (approximately 16) and completed the necessary dissections of the male genitalia.

Dr. Schuh signed a contract with Cornell University Press and completed several chapters for a book, "Natural History of the Heteroptera," to be co-authored with Research Associate James A. Slater and Pavel Stys of Charles University, Prague. This approximately 350-page volume will treat the true bugs at the family and subfamily levels. The anticipated completion date is December, 1989.

Research Associate Gary M. Stonedahl published a revision of six genera of brycorine plant bugs from the Indo-Pacific. He submitted and had accepted for publication a monograph on the nearly 200 species of the mirid genus *Phytocoris* found in western United States, a study that relied heavily on specimens derived from Dr. Schuh's fieldwork in that region. Dr. Stonedahl continued work (supported by Dr. Schuh's National Science Foundation grant) on a revision of the genus *Atractotomus*, finishing the descriptions and examinations of genitalia and scanning electron micrographs of the group. Dr. Stonedahl, a former Kalbfleisch Research Fellow in the department, has accepted a position as heteropterist with the Commonwealth Institute of Entomology, housed in the British Museum (Natural History).

Michael Schwartz received his doctorate from the City University of New York. His dissertation topic was a "Phylogenetic revision of the Stenodemini with a review of the Mirinae (Heteroptera, Miridae)."

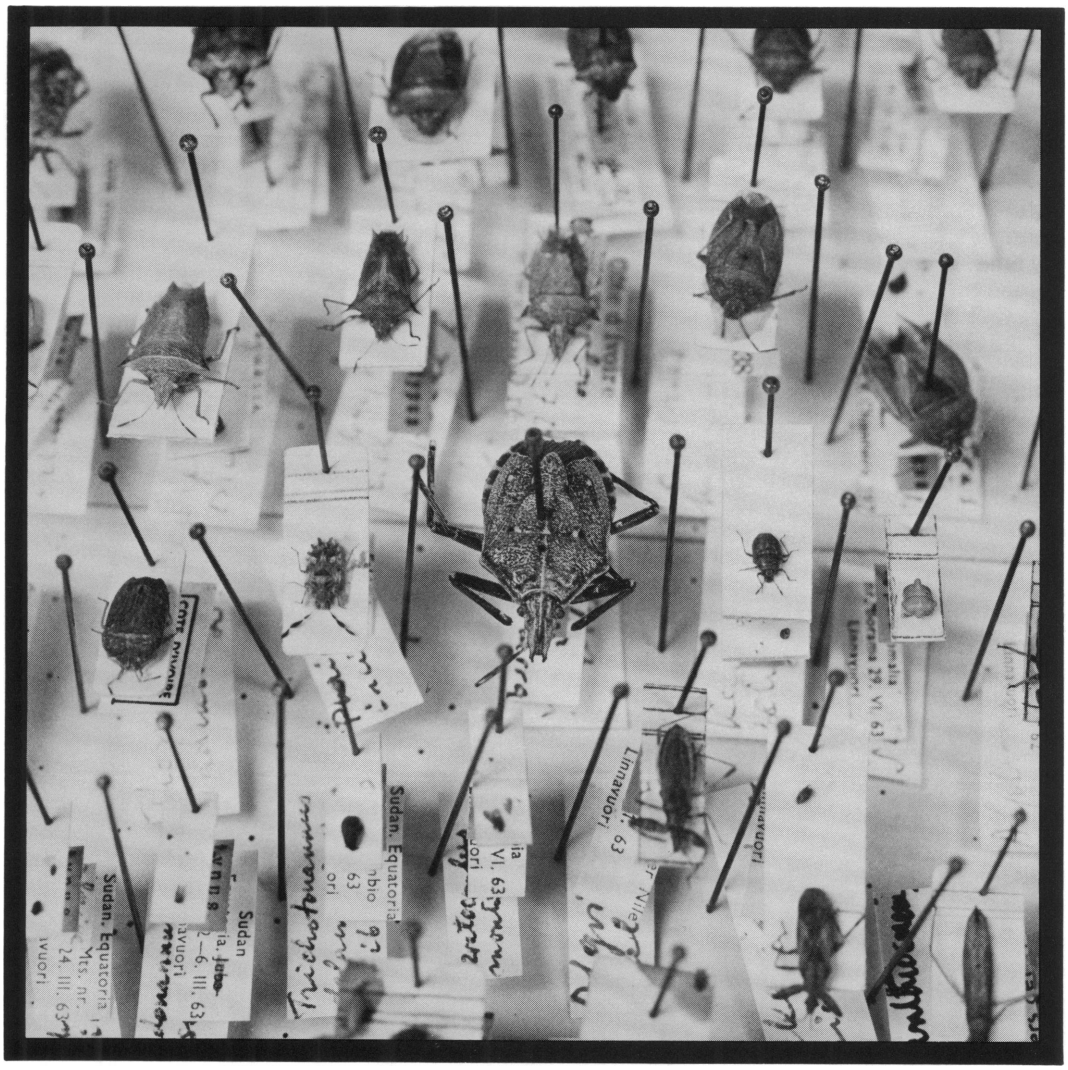
Staff Transitions The department's curatorial staff was augmented this year by the appointment of Kalbfleisch Curatorial Fellow James S. Miller, a specialist on butterflies and moths. Dr. Schuh completed a seven-year term as departmental Chairman, and was succeeded in that post by Dr. Platnick. Eric L. Quinter was appointed Scientific Assistant, and Daniel Bickle was appointed Research Associate.

Scientific Publications:

Cranston, P. S., and D. D. Judd
1987. *Metriocnemus* (Diptera, Chironomidae)—an ecological survey and description of a new species. J. N. Y. Entomol. Soc. 95: 534-546.

Goloboff, P. A., and N. I. Platnick
1987. A review of the Chilean spiders of the superfamily Migoidea (Araneae, Mygalomorphae). Am. Mus. Novitates 2888, 15 pp.

These stink bugs and other heteropterans are part of a collection acquired from the Finnish entomologist Rauno Linnavuori by the Department of Entomology. The acquisition consists of 65,000 specimens of Heteroptera and Homoptera, the true bugs and their



allies, mostly collected in the Middle East and North Africa. An additional 85,000 specimens from the Linnavuori Collection are anticipated. Nearly all of the species included in the acquisition are new to the Museum and broaden the geographic scope of the collection.

Goodloe, L., R. Sanwald, and H. Topoff
1987. Host specificity in raiding behavior of the slave-making ant *Polyergus lucidus.* Psyche 94: 39-44.

Grimaldi, D. A.
1987. Phylogenetics and taxonomy of *Zygothrica* (Diptera, Drosophilidae). Bull. Am. Mus. Nat. Hist. 186: 103-268.

1988. Relicts in the Drosophilidae (Diptera). *In* J. K. Liebherr (ed.), Zoogeography of Caribbean insects, 183-213. Cornell Univ. Press.

1988. Bee flies and bluets: *Bombylius* flower constant on *Hedyotis caerulea* (Rubiaceae) and the manner of foraging. J. Nat. Hist. 22: 1-10.

Griswold, C. E.
1987. A revision of the jumping spider genus *Habronattus* F. O. P.-Cambridge (Araneae, Salticidae), with phenetic and cladistic analyses. Univ. California Publ. Entomol. 107: 1-344.

1987. The African members of the trap-door spider family Migidae (Araneae, Mygalomorphae) 1: the genus *Moggridgea* O. P.-Cambridge, 1875. Ann. Natal Mus. 28: 1-118.

1987. The spider genus *Symphytognatha* Hickman (Araneae, Symphytognathidae) newly described from Africa. Ann. Natal Mus. 28: 133-136.

1987. The African members of the trap-door spider family Migidae (Araneae, Mygalomorphae) 2: the genus *Poecilomigas* Simon, 1903. Ann. Natal Mus. 28: 475-497.

1987. A review of the southern African spiders of the family Cyatholipidae Simon, 1894 (Araneae, Araneomorphae). Ann. Natal Mus. 28: 499-542.

Griswold, C. E., and *T. Meikle-Griswold*
1987. *Archaeodictyna ulova,* new species (Araneae, Dictynidae), a remarkable kleptoparasite of group-living eresid spiders (*Stegodyphus* spp., Araneae, Eresidae). Am. Mus. Novitates 2897, 11 pp.

Griswold, C. E., and N. I. Platnick
1987. On the first African spiders of the family Orsolobidae (Araneae, Dysderoidea). Am. Mus. Novitates 2892, 14 pp.

Johnson, K.
1988. A new subspecies of *Sandia macfarlandi* from the Sierra Madre Oriente of Mexico (Lepidoptera, Lycaenidae). Insecta Mundi 2: 16-20.

1988. *Tergissima* and *Femniterga,* new sister genera of *Calycopis* Scudder and *Calystrymon* Field from the south central Andes (Lepidoptera, Lycaenidae). Insecta Mundi 2: 28-42.

1988. Replacement name for *Mitoura siva rhodope* Clench (1981) [nec Godman and Salvin, 1887] (Lepidoptera, Lycaenidae). Insecta Mundi 2: 76-80.

Johnson, K., and *D. Matusik*
1987. The status of *"Papilio hipparcus"* Staudinger (Papilionidae). J. Lepidopterists' Soc. 41: 65-69.

1987. A new white-and-black subspecies of *Protesilaus euryleon* (Papilionidae). J. Lepidopterists' Soc. 41: 70-74.

1987. The types and status of *Papilio tasso* Staudinger. J. Lepidopterists' Soc. 41: 108-113.

Johnson, K., E. L. Quinter, and *D. Matusik*
1987. A new species of *Calisto* from Hispaniola with a review of the female genitalia of Hispaniolan congeners. J. Res. Lepidoptera 25: 73-82.

Krishna, K., and *S. Bacchus*
1987. A new fossil species of termite from Dominican amber, *Cryptotermes yamini* (Isoptera, Kalotermitidae). Am. Mus. Novitates 2884, 5 pp.

McGinley, R. J., and J. G. Rozen, Jr.
1987. Nesting biology, immature stages, and phylogenetic placement of the Palaearctic bee *Pararhophites* (Hymenoptera, Apoidea). Am. Mus. Novitates 2903, 21 pp.

McIver, J. D., and G. M. Stonedahl
1987. Biology of the myrmecomorphic plant bug *Coquillettia insignis* Uhler (Heteroptera, Miridae, Phylinae). J. N. Y. Entomol. So. 95: 258-277.

1987. Biology of the myrmecomorphic plant bug *Orectoderus obliquus* Uhler (Heteroptera, Miridae, Phylinae). J. N. Y. Entomol. Soc. 95: 278-289.

Michener, C. D., and D. A. Grimaldi
1988. A *Trigona* from late Cretaceous amber of New Jersey (Hymenoptera, Apidae, Meliponinae). Am. Mus. Novitates, 2917, 1-10.

Miller, J. S.
1987. A revision of the genus *Phryganidia* (Lepidoptera, Dioptidae), with description of a new species. Proc. Entomol. Soc. Wash. 89: 303-321.

1987. Host-plant relationships in the Papilionidae (Lepidoptera): Parallel cladogenesis or colonization? Cladistics 3: 105-120.

1987. Phylogenetic studies in the Papilioninae (Lepidoptera, Papilionidae). Bull. Am. Mus. Nat. Hist. 186: 365-512.

Millidge, A. F.
1987. The erigonine spiders of North America. Part 8. The genus *Eperigone* Crosby and Bishop (Araneae, Linyphiidae). Am. Mus. Novitates 2885, 75 pp.

Platnick, N. I.
1987. Seminario de filogenia: Establecimiento de seriaciones fileticas. Actas X Congr. Internatl. Arachnol. 2: 55-57.

Platnick, N. I., and R. R. Forster
1987. On the first American spiders of the subfamily Sternodinae (Araneae, Malkaridae). Am. Mus. Novitates 2894, 12 pp.

Platnick, N. I., and M. U. Shadab
1988. A revision of the American spiders of the genus *Micaria* (Araneae, Gnaphosidae). Am. Mus. Novitates 2916, 64 pp.

Rindge, F. H.
1987. The *Eupithecia* (Lepidoptera, Geometridae) of Chile. Bull. Am. Mus. Nat. Hist. 186: 269-363.

1987. *Speyeria* collection of Paul Grey to the American Museum of Natural History. J. Lepidopterists' Soc. 41: 123.

Rozen, J. G., Jr.
1987. Nesting biology and immature stages of a new species in the bee genus *Hesperapis* (Hymenoptera, Apoidea, Melittidae, Dasypodinae). Am. Mus. Novitates 2887, 13 pp.

1987. Nesting biology of the bee *Ashmeadiella holtii* and its cleptoparasite, a new species of *Stelis* (Apoidea, Megachilidae). Am. Mus. Novitates 2900, 10 pp.

Rozen, J. G., Jr., and C. D. Michener
1988. Nests and immature stages of the bee *Paratetrapedia swainsonae* (Hymenoptera, Anthophoridae). Am. Mus. Novitates 2909, 13 pp.

Schuh, R. T., and L. H. Herman
1988. Biography and bibliography: Petr Wolfgang Wygodzinsky (1916-1987). J. N. Y. Entomol. Soc. 96: 227-244.

Schuh, R. T., and M. D. Schwartz
1988. Revision of the New World Pilophorini (Heteroptera, Miridae, Phylinae) Bull. Amer. Mus. Nat. Hist. 187: 101-201.

Sedgwick, W. C., and N. I. Platnick
1987. A new species of *Liphistius* (Araneae, Mesothelae) from Johore, Malaysia. Malayan Nature J. 41: 361-363.

Shear, W. A.
1988. The chordeumatid millipeds of Chile (Diplopoda, Chordeumatida). Am. Mus. Novitates 2912, 10 pp.

Shear, W. A., *P. A. Selden, W. D. I. Rolfe, P. M. Bonamo,* and *J. D. Grierson*
1987. New terrestrial arachnids from the Devonian of Gilboa, New York (Arachnida, Trigonotarbida). Am. Mus. Novitates 2901, 74 pp.

Stonedahl, G. M.
1988. Revisions of *Dioclerus, Harpedona, Mertila, Myiocapsus, Prodromus,* and *Thaumastomiris* (Heteroptera, Miridae, Bryocorinae, Eccritotarsini). Bull. Am. Mus. Nat. Hist. 187: 1-99.

Topoff, H.
1987 Editor, Readings in animal behavior. New York: Columbia University Press.

Abstracts, Reviews and Popular Publications:

Grimaldi, D. A.
1988. [Review of] Manual of Nearctic Diptera, vol. 2, edited by J. F. McAlpine. J.N.Y. Entomol. Soc. 96: 124-126.

Miller, J. S.
1988. [Review of] The butterflies of Costa Rica and their natural hsitory: Papilionidae, Pieridae, Nymphalidae, by P. J. DeVries. J. N. Y. Entomol. Soc. 96: 247-248.

1988. [Response to] Scoble's response to Weintraub and Miller's review of Scoble (1986). Cladistics 4: 97-98.

Platnick, N. I.
1987. Cladistics: A mixed bag of a book, [Review of] Biological metaphor and cladistic classification, edited by H. M. Hoengiswald and L. F. Wiener. Scientist, 1(21): 22.

1987. [Review of] Spinnenfauna Gestern und Heute, by J. Wunderlich. J. N. Y. Entomol. Soc. 95: 456-458.

Rindge, F. H.
1987. A tribute to Dr. Hiroshi Inoue. Tinea 12 suppl.: 733.

1987. [Obituary of] Cyril Franklin dos Passos (1887-1986). J. N. Y. Entomol. Soc. 95: 459-460.

1988. [Review of] Noctuelles et Geomtres d'Europe: Geomtres, Vol. 3, 1917-1919, by Jules Culot. J. Lepidopterists' Soc. 41:239.

1988. [Review of] The butterflies of Costa Rica and their natural history: Papilionidae, Pieridae, Nymphalidae, by P.J. DeVries. Recent Publ. Nat. Hist. 5: 3-4.

Rozen, J. G., Jr.
1988. [Review of] Immature insects, edited by F. W. Stehr. J. N. Y. Entomol. Soc. 96: 245-247.

Topoff, H.
1988. [Review of] The behavioral ecology of ants, by J. H. Sudd and N. R. Franks. J. N. Y. Entomol. Soc. 96: 251-252.

Weintraub, J., and J. S. Miller
1987. [Review of] The structure and affinities of the Hedyloidea, by M. J. Scoble. Cladistics 3: 299-304.

Department of Herpetology and Ichthyology

The department, newly formed through the merger of the separate departments of Herpetology and Ichthyology, conducts research, collection, curation and graduate education. Recent studies involve Central and South American unisexual lizards, dart-poison frogs, and snakes; frogs of New Guinea; herpetology of Panama; new species of fishes from Africa, the Caribbean, East Asia and the south Pacific; ecology of local, Caribbean and west Pacific fishes, and fishery resources of the Hudson River. Recent acquisitions include large collections of amphibians and reptiles from New Guinea, New England and Brazil, and of fishes from the northern Gulf of Mexico. Completed doctoral dissertations describe the osteology and relationships of mosquitofishes (genus Gambusia*) and freshwater catfishes of South America (family Auchenipteridae).*

HERPETOLOGY

Unisexual Species of Lizards
Charles J. Cole, Curator, continued a comparative study of unisexual (all-female) and bisexual species of whiptail (*Cnemidophorus*) and shiny (*Gymnophthalmus*) lizards, in collaboration with George F. Barrowclough, Curator in the Department of Ornithology, Research Associate Herbert C. Dessauer of the Department of Biochemistry and Molecular Biology at Louisiana State University Medical Center, and Laurence M. Hardy of the Department of Biological Sciences

The head musculature of Atractus elaps, *a species of South American burrowing snake that feeds exclusively on earthworms, is examined in the Department of Herpetology and Ichthyology. Frances J. Irish, Kalbfleisch Research Fellow in the department, expects that features such*

as neck musculature, tooth form and salivary glands will help to clarify the systematics of these animals. The department also conducts studies on unisexual lizards, dart-poison frogs, new fish species from many parts of the world, fish ecology and fishery resources.

at Louisiana State University at Shreveport. This study, supported by the National Science Foundation, shows that *Cnemidophorus neomexicanus*, a unisexual species of western North America, is a hybrid of two bisexual species, *C. inornatus* and *C. marmoratus*. Bisexual species produce eggs, which require fertilization for development. The unisexual species is a clone stemming from one or more than one hybrid female whose eggs develop without fertilization (parthenogenesis). This multidisciplinary study combines research on habitat preference, geographic distribution, histology of reproductive organs, chromosomes, biochemical genetics, and comparative studies of field samples with laboratory lineages of known ancestry.

Dr. Cole pursued studies of other unisexual species and their bisexual relatives in western North America and in the Guiana region of northern South America as well as the West Indies. Current data indicate that the unisexual species are clones of hybrid origin and that all female species have arisen numerous times independently through hybridization of bisexual species. Environmental change sometimes causes different species of lizards, previously separated geographically, to come together and hybridize. The ability to reproduce through unfertilized eggs is apparently achieved in certain first-generation hybrid females as a byproduct of genetic dysfunction.

Skunk Frogs and Poison Frogs
Charles W. Myers, Curator, in collaboration with Research Associate John Daly of the National Institutes of Health, and Field Associate Alfredo Paolillo, of the Foundation for the Conservation of Biological Diversity in Caracas, investigated an extraordinary frog, recently discovered by Mr. Paolillo, in a remote Venezuelan cloud forest. The frog differs from all other members of its family (Dendrobatidae) in its large size, nocturnal and aquatic habits, and bad smell. The last trait caused the party to christen it the "Venezuelan Skunk Frog." The frog probably represents a new genus and species, and its relationships are under study.

Dr. Myers completed descriptions of new genera of neotropical poison frogs (family Dendrobatidae).

Surveys of Herpetofauna
Dr. Myers completed an ecological survey of the herpetofauna of Barro Colorado Island, Panama, in collaboration with A. S. Rand, Senior Scientist at the Smithsonian Tropical Research Institute. In addition, he and Paulo E. Vanzolini, Research Associate, and Director of the Museu de Zoologia at the Universidade de São Paulo, visited sites in the Territory of Roraima (northern Brazil) for the planning of an intensive herpetological survey in that area.

Collecting in New Guinea
Richard G. Zweifel, Curator, with support from the Sabin Conservation Fund, spent several weeks collecting frogs and reptiles in the rain forest of Papua New Guinea. He photographed frogs and tape recorded frog vocalizations, both activities relevant to his ongoing taxonomic research.

Burrowing Snakes
Frances J. Irish, Kalbfleisch Research Fellow, studied the 120 species of South American burrowing snakes (genera *Atractus* and *Geophis*), remarkable for their habit of feeding exclusively on earthworms. She has discovered that certain features, including neck musculature, tooth form and salivary glands, promise to clarify the systematics of these animals.

Dr. Irish, in collaboration with David Cundall, Associate Professor of Biology at Lehigh University, and with the cooperation of the Jersey Wildlife Preservation Trust, England, completed studies of the endangered Round Island boa (genus *Casarea*) through study of captive animals and specimens in the collection of the British Museum (Natural History). This peculiar and probably very ancient species occurs only on one small island off the coast of Mauritius in the Indian Ocean.

Collection Growth About 3000 specimens were accessioned, and 4250 were cataloged, bringing the total specimens in the collection to 282,000. Notable accessions include 1000 specimens from Papua New Guinea; 113 specimens on exchange from the Museu de Zoologia, Universidade de São Paulo, including eight genera and 55 species of lizards and snakes new to the collection, and 1400 specimens from New England, two-thirds of them donated by Michael W. Klemens, Senior Scientific Assistant.

ICHTHYOLOGY

African and Malagasy Cichlids
Melanie Stiassny, Assistant Curator, came to the American Museum of Natural History in August, 1987, from the Museum of Comparative Zoology at Harvard University. Her research interests include the systematics and evolution of African freshwater fishes of the family Cichlidae, known primarily for their explosive speciation in the great lakes of Africa. During the year Dr. Stiassny finished a revision of the genus *Tylochromis*, an enigmatic group of 18 species that is curiously not involved in this impressive lacustrine speciation. In this work

she described eight new species.

In June and July, 1988, in collaboration with Peter Reinthal, Visiting Scientist, and Patricia Wright of the Department of Anthropology at Duke University, Dr. Stiassny collected fishes in Madagascar, an area that harbors many fishes only remotely related to those of the African mainland.

Shape of Flatfishes Steven Leipertz, Thorne Research Fellow, studied the shape of various species of flatfishes (order Pleuronectiformes), with the use of digitized computer images. He discovered that variability of overall shape is mainly a function of the number of elements (vertebrae) in the backbone. Specimens used in this study were on loan from the University of Hokkaido, National Museum of Canada, Museum of Comparative Zoology and University of Hamburg.

Livebearers from Mexico
Michael L. Smith, Kalbfleisch Assistant Curator, achieved an initial estimate of the interrelationships of the 40 species of Mexican livebearers (family Goodeidae), in studies sponsored by the National Science Foundation. Data for this estimate were derived from scanning electron micrographs of embryonic structures, termed trophotaenia. The relationships of these fishes indicate that their evolution is probably much older (on the order of tens of millions of years) than had been anticipated. The relationships correspond with fault movement, such as that of San Andreas, rather than with Pleistocene volcanism and its varied impacts upon river drainage patterns.

Mary Rauchenberger, Graduate Student, described a new species of livebearer (*Allodontichthys polylepis*) from Jalisco, Mexico.

Caribbean Pupfishes
Dr. M. L. Smith collected two undescribed pupfishes (genus *Cyprinodon*) of the killifish family (Cyprinodontidae) in the Dominican Republic. In collaboration with Gerald Smith of the University of Michigan's Museum of Zoology, he determined that the mitochondrial DNA of these forms warranted their descriptions as new species. The relationships of these forms seem to be geographically diverse, adding significant complexity to the evolution of the 40 or so species of pupfishes of the New World.

Melanie Stiassny, Assistant Curator in the Department of Herpetology and Ichthyology, examines one of the primitive species of cichlid fish that she and Visiting Scientist Peter Reinthal brought back from Madagascar. Dr. Stiassny is studying the systematics and evolution of cichlids from Africa and Madagascar. Cichlids are abundant, show a wide variety of colors and behaviors, are an important food fish and are popular as aquarium fish. They are known primarily for their explosive speciation in the great lakes of Africa. Many new species are expected to be observed in the rivers and lakes of Madagascar as well.

Cardinalfishes from Rapa
C. Lavett Smith, Curator, in collaboration with John E. Randall of the Bernice P. Bishop Museum, Honolulu, finished descriptions of two new species and one new genus of cardinalfishes (Apogonidae) from Rapa Island. Dr. Smith had collected fishes from this remote outpost of French Polynesia in 1970 during the Ingersoll-Stout Expedition.

Sex change in Humbug
C.L. Smith, in collaboration with Abby L. Schwarz, an independent consultant, completed a study of behavior and of the histology of the gonads of the reticulated humbug (*Dascyllus reticulatus*) from Australia and Guam. They showed that the fish regularly changes sex from female to male, a type of life-history pattern that is being discovered in an increasing number of coral-reef fishes.

Marine Ecology C.L. Smith, in collaboration with James C. Tyler, Research Associate, began projects sponsored by the Sea Research Foundation in Turks and Caicos Islands, British West Indies. The projects include studies of community structure of adult fishes inhabiting rocky islets, and of associations of small fishes in a sponge-coral habitat. Drs. Smith and Tyler continued to videotape the behavior of territorial blennies (genus *Emblemaria*) in Carrie Bow Cay, Belize. A frame-by-frame analysis of this videotape is being sponsored by the Smithsonian Institution.

Joseph W. Rachlin, Research Associate, and Barbara E. Warkentine, Graduate Student at Lehman College, continued their investigations of the dietary habits of benthic fishes of the New York Bight. Significant results include redefinitions of the concepts of generalist, specialist and opportunistic species, based on a novel analytical approach which assumes that food organisms are best sampled by the fishes themselves. The use of the department's collection has been instrumental in the validation of this approach.

Dr. Rachlin and Ms. Warkentine have reexamined some aspects of

Several primitive species of cichlid fish are pictured on a map of Madagascar. These cichlids, as well as a new species of silverside fish, were brought back from Madagascar by researchers in the Department of Herpetology and Ichthyology. The specimens will contribute to studies of biogeography, morphology, systematics, physiology and

behavior. The Museum now has approximately 2000 fish specimens from Madagascar, the biggest collection of fish endemic to that island. The combined effects of deforestation, erosion, agriculture and the introduction of foreign species make it urgent that comprehensive surveys of Madagascan fauna and flora be conducted.

the population dynamics of the silver hake (whiting) population of the New York Bight. Current results, compared with findings published 30 years ago, show that the condition of the species is much improved, as shown by growth rate and length-weight relations. The improvement may reflect better conditions following the cessation of inshore marine dumping in the area of the New York Bight.

Freshwater Ecology
Dr. C. L. Smith, with support of the State University of New York and the Griffis Foundation of New York, has published a book on fisheries research in the Hudson River. The book stems from a conference organized in 1981 by the Hudson River Environmental Society and contains 14 papers on the river and its commercial fishes.

Elephant Fishes Elephant fishes (family Mormyridae), including some 150 species native to African freshwaters, produce weak electric signals. Peter Moller, in collaboration with Robert Landsman, Graduate Student of City College, discovered that injection of male hormone (testosterone) causes the signal pattern produced by juvenile fish to resemble that of adults.

Osteological Studies
Mary Rauchenberger and Carl J. Ferraris, Jr., Graduate Students in the American Museum/City University of New York Joint Program in Evolutionary Biology, completed osteological studies of fish for their doctoral theses.

Dr. Rauchenberger demonstrated that 45 species of mosquitofishes (genus *Gambusia*) have geographical distributions within Central America and the Greater Antilles that are consistent with the ancient history of these land masses. Dr. Ferraris showed that 100 species of enigmatic bottlenose catfishes (genus *Ageneiosus*) and their near relatives of South America are members of the family Auchenipteridae. Their last year of research was supported by Museum pre-doctoral fellowships, two of several awarded during the second year of this fellowship program.

Collection of Skeletons With support from the National Science Foundation, 30 new cabinets were added to house the growing collection of dry skeletons, augmented this year by some 685 newly cataloged specimens. These were obtained through the cooperation of Robert L. Shipp, Assistant Judge of the Alabama Deep Sea Fishing Rodeo and Richard L. Lord, Fulton Fish Market Information Service of New York City. Donated by Garth Lovvorn, Athens, Alabama, and Mitchell Suggs, MacDonald, Georgia, were two blue marlins (*Makaira nigricans*) of 450-550 lbs., that are the only complete skeletons of this species in the collection.

Fishes of the Gulf of Mexico
The department received an important collection of fishes from the northern Gulf of Mexico. This collection was accumulated over a period of 20 years at the University of South Alabama, Mobile, through the activities of Robert L. Shipp, Professor of Biology. The collection includes 7200 lots of 63,000 well preserved specimens.

Computerization
The department has cataloged new acquisitions,totaling 3425 lots, with its personal computers acquired in 1984. Over the last two years, locality information of about 30,000 lots of cataloged specimens has been added to the growing database. Locality data for about two-thirds of the entire collection has been computerized.

Scientific Publications:

Aronson, L. R.
1987. Some remarks on integrative levels. *In* G. Greenberg and E. Tobach (eds.), Cognition, language and consciousness, pp. 269-275. Hillsdale, N.J.: Lawrence Erlbaum Associates.

Aronson, L. R., and E. Tobach
1988. Conservative aspects of the dolphin cortex match its behavioral level. Behav. and Brain Sci., pp. 89-90.

Brown, B. A., and C. J. Ferraris, Jr.* (Sponsor: G. Nelson)
1988. Comparative osteology of the Asian catfish family Chacidae, with the description of a new species from Burma. Am. Mus. Novitates 2907, 16 pp.

Cole, C. J., H. C. Dessauer, and G. F. Barrowclough
1988. Hybrid origin of a unisexual species of whiptail lizard, *Cnemidophorus neomexicanus*, in western North America: new evidence and a review. Am. Mus. Novitates 2905, 38 pp.

Cundall, D., and F. J. Irish
1987. Aspects of locomotor and feeding behavior in the Round Island boa, *Casarea dussumieri.* Dodo, J. Jersey Wild. Preserv. Trust 23: 108-111.

Daly, J. W., C. W. Myers, and *N. Whittaker*
1987. Further classification of skin alkaloids from Neotropical poison frogs (Dendrobatidae), with a general survey of toxic/noxious substances in the Amphibia. Toxicon 25(10): 1023-1095.

Izower, J., and L. R. Aronson
1988. Behavioral correlates of cerebellar ablations in the teleost fish, *Aequidens latifrons.* Int. J. Comp. Psych. 1(1): 28-49.

Klemens, M. W., *E. Kiviat,* and *R. E. Schmidt*
1988. Distribution of the northern leopard frog, *Rana pipiens*, in the lower Hudson and Housatonic river valleys. Northeastern Environmental Sci. 6(2): 99-101.

Leipertz, S.
1988. The rockhead poacher, *Bothragonus swani* (Teleostei, Agonidae): selected osteology with comments on phylogeny. Copeia 1988(1): 64-71.

Meylan, A.
1988. Spongivory in hawksbill turtles: a diet of glass. Science 239: 393-395, cover photo.

Myers, C. W.
1987. New generic names for some Neotropical poison frogs (Dendrobatidae). Papéis Avulsos Zool., São Paulo, 36(25): 301-306.

Myers, C. W., and *P. A. Burrowes*
1987. A new poison frog (*Dendrobates*) from Andean Colombia, with notes of a lowland relative. Am. Mus. Novitates 2899, 17 pp.

Pappantoniou, A., J. W. Rachlin, and *B. E. Warkentine*
1988. Resource partitioning in a stream fish community. Ann. New York Acad. Sci. 529: 152-156.

Rachlin, J. W. and *B. E. Warkentine*
1987. Dietary preference of the spotted hake, *Urophycis regia*, from the inner New York Bight. Ann. New York Acad. Sci. 494: 434-437.

1988. Feeding preference of sympatric hake from the inner New York Bight. Ann. New York Acad. Sci. 529: 157-159.

Rauchenberger, M.* (Sponsor: G. Nelson)
1988. A new species of *Allodontichthys* (Cyprinodontiformes, Goodeidae), with comparative morphometrics for the genus. Copeia 1988(2): 433-441.

Rivlin, K. A., J. W. Rachlin, and *G. Dale*
1987. Intraspecific chromosomal variation in *Apogon binotatus* (Perciformes, Apogonidae) from the Florida Keys and St. Croix. Ann. New York Acad. Sci. 494: 263-265.

Rivlin, K. A., J. W. Rachlin, and *B. E. Warkentine*
1988. G-banding of the chromosomes of *Apogon maculatus* and *A. pseudomaculatus* (Perciformes, Apogonidae). Ann. New York Acad. Sci. 529: 160-163.

Roze, J. A.
1987. Summary of coral snakes (Elapidae) from Cerro de la Neblina, Venezuela, with description of a new subspecies. Rev. fr. Aquariol. 14: 109-112.

Sherbrooke, W. C.
1987. Defensive head posture in horned lizards (Phrynosoma, Sauria, Iguanidae). Southwestern Naturalist 32(4): 512-515.

Smith, C. L. (ed.)
1988. Fisheries research in the Hudson River, 407 pp. Albany: State Univ. of N. Y.

Smith, M. L., and *R. R. Miller*
1987. *Allotoca goslinei*, a new species of goodeid fish from Jalisco, Mexico. Copeia 1987(3): 610-616.

Stiassny, M. L. J.
1987. Cichlid intrafamilial relationships and the placement of the Neotropical genus *Cichla*. J. Nat. Hist. 21: 1311-1331.

Stiassny, M. L. J., and *J. S. Jensen*
1987. Labroid intrarelationships revisited: morphological complexity, "key innovation" and the study of comparative diversity. Bull. Mus. Comp. Zool. 151(5): 269-319.

Warkentine, B. E., and J. W. Rachlin
1987. Age and growth of 0+ year class *Menidia menidia*. Ann. New York Acad. Sci. 494: 438-440.
1988. Analysis of the dietary preference of the sand flounder, *Scophthalmus aquosus*, from the New Jersey coast. Ann. New York Acad. Sci. 529: 164-168.

Abstracts, Reviews and Popular Publications:

Atz, J. W.
1988. [Review of] The biology and evolution of lungfishes, edited by W. E. Bemis, W. W. Burggren, and N. E. Kemp. Copeia 1988(1): 265-267.

1988. Properly scaled fishes and non-kosher fishes. *In* Y. Lipschutz, Kashruth: a comprehensive background and reference guide to the principles of kashruth, 139-160. Brooklyn, N.Y.: Mesorah Publications, Ltd.

Ferraris, C. J., Jr.* (Sponsor: G. Nelson)
1987. [Review of] Smiths' Sea Fishes, edited by M. M. Smith and P. Heemstra. Recent Publ. in Nat. Hist. 5(2): 3-4.

1987. The Auchenipterid catfishes. *In* P. Loiselle (ed.), Catfish and loaches, 31-34. Fed. Rep. Ger.: Tetra Press.

1987. The Doradidae: best kept secret in catfishes. *In* P. Loiselle (ed.), Catfish and loaches, 43-47. Fed. Rep. Ger.: Tetra Press.

Landsman, R. E., S. H. Jou, and P. Moller
1987. Stress obscures signalling of sexual identity in *Gnathonemus petersii* (Mormyriformes). *In* D. R. Idler, L. W. Crim, J. M. Walsh (eds.), Proc. 3rd Int. Symp. Reprod. Physiol. of Fish: 307, Memorial Univ. of Newfoundland.

Moller, P.
1987. [Review of] Electroreception, edited by T. H. Bullock and W. Heiligenberg. Quart. Rev. Biol. 62: 220-221.

1987. (Abstract) Communication in weakly electric fish: does *Brienomyrus niger* manipulate its "electric" *Umwelt*? Univ. of Bielefeld, Fed. Rep. Ger.

1988. Animal behavior in the biology curriculum: communication in weakly electric fish. New York Biology Teachers Association.

Moller, P., J. Serrier, and *D. Bowling*
1987. (Abstract) Int. Ethol. Conference, Madison, Wisconsin. Electro-communication in mormyrid fish.

Nelson, G.
1988. [Review of] Fishes of the North-eastern Atlantic and Mediterranean. Amer. Sci. 76:91.

1988. [Review of] Darwinism: The refutation of a myth. Syst. Zool. 37:80.

Rachlin, J. W., and *B. E. Warkentine*
1987. (Abstract) Population dynamics of whiting from the New York Bight. Proc. of the 44th Northeast Fish and Wildlife Conf. Boston.

1988. Niche breadth of a benthic fish community from the New York Bight. Proc. of the 45th Northeast Fish and Wildlife Conf., White Sulphur Springs, 27-30 March 1988.

Smith, M. L.
1988. (Abstract) Interrelationships of pupfishes and their allies (Family Cyprinodontidae). New Trends in Ichthyology, Munich.

1988. John Treadwell Nichols, founder of Copeia. Amer. Soc. Ichthyol. Herpetol., Ann Arbor.

Warkentine, B. E., and J. W. Rachlin
1987. (Abstract) Growth characteristics of the sand flounder: a future fishery. Proc. of the 117th Ann. Meeting of the Am. Fish. Soc., Winston-Salem, 11-17 September 1987:233.

1987. Resource utilization and diet similarity of four sympatric species of flatfish. Proc. of the 44th Northeast Fish and Wildlife Conf., Boston:3.

1988. Species diversity of the vertebrate and invertebrate fauna from three selected stations of the New York Bight. Proc. of the 45th Northeast Fish and Wildlife Conf., White Sulphur Springs, 27-30 March 1988.

Department of Invertebrates

The scope of activity of the Department of Invertebrates is vast: from two-billion-year-old microorganisms and the advent of complex, multicellular life 600 million years ago, up through the rich diversity of modern invertebrate life forms. During the past fiscal year, the department pursued its studies of modern and ancient invertebrates in the field and laboratory. Curatorial staff and resident research associates brought a variety of biological perspectives to their studies, which ranged from behavioral and ecological field investigations to the fine details of anatomy and development, and from systematics and phylogenetic reconstruction of both fossil and Recent invertebrates to theoretical analyses of the interplay between evolutionary and ecological processes.

Curatorial Progress The department's collection of Recent mollusks grew by 25,695 specimens in 40 separate accessions.

Noteworthy donations included a specimen of the marine snail *Perotrochus midas* by Elsie A. Malone; 5000 specimens of marine and terrestrial mollusks from Morton L. Goodfriend; 3000 specimens from Melvin B. Robin; and 6700 specimens of eastern Pacific marine gastropods and bivalves from Helen DuShane. These acquisitions added previously unrepresented species to the collection, and served to fill gaps in our holdings of other species which were poorly represented.

Noteworthy, too, was the transfer of computerized documentation of the collection of 38,500 type and figured specimens of fossil invertebrates from the City University of New York computer center to an inhouse IBM microcomputer system, greatly facilitating electronic database aspects of our curatorial program.

Book on Macroevolution Niles Eldredge, Chairman and Curator, has completed the first draft of a new book on large-scale aspects of the evolutionary process. Noting that evolutionists from Darwin up to modern times have as yet failed to specify the conditions under which adaptive change occurs in evolution, his book examines the biological context of evolutionary change. He has been especially concerned with the relationship between true speciation (viewed as transformation of reproductive adaptations) and its causal relationship with true economic adaptive change. The book will be published by McGraw-Hill in 1989.

New Marine Snail Discovered Museums receive specimens for their scientific collections from many sources. Among biological collections, those of mollusks are unusual in that 80 percent or more of the specimens in major museums were originally collected by amateurs. During the past year, the department accessioned more than 25,000 specimens of Recent mollusks, most of which were collected by knowledgeable amateurs and generously donated by them to the museum. Through the years, our molluscan collection database has been expanded by the cooperation of a legion of shell collectors. A case in point is the recent discovery of a new species of gastropod from off the coast of Somalia. The specimens were obtained from Danish commercial shrimpers by Captain Adolphe Stephant of Lorient, France, a shell collector for whom the new species was named. Two American shell dealers, Edward T. Schelling of Shalimar, Florida, and John H. Bernard of Crossville, Tennessee, alertly called attention to this discovery and donated the type specimens used by William K. Emerson, Curator, and Walter E. Sage, III, Scientific Assistant, to describe the new species, *Vasum stephanti.*

Chambered Nautilus Neil H. Landman, Associate Curator, has continued to pursue his study of living and fossil shelled cephalopods. He published a co-edited volume with W. B. Saunders synthesizing the systematics, life history and ecology of Recent *Nautilus.* Among the papers in it is a study with Research Associate J. K. Cochran of the growth rate of *Nautilus* using radioactive isotopes. Dr. Landman has also completed a study comparing the embryology of *Nautilus* with that of extinct ammonites.

Riddle of Avicularia With the support of the National Geographic Society, Judith E. Winston, Associate Curator, continued her studies of the function of avicularia—supposed defensive zooids of bryozoan colonies. During several months of fieldwork at the University of Washington's Friday Harbor Laboratories she made video studies to document avicularian behavior and the interactions of these specialized zooids with other organisms.

Permian Snails Roger L. Batten, Curator Emeritus, has analyzed the complicated genus *Apachella,* the most diverse pleurotomarian genus of the Permian. He has concluded that this genus probably had its origin in Europe during the Carboniferous and spread east through Asia to North America via the Tethyan Sea that girdled the Earth in the equatorial latitudes during the Permian.

Linda H. Mantel, left, Research Associate in the Department of Invertebrates, and her student, Harshinee Wijesinghe, taking blood from a blue crab. They are studying the hormonal regulation of salt transport in this species and in the green crab. The department has broad interests, from two-billion-year-old microorganisms up through the rich diversity of

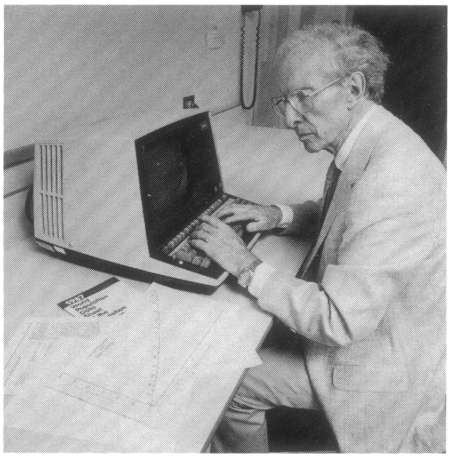
modern life forms. Research includes laboratory studies of the anatomy, development, systematics and phylogeny of endosymbiotic algae, snails, the chambered nautilus and brachiopods; field studies of the ecology of bryozoans; a study of carbon dioxide and human populations, and theoretical analyses of evolutionary and ecological processes.

CO^2 and Population Norman D. Newell, Curator Emeritus, and Research Associate Leslie F. Marcus, pointed out in the journal *Palaios* the nearly perfect correlation, 0.9985, between the accelerating increase in human population and daily increase in atmospheric carbon dioxide. This suggests that nearly all the greenhouse buildup of carbon dioxide in the atmosphere originates in human activities, such as the combustion of wood and fossil fuels and the clearing of forests. Besides the frequently voiced inference that the population explosion is the prime source of many of the world's woes, these investigators conclude that the international monitoring of the atmosphere could supply a convenient and accurate daily count of human numbers, as well as an index to the progress of industrialization and development.

Middle East Brachiopods Howard R. Feldman, Research Associate, continued his analysis of the biogeography and systematics of Mesozoic brachiópods from the Ethiopian Province of Sinai and Israel. He is completing taxonomic revisions before attempting to reconstruct the biogeographic history of the area.

Endosymbiotic Algae John J. Lee, Research Associate, and collaborators have focused on fine structural studies of the red algal symbiont from the large foraminifera *Peneroplis*. The alga is a *Porphyridium* and is unusual in its relationships with hosts since it is not surrounded by a host vacuole. In addition, expeditions to Palau and Kudaka Jima in the Pacific revealed new species of diatom-bearing larger foraminifera. One new species of endosymbiotic *Navicula* was found in the new collections but most specimens contained diatoms already described in collections from the Red Sea.

Blue and Green Crabs Linda H. Mantel, Research Associate, and her students continued their studies on hormonal regulation of salt transport in the blue crab, *Callinectes sapidus*, and the green crab, *Carcinus maenas*. They have isolated cellular membranes, which contain enzymes involved in salt uptake, from the gills of these crabs. Currently, they are using electron microscopy to study membrane structure and the response of membrane fragments to neurohormones and other physiological factors.



Norman D. Newell, Curator Emeritus in the Department of Invertebrates, enters data for a study conducted with Leslie F. Marcus, Research Associate in the department, on carbon dioxide and human populations. Their research shows that there is a strong correlation between human population growth and an increase in atmospheric carbon dioxide which, along with other accumulating gases, causes a warming of the atmosphere. Dr. Newell concludes that monitoring of the atmosphere could provide an index of population density as well as industrial and agricultural activity.

Departmental Outreach The department made 58 loans to research scientists at other institutions. There were 103 visitors to the collections. Departmental members continued to teach at local universities, and to lecture on campuses throughout the United States. Staff members also provided revised materials for the Halls of the Biology of Invertebates and the John Lindsley Hall of Earth History and cooperated with Membership, Discovery Tours and the Department of Education in offering lectures and leading natural history trips.

The department also notes with regret the retirement of former Chairman and Curator Ernst Kirsteuer and the death of Dorothy E. Bliss, Curator Emerita, and also the first chairman of the Department of Invertebrates.

Scientific Publications:

Arnold, J. M., N. H. Landman, and *H. Mutvei*
1987. Development of the embryonic shell of *Nautilus*. *In* W. B. Saunders and N. H. Landman (eds.), Nautilus: The biology and paleobiology of a living fossil, 373-400. New York: Plenum Press.

Batten, R. L.
1987. Robert Parr Whitfield: Hall's assistant who stayed too long. J. Earth Hist. 6(1): 61-71, 8 figs.

Boucot, A. J., N. Eldredge, *J. Gray, J. Pojeta*, and *J. N. Theron*
1986. Devonian invertebrates from the Bokkeveld Group below the Karoo succession near Sutherland. Ann. Geol. Surv. of S. Africa 20: 119-128.

Dott, R. H., and R. L. Batten
1988. The evolution of the earth. Fourth Edition. New York: McGraw-Hill.

Eldredge, N.
1988. The evolutionary context of social behavior. *In* G. Greenberg and E. Tobach (eds.), Evolution of social systems and integrative levels, 19-30. Hillsdale, N.J.: Lawrence Erlbraum Associates.

Eldredge, N., and S. J. Gould
1988. Punctuated equilibrium prevails. Nature 332: 211-212.

Emerson, W. K., and *R. N. Hughes*
1988. Harpidae Bronn, 1848 (Gastropoda) conserved by ICZN. The Veliger 30(4): 122-123.

Emerson, W. K., and W. E. Sage, III
1987. On the availability of names proposed in Pacific Shell News, Tokyo, 1970-1972. The Nautilus 101(4): 194-199.
1988. A new species of *Vasum* (Gastropoda, Turbinellidae) from off Somalia. The Nautilus 102(1): 36-39.

Feldman, H. R.
1987. A new species of the Callovian (Jurassic) brachiopod *Septirhynchia* from northern Sinai. J. of Paleontol. 61(6): 1156-1172.

Feldman, H. R., and *E. F. Owen*
1988. *Goliathyris lewyi*, new species (Brachiopoda, Terebratellacea), from the Jurassic of Gebel El-Minshera, northern Sinai. Am. Mus. Novitates 2908, 12pp.

Kuile, B. H., J. Erez, and J. J. Lee
1987. The role of feeding in the metabolism of larger symbiont bearing foraminifera. Symbiosis 4: 335-350.

Landman, N. H.
1988. Early ontogeny of Mesozoic ammonites and nautilids. *In* J. Wiedmann and J. Kullmann (eds.), Cephalopods—present and past, 215-228. Stuttgart: Schweizerbartsche Verlagsbuchhandlung.

Landman, N. H., and J. K. Cochran
1987. Growth and longevity of *Nautilus*. *In* W. B. Saunders and N. H. Landman (eds.), Nautilus: the biology and paleobiology of a living fossil, 401-420. New York: Plenum Press.

Landman, N. H., *W. B. Saunders*, J. E. Winston, and *P. J. Harries*
1987. Incidence and kinds of epizoans on the shell of live *Nautilus*. *In* W. B. Saunders and N. H. Landman (eds.), Nautilus: the biology and paleobiology of a living fossil, 163-177. New York: Plenum Press.

Lee, J. J.
1988. Foraminifera (chapter 17) *In* L. Margulis, D. Chapman, J. O. Corliss (eds.), Protoctista. Boston: Science Books International.

Lee, J. J., and *P. Hallock*
1987. Algal symbiosis as the driving force in the evolution of larger foraminifera. *In* J. J. Lee, and J. Fredrick (eds.), Endosymbiosis III. Ann. N.Y. Acad. Sci. 503: 330-347.

Lindemann, R. H., and H. R. Feldman
1987. Paleogeography and brachiopod paleoecology of the Onondaga Limestone in eastern New York. New York State Geological Association Guidebook for Fieldtrips (59th Annual Meeting), D1-D30.

Newell, N. D.
1987. Paleobiology's golden age. Palaios 2(3): 305-309.

Newell, N. D., and L. F. Marcus
1987. Carbon dioxide and people. Palaios 2(1): 101-103.

Saunders, W. B., and N. H. Landman (eds.)
1987. Nautilus: the biology and paleobiology of a living fossil, 632 pp. New York: Plenum Press.

Thorpe, J. P., and J. E. Winston
1987. *Alcyonidium* Lamouroux 1813 (Bryozoa): proposed conservation by the suppression of *Fucus* Hudson,1762 and *Ulva* (Hudson, 1788 in their zoological sense). Bull. of Zool. Nomenclature 44: 86-88.

Turgeon, D. D., and *A. E. Bogan, E. V. Coan,* W. K. Emerson, *W. G. Lyons, W. L. Pratt, C. F. E. Roper, A. Scheltema, F. G. Thompson,* and *J. D. Williams*
1988. Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusca, American Fisheries Soc. Spec. Publ. (16), 277 pp.

Winston, J. E.
1988. The systematist's perspective. Calif. Acad. Mem. 13: 1-6.

Winston, J. E. and *B. F. Heimberg*
1988. The role of bryozoans in the benthic community at Low Island, Antarctica. Antarctic J. of the U.S. 21(5): 188-189.

Abstracts, Reviews and Popular Publications:

Eldredge, N.
1987. [Review of] Evolution as entropy, by D. R. Brooks and E. O. Wiley. Bioessays 6(5): 239-240.
1987. (Letter to the editor). The New York Times, June 29, A16.
1987. The natural history reader in evolution (editor) New York: Columbia Univ. Press.

Horenstein, S.
1988. Familiar fossils of North America. New York: Knopf.

1986. A page from earth's history: the Tischman building. The New York Chronicle 1(1): 4-5.

1986. Grand Central Terminal. The New York Chronicle 1(2): 4-5.

1987. Photographs for life pulse, by N. Eldredge. New York: Facts on File.

1987. New York's Ice Age elephants. The New York Chronicle 1(3): 10-11.

Mantel, L. H.
1987. [Review of] Transport processes—iono and osmoregulation, edited by R. Gilles and M. Gilles. Bioscience 37: 746-747.

1987. [Review of] Crustacean issues 3: factors in adult growth, edited by A. M. Wenner, A. A. Balkema, Rotterdam 1985. Q. Rev. of Biol. 62: 320.

1988. Crustaceans. *In* The new book of knowledge. Danbury, Ct: Grolier Educ. Corp.

Sage, W. E.
1987. [Obituary] Worthington Smith Bitler. N. Y. Shell Club Notes (302): 2.

1987. [Review of] Living terebras of the world: a monograph of the Recent Terebridae of the world, by T. Bratcher and W. O. Cernohorsky. N. Y. Shell Club Notes 303: 4-5.
1987. Conchologists of America — 15th Annual Convention. N. Y. Shell Club Notes 304: 18-19.

1987. [Review of] Compendium of seashells (third printing, revised), by R. T. Abbott and S. P. Dance. N.Y. Shell Club Notes 304: 19.

1987. We have met the Gremlin, and it is US! Am. Conchologist 15(3): 4.

1987. *Mitra heilprini* becomes *Mitra lineolata*. Am. Conchologist 15(3): 8.

1987. A day's collecting in the Florida Keys. Am. Conchologist 15(3): 12.

1987. Spotlight on *Lyria*. Am. Conchologist 15(4): 17.

1988. Some notes on nomenclature and labeling. Hawaiian Shell News 36(2): 7.

Winston, J. E.
1987. (Abstract) Polymorphism in animal colonies: bryozoan avicularia as examples. Western Society of Naturalists, Program/Abstracts, 68th Annual Meeting, Calif. State Univ., Long Beach, Dec. 26-30, 1987, 49-50.

Winston, J. E. and *B. Goodman*
1988. Life on a grain of sand. Sea Frontiers 34: 76-78.

Department of Mammalogy

The Department of Mammalogy spent much of the year studying the evolutionary relationships of mammals in various habitats in South America, southeastern Asia and Africa. More than 200 specimens of Bolivian mammals were collected as part of a departmental survey. Laboratory studies of morphological variation and social behavior in various species were also carried out. Progress was made on expansion and reorganization of many specimens so they are available for study and properly conserved for the future.

South American Mammals Studies of the mammals of Bolivia have continued in the laboratory and in the field. Curator Sydney Anderson is collaborating with the Museum of Southwestern Biology at the University of New Mexico and with several Bolivian institutions. These include the Instituto de Ecologia and the Museo Nacional de Historia Natural in La Paz and the Museo de Historia Natural "Prof. Noel Kempff Mercado" in Santa Cruz.

Dr. Anderson visited Bolivia in October and November and obtained about 200 specimens, some of which were left with Bolivian institutions. This important survey of Bolivian mammals, which was initiated several years ago, has received most of its financial support from the American Museum of Natural History and a grant from the National Science Foundation.

Work has continued on a collaborative three-volume treatise on South American mammals, to be published by the University of Chicago Press. Alfred Gardner of the U.S. Fish and Wildlife Service and James L. Patton of the Museum of Vertebrate Zoology at the University of California at Berkeley are co-editors along with Dr. Anderson.

Revision in Progress From late June to mid-September, 1987, Assistant Curator Robert S. Voss collected small mammals in the Venezuelan states of Bolivar, Yaracuy, Sucre and Apure. He worked with Hernan G. Castellanos, curator of mammals at the Museo de Historia Natural La Salle in Caracas. The purpose of the fieldwork was to obtain morphological, chromosomal and biochemical samples of the muroid rodent genus *Zygodontomys* for a systematic revision currently in progress. They were also interested in documenting the sympatric fauna with which *Zygodontomys* coexists in the savannas of the northern Neotropics.

An additional goal of the Venezuelan expedition was to obtain live specimens of *Zygodontomys* in order to establish a breeding colony at the American Museum. Twenty-four live specimens were collected and transferred to a laboratory where they are being maintained at tropical temperatures and photoperiodicity. The goal of the breeding program is to produce specimens of known age, sex and genealogy. Measurements of morphological characters, principally of the skull and dentition, of these animals give information about variation within populations which are helpful for evaluation of differences between populations.

The original colony has produced 100 litters, consisting of approximately 500 young. Reproductive data are also being collected from these offspring for use in future hybridization experiments of these mainland South American mice with a giant island race that Dr. Voss hopes to obtain from Tobago in 1989. This will yield genetic information about differences between populations.

In conjunction with these laboratory studies, Dr. Voss has been statistically analyzing measurement data from thousands of Museum specimens of *Zygodontomys*, in collaboration with Research Associate Leslie F. Marcus of the Department of Invertebrates and Patricia Escalante, a graduate student in the Department of Ornithology. These analyses reveal consistent patterns of within-population variation that suggest similar patterns of relative growth between populations.

Mice of the Savannas Nancy Olds, a graduate student in the American Museum/City University of New York Joint Program in Evolutionary Biology, completed her doctoral dissertation on the taxonomy, geographic and altitudinal distributions and phylogenetic relationships of *Calomys*, a genus containing ten species of South American mouse, distributed from lowlands to altiplano. Morphological characters (including fur, body size, tail length and cranial structures) and karyotypes were described.

As in other vertebrate taxa, species of *Calomys*, such as *C. hummelincki*, occur in savannas scattered throughout Venezuela and the Guianas but not in intervening forest blocks. Such distributions suggest that grassland habitats may once have been continuous across the northern Neotropics.

Dr. Olds' research was partly supported by the Museum's doctoral training program and an Exxon Curatorial Assistantship.

Cloud Forest Rodents This year Dr. Voss also initiated research on the systematics and zoogeography of *Thomasomys*, a genus containing many species of muroid rodents restricted to cloud forests in the South American Andes. The genus contains approximately 30 to 40 species and ranges from Colombia to Bolivia. The genus has often been assumed to be a sister group to most or all

other groups in the South American muroid fauna, and its relationships are crucial to resolving many problems about Neotropical muroid systematics.

Muroids of Two Continents
In his attempt to understand the phylogenetic relationships and zoogeography of muroid rodents, Chairman and Curator Guy G. Musser worked on defining and describing the species native to the Philippines, Flores, Timor and other regions in the Indo-Australian region. Endemic faunas of Flores and Timor are represented by hundreds of subfossil fragments that have been sorted into species but not yet described.

Work on the Philippine rodents, a collaborative effort with Lawrence Heaney of the National Museum of Natural History, Smithsonian Institution, is progressing slowly because they are waiting to analyze fresh samples collected this year by Dr. Heaney during his latest field expedition to the Philippine Archipelago.

One interesting project nearing completion is the definition and zoogeographic relationships of species in the genus *Rattus* that are native to Sulawesi and the Moluccas. Dr. Musser and Exxon Curatorial Assistant Mary Ellen Holden are describing three new species from the islands of Taliabu and Pelang, east of Sulawesi, and from the Moluccan islands, between Taliabu and New Guinea. Results may reveal patterns of relationships among Indo-Australian species of *Rattus*, patterns that have eluded previous investigators.

Dr. Musser also spent time during the year studying the systematics and zoogeography of South American muroid rodents. He and Michael D. Carleton of the National Museum of Natural History, Smithsonian Institution, are seeking to describe species diversity in the genus *Oecomys*. By using suites of morphological features and information on geographic distributions, they have sorted hundreds of specimens into about 10 species. Curatorial Assistant Jane Mason prepared range maps reflecting the distribution of each species. Future researchers, who wish to test the accuracy of the maps and the conclusions of Drs. Musser's and Carleton's morphometric analyses of the species and their phylogenetic relationships to one another, will be able to examine the same specimens and try to repeat their results.

Bats Curator Emeritus Karl Koopman continued his research into the taxonomy, geographic distributions and phylogenetic relationships of bats. During January and February he worked in the Transvaal Museum at Pretoria and also traveled to eastern Transvaal where he collected bats in the field.

Jean M. Augustin, Senior Technician in the Department of Mammalogy, selects giraffe skeletal material for measurement and study. The newly installed cabinets housing these specimens can easily be moved, are airtight and offer more protection than the ones they replaced. The state-of-the-art cabinets ensure improved conservation and accessibility of specimens. Visiting scientists use the mammal collections in studies of the evolution and systematics of African mammals, and for comparisons with fossil materials.

Manuscripts reporting his work on the biogeography of West Indian bats, the taxonomy and geographic distributions of the Liberian bats and the taxonomy of Neotropical vampire bats have been submitted and will be published soon. Dr. Koopman has also been busy revising the Second Edition of the Association of Systematics Collections Checklist of Mammals of the World.

Social/Emotional Behavior
Curator Ethel Tobach continued her laboratory investigations of social/emotional behavior in a variety of species.

Biochemical and genetic processes have been investigated in the Fawnhooded DAB rat stock (*Rattus norvegicus*) and in the related stocks of normal (Wistar and Long-Evans DAB) animals for several years. It had been found that the Fawnhooded rat, which is characterized by low levels of the neurotransmitter serotonin in its blood platelets, is also likely to preferentially drink L-tryptophan (a precursor of serotonin), when compared with the other two stocks. Fawnhooded rats will also drink less D-tryptophan, which has no known function and is sweet-tasting, than the other two stocks. These results showed that the rats were not responding only to the sweetness or bitterness of the solutions offered, but were discriminating between the two forms of tryptophan.

In collaboration with Ralph Peters of Wichita State University, the serotonin function of the brains of the three stocks have been compared. Dr. Peters has found that the Fawnhooded rats have higher levels of serotonin in the hippocampus than the other stocks do. The effects of this neurochemical difference on aggressive behavior, memory and other patterns of behavior involving the hippocampus are being investigated.

A rodent skull is measured in the Department of Mammalogy as part of a field and laboratory study of the systematics of the genus Zygodontomys. *The genus occurs in the savannas of northern South America where it coexists with a number of other small mammals. Measurements of both Museum specimens and live animals, as well as chromosomal and biochem-*

ical data, give information about variation and growth of individuals in a population. In other research on rodents, department scientists are studying the taxonomy and distribution of a genus of South American mouse that also occurs in savannas, and the systematics and zoogeography of a genus of rodents that lives in forests of the Andes.

Recuration of Collections

At the end of October, Senior Technician William T. Coull retired after 32 years of service in the Department of Mammalogy. For most of his tenure Mr. Coull worked as a tanner but during the last six to seven years he joined forces with Senior Technician Helmut Sommer to recurate parts of the collection.

The department is responsible for one of the finest collections of large mammals in any museum: elephants, whales, hippos, rhinoceroses, horses and zebras, tapirs, giraffes, manatees and dugongs, deer and moose, African and Asian antelope and buffalo, bison and bears. Much of the material is represented by skulls and complete skeletons that necessitate special storage.

For years, specimens were stored in cramped quarters, many specimens were improperly cataloged and numbered and a certain percentage of the specimens consisted of mismatched parts. More than six years ago, Mr. Coull and Mr. Sommer began to recurate, expand and transfer specimens to spacious new storage areas, thus ensuring their future conservation and accessibility to visiting scientists and departmental staff.

During the past year, the recurated and expanded collections of horses, zebras, giraffes and tapirs were moved into new specimen cabinets located in the newly renovated former tannery. The smaller-bodied carnivores were also recurated and expanded into more spacious quarters. Mary Ellen Holden, Exxon Curatorial Assistant, has correctly identified, numbered, packaged and reinstalled many specimens of civets and mongooses, the Viverridae and Herpestidae, so they are available for study and properly conserved for the future.

Scientific Publications:

Anderson, S., T. L. Yates, and *J. A. Cook*
1987. Notes on Bolivian mammals 4: The genus *Ctenomys* (Rodentia, Ctenomyidae) in the eastern lowlands. Am. Mus. Novitates 2891, 20 pp.

Anderson, S., and *P. Ergueta Sandoval*
1987. Lista de mamiferos considerados elementos especialies, 8 pp. Unpublished internal document of Centro de Datos para la Conservacion, La Paz, Bolivia.

Hinojosa P. F., S. Anderson, and J. L. Patton
1987. Two new species of *Oxymycterus* (Rodentia) from Peru and Bolivia (Rodentia). Am. Mus. Novitates 2898, 17 pp.

Janis, C. M., and K. M. Scott
1987. The interrelationship of higher ruminant families with special emphasis on the members of the Cervoidea. Am. Mus. Novitates 2893, 85 pp.

Jenkins, P. D.
1988. A new species of *Microgale* (Insectivora, Tenrecidae) from Northeastern Madagascar. Am. Mus. Novitates 2910, 7 pp.

Lawrence, M. A.
1987. Zoological collection incunabula: the Wied Brazilian collection. Collect. Forum 3: 16-18.

1988. The identify of *Sciurus duida* J. A. Allen (Rodentia, Sciuridae). Am. Mus. Novitates 2919, 8 pp.

Lawrence, M. A., and *M. Genett*
1988. Conserving a Wied-Neuwied type: an archival container. Curator 31: 53-60.

Layne, J. N.
1987. An enclosure for protecting small mammal traps from disturbance. J. of Mamm. 68(3): 666-668.

1987. Prairie falcon sighting in Florida. Florida Field Nat. 15: 79-80.

Layne, J. N., and *D. A. Wassmer*
1988. Records of the panther in Highlands County, Florida. Florida Field Nat. 16(3): 72-73.

MacPhee, R. D. E.
1987. The shrew tenrecs of Madagascar: systematic revision and Holocene distribution of *Microgale* (Tenrecidae, Insectivora). Am. Mus. Novitates 2889, 299 pp.

McCarthy, T. J.
1987. Distributional records of bats from the Caribbean lowlands of Belize and adjacent Guatemala and Mexico. *In* B. D. Patterson and R. M. Timm (eds.), Studies in neotropical mammalogy: essays in honor of Philip Hershkovitz, 137-162. Fieldiana: Zoology, new ser., 39.

1987. Records of *Tonatia carrikeri* (Chiroptera, Phyllostomidae) from the Brazilian Amazon and *Tonatia shulzi* in Guayana. Bat Res. News, 28(3): 21-23.

Maher, D. S., J. N. Layne, *E. Darrell Land, J. W. McCowan,* and *J. Roof*
1988. Long distance movements of a Florida black bear. Florida Field Nat. 16(1): 1-6.

Olds, N., and S. Anderson
1987. Notes on Bolivian mammals 2. Taxonomy and distribution of rice rats of the subgenus *Oligoryzomys*. *In* B. D. Patterson and R. M. Timm (eds.), Studies in neotropical mammalogy: essays in honor of Philip Hershkovitz, 261-281. Fieldiana, Zool. new ser. 39.

Olds, N., S. Anderson, and T. L. Yates
1987. Notes on Bolivian mammals 3: A revised diagnosis of *Andalgalomys* (Rodentia, Muridae) and the description of a new subspecies. Am. Mus. Novitates 2890, 17 pp.

Serrano, P., and S. Anderson
1986. Datos sobre la alientacion de *Athene cunicularis* en la Reserva de Fauna Altoandina de Ulla-Ulla, Bolivia. Donana, Acta Vert. 13: 180-182.

Tobach, E.
1987. Introduction I, Some historical perspectives; Introduction II, Contemporary status of comparative psychology. *In* E. Tobach (ed.), Historical perspectives and contemporary issues, 3-4 and 159-161 respectively. NJ: LEA, Inc.

1987. Integrative levels in the comparative psychology of cognition, language and consciousness. *In* G. Greenberg and E. Tobach (eds.), Cognition, language and consciousness: integrative levels, 239-267. NJ: LEA, Inc.

1988. The single and multidimensional scale and the single or multidimensional comparative study: are these incompatible in a comparative psychology approach? Comment on T. Torigoe's paper. Hirosphia Forum, 1986, for Psychol. 11: 101-102.

1987 Editor, Proceedings of the ISCP, vol. 1. Historical perspectives and the international status of comparative psychology. NJ: LEA, Inc.

Abstracts, Reviews and Popular Publications:

Burney, D. A., and R. D. E. MacPhee
1988. Looking in the last place on Earth (Madagascar). Nat. Hist. June 1988: 46-55.

Raymond, M. A. V., and J. N. Layne
1988. (Abstract) Breeding season and litter size of flying squirrels in south-central Florida. Florida Sci. 51 (Supp. 1): 26.

Tobach, E., and *B. Rosoff* (series eds.)
1988. Women at work: socialization towards inequality. Genes & Gender Series. N.Y.: Gordian Press.

Wassmer, D. A., D. D. Guenther, and J. N. Layne
1988. (Abstract) Home range of bobcats in south-central Florida. Florida Sci. 51 (Supp.1): 26.

Department of Mineral Sciences

The Department of Mineral Sciences carries out its research programs on minerals, gems, rocks, ore deposits and meteorites. The specimens studied provide important data on the processes operative in the earth and in the solar system. Research this year included studies of fluids in the earth that are trapped in deep-seated rocks, the role of fluids in platinum deposits within layered intrusions, silver deposits in Peru which crystallize from hot water, gold-silver telluride minerals in Colorado, jadeites from Guatemala and their archeological implications, unique new chondritic and achondritic meteorites from Antarctica, ore deposits under volcanoes and historical studies of major collectors important to the Museum mineral collections. Computer capabilities of the department were greatly advanced and they aid enormously in the research and collections management programs. The mineral and meteorite collections grew steadily with significant new additions and improvements in management procedures.

Acquisitions and Loans This year 134 minerals and gems were acquired, down from last year's total of 1350. Of these, 47 were donated, 14 were acquired through exchange, and 73 were purchased. The donation of specimens has been drastically curtailed due to changes in regulations by the Internal Revenue Service.

Some of the notable gifts include a superb kunzite crystal from Nuristan, Afghanistan, and a tree limb replaced by precious opal, from Virgin Valley, Nevada, both from Mabel C. Lamb; a cat's eye chrysoberyl cabochon (23.05 carats) from Sri Lanka; 24 faceted gem labradorites from Clear Lake, Oregon; 11 faceted crystals of imperial topaz from Minas Gerais, Brazil; a 254.25 carat fluorite from the Elmwood mine, Smith Co., Tennessee, from Art Grant; an exceptionally perfect quartz crystal found in the McEarl Mine, Hot Springs, Arkansas, from Lawrence H. Conklin, and specimens of azurite and cinnabar from China, esophorite from Brazil and chalcocite from Cornwall, England.

Other minerals acquired include an unusual white beryl, with attached schorl, from California, tourmaline from Brazil, an aquamarine from Pakistan and dyscrasite from Czechoslovakia. Among the 127 minerals and gems loaned to various institutions are 26 American gems to the Field Museum of Natural History (Chicago) for their Tiffany exhibit, 32 gems to the Morris Museum (N.J.) for their diamond jubilee, and several gems to the Jekyll Museum (Georgia) for an exhibition on their history which included former American Museum of Natural History trustee J.P. Morgan, Sr. Many universities across the country were loaned specimens for their research programs.

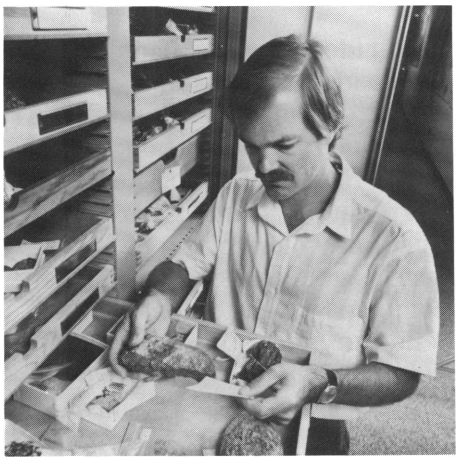
The meteorite collection experienced a great deal of activity. During the past year nine new specimens were donated and eight were acquired through exchange. Thirty specimens (mostly polished thin sections) were loaned for research purposes, and pieces of 34 meteorites were given away to a wide variety of researchers for analysis. Some of the newly acquired meteorites are Havero (Finland), Bocaiuva (Brazil), Gunlock (Utah), Mt. Padbury (Australia), Angra Dos Reis (Brazil), Kodaikanal (India), Cadoo County (Oklahoma), and an iron meteorite from Zagorra (Morocco).

Education and Exhibition
The role of the department in education was significantly increased this year. All four curators taught courses for the Department of Geological Sciences at Lamont-Doherty Geological Observatory of Columbia University as part of the newly established AMNH-Columbia doctoral training program. Curator George E. Harlow taught a course entitled "Mineral Physics and Crystal Chemistry," Chairman and Curator Martin Prinz taught "Meteorites and Planetary Origins," Assistant Curators Edmond A. Mathez and Demetrius C. Pohl co-taught "Evolution of Volatile Fluids in the Crust," the latter attended by many of the faculty in igneous petrology and geochemistry as well. Each of these courses utilizes the strengths of the staff at the Museum and supplements the strengths at Columbia, thereby producing a stronger and more varied program. Columbia graduate student Cheryl L. Peach began her course work and research association with Dr. Mathez, as part of the program. Scientific Assistant Michael K. Weisberg is also a Ph.D. student at Brooklyn College of the City University of New York. A new postdoctoral fellow and two graduate students from the City University of New York will work with Dr. Prinz on his meteorite research program in 1988-1989.

Dr. Pohl taught a summer field geology course "Geology of the Grand Canyon" with Christine Carlson of Hunter College of the City University of New York. They also co-taught two adult education courses at the Museum, "Weekend of Geology" and "Iron Mining Geology."

Dr. Harlow, Dr. Pohl and Mr. Peters taught a course on "Gems and Crystals" at the Museum. Each of the curators gave talks at scientific meetings and at local universities. Dr. Prinz also spoke at the University of Rochester.

Dr. Harlow helped organize and co-curated the special exhibition "Tiffany: 150 Years of Gems and Jewelry" which ran from March 30 to June 5, 1988, in Gallery 1. The exhibit focused on Tiffany's use of gems, including those of American origin, natural themes in design, and its unique relationship with the Museum through the connection with George F. Kunz. Dr. Kunz was Tiffany's premier gem expert from 1879 to 1932 and was largely responsible for the assembly of two major collections of gems and precious stones that were ultimately donated to the Museum by J.P. Morgan.



George E. Harlow, Curator in the Department of Mineral Sciences, examines jadeite-rich rocks and related samples that he collected in Guatemala. The rocks are part of Dr. Harlow's research comparing archeological Central American jade artifacts with jadeitites in order to evaluate the sources of the jade. The samples should also add information about the local environment that formed the rocks and about how plate tectonics shaped the area.

Fluids in the Earth One of the most active areas of research among petrologists is understanding the behavior of fluids in the Earth. Fluids may drive volcanic eruptions, control the geochemistry of rocks, exert a major influence on bulk-rock physical properties, such as rheology (the way rocks flow) and electrical conductivity, and determine how parts of the Earth partially melt to produce the wide range of magma types.

In order to understand how fluids behave in the mantle, Dr. Mathez has been studying the distribution of carbonaceous compounds in fragments of the mantle brought to the surface of the Earth with erupting basalts. He discovered that carbon exists in these rocks as particles composed primarily of graphitic compounds which, based on their complex chemical properties, are thought to be major carriers for certain geochemically important trace elements. Dr. Mathez also discovered that crack surfaces in these rocks are coated with a film of carbonaceous matter. Using X-ray photoelectron spectroscopy, he determined that the films are in part composed of low-temperature hydrocarbons. He proposed that the hydrocarbons formed abiotically by reaction of volcanic gas with fresh mineral surfaces that were themselves formed as the rocks cooled. Documentation of the various carbon fractions in the mantle rocks provides the basis for interpreting the carbon, hydrogen and oxygen isotope compositions of mantle rocks.

Dr. Mathez has also been studying the manner in which fluids affect geochemistry in the environment of a crystallizing magma in the shallow crust. The investigation is in part motivated by the question of the extent to which fluids are responsible for concentrating platinum and related elements in specific horizons in layered intrusions. From a theoretical study, Dr. Mathez and J.R. Holloway (Arizona State University) proposed that the first fluids to come out of the basaltic magmas that gave rise to the platinum deposits were enriched in the elements carbon and chlorine. A thermodynamic analysis of fluids in the system carbon-oxygen-hydrogen-chlorine indicated that the fluids associated with the layered intrusions were initially composed of mixtures of CO_2, CO

and HCl and that these fluids evolved to more water-rich compositions as the rocks cooled and crystallized.

Dr. Mathez acquired NSF funding to investigate how the platinum group elements distribute themselves between sulfide and silicate melts. The investigation is focusing on the study of sulfides in submarine basalts and on experimentation using synthetic systems. The latter is being conducted by Ms. Peach as part of her Ph.D. research at the Lamont-Doherty Geological Observatory of Columbia University.

Epithermal Silver Deposits Dr. Pohl continued documenting the alteration and ore mineral zonation of epithermal vein deposits in andesitic volcanic terrains of Central Peru, and verifying in detail the sequence of the silver ore minerals. This includes native silver, miargyrite, pyrargyrite, polybasite-argentite, tetrahedrite and argentiferous galena. These minerals were established on a macroscopic scale, from the surface to depth, and are consistent on a district-wide scale. The zoning scheme appears to hold in spite of multiple mineralizing events in the vein system suggesting that silver minerals with their more restricted stability ranges can be better zoning indicators than more common ore minerals. Silver is the economic mineral of interest in these deposits with lead, zinc and copper being largely byproducts. The suite of silver minerals developed in a vein appears to correlate strongly with the grade of the mineralization in these deposits, and thus may be of considerable economic significance.

The wallrock alteration assemblage appears to be dominated by argillization and silicification reactions without the development of secondary K-feldspar commonly reported in other epithermal vein deposits. Secondary K-feldspar is considered a positive geochemical indicator in many epithermal precious metal deposits. However, most epithermal precious metal deposits described in the literature appear to occur in more silicic and potassic volcanic rocks than those of central Peru. Obviously, the apparent lack of K-feldspar does not downgrade the ore potential of these veins and the current model of epithermal precious metal deposition may have to be modified to account for ore occurrences in intermediate volcanic rocks.

Telluride Mineralization Dr. Pohl is also investigating a precious metal telluride assemblage from Colorado in collaboration with David Beaty of Canyon Resources Corporation. Tellurides are minerals which consist of metals such as gold and silver which have combined with the element tellurium. This study is intended to determine the relationship of the tellurides, apparently formed early and at low temperatures, to the major event, which formed later from hot water at higher temperatures. It appears that the silver content of the mineral sylvanite in the assemblage of telluride minerals can be used as a geothermometer. Preliminary results indicate that the telluride assemblage was formed at moderate temperatures, and was not of low temperature origin as originally thought. This type of origin is also compatible with oxygen isotopic data. The content of precious metals in the ore deposit appears to be related to the telluride mineralization, and this relationship is of significance in exploration of the deposit and in the extraction of the metal from the ore.

Dr. Pohl is also working on an apparently new copper calcium manganese silicate mineral from the Kalahari manganese fields of South Africa. The mineral was acquired from Ludwig von Bezing of Kimberly, South Africa, who found it while assembling a suite of ore minerals from that locality. The work on this new mineral is in collaboration with Dr. Harlow and Scientific Assistant Gregory Cavallo. Dr. Pohl also made further collections of ore and gangue (non-ore) minerals from the manganese deposits at Brumado, Bahia, Brazil.

Jadeitites Dr. Harlow continued his research on the jadeite-rich rocks from Guatemala that he collected in 1984. During the summer of 1987 he made two trips to the Motagua Valley of Guatemala to obtain more specimens of jadeitite and related rocks, including some eclogites and garnet amphibolites from adjacent areas. These samples should add to the general study of the local formational environment and help determine how plate tectonics worked in the area.

Progress this year was primarily in the comparison of archeological Middle-American jade artifacts with jadeitites from Guatemala in order to evaluate their sources. Part of the criteria is a working model of jadeitite petrogenesis which constrains the geological and tectonic environment where jade sources could be. The other criteria are largely based on comparisons of the mineralogy and mineral chemistry of jadeite rock and jade artifacts. Results were presented at a special conference on Middle American Jade held in August, 1987, in Denver, Colorado, where North and Central American jade experts met. A proceedings paper which focuses archeological attention on these interpretations is in press.

Antarctic Meteorites Dr. Prinz continued his NASA-supported research on meteorites in collaboration with Mr. Weisberg

This superb, gem-quality crystal, spodumene, from Nuristan, Afghanistan, given to the Department of Mineral Sciences by Mabel C. Lamb, was one of 47 minerals and gems acquired by the department through donation this year. Other notable gifts

included 11 faceted crystals of imperial topaz from Minas Gerais, Brazil; an exceptionally perfect quartz crystal from Hot Springs, Arkansas, given by Lawrence H. Conklin; specimens of azurite and cinnabar from China, and an unusual white beryl from California.

and Research Associate C. E. Nehru. Some of the most exciting results this year involved the study of two small meteorites recently brought back from Antarctica.

One is a new type of chondritic meteorite, the primitive samples which record events in the solar nebula prior to the formation of differentiated planets. Most chondrites can be grouped into one of three major groups—the ordinary, enstatite, or carbonaceous chondrites—which have their own specific characteristics and record different sets of nebular processes.

This new meteorite, Allan Hills 85085, contains aspects of all three types, and some characteristics that differ from all three. One unusual characteristic is that it consists mainly of microchondrules, small round objects that formed in the solar nebula. These are "micro" because they are much smaller than most chondrules. The meteorite also contains lumps of a primitive dark material called opaque matrix, considered to be the precursor to chondrules. The presence of this material as lumps is unusual. Micro-sized calcium-aluminum-rich inclusions, rare and important components of carbonaceous chondrites, were also found.

Preliminary results indicate that this meteorite is a newly recognized type of chondrite. More important, the sample will now be studied by a wide variety of other analytical techniques, and the data will be used to further our understanding of nebular processes.

The other meteorite, Lewis Cliffs 86010, is a coarse-grained igneous rock which formed from a hot silicate melt. It contains mainly three common minerals—olivine, pyroxene and plagioclase. Their compositions, however, are remarkable; they are so rich in calcium, aluminum and iron that it is difficult to perceive of a differentiated planet which could produce this type of rock. Since differentiated meteorites form from known chondritic materials, it is not a rock type one can reasonably expect to have formed. However, one minor primitive component of chondrites is rich in calcium and aluminum, and another is rich in iron. If, somehow, these components came together in a small planet and then melted, a rock type of this sort might form. This presumes a planet of highly unusual composition. This theory, and others, are now being explored in a consortium study. The data will result in some major revisions of our understanding of the origin of planets.

A Golfball-sized Chondrule The new Gunlock meteorite from Utah was brought to the attention of Dr. Prinz by Robert Goelet, President of the Museum. The meteorite was found by a geologist carrying out a mineral exploration project in southern Utah. It is classified as an ordinary chondrite of the L (low iron) group which makes it a fairly common type of meteorite, except for the fact that it is a petrologic type 3. This means that the silicate minerals have widely varying compositions or it is unequilibrated. In examining the specimen more closely, it was noted that it contained a major portion of a huge chondrule. The estimated diameter of the chondrule is about 5 centimeters, or roughly golfball-sized. Chondrules are enigmatic small round objects found only in primitive (chondritic) meteorites. Since most chondrules are only about 1 millimeter wide, this chondrule is about 50 times larger than the normal size. Texturally, however, it resembles normal-sized chondrules.

The discovery of this chondrule resulted in a search for larger chondrules or chondrule fragments in other chondrites to determine their characteristics and significance. These were termed macrochondrules. A number of fine examples were found, although none as large as the one in Gunlock. The origin of chondrules in the solar nebula is still uncertain. The presence of macrochondrules, as well as microchondrules, adds to our understanding of what nature has produced. The hypothesis that is eventually accepted will need to allow for formation over a wide variety of sizes and for complex sorting processes.

Ore Deposits Under Volcanoes Kalbfleisch Fellow Christopher J. Fridrich continued his research on a mineralized volcanic system in the Sierrita Mountains of south-eastern Arizona. The large caldera volcano and associated copper deposits in this range formed about 70 million years ago in a now-extinct volcanic chain similar in character to the present-day Andes.

Analysis of volcanic rocks at Sierrita shows that, at the height of the eruptive stage, the magma reservoir feeding the volcano developed vertical stratification suggesting convection in layers, a regime that is common in the oceans. In the magma, this convective regime allowed development of strong compositional gradients concentrating copper, for instance, in the lower, unerupted part of the reservoir. Toward the close of the eruptive stage, the convective regime changed, erasing the chemical gradients. Downward crystallization commenced, resulting in progressive buildup of dissolved water, chlorine, sulfur and other chemicals that were not crystallizing from the magma. Field relations at Sierrita indicate that the magma did not saturate in water until the reservoir crystallized down to a depth of about 10 kilometers. Experimental evidence shows that water boiling off a magma at this depth will initially be much more saline and acidic, and will therefore dissolve much more copper, than if saturation occurred at lower pressures. The hot acidic brines that boiled off carried much of the

copper from the magma, transporting it to the site for ore deposition at the roof of the crystallizing sub-volcanic magma reservoir, now a granite body.

Diverse Research Scientific Assistants, Associates and volunteers contribute greatly to the overall research and collection management programs. Indeed, without them these programs would be severely reduced.

Mr. Peters published a paper on the Bailey mineral collection with volunteer Charles Pearson. They also collaborated on two other articles, now in press, one on Charles S. Bement and the other on Norman Spang, both of whose highly important collections came to the Museum many years ago.

Associate Anna Sofianides is writing a book on gems, in collaboration with Dr. Harlow, and this long-term project made considerable progress last year. Scientific Assistant Gregory Cavallo provides important research support for Drs. Harlow and Pohl, by carrying out X-ray studies and identifications. Some of the X-ray studies include alteration minerals in silver vein deposits from Peru, a copper-calcium sulfate mineral from South Africa, potassium in pyroxene inclusions in diamonds, patinas on anthropological articles (with Conservator Judith Levinson of the Department of Anthropology), pyroxene and amphibole minerals in the Columbia University Collection, asbestiform minerals and new mineral acquisitions.

Mr. Weisberg collaborates closely with Dr. Prinz on meteoritic research. He carries out microprobe analyses on minerals and rocks, does extensive photographic work, and has written several papers, some of which are in press.

A fund in memory of Howard Belsky was established to support installation of a micromineral exhibition in the Guggenheim Hall of Minerals.

Scientific Publications:

Davis, A. M., M. Prinz, and *J. R. Laughlin*
1987. An ion microprobe study of plagioclase-rich clasts in the North Haig polymict ureilite. Lunar Planet. Sci. 19: 251-252.

Mathez, E. A.
1988. Carbonaceous matter in mantle xenoliths: Composition and relevance to the isotopes. Geochim. Cosmochim. Acta 51: 2339-2347.

Parks, G. A., and D. C. Pohl
1988. Hydrothermal solubility of uraninite. Geochim. Cosmochim. Acta 52: 863-867.

Prinz, M.
1988. Evolution of ureilites. Nature 331: 299-300.

Prinz, M., M. K. Weisberg, C. E. Nehru, and J. S. Delaney
1987. Mineral and lithic clasts in the EET83309 polymict ureilite: Evidence for primitive origins, 28-1 to 28-3. 12th Symp. Antarctic Meteorites, Natl. Inst. Polar Res., Tokyo.

Prinz, M., M. K. Weisberg, and C. E. Nehru
1988. Feldspathic components in polymict ureilites. Lunar Planet. Sci. 19: 947-948.
1988. LEW86010, A second angrite: Relationship to CAI's and opaque matrix. Lunar Planet. Sci. 19: 949-950.

Sutton, S. R., J. S. Delaney, J. V. Smith, and M. Prinz
1987. Copper and nickel partitioning between metal and troilite in iron meteorites. Geochim. Cosmochim. Acta 51: 2653-2662.

Weisberg, M. K., M. Prinz, and C. E. Nehru
1988. ALH85085: A unique unequilibrated chondrite. Lunar Planet. Sci. 19: 1257-1258.

Abstracts, Reviews and Popular Publications:

Fridrich, C. J.
1987. Syntectonic caldera formation, plutonism, and porphyry Cu(Mo) mineralization in the Sierrita Mountains, Arizona. Geo. Soc. Am. 19: 668.

Harlow, G. E.
1988. "Pyroxene," *In* McGraw-Hill Yearbook of Science and Technology, 1988: 364-367.

Johnson, C. M., and C. J. Fridrich
1987. Sr, Nd, and Pb isotopic zonation in the mafic latite to high silica rhyolite Grizzly Peak Tuff, Colorado. Geo. Soc. Am. 19: 718.

Mathez, E. A., and *J. R. Holloway*
1987. The evolution of C-O-H-Cl fluids during crystallization of mafic magmas. Am. Geophys. Union EOS 68: 1542.

Peters, J. J., and C. L. Pearson
1988. The S.C.H. Bailey mineral collection of the American Museum of Natural History. Matrix 1: 3-6.

Pohl, D. C.
1988. [Review of] The Tourmaline Group, by R.V. Dietrich. Am. Sci. 75(5): 531.
1988. [Review of] Geochemical Processes at Mineral Interfaces, edited by J.A. Davis and K.F. Hayes. Recent Publ. in Nat. Hist.

Prinz, M.
1988. Hybrid meteorite highlights meeting. Geotimes 33: 15-16.

Prinz, M., M. K. Weisberg, and C. E. Nehru
1987. Black inclusions of carbonaceous chondritic matrix in polymict ureilites. Meteoritics 22: 482-483.

Weisberg, M. K., M. Prinz, C. E. Nehru, and J. S. Delaney
1987. Barred olivine-textured Bencubbin major silicates: A ureilite connection? Meteoritics 22: 526-527.

Department of Ornithology

The staff conducts a vigorous research program on the significance of geographic variation, the spatial and temporal scales of species formation, the role of social behavior in the evolution of species taxa, the population biology of terns (see Research Stations section, Great Gull Island, p. 55), the phylogeny of flycatcher genera, the development of North American fossil avifaunas and the evolution of extinct giant ground birds. These endeavors reflect the overall goals of the department's research, which are to understand and explain the origin and evolution of organic diversity in birds within an evolutionary framework.

Loss of Colleagues
Associate Lois Heilbrun died on Oct. 21. Highly competent in matters both historical and ornithological, Mrs. Heilbrun had worked on a regular schedule in the Department of Ornithology since 1984, and had effectively become our curator of archives. Charles E. O'Brien, who started working in the department in 1924 and retired in 1973, died in September, 1987. His knowledge of the bird collections was such that he remembered the whereabouts of every specimen, a feat no one else has been able to repeat.

Biogeography Curator François Vuilleumier became Chairman on July 1, succeeding Curator Lester L. Short, who had served as Chairman from 1980 to 1987.

Dr. Vuilleumier's long-range goals are to integrate the hierarchy of biogeographic patterns in South American birds with broader theoretical issues. He is currently working on a book "Topics in Biogeography."

His study of secondary contacts and double invasions in Patagonia, with support from the Leonard C. Sanford Fund, concentrated on the overlap of two species of *Geositta* in Tierra del Fuego. These birds were found to be interspecifically territorial near their nests, but not so in feeding areas where both species foraged side by side. The two species are very similar in morphology but differ in vocalizations, and this is perhaps what keeps them apart as distinct species. To date, no hybrid has been found, unlike the hybrid swarm of *Phrygilus* discovered in the same area on a previous expedition. Thus different taxa appear to respond in different ways to the retreat of the Pleistocene ice cap.

Dr. Vuilleumier published an important paper on avian diversity in South America, using hierarchical models of landscape biogeographers as a tool for making decisions about the size and number of parks and reserves in South American ecosystems.

Flycatcher Phylogeny Wesley E. Lanyon, Lamont Curator of Birds, retired after 31 years of service on the curatorial staff, including the Chairmanship of the department from 1973 to 1980. This year was devoted to completing the reconstruction of phylogeny of the tyrant flycatchers, the largest family of birds in the New World. Of the approximately 114 genera in the family, 101 have been placed in phyletic assemblages, largely with the use of cranial and syringeal characters. The remaining genera will require a different approach, perhaps biochemical, for relationships to be resolved.

Marked Honeyguides With the support of the Leonard C. Sanford Fund, Curator Lester L. Short studied little known African honeyguides in central Kenya with Jennifer F. M. Horne, Fellow of the National Museums of Kenya. They radio-tracked two breeding male *Indicator variegatus* for two months, learning of their movements and habits. They color-tagged and investigated the behavior of four species of honeyguides as part of a five-year study of the systematics and behavioral ecology of these birds. Museum work showed that one honeyguide "species" was, in fact, the young of another species, *Indicator meliphilus*.

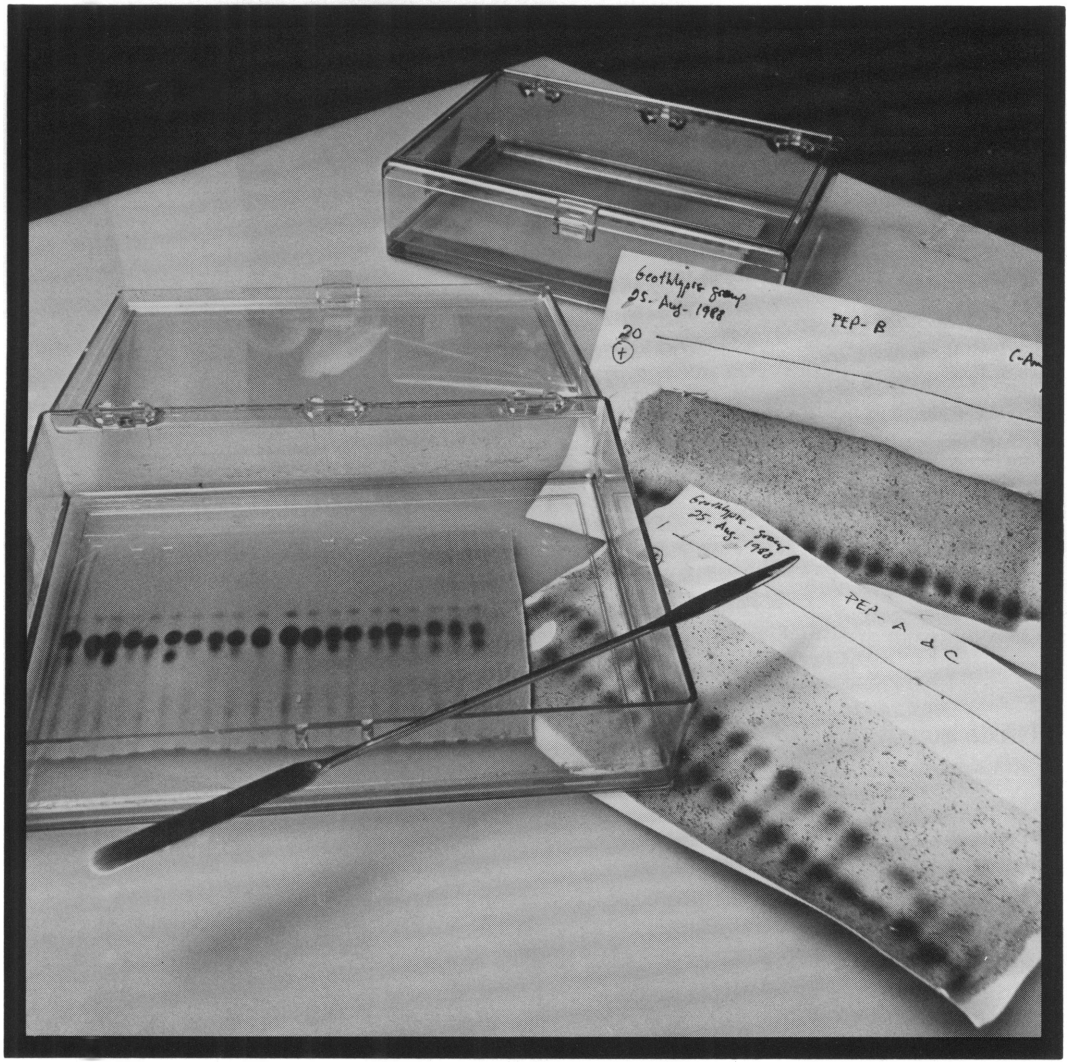
Geographic Variation George F. Barrowclough, Associate Curator, and R. J. Gutierrez of Humboldt State University studied geographic differences in electrophoretic patterns of *Strix occidentalis*, occurring in New Mexico. This project was supported by the U. S. Forest Service.

Dr. Barrowclough continued to describe and analyze geographic variation in the genus *Junco*. During May and June he worked in the Appalachian Mountains of North Carolina and in eastern Newfoundland, Canada. Many skeletons of *Junco hyemalis* were collected at these two localities in order to obtain data about variation within populations, both north of and south of the line of maximal glacial extent during the Pleistocene.

Dr. Barrowclough and Chapman Fellow Angelo Capparella initiated a joint study of geographic variation in the neotropical, lowland forest bird, *Glyphorhynchus spirurus*. This study of genetic, skeletal and plumage variation will be the first quantitative analysis of differentiation using multiple suites of characters and statistical analysis (variance partitioning) of tropical species.

Snow Goose Studies Research Associate Robert F. Rockwell pursued his long-term research on the population biology of the Lesser Snow Goose (*Chen caerulescens*) at

Electrophoretic patterns, like these, are used by members of the Department of Ornithology to gain understanding of geographic variation in bird species. Electrophoresis, in which a mixture of proteins is separated on the basis of electrical charge, is one of the tech-



niques that Museum scientists use to study systematics and evolution. Along with other methodologies, such as karyotyping and protein radioimmunoassay, electrophoresis is part of a growing trend at the Museum toward a molecular approach in the study of phylogeny and evolution.

La Perouse Bay, Manitoba, in collaboration with Fred Cooke of Queen's University, Canada. The present focus of this project is the construction of a complete life history table, including a model for reproductive fitness. As part of the evaluation of reproductive fitness, embryos that failed to hatch were collected and were examined for abnormalities, which could warn of the accumulation of toxic compounds, perhaps caused by adults feeding extensively on agricultural lands.

Bird of Paradise Displays Senior Scientific Assistant Mary LeCroy spent four weeks in Papua New Guinea studying displays of several species of Bird of Paradise. Lawes' and Queen Carola's Six-wired Birds of Paradise were actively displaying, simultaneously as well as separately, on two side-by-side display courts in mountain forest at 6000 feet. The Black Sicklebill Bird of Paradise was not actively displaying during her stay, but observations were made of daily patterns of activity and vocalizations in the vicinity of the display post.

Giant Ground Birds Scientific Assistant Allison V. Andors received his Ph.D. from Columbia University in January. His research was on giant groundbirds of North America (Aves, Diatrymidae). *Diatryma*, a bird with a formidable-looking bill lived in coastal lowlands and alluvial floodplains and was a browsing herbivore (and not, as previously believed, a carnivore). Flightless, its wings were reduced to about the same proportions as those of the kiwis, emus and extinct flightless geese.

Male Hormones Research Associate Cheryl Harding continued her study of the role of hormone metabolism in the control of male social behavior, focusing on the interaction of male and female hormones in the normal activation of social behavior in male birds. Research during the past year (supported by a Research Development Award from the National Institutes of Mental Health) has documented the importance of female, as well as male, hormones in controlling singing behavior. Dr. Harding is assisted in her research by postdoctoral fellows Sharon Barclay and Michael Walters and graduate students Amelia Gardner and Joanne Oliva-Purdy.

African Birds Research Associate Stuart Keith pursued his systematic research on African birds and continued to work on "The Birds of Africa." Volume III of this important treatise was published in 1988 and good progress was made on Volume IV.

An expedition to Liberia was organized and carried out in March-April by Research Associate Robert W. Dickerman, assisted by Associate Parker Cane and former Peace Corps Volunteer Michael Carter. Nearly 500 specimens of birds were collected, many of which are important additions to the anatomical collection. This expedition was funded by the Chapman Fund and private donors.

Chinese Voices Ben F. King, Associate, was invited to visit an area in Sichuan Province, southwest China, to search for the endemic Sichuan Hill-Partridge (*Arborophila rufipectus*), which lives at an altitude of 1000-2000 meters in an area only 60 by 160 kilometers. Mr. King obtained tape recordings of this rare bird's voice. Mr. King visited two reserves in Zhejiang and Guangdong Province, and various areas in Guizhou Province, where he tape-recorded a number of species, especially those of the genus *Bradypterus*, the systematics of which he is studying.

Philosophy of Biology Curator Emeritus Ernst Mayr continued his research into the history of major concepts in biology, and published another important book, "Toward a New Philosophy of Biology: Observations of an Evolutionist."

Chapman Fellows Jonathan Becker's research examined the systematics and biogeography of small arboreal land birds occurring in North America 9 million to 11 million years ago. He collaborated with Storrs L. Olson, of the National Museum of Natural History, Smithsonian Institution, on a description of the extensive marine avifaunas of Miocene and Pliocene age from the Lee Creek Mine, near Aurora, North Carolina. Another ongoing project is the description of a late Pleistocene avifauna from Aldabra Atoll, Republic of Seychelles.

Angelo Capparella initiated two major projects: (1) the phylogeny and diversification of the Neotropical family woodcreepers (Dendrocolaptidae), involving skin and syringeal analysis and electrophoretic tissue analysis and (2) geographic variation of skin, skeletal and biochemical characters in the Wedge-billed Woodcreeper (*Glyphorhynchus spirurus*), a joint project with Dr. Barrowclough.

Graduate Students Joseph DiCostanzo (Sponsor: Dr. Rockwell) studied how age affects reproduction in Common Terns at Great Gull Island. Patricia Escalante (Sponsor: Dr. Vuilleumier) spent a second season in Mexico, studying the yellowthroat genus *Geothypis*. Rosemarie Gnam (Sponsor: Dr. Short) investigated the breeding biology of the Abaco population of the Bahama Parrot (*Amazona leucocephala bahamensis*). Sylvia Hope (Sponsor: Dr. Lanyon) nearly completed the writing of her Ph.D. thesis on phylogeny and evolution in the family Corvidae. Mary Katz (Sponsor: Dr. Short) began a three-year study of geographical variation of the endemic Australian *Pardalotus strictus* (her doctoral

research is supported by the Australian Bird Fund). F. Jay Pitocchelli (Sponsor: Dr. Lanyon) collected birds and tape-recorded their vocalizations in North Dakota, Manitoba and Saskatchewan, for his study of morphometric and song geographic variation in the Mourning Warbler (*Oporornis philadelphia*).

Conservation Dr. Vuilleumier gave an invited lecture at the third meeting of Comparative Studies of Tropical Mountain Ecosystems, in Tenerife, Spain, sponsored by Unesco (Man and Biosphere Program) and the International Union of Biological Sciences. Scientists, conservationists and government officials gathered there to discuss strategies for preservation and rational use of these fragile ecosystems.

Chairing the Woodpecker Specialist Group of the International Union for the Conservation of Nature and Natural Resources, Dr. Short arranged for continuation of Ivory-billed Woodpecker investigations in Cuba by Committee members Ted Parker III of Louisiana State University and Jerome Jackson of Mississippi State University, and planned further studies of this rarest of birds. He also advised the U. S. Fish and Wildlife Service on its searches for it in the United States.

Collaborative Studies Dr. Vuilleumier collaborated with Ms. LeCroy and Dr. Mayr on a revision of the new species of birds described between 1981 and 1985. With the help of Dr. Andors, Dr. Vuilleumier began a study of the important Macmillan collection of New Caledonian birds.

With Jennifer Horne and Cecilia Gichuki of the National Museums of Kenya, Dr. Short completed an annotated checklist of East African birds. He published three major works, two with Ms. Horne, on African honeyguides, barbets and woodpeckers. With Lamont Curator Emeritus Dean Amadon, he prepared a manuscript reviewing and introducing new terminology for taxonomic categories between subspecies and genera.

Dr. Amadon is publishing "Hawks and Owls of the World: An Annotated List," with Field Associate John Bull. Two other projects, "Review of Minor Taxonomic Categories" (with Dr. Short) and "Monotypic Genera in Ornithology," were advanced toward completion.

Ms. LeCroy carried out systematic studies jointly with Research Associate Jared Diamond on *Malurus grayi-campbelli* populations and on the *Gallirallus philippensis* complex. Research Associate Walter J. Bock and James Gulledge continued work on a revised version of the "Reference List of Birds of the World."

Diverse Activities Research Associate Robert Bleiweiss continued his studies of biochemical systematics in hummingbirds, geographic variation in Andean birds and evolution of plumage coloration. Dr. Bleiweiss' work was partially supported by a grant from the University of Wisconsin Natural History Museums Council.

In March-April, Dr. Diamond resurveyed the land and freshwater birds of two island groups (the Kei Islands of Southeastern Indonesia and the Aru Islands between New Guinea and Australia) whose avifauna had been the object of numerous collecting expeditions in the 19th century, but about which virtually no field observations or recent knowledge of status were available.

Dr. Dickerman completed his systematic studies of Red-tailed Hawks in the northeastern United States, revised several South American bird species and conducted field studies in North Carolina, Newfoundland, Alaska and Panama.

Honors and Awards
Dr. Barrowclough was elected a Fellow of the American Ornithologists' Union in August. Dr. Bock became a faculty member of the program in Ecology and Systematics at the City University of New York. He also became permanent secretary of the International Ornithological Committee of the International Ornithological Congress. Mr. King was appointed a Field Associate of the Laboratory of Ornithology at Cornell University.

The Frank M. Chapman Memorial Fund Committee awarded 63 grants to researchers, totaling $44,000.

Acquisitions Dr. Barrowclough, with the assistance of Dr. Andors, Ms. Escalante, Mr. Pitocchelli and Drs. Dickerman and Cane, continued to oversee the growth of the anatomical collection.

A total of 759 spirit specimens and 290 skeletons were incorporated into the anatomical collection (including noteworthy accessions from Mary C. McKittrick, Robert M. Zink, Kim H. Howell, Dr. Dickerman, Dr. Barrowclough and Ms. Escalante). Other contributions to the anatomical collection were made by the Liberty Wildlife Rehabilitation Foundation, the New Jersey Raptor Trust, Novak's Aviary and the New York Zoological Society.

A total of 914 skin specimens were cataloged during the year. Among these new acquisitions are significant collections made by Drs. Vuilleumier in Chile; Barrowclough in the U.S. and Canada; Dickerman in the U.S., Canada and Liberia (with Dr. Cane); Ms. Escalante in Mexico, and Mr. Pitocchelli in the U.S. and Canada.

As in the past, our loan program is vigorous: 112 loans were closed (23 foreign), 44 loans were opened (10 foreign), involving a total of 2477 and 1018 specimens, respec-

tively. The scientific staff received 95 loans (1690 specimens) and returned 94 loans (1689 specimens) from other institutions. Nearly 250 visitors used the collections.

Scientific Publications:

Amadon, D.
1987. Comments on reversed sexual dimorphism: the female dominance theory. Gabar 2: 49-50.

Becker, J.
1987. Neogene avian localities of North America. Smithson. Res. Monogr. 1: 1-171. Washington, D. C.: Smithsonian Inst. Press.

1987. The fossil birds of the late Miocene and early Pliocene of Florida. I. Geology, Correlation, and systematic overview. *In* C. Mourer-Chauviré (ed.), Table ronde internationale du CNRS, L'evolution des oiseaux d'après le témoignage des Fossiles. Documents des Laboratoires de Géologie, Lyon, 99: 159-171.

Bleiweiss, R.
1988. Systematics and geographic variation in the Golden-breasted Puffleg *Eriocnemis mosquera* (Aves, Trochilidae). Am. Mus. Novitates 2913: 1-8.

Bock, W. J.
1988. The nature of explanations in morphology. Am. Zool. 28: 205-215.

Bock, W. J., and *D. Homberger*
1988. Introduction to the symposium: Questions, explanations, models and tests in morphology: The interaction between hypothesis and empirical observations. Am. Zool. 28: 185-187.

Bull, J.
1988. Vermilion Flycatcher on Long Island: a first record for New York State. Am. Birds 42 (1): 16.

1988. A first substantiated record of Golden-crowned Sparrow from New York State. Kingbird 38 (1): 8-9.

Cole, C. J., *H. C. Dessauer,* and G. F. Barrowclough
1988. Hybrid origin of a unisexual species of whiptail lizard, *Cnemidophorus neomexicanus,* in western North America: New evidence and a review. Am. Mus. Novitates 2905: 1-38.

Cooke, F., and R. F. Rockwell
1988. Reproductive success in a lesser snow goose population. *In* T. H. Clutton-Brock (ed.), Reproductive success, 237-250. Chicago: Univ. of Chicago Press.

Dickerman, R. W.
1987. Notes on the Brown Creeper. Texas. Bull. of the Texas Ornithol. Soc. 16: 34-35.

1987. The "Old Northeastern" subspecies of Red Crossbill. Am. Birds 41: 187-194.

1988. An unnamed subspecies of *Euphonia rufiventris* from Venezuela and northern Brazil. Bull. of the Br. Ornithol. Club 108: 20-22.

Dickerman, R. W., and R. G. Goelet
1987. Northern Gannet starvation after swallowing styrofoam. Mar. Poll. Bull. 18: 293.

Dickerman, R. W., and *K. C. Parkes*
1987. Subspecies of the Red-tailed Hawk in the northeast. Kingbird 37: 57-64.

Dickerman, R. W., and W. H. Phelps, Jr.
1987. Tres nuevos atrapamoscas (Tyrannidae) del Cerro de la Neblina, Territorio Amazonas, Venezuela. Boletín de la Sociedad Venezolana de Ciencias Naturales 41: 27-32.

Fry, C. H., S. Keith, and *E. K. Urban* (eds.)
1988. The birds of Africa, vol. 3. London: Academic Press.

King, B.
1987. The waterfall swift *Hydrochous gigas.* Bull. of the Br. Ornithol. Club 107 (1): 36-37.

Lande, R., and G. F. Barrowclough
1987. Effective population size, genetic variation and their use in population management. *In* M. E. Soule (ed.), Viable populations for conservation, 87-123. Cambridge Univ. Press.

Lanyon, W. E.
1988. A phylogeny of the thirty-two genera in the *Elaenia* assemblage of tyrant flycatchers. Am. Mus. Novitates 2914: 1-57.

1988. The phylogenetic affinites of the flycatcher genera *Myiobius* Darwin and *Terenotriccus* Ridgway. Am. Mus. Novitates 2915: 1-11.

1988. A phylogeny of the flatbill and tody-tyrant assemblage of tyrant flycatchers. Am. Mus. Novitates 2923: 1-41.

Pitocchelli, J. * (Sponsor: W. E. Lanyon)
1987. Software capsule reviews: Macspin, Macproof and Mapmaker. Network VII (1): 2-4.

1987. Power pasting for the Macintosh: SmartScrap and the Clipper. Network VII (1): 10-11.

Rockwell, R. F., *C. S. Findlay,* and *F. Cooke*
1987. Is there an optimal clutch size in lesser snow geese? Am. Nat. 130: 839-863.

Rockwell, R. F., and G. Barrowclough
1987. Gene flow and the genetic structure of populations. *In* F. Cooke and P. A. Buckley (eds.), Avian genetics, 223-255. London: Academic Press.

Short, L. L.
1988. Picidae. *In* C. H. Fry, G. S. Keith, and E. K. Urban (eds.), The birds of Africa, vol. 3: 512-556. London: Academic Press.

Short, L. L., and *J. F. M. Horne*
1987. The gender of the barbet genus *Tricholaema* Verreaux and Verreaux. Bull. of Br. Ornithol. Club 107: 69.

1987. Black mamba takes Northern Crombec from mobbing bird group. Scopus 11: 53-54.

1988. Capitonidae. *In* C. H. Fry, G. S. Keith, and E. K. Urban (eds.), The birds of Africa, vol. 3: 413-486. London: Academic Press.

1988. Indicatoridae. *In* C. H. Fry, G. S. Keith, and E. K. Urban (eds.), The birds of Africa, vol. 3: 486-512. Academic Press, London.

Short, L. L., *J. F. M. Horne,* and *J.P. Chapin*
1988. *Indicator narokensis* Jackson is synonym of *Indicator meliphilus* (Oberholser). Mitteilungen Zool. Museum Berlin, 63 (1987), Suppl., Ann. Orn. 11: 161-168.

Vuilleumier, F.
1987. Suggestions pour des recherches sur les avifaunes cénozoiques d'Amérique du Sud. *In* C. Mourer-Chauviré (ed.), Table ronde internationale du CNRS, L'evolution des oiseaux d'après le témoignage des fossiles. Documents des Laboratoires de Géologie, Lyon 99: 239-248.

1988. Avian diversity in tropical ecosystems of South America and the design of national parks. Biota Bull. 1(2): 5-32.

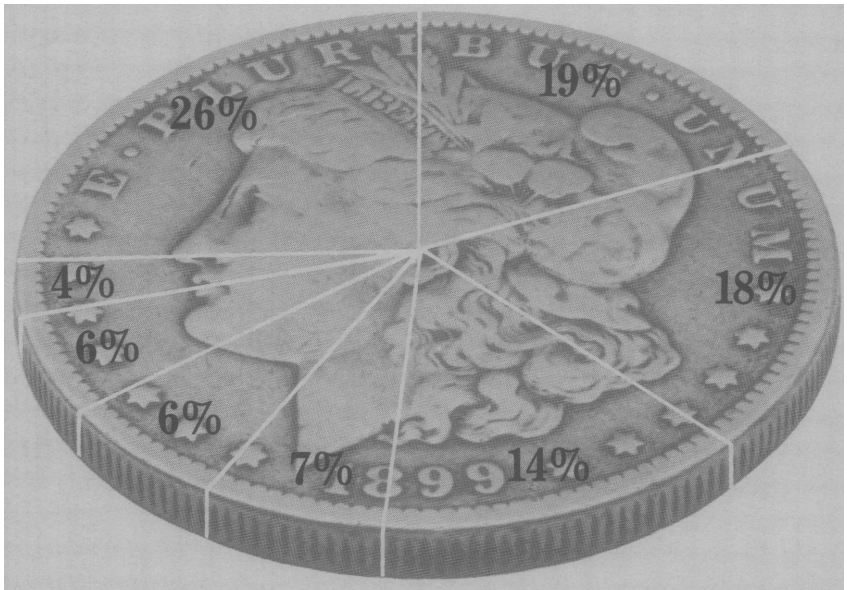
*Walters, M. J.** (Sponsor: C. F. Harding), and C. F. Harding
1988. The effects of an aromatization inhibitor on the reproductive behavior of male zebra finches. Hormones and Behavior 22: 207-218.

Financial Statements

American Museum of Natural History

Revenue 1987-88
44,794,795

26%	Natural History Magazine & Membership
19%	City of New York (Appropriated Funds 15%) (Value of Energy Services & Contributions to Pension Costs 4%)
18%	Endowment & Related Funds
14%	Auxiliary Activities
7%	Visitor Contributions
6%	Grants & Other Restricted Funds
6%	Other Revenue
4%	Corporate & Individual Contributions



Expenses 1987-88
43,389,042

33%	Scientific Research, Education & Exhibition
25%	Natural History Magazine & Membership
21%	Plant Operation & Maintenance
12%	Administrative & General
9%	Auxiliary Activities

Treasurer's Report

The Financial Statements of the American Museum of Natural History appear on the following pages. These statements which consist of the Balance Sheets, Statements of Revenue and Expenses of Current Funds, and Statements of Changes in Fund Balances have been audited by Coopers & Lybrand. The related notes appear on pages A-8, A-9 and A-10. In reviewing the Balance Sheets it should be noted that investments in marketable securities are recorded at cost and amounted to $167,573,363. They are recorded on a trade-date basis. They include the General Fund of $8,963,318, Special Funds of $19,643,602 and Endowment Funds of $138,966,443. The General Fund investments of $8,963,318 consist mainly of cash payments from Museum members for benefits to be provided in future years and are generally offset by the liability for unearned membership income which amounts to $8,686,710. Special Funds investments of $19,643,602 consist mainly of funds received for the completion of special programs and projects funded by government agencies, private foundations and individuals, as well as Museum funds set aside for specific programs to be completed in future years. Endowment Funds investments of $138,966,443 represent funds allocated for endowment purposes by donors or by the Board of Trustees since the organization of the Museum in 1869.

Despite the October stock market crash, the market value of total invested funds declined only slightly to $177 million on June 30, 1988, from $180 million on June 30, 1987. This resulted from a conservative asset allocation and good results by our outside investment managers.

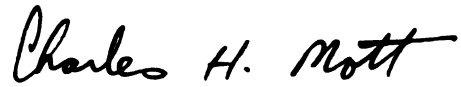
The revenue and expenses of the General and Special Funds appear on page A-6 in the Statement of Revenue and Expenses of Current Funds. Total revenue for the funds amounted to $44,794,795. Total expenses amounted to $43,389,042. In reviewing this statement it should be noted that while the combined operation for both funds shows a total excess of revenue over expenses of $2,076,753, the General Fund which provides the continuous support for scientific and educational as well as administrative activities, had an excess of expenses over revenue after support grants of $221,807. Special Funds, which are restricted and used for special programs and projects which may continue for several years, had an excess of revenue over expenses of $2,298,560.

The General Fund revenue in fiscal 1987-88 amounted to $34,777,193, an increase of $2,902,892 over the prior year. These increases occurred in the following areas: appropriated funds contributed by the City of New York, distribution from Endowment Funds; interest and dividends; *Natural History* magazine and membership, and auxiliary activities.

The increase in the appropriated funds represented a funding of negotiated salary increases and social benefits for the current and prior years. The increase of distribution from Endowment Funds resulted from an application of the income allocation formula as explained in Note 8. The increase in interest and dividends is due to an increase in the level of investments as well as a higher rate of return on invested funds. The increase in *Natural History* magazine and membership resulted from the effect of an increase in dues which was put into effect on July, 1985. The revenue of auxiliary activities was increased by $782,120 as detailed in Note 11.

General Fund expenses for the year amounted to $35,670,000, compared to $32,831,183 in the prior year, an increase of $2,838,817. It consisted of increases for scientific and educational activities, administrative and general, plant operation and maintenance, *Natural History* magazine and membership, and covered cost-of-living adjustments to the salaries of employees, increased costs for personnel services and supplies purchased from outside vendors, as well as increased expenditures for conservation and research programs and major physical improvements to Museum facilities.

In summary, the Museum's revenues enabled it to maintain the quality of programs for which it strives, and to plan for future development and growth. Earned revenues derived from visitors, members and others showed a healthy increase, as did interest and dividends and the distribution from endowment. These sources of funds grew at a greater rate than did expenses. Unearned revenues from gifts, bequests and grants were lower than last year's, but should benefit significantly in the future from the changes in governance introduced by the Trustees, to be implemented at the beginning of the 1989 fiscal year.



Charles H. Mott
Treasurer

Report of Independent Certified Public Accountants

To the Board of Trustees of the American Museum of Natural History:

We have audited the accompanying balance sheets of the AMERICAN MUSEUM of NATURAL HISTORY as of June 30, 1988 and 1987, and the related statements of revenue and expenses of current funds and changes in fund balances for the years then ended. These financial statements are the responsibility of the Museum's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the American Museum of Natural History at June 30, 1988 and 1987, and the results of its operations and changes in its fund balances for the years then ended, in conformity with generally accepted accounting principles.

Coopers & Lybrand

New York, New York
October 12, 1988

American Museum of Natural History Balance Sheets, June 30, 1988 and 1987

Assets:	
Cash	
Receivable for securities sold	
Accrued interest and dividends receivable	
Accounts receivable, less allowance for doubtful accounts of $462,000 in 1988 and $312,000 in 1987	
Investments (Note 2)	
Planetarium Authority bonds (Note 3)	
Inventories (Note 4)	
Prepaid expenses and other assets	
Liabilities and Funds:	
Accounts payable and accrued expenses	
Accrued employee benefit costs	
Payable for securities purchased	
Unearned membership income	
Funds:	
General Fund deficit	
Special Funds (Notes 5 and 6)	
Endowment Funds (Notes 7 and 8)	

The accompanying notes are an integral part of these financial statements.

1988				1987			
Current Funds				Current Funds			
General Fund	Special Funds	Endowment Funds	Total	General Fund	Special Funds	Endowment Funds	Total
$ 1,714,552	$ 39,146		$ 1,753,698	$ 306,080		$ 143,187	$ 449,267
		$ 177,043	177,043			1,141,826	1,141,826
31,937	69,992	1,115,752	1,217,681	16,318	$ 28,525	933,635	978,478
1,757,580	61,399		1,818,979	1,489,530	306,868		1,796,398
8,963,318	19,643,602	138,966,443	167,573,363	9,719,622	16,981,095	142,893,291	169,594,008
	425,000		425,000		425,000		425,000
1,178,370			1,178,370	1,085,475			1,085,475
785,541	199,697		985,238	710,564	150,682		861,246
$14,431,298	$20,438,836	$140,259,238	$175,129,372	$13,327,589	$17,892,170	$145,111,939	$176,331,698
$ 3,586,580	$ 698,250	$ 1,124,442	$ 5,409,272	$ 3,899,882	$ 450,144	$ 133,739	$ 4,483,765
2,379,815			2,379,815	2,217,235			2,217,235
		568,545	568,545			13,223,902	13,223,902
8,686,710			8,686,710	7,507,354			7,507,354
(221,807)			(221,807)	(296,882)			(296,882)
	19,740,586		19,740,586		17,442,026		17,442,026
		138,566,251	138,566,251			131,754,298	131,754,298
$14,431,298	$20,438,836	$140,259,238	$175,129,372	$13,327,589	$17,892,170	$145,111,939	$176,331,698

Statements of Revenue and Expenses of Current Funds for the years ended June 30, 1988 and 1987

	General Fund		Special Funds		Total	
Revenue:	1988	1987	1988	1987	1988	1987
The City of New York:						
Appropriated funds	$ 6,747,276	$ 6,188,506			$ 6,747,276	$ 6,188,506
Value of energy services and contributions to pension costs (Notes 9 and 10)	1,983,115	1,982,663			1,983,115	1,982,663
Gifts, bequests and grants	1,844,599	1,913,679	$ 2,643,927	$ 4,209,629	4,488,526	6,123,308
Distribution from Endowment Funds (Note 8)	4,285,000	3,512,000	1,697,641	1,370,142	5,982,641	4,882,142
Interest and dividends	1,358,354	956,646	585,698	515,509	1,944,052	1,472,155
Visitors' contributions			3,025,902	2,641,531	3,025,902	2,641,531
Natural History Magazine and membership	11,552,481	11,009,704			11,552,481	11,009,704
Other revenue	652,584	739,439	2,064,434	2,039,481	2,717,018	2,778,920
Auxiliary activities (Note 11)	6,353,784	5,571,664			6,353,784	5,571,664
Total revenue	34,777,193	31,874,301	10,017,602	10,776,292	44,794,795	42,650,593
Expenses:						
Scientific and educational activities	7,184,440	6,540,224			7,184,440	6,540,224
Exhibition halls and exhibits			2,270,409	1,748,553	2,270,409	1,748,553
Other special purpose programs and projects			4,666,767	4,622,673	4,666,767	4,622,673
Administrative and general	4,536,640	4,334,548	781,866	624,295	5,318,506	4,958,843
Plant operation and maintenance (Note 9)	9,255,034	8,200,282			9,255,034	8,200,282
Natural History Magazine and membership	10,857,987	10,257,161			10,857,987	10,257,161
Auxiliary activities (Note 11)	3,835,899	3,498,968			3,835,899	3,498,968
Total expenses	35,670,000	32,831,183	7,719,042	6,995,521	43,389,042	39,826,704
Excess of revenue over expenses (expenses over revenue) before support grants	(892,807)	(956,882)	2,298,560	3,780,771	1,405,753	2,823,889
Support grants (Note 12)	671,000	660,000			671,000	660,000
Excess of revenue over expenses (expenses over revenue)	($221,807)	($296,882)	$ 2,298,560	$ 3,780,771	$ 2,076,753	$ 3,483,889

The accompanying notes are an integral part of these financial statements.

Statements of Changes in Fund Balances for the years ended June 30, 1988 and 1987

	Current Funds					
	General Fund		Special Funds		Endowment Funds	
	1988	1987	1988	1987	1988	1987
Balances, beginning of year	($296,882)	($229,182)	$17,442,026	$13,661,255	$131,754,298	$110,630,833
Additions:						
Gifts, bequests and grants					1,886,972	1,974,603
Interest and dividend income (Note 8)					1,280,919	1,673,444
Net gain on sale of investments					5,178,123	18,511,090
Excess of revenue over expenses			2,298,560	3,780,771		
Total additions			2,298,560	3,780,771	8,346,014	22,159,137
Deductions:						
Excess of expenses over revenue	221,807	296,882				
General and administrative expenses					647,820	562,632
Contributions to pension cost (Notes 8 and 10)					589,359	243,858
Total deductions	221,807	296,882			1,237,179	806,490
Transfers between funds:						
Financing of: 1987 and 1986 General Fund deficits	296,882	229,182			(296,882)	(229,182)
Total transfers	296,882	229,182			(296,882)	(229,182)
Balances, end of year	($221,807)	($296,882)	$19,740,586	$17,442,026	$138,566,251	$131,754,298

The accompanying notes are an integral part of these financial statements.

Notes to Financial Statements

1. Summary of Significant Accounting Policies: The American Museum of Natural History ("Museum") maintains its accounts principally on the accrual basis.

The land and buildings occupied by the Museum are owned by the City of New York ("City") and are not reflected in the balance sheets. Fixed assets, exhibits, collections and library additions are expensed at time of purchase.

The accounts of the Museum are maintained in accordance with the principles of fund accounting in order to abide by the limitations and restrictions placed on the use of the resources available to the Museum. Revenue received and expenses incurred for specified purposes are classified for accounting and financial reporting purposes into individual funds for which separate accounts are maintained. However, in the accompanying financial statements, funds that have similar characteristics have been combined into fund groups. The General Fund consists of resources that are available at the discretion of the Board of Trustees ("Trustees") for general Museum operations. Special Funds are restricted by donors or by the Trustees for specified purposes. Endowment Funds include funds subject to restrictions established by the donor that require the original principal be invested in perpetuity, and funds established by donors or Trustees (funds functioning as endowments) where the principal may be expended for the purposes authorized.

Interest and dividend income from Endowment Funds is distributed to current funds based on a formula adopted by the Board of Trustees as described in Note 8.

Investments are stated at cost or, if acquired by gift, at fair value at date of acquisition. Nonmarketable securities are valued by the Finance Committee of the Museum and approved by the Trustees. Securities transactions are recorded on a trade date basis. Realized gains and losses on disposition of investments are calculated on the basis of average cost. Net capital gains on current funds are included in other revenue.

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

Membership income is recognized ratably over the membership term.

2. Investments:

Cost and market values of investments at June 30 are as follows:	1988		1987	
	Cost	Market	Cost	Market
General Fund	$ 8,963,318	$ 9,641,614	9,719,622	$ 10,621,618
Special Funds	19,643,602	21,132,767	16,981,095	18,558,651
Endowment Funds	138,966,443	146,955,776	142,893,291	162,402,360
Investments on trade date basis	167,573,363	177,730,157	169,594,008	191,582,629
Receivable for securities sold	177,043	177,043	1,141,826	1,141,826
Payable for securities purchased	(568,545)	(568,545)	(13,223,902)	(13,223,902)
Investments on settlement date basis	$167,181,861	$177,338,655	$157,511,932	$179,500,553

After reflecting in short-term obligations the effect of receivables and payables for securities sold and purchased, the Museum's investments consist of the following:

	1988		1987	
	Cost	Market	Cost	Market
Short-term obligations	$ 28,691,520	$ 28,691,520	$ 38,115,824	$ 38,115,824
Fixed income securities	54,901,096	56,578,333	58,351,222	60,409,463
Common and preferred stocks	79,383,724	87,939,850	59,044,886	78,919,081
Other investments	4,205,521	4,128,952	2,000,000	2,056,185
	$167,181,861	$177,338,655	$157,511,932	$179,500,553

The Museum participates in a securities lending program with United States Trust Company of New York ("Custodian"), whereby certain investments are temporarily loaned to brokerage firms. In exchange, the Museum receives cash or letters of credit as collateral in an amount which equals or exceeds the value of securities loaned. At June 30, 1988 and 1987, the market value of securities loaned amounted to approximately $ 8,929,000 and $ 9,312,000, respectively, and the market value of the related collateral amounted to approximately $9,102,000 and $ 9,315,000, respectively. 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.

3. Planetarium Authority Bonds: 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 of the Planetarium at a cost of $425,000 ($570,000 principal amount), which are past due. For the years ended June 30, 1988 and 1987, interest income on these bonds (at 4 ½%) of $25,650 was paid and is included in the General Fund revenue.

4. Inventories	1988	1987
Natural History Magazine paper	$ 594,817	$ 595,164
Museum Shops merchandise	583,553	490,311
	$1,178,370	$1,085,475

5. Special Funds: Included in Special Funds balances are approximately $7,792,000 and $6,856,000 at June 30, 1988 and 1987, respectively, restricted by the donor as to use.

6. Overdrafts: Special Funds balances at June 30, 1988 and 1987 are net of overdrafts of approximately $2,900,000 and $2,503,000, respectively. These overdrafts represent expenditures in anticipation of transfers from Endowment Funds, other Special Funds, or receipts of gifts and grants from private donors or government agencies.

7. Endowment Funds: Endowment Funds balances consist of:	June 30, 1988	June 30, 1987
Endowment Funds, income available for:		
Restricted purposes	$ 59,211,726	$ 56,571,816
Unrestricted purposes	18,854,532	18,093,000
Funds functioning as endowment, principal and income available for:		
Restricted purposes	28,108,710	27,073,384
Unrestricted purposes	32,391,283	30,016,098
	$138,566,251	$131,754,298

8. Distribution from Endowment Funds: Total interest and dividend income for the Endowment Funds for fiscal 1988 and 1987 amounted to $7,263,560 and $6,555,586, respectively. The policy adopted by the Board of Trustees provides for distributions to current funds at five percent of the average of the market value of the Endowment Funds for the three preceding years. The distributions are allocated between General and Special Funds on a unit basis which reflects the ratio of the related funds invested in the pooled portfolio to total market value. The distributions were:

	1988	1987
General Fund	$4,285,000	$3,512,000
Special Funds	1,697,641	1,370,142
	$5,982,641	$4,882,142

The excess income was retained in the Endowment Funds. Of this amount, $289,359 and $243,858 in fiscal 1988 and 1987, respectively, were allocated for pension support to the Cultural Institutions Retirement System Plan ("CIRS Plan"), based on the five percent formula. In addition, in fiscal 1988, $300,000 was withdrawn from the Pension Support Endowment Fund to fund an increase in pensions for those employees who retired before the Museum joined CIRS (7/1/71).

9. Plant Operation and Maintenance Expenses: Plant operation and maintenance expenses in fiscal 1988 and 1987 include the value of energy services supplied by the City of New York of $1,622,602 and $1,544,677, respectively.

10. Pension Plan: The Museum participates in the CIRS Plan. It is a multiemployer plan and the actuarial present value of vested and nonvested accumulated plan benefits and net assets available for plan benefits are not determinable on an individual institution basis. On July 1, 1986, the CIRS Plan was changed from a defined benefit plan to a defined benefit/defined contribution 401K plan.

The Museum accrues and funds annually the normal cost for eligible employees participating in the CIRS Plan. To be eligible under this plan, employees must be over 21 and employed for a minimum of one year. The unfunded prior service cost, with interest, is being funded over 30 years, ending in fiscal 2004. Total pension costs for eligible employees, including Planetarium personnel, amounted to approximately $1,096,000 and $1,307,000 in fiscal 1988 and 1987, respectively. Of this amount, $360,513 and $437,986 were paid by the City of New York directly to CIRS in fiscal 1988 and 1987, respectively, and $289,359 and $243,858 respectively, were funded through the Pension Support Endowment Fund.

The Planetarium reimburses the Museum for actual payroll costs for its staff. It also reimburses the Museum for all employee benefit costs, including pension, which are calculated as a percentage of payroll and amounted to $158,193 and $152,941 in 1988 and 1987, respectively.

11. Auxiliary Activities: Revenue and expenses for auxiliary activities in fiscal 1988 and 1987 were:

	1988		1987	
	Revenue	Expenses	Revenue	Expenses
Museum Shops	$3,124,898	$2,349,988	$2,668,054	$2,028,617
Discovery Tours	966,524	642,020	1,125,066	713,975
Naturemax	959,973	353,311	573,039	323,177
Other	1,302,389	490,580	1,205,505	433,199
	$6,353,784	$3,835,899	$5,571,664	$3,498,968

12. Support Grants: In fiscal 1988 and 1987 support grants were received from the New York State Council on the Arts and the Institute of Museum Services as follows:

	1988	1987
New York State Council on the Arts	$596,000	$585,000
Institute of Museum Services	75,000	75,000
	$671,000	$660,000

13. Post-retirement Benefits: The Museum provides health insurance for all retired employees and life insurance for certain retired employees. These costs are summarized below:

	1988	1987
Health insurance	$373,210	$291,392
Life insurance	76,238	74,886
	449,448	366,278
Less: Life insurance dividend	26,294	131,687
Net benefit costs	$423,154	$234,591

In 1987, the life insurance dividend included a partial return of reserve accounting to $113,816.

14. Related Party Transactions: The Museum provides certain services to the Planetarium, such as insurance, accounting and maintenance, for which the Planetarium was charged an aggregate amount of $174,664 and $172,244 in fiscal 1988 and 1987, respectively. Admission fees paid to the Planetarium include entry to the Museum. The Museum received approximately $61,900 and $58,000 in fiscal 1988 and 1987, respectively, for visitors who entered the Museum from the Planetarium.

15. Buildings: The City appropriates funds for the renovation, improvement and alteration of the buildings occupied by the Museum. Funds committed by the City for these capital projects in fiscal 1988 and 1987 amounted to $1,064,000 and $1,443,000, respectively.

16. Tax Status: The Museum is a not-for-profit organization exempt from corporate federal income tax under Section 501(c)(3) of the Internal Revenue Code.

17. Reclassifications: Certain amounts in the 1987 financial statements have been reclassified to conform with the 1988 presentation.

Financial Statements

American Museum of Natural History
Planetarium Authority

(Hayden Planetarium)

Report of Independent Certified Public Accountants

To the Board of Trustees of
the American Museum of Natural
History Planetarium Authority:

We have audited the accompanying balance sheets of the AMERICAN MUSEUM of NATURAL HISTORY PLANETARIUM AUTHORITY as of June 30, 1988 and 1987, and the related statements of revenue and expenses of current funds and changes in fund balances for the years then ended. These financial statements are the responsibility of the Planetarium's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the American Museum of Natural History Planetarium Authority at June 30, 1988 and 1987, and the results of its operations and changes in its fund balances for the years then ended, in conformity with generally accepted accounting principles.

Coopers & Lybrand

New York, New York
September 28, 1988

American Museum of Natural History Planetarium Authority Balance Sheets, June 30, 1988 and 1987

Assets:

Cash
Investments (Note 2)
Receivables and other assets
Planetarium shop inventory

Building, at cost

Building improvements and equipment:
  Building improvements, at cost
  Zeiss planetarium instrument, at cost

  Less, Accumulated depreciation

Liabilities, Contributed Capital and Funds:

Liabilities:
  Accounts payable and accrued expenses
  Accrued employee benefit costs
  4 ½% Refunding Serial Revenue Bonds, past due (Note 3)
  Accrued interest, past due

Contributed capital:
  Charles Hayden
  Charles Hayden Foundation
  The Perkin Fund

Funds:
  General Fund
  Special Funds (Note 4)

The accompanying notes are an integral part of these financial statements.

	1988			1987		
	General Fund	Special Funds	Total	General Fund	Special Funds	Total
	$ 116,298		$ 116,298	$ 75,885		$ 75,885
	422,767	$1,177,233	1,600,000	603,847	$1,046,153	1,650,000
	10,036	12,458	22,494	15,705	2,280	17,985
	48,335		48,335	64,244		64,244
	597,436	1,189,691	1,787,127	759,681	1,048,433	1,808,114
	1,019,210		1,019,210	1,019,210		1,019,210
	1,111,864		1,111,864	698,833		698,833
	221,928		221,928	221,928		221,928
	1,333,792		1,333,792	920,761		920,761
	(716,739)		(716,739)	(655,493)		(655,493)
	617,053		617,053	265,268		265,268
	$2,233,699	$1,189,691	$3,423,390	$2,044,159	$1,048,433	$3,092,592
	$ 98,728	$ 60,959	$ 159,687	$ 73,229	$ 10,511	$ 83,740
	69,204		69,204	86,346		86,346
	570,000		570,000	570,000		570,000
	315,450		315,450	315,450		315,450
	1,053,382	60,959	1,114,341	1,045,025	10,511	1,055,536
	156,869		156,869	156,869		156,869
	429,455		429,455	429,455		429,455
	400,000		400,000	400,000		400,000
	986,324		986,324	986,324		986,324
	193,993		193,993	12,810		12,810
		1,128,732	1,128,732		1,037,922	1,037,922
	$2,233,699	$1,189,691	$3,423,390	$2,044,159	$1,048,433	$3,092,592

Statements of Revenue and Expenses of Current Funds for the years ended June 30, 1988 and 1987

Revenue:

Admission fees, net
Planetarium shop sales
Special lectures and courses
Gifts, bequests and grants
Income from investments
Other revenue

Total Revenue

Expenses:

Preparation, presentation and promotion
Operation and maintenance
Administrative and general
Planetarium shop expenses
Special lectures and courses
Special purpose programs and projects
Laser program expenses
Interest on past due 4 1/2% Refunding Serial Revenue Bonds
Depreciation (Note 5)

Total Expenses

Excess of revenue over expenses

Statements of Changes in Fund Balances for the years ended June 30, 1988 and 1987

Balances, beginning of year
Excess of revenue over expenses
Transfers between funds (Note 5)

Balances, end of year

The accompanying notes are an integral part of these financial statements.

General Fund		Special Funds		Total	
1988	1987	1988	1987	1988	1987
$1,132,621	$1,080,174	$241,050	$267,955	$1,373,671	$1,348,129
269,388	237,556			269,388	237,556
73,070	59,180			73,070	59,180
21,000	36,000	38,000	232,250	59,000	268,250
40,894	29,544	75,947	54,867	116,841	84,411
51,756	65,250			51,756	65,250
1,588,729	1,507,704	354,997	555,072	1,943,726	2,062,776
736,901	664,659			736,901	664,659
246,140	233,231			246,140	233,231
128,282	129,317			128,282	129,317
206,677	203,548			206,677	203,548
52,753	41,268			52,753	41,268
		17,598	7,100	17,598	7,100
		196,486	204,149	196,486	204,149
25,650	25,650			25,650	25,650
61,246	56,717			61,246	56,717
1,457,649	1,354,390	214,084	211,249	1,671,733	1,565,639
$ 131,080	$ 153,314	$140,913	$343,823	$ 271,993	$ 497,137

General Fund		Special Funds	
1988	1987	1988	1987
$ 12,810	($186,125)	$1,037,922	$ 739,720
131,080	153,314	140,913	343,823
50,103	45,621	(50,103)	(45,621)
$193,993	$ 12,810	$1,128,732	$1,037,922

Notes to Financial Statements

1. Summary of Significant Accounting Policies: The American Museum of Natural History Planetarium Authority's ("Planetarium") corporate charter terminates when all of 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 any other City property occupied by the Museum. The Museum and the Planetarium are separate legal entities which share the same Board of Trustees ("Trustees") and Officers. The land utilized by the Planetarium was donated by the City of New York.

The Planetarium maintains its accounts principally on the accrual basis.

The accounts of the Planetarium are maintained in accordance with the principles of fund accounting in order to abide by the limitations and restrictions placed on the use of the resources available to the Planetarium. Revenue received and expenses incurred for specified purposes are classified for accounting and financial reporting purposes into individual funds for which separate accounts are maintained. However, in the accompanying financial statements, funds that have similar characteristics have been combined into fund groups. The General Fund consists of resources that are available at the discretion of the Trustees for general Planetarium operations. Special Funds are restricted by donors or by the Trustees for specified purposes.

Major building improvements are capitalized and depreciated using 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.

Investments are stated at cost.

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

2. Investments: Investments at June 30, 1988, consist of short-term obligations in the amount of $1,100,000 and fixed income securities in the amount of $500,000. The aggregate market value approximates cost.

3. Revenue Bonds: The Planetarium 4 ½% Refunding Serial Revenue Bonds are owned by the Museum. The Charles Hayden Foundation contributed $200,000 to the Museum toward the purchase of such bonds.

4. Special Funds: Included in Special Funds balances were approximately $199,214 and $258,000 at June 30,1988 and 1987, respectively, restricted by the donor as to use.

5. Depreciation: Depreciation on major plant additions and replacements which have been financed from cash generated by restricted funds is funded by transfers from restricted funds.

6. Related Party Transactions: The Museum provides certain services, such as insurance, accounting and maintenance, to the Planetarium. The aggregate charges for these services in fiscal 1988 and 1987 were $174,664 and $172,244, respectively.

The Planetarium reimburses the Museum for actual payroll costs for its staff. In addition, the Planetarium reimburses the Museum for estimated benefit costs, including pension, which are calculated as a percentage of payroll and amounted to $158,193 and $152,941 in 1988 and 1987, respectively.

Admission fees paid to the Planetarium also include entry to the Museum. The Planetarium paid the Museum approximately $61,900 and $58,000 in fiscal 1988 and 1987, respectively, for visitors who entered the Museum from the Planetarium.

7. Tax Status: The Planetarium is a not-for-profit organization exempt from corporate federal income tax under Section 501 (c)(3) of the Internal Revenue Code.

Abstracts, Reviews and Popular Publications

Barclay, S. R., A. Gardner, and C. F. Harding
1988. (Abstracts) Steroid modulation of monoamine levels and turnover in the vocal control system and hypothalmus of the male zebra finch. Soc. for Neurosci. 13: 57.

Barrowclough, G. F.
1987. [Review of] Birds: a guide to the literature, by M.A. Miller. Recent Publ. in Nat. Hist. 5(2): 2-3.

1987. [Review of] Patterns and evolutionary significance of geographic variation in the Schistacea group of the Fox Sparrow (*Passerella iliaca*), by R. M. Zink. Wilson Bull. 100: 167-169.

1988. [Review of] Ecology and evolution of Darwin's finches, by P. R. Grant. Condor 90: 522-523.

Bull, J.
1988. Logic in English bird names (part 1). Linn. Newsl. 41(9): 1-3.

1988. Logic in English bird names (part 2). Linn. Newsl. 42(1): 1-3.

Clark, Jr., G. A., L. von Haartman, T. R. Howell, J. A. Keast, B. King, *D. T. Lees-Smith,* E. Mayr, *H. Morioka, K. C. Parkes, S. D. Ripley, R. W. Schreiber, W. H. Timmis, M. D. F. Udvardy, K. H. Voous,* F. Vuilleumier, and *D. R. Wells*
1988. Indomalayan region: a substitute name for Wallace's Oriental Region. Ibis 130:447-448.

Gnam, R.* (Sponsor: L. L. Short)
1987. Underground parrots. Anim. Kingdom 90: 40-44.

1987. Preliminary results on the breeding biology of the Bahama Amazon. Parrotletter 1: 23-26.

Keith, G. S.
1987. [Review of] Handbook of the birds of Europe, the Middle East and North Africa. The birds of the Western Palaearctic, Vol. IV, by S. Cramp (chief ed.). Wilson Bull. 99: 728-729.

1987. [Review of] Key to ageing and sexing of European passerines, by P. Busse. Auk 104: 580.

King, B.
1987. [Review of] A Guide to the birds of Nepal, by C. Inskipp and T. Inskipp. Auk, 104:148-149.

1987. Wild sighting of Brown Eared Pheasant. World Pheasant Assoc. News 15: 14.

1987. Elliot's Pheasant observation in SE China. World Pheasant Assoc. News 15: 22-24.

1987. [Review of] Pocket guide to the birds of Borneo, by C. Francis. Auk 104: 588.

1987. [Review of] New colour guide to Hong Kong birds, by C. Viney and K. Phillipps. Auk 104: 588.

1987. Some bird observations at Pang quango Reserve in West Central Shanxi Province in NE China. Hong Kong Bird Rep. 1984/1985: 111-114.

1987. Some notes on the birds of the Yi Shan area of NW Tiangxi Province, China. Hong Kong Bird Rep. 1984/1985: 115-119.

1988. Wild sighting of Cabot's Tragopan. World Pheasant Assoc. News 18: 21-23.

King, B., *J. Clements,* and *R. Clements*
1988. First long-legged buzzard, *Buteo rufinus,* for Sri Lanka. Ceylon Bird Club Notes, January 1988: 1.

1988. Sri Lanka field notes, January 1988. Ceylon Bird Club Notes, January 1988: 2-3.

Short, L. L.
1987. [Review of] Threatened birds of Africa and related islands, by N. J. Collar and S. N. Stuart. Wilson Bull. 99: 736-737.

1987. In search of Cuban Ivory-billed Woodpecker. Assoc. of Syst. Collect. Newsl. 15(4): 9.

1987. The Ivory-bill: a galvanizing effect. World Birdwatch 9(3): 9.

Short, L. L., and *M. Carbonell*
1987. Cuba—in focus. World Birdwatch 9(3): 8-9.

Short, L. L. and *J. F. M. Horne*
1988. Answering the call of the honeyguide. Int. Wildlife 18(2): 42-44.

Vuilleumier, F.
1987. The origin of high Andean birds. *In* N. Eldredge (ed.), The natural history reader in evolution, 108-116. New York: Columbia Univ. Press.

1987. [Review of] An atlas of past and present pollen maps for Europe: 0-13000 years ago, by B. Huntley and H. J. B. Birks. Auk 104: 794-795.

1987. [Review of] A guide to the birds of Colombia, by S.L.Hilty and W. L. Brown. Linn. Newsl. 41(4 and 5): 2-3.

1987. [Review of] Biogéographie évolutive, by J. Blondel. Q. Rev. of Biol. 62: 456-457.

1988. [Review of] Les oiseaux des regions forestières du Nord-est du Gabon, vol. 1, Ecologie et comportement des espèces, by A. Brosset and C. Erard. Wilson Bull. 100: 157-158.

Department of Vertebrate Paleontology

The Department of Vertebrate Paleontology foscused its activities on the summer, 1988, exhibition "From the Land of Dragons," which displayed for the first time to western audiences a spectacular collection of Chinese fossils. Planning also proceeded for the extensive renovation of the Osborn Hall of Late Prehistoric Mammals, which will more effectively display the vast diversity represented in the department's Frick Collection. These programs were complemented by the broad spectrum of research on fossil vertebrates by departmental staff, research fellows and students. For such purposes the department draws on one of the richest and most varied collections of fossil vertebrates in the world, a collection that has, in part, received notable improvements in facilities during the past year.

Program Support The awesome new collection of Brazilian Cretaceous fishes and other vertebrates donated by Herbert Axelrod provided the impetus for renovation of the fossil fish collection and study area. With support from a National Science Foundation grant awarded to Associate Curator John G. Maisey,

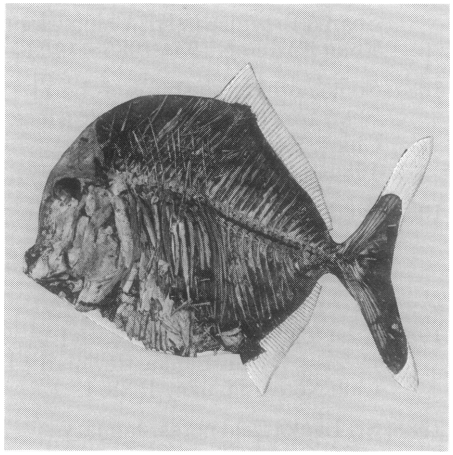
and cost-sharing by the Museum, air-conditioning was installed and track work for an elaborate system of movable compact storage was constructed. Newly purchased computer equipment will assist in database management of the fossil fish collection.

Exhibition Programs Curator Eugene S. Gaffney and Exhibition Coordinator Lowell Dingus developed themes, labels, a brochure and a video script for the special exhibition of spectacular fossils from China. This was the first exhibition of its kind to be held in North America and its July, 1988, opening was highlighted by a symposium presenting a number of international experts on Chinese fossil vertebrates.

Dr. Gaffney also prepared, with assistance from Senior Artist Frank Ippolito and Laboratory Preparators Jeanne Kelly and Jane Shumsky, a temporary exhibit of *Proganochelys*, the world's oldest turtle, for viewing in the Museum's Rotunda.

Curator Richard H. Tedford worked closely with Dr. Dingus in plans for extensive renovation of the Osborn Hall of Late Prehistoric Mammals. A number of new and fascinating skeletal mounts, including the fossil camel, *Procamelus,* and the primitive carnivore *Amphicyon* will go on display. The phylogenies and evolutionary histories of those orders of mammals whose major differentiation took place after the Eocene will be exhibited. An early phase of this program will require much cleaning and restoration of the skeletal mounts by the department's laboratory staff. The unique and outstanding material planned for display is drawn from the spectacular Frick Collection of fossil vertebrates. This and many other activities continue to be supported generously by the Frick Laboratory Endowment Fund.

Fish Systematics and Evolution Dr. Maisey continues his investigations on chondrichthyan interrelationships and on skeletal structures important to vertebrate evolution. With the assistance of Axelrod Fellow Stanley Blum, he has completed a good part of a manuscript for an illustrated atlas



A 110-million-year-old fossil fish from the Cretaceous period is embedded in acrylic plastic before the surrounding rock is dissolved with acid, resulting in a specimen with elaborate detail. The fossil is from a new collection of Brazilian Cretaceous fishes and other vertebrates donated by Herbert Axelrod to the Department of Vertebrate Paleontology. A major renovation of the fossil fish collection area; included installation of air conditioning and a movable compact storage system that increases storage space and provides for greater accessibility.

on Brazilian Cretaceous fishes. Dr. Maisey also participated in a multidisciplinary expedition to Western Australia in the summer of 1987, which recovered middle to late Paleozoic and Mesozoic fishes from many localities. This year marks the final stage of Dr. Maisey's NSF-funded research on the cranial anatomy of hybodontid sharks.

Turtlemania Together with Postdoctoral Fellow Peter Meylan, Dr. Gaffney hosted the second meeting of the World Palaeochelonological Society, held at the Museum in early October. At this symposium, 40 scientists from the United States, Europe and China, presented their findings, from areas as diverse as morphology and molecular biology, on the systematics of all known living and extinct turtles.

Dr. Gaffney also continued his studies of the giant meiolaniid turtles of Queensland and Lord Howe Island. Some of these animals reached nearly 14 feet in length. He also studied fossils of the Australian *Pseudemydura,* the rarest living turtle, and the turtle *Proganochelys* from 200-million-year-old deposits in Germany. Nearly as ancient is the 180-million-year-old *Kayentachelys,* the earliest turtle from North America. This genus was the subject of a multi-authored article published in *Science.*

From Molecules to Molars Frick Curator Malcolm C. McKenna pursued his studies of mammalian history from several directions. Recently published was his contribution to a volume on molecular and morphological evidence of phylogeny. Amino-acid sequence data as well as the more traditional dental and skeletal evidence were presented in this review of higher mammal relationships. This analytical treatment was accompanied by continued computerization of mammalian classification data, which is being loaded onto a MacIntosh II system. Carnivores, rodents, artiodactyls and several other orders of mammals have been thoroughly revised, and geologic ranges have been updated for several thousand taxa.

Dr. McKenna also completed, with coauthors J. Howard Hutchison and Joseph Hartman, a paper on the nonmarine Paleocene faunas of the Goler Formation of eastern California. These faunas lived in an environment close to the Pacific Ocean, when it extended far inland during late Paleocene times. He participated in a summer 1987

expedition to Axel Heiberg, Ellesmere and Devon Islands in the Canadian High Arctic, a venture yielding many new taxa of Eocene vertebrates. Among projects completed or nearing completion were studies of earliest perissodactyls, South American herbivorous Arctostylopidae and early fossil plagiomeniids, a group thought to be related to modern flying lemurs.

Related to these mammalian inquiries is Andre Wyss' important paper on the relationships of the walruses and the origin of the pinnipeds. Mr. Wyss argues that pinnipeds, which include the walruses, "true" seals and sea lions, are a monophyletic group, or one having a single origin. This idea rejects some well-known claims for pinniped diphyly but is supported by independent evidence.

The Origins of Bats As bats are the only mammals capable of powered flight, a single origin for their group has long been a plausible and popular notion. A much publicized challenge to this concept was recently issued by several neurobiologists who claim that brain structure demonstrates a close affinity between the non-echolocating "fruit bats" (suborder Megachiroptera) and primates. John Wible (University of Chicago) and Michael J. Novacek, Chairman and Associate Curator, published a paper in *Novitates* rejecting the argument that some bats are actually "flying primates." They documented not only details of wing structure but features of skull anatomy that explicitly support the traditional view of a single origin, a view also corroborated by new molecular evidence from amino-acid sequences.

Dr. Novacek continued his examinations of other major issues in mammalian phylogeny. A paper coauthored with Ross MacPhee (Duke University) and Gerhard Storch (Senckenberg Museum) disclosed the evidence against the theory that primates were phylogenetically close to the erinaceomorph (hedgehoglike) insectivorans. He also completed an updated review of problems in higher mammalian phylogeny for a volume of "Current Mammalogy." A contribution to the Linnaean Society's tetrapod symposium (described in the 1987/1988 Annual Report), coauthored with Dr. McKenna and Mr. Wyss, will appear late in 1988.

Dr. Novacek complemented these activities with a third season of field investigations of fossil mammalian faunas in the high Andes of Chile. Despite some severe Patagonian weather, this year's effort yielded a large sample of exquisitely preserved skulls and jaws of rodents and marsupials. Geological description and paleomagnetic sampling of this sequence was also completed by Research Associate John J. Flynn and co-workers. The work was supported in part by the Eppley Foundation.

Chinese Mammal History In the fall of 1987, Dr. Tedford coordinated a NSF-funded expedition to examine Neogene-aged deposits in the Yushe Basin of North China. Work concentrated on intensive biostratigraphic collecting and rock sampling for paleomagnetic analyses. Other members of the field team included Lawrence J. Flynn (postdoctoral fellow at Harvard University and former Carter Fellow in this department), Will Downs (Northern Arizona University), Neil Opdyke (University of Florida), and Zhanxiang Qiu (Institute of Vertebrate Paleontology and Paleoanthropology, Beijing). This year's activities included monitoring the succession of small mammal communities through geological time. The appearance of murid rodents and the later immigration of North American canids and camelids to the North China region was narrowed down to a specific time period. These events seem to bracket a time of marked turnover in the resident fauna.

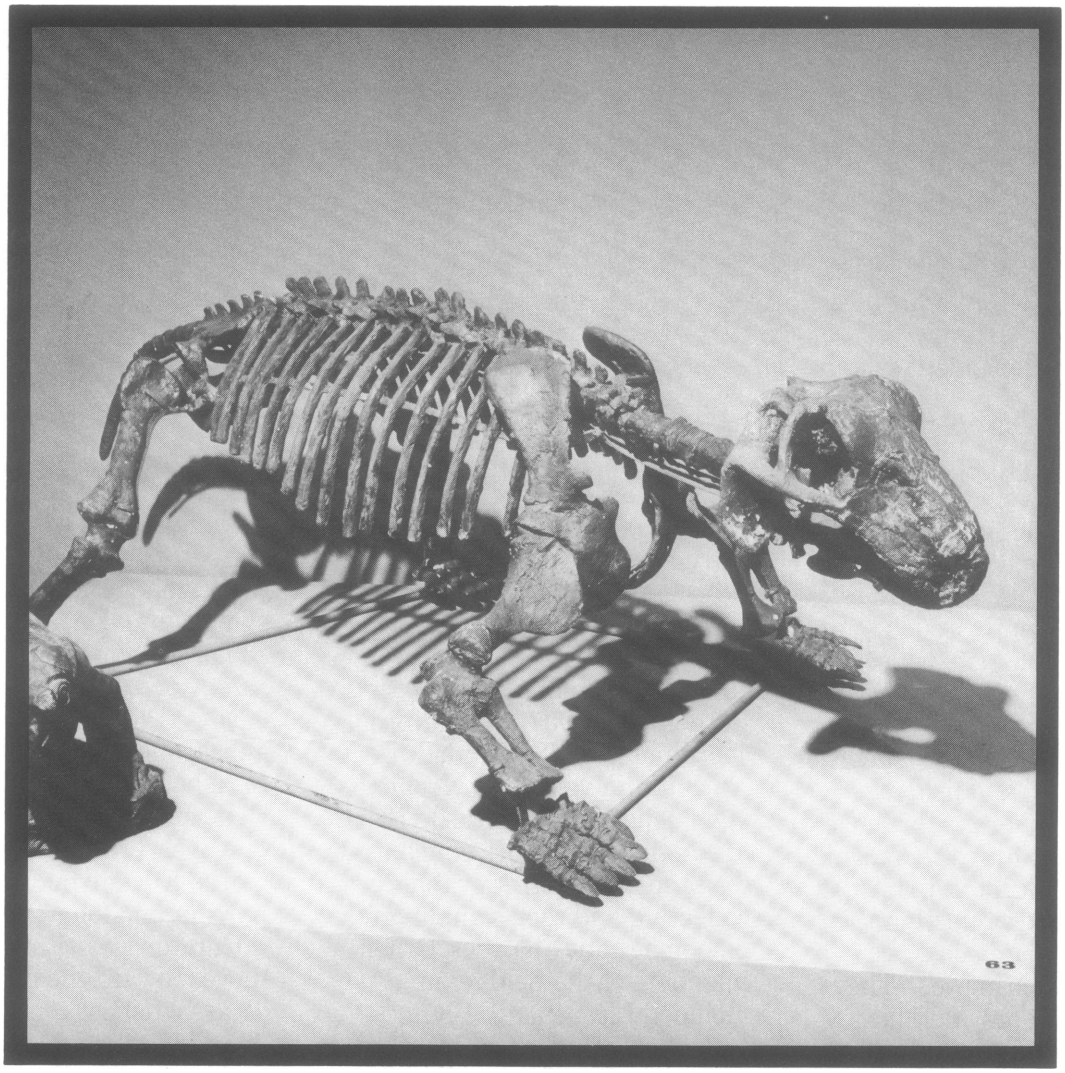
In the spring of 1988, Dr. Qiu and Yuqing Li (Tianjin Museum of Natural History) visited the AMNH to study collections of carnivores and suid artiodactyls originally gathered from the Yushe Basin sequence. This research exchange was supported both by NSF funds and the department's Carter Fund for research.

Other Contributions Dr. Tedford also completed two coauthored manuscripts on middle and late Pleistocene faunas of central Australia and the historic Pliocene-age Coimadai Fauna of Victoria. Completed or nearly completed are several papers on marsupial and carnivore systematics, including a coauthored review of carnivore phylogeny for the Linnaean Society's tetrapod symposium. Dr. Tedford was the senior author of an exhaustive survey of Late Oligocene through earliest Pliocene mammalian geochronology of North America for a book on the North American Cenozoic. Dr. McKenna was also one of several authors on a chapter on the Eocene published in this important and long-awaited volume.

Curator Emeritus Bobb Schaeffer moves toward the end of studies on Triassic fishes from Angola (with John Maisey and Keith Thomson) and his joint project with Brian Gardiner (University of London) on the interrelationships of the lower actinopterygian fishes. To add to this very active research program, Dr. Schaeffer continues to write and edit several sections for a textbook on vertebrate paleontology.

Curator Emeritus Edwin H. Colbert reports continued activity

The dicynodont, a plant-eating relative of mammals originating about 260 million years ago, is one of 42 fossils brought to the American Museum from China for the exhibition, "From the Land of Dragons," which was scheduled for later in the year. The Department of Vertebrate Paleontology also



planned the extensive renovation of the Osborn Hall of Late Prehistoric Mammals in order to display the enormous diversity represented in the department's Frick Collection. A number of skeletal mounts, including the fossil camel Procamelus *and the primitive carnivore* Amphicyon, *will go on display in the updated hall.*

in both research and popular writings on dinosaur evolution.

Research Associate Eric Delson and graduate students under his direction completed several studies on cercopithecid phylogeny and early hominid evolution. Dr. Delson's insights on the implications of new finds of early, anatomically modern humans were published in *Nature* and discussed in the *New York Times*. He also continued as a co-editor of the *Journal of Human Evolution* and as a co-editor (with Curator Ian M. Tattersall and John A. Van Couvering, Editor) of the "Encyclopedia of Human Evolution and Prehistory."

Staff Transitions It is noteworthy that this year Research Associate Don Baird retired as Curator/Professor in Geological and Geophysical Sciences at Princeton University. Dr. Baird's expert care of Princeton's superlative fossil vertebrate collection (recently transferred to Yale University) is as appreciated by his many colleagues as his important scientific contributions. Starting July 1, Dr. Baird began a new phase of his scientific career in association with the Carnegie Museum of Natural History in Pittsburgh.

Scientific Publications:

Azzaroli, A., M. Boccaletti, E. Delson, *G. Moratti,* and *D. Torre*
1987. Chronological and paleogeographical background to the study of *Oreopithecus bambolii.* J. Human Evol. 15: 533-540.

Delson, E.
1987. An anthropoid enigma: Historical introduction to the study of *Oreopithecus bambolii.* J. Human Evol. 15: 523-531.

1988. One source not many. Nature 332: 206.

Gaffney, E. S., *J. H. Hutchison, F. A. Jenkins, Jr.,* and L. J. Meeker
1987. Modern turtle origins: The oldest known cryptodire. Science 237: 289-291.

Hook, R. W., and D. Baird
1987. An overview of the Upper Carboniferous fossil deposit at Linton, Ohio. Ohio J. Sci. 88: 55-60.

Hunt, R. J.
1987. Evolution of the aeluroid Carnivora: Signficance of auditory structure in the nimravid cat *Dinictis.* Am. Mus. Novitates 2886: 1-74.

Krishtalka, L., R. M. West, C. C. Black, M. R. Dawson, J.J. Flynn, *W. D. Turnbull, R. K. Stucky,* M. C. McKenna, *T. M. Bown, D. J. Golz,* and *J. A. Lillegraven*
1987. Eocene (Wasatchian through Duchesnean) biochronology of North America. *In* M. O. Woodburne (ed.), Cenozoic mammals of North America: geochronology and biostratigraphy, 77-117. Berkeley: Univ. Calif. Press.

MacFadden, B. J.
1988. Horses, the fossil record, and evolution: A current perspective. *In,* M. K. Hecht, B. Wallace, G. T. Prance (eds.), Evolutionary Biology, 22: 131-158. New York: Plenum Press.

MacFadden, B. J., and *A. Azzoroli*
1987. Cranium of *Equus insulatus* (Mammalia, Equidae) from the middle Pleistocene of Tarijia, Bolivia. Jour. Vert. Paleo. 7(3): 325-334.

MacFadden, B. J., *M. J. Whitelaw, P. MacFadden,* and *T. H. V. Rich*
1987. Magnetic polarity stratigraphy of the Pleistocene section at Portland (Victoria), Australia. Quaternary Res. 28(3): 364-373.

MacPhee, R. D. E., M. J. Novacek, and *G. Storch*
1988. Basicranial morphology of early Tertiary erinaceomorphs and the origin of primates. Am. Mus. Novitates 2921: 1-42.

Maisey, J. G.
1987. Cranial anatomy of the Lower Jurassic shark *Hybodos reticulatus* (Chondrichthyes, Elasmobranchii), with comments on hybodontid systematics. Am. Mus. Novitates 2878: 1-39.

1988. Phylogeny of early vertebrate skeletal induction and ossification patterns. Evol. Biol. 22: 1-36.

McKenna, M. C.
1987. Molecular and morphological analysis of high-level mammalian interrelationships. *In* C. Patterson (ed.), Molecules and morphology in evolution: conflict or compromise?, 55-93. Cambridge: Cambridge Univ. Press.

McKenna, M. C., *J. H. Hutchison,* and *J. H. Hartman*
1987. Paleocene vertebrates and nonmarine Mollusca from the Goler Formation, California. *In* B. F. Cox (ed.), Basin analysis and paleontology of the Paleocene and Eocene Goler Formation, El Paso Mountains, California, 31-41. Soc. Econ. Paleo. & Mineral. Pacific Sect.

Meylan, P. A., and *R. G. Webb*
1988. *Rafetus swinhoei* (Gray) 1873, a valid species of living soft-shelled turtle (family Trionychidae) from China. J. Herpetol. 22(1): 118-119.

Naeser, C. W., E. H. McKee, N. M. Johnson, and B. J. MacFadden
1987. Confirmation of a late Oligocene-early Miocene age of the Deseadan Salla Beds of Bolivia. Jour. Geol. 95: 825-828.

Opdyke, N. D., D. S. Jones, B. J. MacFadden, *D. L. Smith, P. A. Mueller,* and *R. D. Shuster*
1987. Florida as an exotic terrane: Paleomagnetic and geochronologic investigation of lower Paleozoic rocks from the subsurface of Florida. Geology 15: 900-903.

Strasser, E.* (Sponsor: E. Delson)
1987. Pedal evidence for the origin and diversification of cercopithecid clades. *In* E. Strasser and M. Dagosto (eds.), The primate postcranial skeleton: studies in adaptation and evolution, 225-245. London: Academic Press.

Strasser, E.* (Sponsor: E. Delson), and *M. Dagosto,* editors
1987. The primate postcranial skeleton: studies in adaptation and evolution, 265 pp. London: Academic Press.

Strasser, E.* (Sponsor: E. Delson), and E. Delson
1987. Cladistic analysis of cercopithecid relationships. J. Human Evol. 16: 81-99.

Tedford, R. H., *R. W. Fields,* T. Galusha, *J. R. Macdonald, J. M. Rensberger,* M. F. Skinner, B. E. Taylor, *S. D. Webb,* and *D. P. Whistler*
1987. Faunal succession and biochronology of the Arikareean through Hemphillian interval (late Oligocene through earliest Pliocene epochs) in North America. *In* M. O. Woodburne (ed.), Cenozoic mammals of North America: geochronology and biostratigraphy, 153-210. Berkeley: Univ. Calif. Press.

Wible, J. R., and M. J. Novacek
1988. Cranial evidence for the monophyletic origin of bats. Am. Mus. Novitates 2911: 1-19.

Wolman, M. G., G. A. Barber, L. S. Cluff, A. V. Cox, D. J. Depaolo, C. L. Drake, A. R. Green, P. C. Grew, J. P. Hunt, C. Kisslinger, M. W. Leighton, M. C. McKenna, et al.
1987. Geologic mapping in the U. S. Geological Survey, 22 pp. Washington D. C.: Natl. Acad. Press.

Wyss, A. R.* (Sponsor: M. C. McKenna)
1987. The walrus auditory region and the monophyly of pinnipeds. Am. Mus. Novitates 2871: 1-31.

Abstracts, Reviews and Popular Publications:

Dean, D.* (Sponsor: E. Delson)
1987. [Review of] The red ape: orangutans and human origins, by J. H. Schwartz. Social Issues and Health Review 2(2): 64.

1988. [Review of] Major topics in primate and human evolution, edited by B. Wood, L. Martin, and P. Andrews. Am. J. Primatol. 14(2): 195-199.

Delson, B., and E. Delson
1988. To find early humans, dig we must. Faces 4(4): 18-22.

Delson, E.
1987. [Review of] L' environnement au temps de la prehistoire, by J. Renault-Miskovsky. Quart. Rev. Biol. 62: 349-350.

1988. [Review of] Variation, culture and evolution in African populations, edited by R. Singer and J. K. Lundy. J. Human Evol. 16: 274-275.

Maisey, J. G.
1987. Evolution of the shark. *In* J. D. Stevens (ed.), Sharks, 14-17. New York: Facts on File.

1987. New fossil coelacanth named after Dr. Herbert R. Axelrod. Tropical Fish Hobbyist, Nov. 1987: 76-84.

1987. [Review of] Chondrichthyes II, by H. Cappetta. Cladistics 3(4): 386-389.

1987. [Review of] The ancestry of vertebrates, by R. P. S. Jefferies. Quart. Rev. Biol. 62(4): 450.

1988. Response to Schultze. Copeia 1988(1): 259-260.

McKenna, M. C.
1988. The vertebrates updated. [Review of] Vertebrate paleontology and evolution, by R. L. Carroll. Science 239: 512-513.

1988. [Letter to the Editor] Stones, bones, names. The New York Times, Feb. 6, 1988.

Novacek, M. J.
1988. Regulation and fossil collecting—an alternative view. Palaios 3: 253-254.

Wahlert, J. R.
1987. [Review of] Looking at vertebrates: a practical guide to vertebrate adaptations, by E. Rogers. Recent Publ. Nat. Hist. 5: 4-5.

Wyss, A. R.* (Sponsor: M. C. McKenna), *M. A. Norell*, M. J. Novacek, J. J. Flynn, and *D. Frasinetti*
1987. (Abstract) Miocene mammals of the southern Andes. J. Vert. Paleontol. 7 (supplement to no. 3): 29A.

Research Stations

In sharp contrast to the Museum's urban setting, four research stations provide curators, visiting scientists and graduate students with research opportunities in diverse habitats. Each station is located in a different section of North America, with distinctive physical and biological environments offering a wide range of habitats and animals for researchers to investigate. Valuable long-range scientific data has been collected from these rural research outposts.

Southwestern Research Station
This year marked the 33rd year of operation for the Southwestern Research Station. Located near Portal, Arizona, the facility continues to attract researchers from the Museum's curatorial staff, universities and museums throughout the United States and worldwide. Many outstanding researchers return to the station for long-term investigation. The continuity of studies for many years has enabled scientists to address many questions of ecological and behavioral significance.

Located at an elevation of 5400 feet in the Chiricahua Mountains, the station provides access to a variety of habitats and an assortment of plants and animals, allowing researchers to study a variety of ecological, behavioral and taxonomic problems. Because of the elevational changes, five separate life zones (ecological groupings of plants and animals) provide vast research opportunities within a limited geographical area.

For the first time since its founding in 1955, the scientific contributions of the station have been summarized. A computerized listing of publications based on research carried out at the station is now available as: "SWRS Bibliography: Bibliography of Research Publications Contributed by Scientists Working at the Southwestern Research Station of the American Museum of Natural History, 1955-1987."

A SWRS Scientific Advisory Committee was established and met at the station. Outstanding field researchers from other institutions contributed their thoughts on the current and future directions of the station in a report to the Director of the Museum. The ongoing committee will continue to serve the station in maintaining its position as a locale where scientists from around the world encounter unique support facilities for their work in a biologically exciting location.

Again it was a fulfilling year for the expanded volunteer program at the station, with 21 potential scientists, mainly university students or recent graduates, participating. In exchange for room and board and the opportunity to work with researchers in the field, volunteers work on station chores four hours a day. They typically remain at the station from six weeks to three months and provide a valuable work force for housekeeping chores and maintenance. The long hours volunteers spend in the field assisting researchers provide them with a unique and valuable

experience enabling them to assess their career goals with greater clarity and depth. Volunteers came from throughout the United States; six from Canada, England, France and Italy.

This year a total of 1318 people stayed at the station, an increase over the previous year. Active researchers at the station totaled 136, a significant increase over the 99 from last year. A total of 10 university or college classes stayed at the station for course work. The station was host to the Arizona Native Plant Society's annual Labor Day Chiricahua Weekend Retreat and numerous birding tours and hiking clubs enjoyed residence at the facility as well. Individual naturalist visitors to the station totaled 602 persons during the year.

The scientific community at the station continued its tradition of inviting the public to seminars and slide presentations. This year 35 such programs were presented. These evening events not only bring cohesion among researchers, research assistants, volunteers and other station residents, but also serve as an educational public service to the surrounding community.

A total of 35 papers based on work accomplished at the station was completed during the year.

Resident Director Wade C. Sherbrooke successfully defended his doctoral dissertation "Integumental Biology of Horned Lizards (*Phrynosoma*)" and received his Ph.D. from the Department of Ecology and Evolutionary Biology at the University of Tucson.

Dr. Sherbrooke spent January and February researching the South American lungfish and its mechanisms for hormonal regulation of color change. He was a visiting professor at the Instituto de Biosciencias of the Universidade de São Paulo.

Great Gull Island Located in Long Island Sound, 17 miles northwest of Montauk Point, Great Gull Island contains the largest concentration of individually marked Common Terns in the world.

This year the largest sampling of Common Terns since research began on the island in 1969 were marked. From the 6500 nests marked during the summer, about 5000 pairs were collected. This was due to the excellence of the field crew, slower egg-laying at the beginning of the season and lower than normal rainfall.

For the past two seasons, two 25-year-old birds were observed; both fledged young, setting the longevity record for the species. This will give valuable insight into the success of older birds in the colony and their contribution. In the next 10 to 15 years, Great Gull Island researchers will have a unique opportunity to study birds that are 20-years-old and older.

Helen Hays, Chairperson of the Great Gull Island Committee and director of the project, continued her long-term research on population dynamics and reproduction of Common Terns with the help of numerous volunteers. By weighing chicks several times during the season, Ms. Hays hopes to determine at what age Common Terns are the most effective parents.

Research on the 17-acre site is supported by a Birdathon, an annual fundraising effort sponsored by the Linnaean Society of New York. A grant from the Anne S. Richardson Foundation for two portable computers will allow data to be entered in the field. A grant from the Exxon Foundation through Richard Haig provided three digital scales. In 1987, the Moriches Bay Audubon Society made a contribution to the project in honor of LeRoy Wilcox and Gilbert Raynor.

Archbold Biological Station Scientists at the Archbold Biological Station, located in south-central Florida, conduct an extensive research program that emphasizes ecology, evolutionary biology and animal behavior. Station staff, research associates and 40 visiting investigators (from 16 college and universities and five government agencies) conducted 96 projects during the year. Staff and visiting scientists published 42 papers based on research at the station.

More than 2100 visitors to the station included college and university classes, elementary school groups, environmental and nature study groups, civic and religious groups, individual visitors, and scientists from other institutions and government agencies.

The long-term study of behavioral ecology of the Florida scrub jay, begun in 1969 by Glen E. Woolfenden, Research Associate, and continued with collaborator John W. Fitzpatrick, of the Field Museum of Natural History, has been expanded.

A project was completed with the Florida Nongame Wildlife Program to develop habitat protection guidelines for Florida scrub jays. A three-year National Science Foundation grant to Dr. Fitzpatrick and Dr. Woolfenden is funding a postdoctoral position to study territorial quality and habitat use. Ronald L. Mumme of Memphis State University, funded separately by NSF, is conducting a two-year field experiment on the role of helpers-at-the-nest, and with Dr. Woolfenden is attempting to band all scrub jays on the station's 4300 acres. Jack P. Hailman, of the University of Wisconsin, is conducting an intensive study of incubation attentiveness and reproductive success. Bertram G. Murray, of Rutgers University, is testing a theory on clutch size with Florida scrub jay data. Several graduate

students are engaged in studies of acorn tannins (a defensive chemical that plants produce) and scrub jay use of acorns, clutch size and fledgling success, nest predators, predator mobbing and sentinel systems.

Sir David Attenborough visited the Archbold Biological Station with a production crew of six from the British Broadcasting Company's natural history unit in April. A segment on the nest defense and feeding of young by Florida scrub jays was filmed as part of a 12-part series entitled, "The Trials of Life: Survival Strategies in the Animal Kingdom," written and presented by Sir David. The series will appear on British and American television during the 1990-1991 season.

The most significant single addition to the physical plant in the station's 47-year history was the construction of an annex at the north end of the main building during 1987. The 3500-square-foot building has an 80-seat lecture hall, three office/laboratories, and four rooms housing the herbarium, fish, herpetological, bird and mammal collections.

Research Associate Thomas Eisner, of Cornell University, made a significant financial contribution to the station and a pledge of future donations. Larry Walkinshaw and H. R. Comstock, of Lake Wales, Florida, donated a collection of 2500 color slides of North American Birds.

St. Catherines Island A relatively undeveloped and unspoiled barrier island off the Georgia coast, St. Catherines Island is available for researchers through the generous support of the Edward John Noble Foundation. Scientists and advanced students conduct field research in archeology, ecology, evolutionary biology and other aspects of the island's natural history.

The island is the site of continued archeological excavations by Dr. Thomas, of the Department of Anthropology, and his research team. Dr. Thomas' research, which has been supported by both the Edward John Noble Foundation and the St. Catherines Island Foundation since 1974, focused on the 16th/17th century Mission of Santa Catalina de Guale.

Having spent several years excavating the church ruins and cemetery at Santa Catalina, the focus has more recently been on the monastery complex itself. The research team has now discovered that the *convento* (friary) consists of not one, but three different buildings: one destroyed by Native American rebellion in 1597, another destroyed by British troops in 1680 and one constructed somewhere in between. Micro-stratigraphic excavation is currently attempting to distinguish the three building episodes and to define the religious and secular implications of each. The *cocina* (kitchen) has revealed an unexpected stratigraphic sequence spanning the 17th century. An extraordinarily high number of European domesticates and local mammalian remains suggests an unusually European character to the high-status diet at Santa Catalina. This picture presently conflicts with contemporary wisdom about the 16th/17th century colonization of the American southeast, which previously implied that the Spanish conquerors had "gone native" when moving to *La Florida*. The emerging picture suggests a rethinking about the economic and subsistence nature of the early Hispanic conquest of the United States.

The research team is also conducting an extensive "remote sensing" survey of the mission site on St. Catherines Island. Reworking previously conducted surveys by proton magnetometer, soil resistivity and ground-penetrating radar, the team is conducting close-interval, small-scale sampling to extend the boundaries of the mission site without the necessity of conducting large-scale excavation. This noninvasive, nondestructive approach to archeology promises to leave significant portions of the archeological record intact for future generations of archeologists who will undoubtedly be equipped with more sophisticated theoretical and technological insights.

Under the auspices of the St. Catherines Island research program, administered by the Office of Grants and Fellowships, several scientists from around the country have studied the island's zoology, geology and botany.

Department of Education

From its presentation of Identification Day and the annual Margaret Mead Film Festival to operation of the Alexander M. White Natural Science Center, the department of Education is at the forefront of the Museum's interface with the public. Through its programs and activities the department directly touches more than 200,000 visitors each year, about half that number being young people. The aims of the department are to address programs and activities to public audiences of adults as well as young people; to broaden the base of the Museum's constituency by attracting new audiences; and to add to public understanding of the collections and exhibitions.

Service to Schools The reservation/registration office in the department processes thousands of requests from teachers in the tri-state region for independent visits on school-

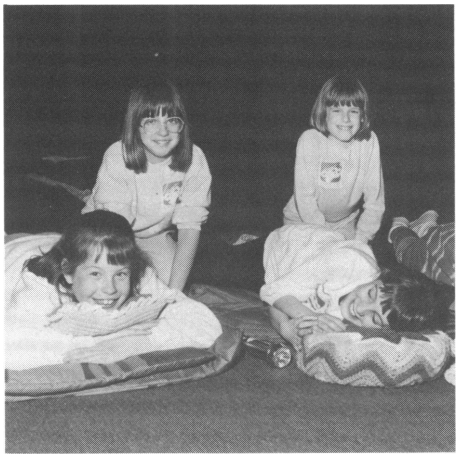
day mornings as well as hundreds of requests for school programs taught by staff members and which are open to schools in New York City. In 1987-88, a total of more than 138,000 children, teachers and adult chaperones were registered for independent class visits. A group of 60 department volunteers encounters many of these groups and provides short but effective learning experiences in the exhibition halls. More than 27,000 youngsters were reached by volunteers in this way.

In addition, nearly 20,000 youngsters in school class groups had the opportunity of having a program taught by a department staff member. The most popular topics follow a familiar pattern with dinosaurs, ocean life, Eastern Woodland and Plains Indians, and peoples of Africa at the top of the list. To these totals must be added another 19,000 youngsters in class groups that participated in February programs during Black History Month.

Adult Learning People often associate museum education with young people, but the department serves an equal number of adults. There are ticketed afternoon and evening lecture series, annual events such as the Margaret Mead Film Festival, college accredited courses for teachers and local field trips. There also is a largely adult audience in one of the department's weekend demonstration/performance facilities, the Frederick H. Leonhardt People Center.

More than 6000 adults enrolled for lecture series, a local field trip or a course for teachers. Another 34,000 people had less formal learning experiences in the Leonhardt People Center, which hosted an average of 1000 visitors each weekend from October through June.

Among the outstanding lecture series this year was one in conjunction with the special exhibition, "Carthage: A Mosaic of Ancient Tunisia." Among the six lecturers for this series were the guest curator for the exhibition as well as the director of the Musee de Bardo in Tunis, from which most of the objects were borrowed. Other series topics included dinosaur evolution, human sexuality, bats, gems, animal nutrition, mushrooms and mosses, and films from the Museum archives.



Members of Girl Scout troops in the tri-state area camp overnight beneath the 94-foot-long blue whale model in the Hall of Ocean Life and the Biology of Fishes. The camp-in, with 150 girls participating, was an Education Department program during which the girls took part in science workshops, heard staff members talk about career opportunities in science, took a flashlight tour of the dinosaur halls and saw nature and anthropology films. The program was the first of its kind sponsored by a museum in New York City.

Local field trips included a two-day bus trip to survey geological formations in northeastern Pennsylvania, a birding weekend in the Pine Barrens of New Jersey and a weekend of whale watching off the rich feeding grounds of Stellwagon Bank near Cape Cod. Morning walks in Central Park for birders remain popular, particularly in the spring season

To the list of local trips sponsored by the department should be added three summer cruise/lectures on the geological features of the rivers and harbor areas of New York City. Some 1600 people took advantage of these opportunities to sail and learn.

The Frederick H. Leonhardt People Center focused on a different region of the world or cultural tradition each month. Africa, the Caribbean, India, Korea, American Indians and Latin America were highlighted with live demonstration/ performances of music and dance, along with short slide talks, films and demonstrations of crafts.

Community Programming Most of the community programs are designed to attract new audiences, particularly members of the African-American, Latin American and Caribbean communities. There are scores of programs offered throughout the year, ranging from lectures and participatory workshops to films and performances.

An outstanding achievement this year was a series of programs for school groups during Black History Month. In a four-week period more than 19,000 youngsters in school classes attended programs in four facilities: the Louis Calder Laboratory, the Harold Linder Theater, the Henry Kaufmann Theater and the Edith Blum Lecture Room. Teachers reserved one from among more than 150 separate craft workshops, theater performances or film programs. Supported by a grant from the New York State Council on the Arts, this special month was in addition to the regular teaching programs offered to schools daily throughout the academic year.

Another community program, the Junior High School Natural Science Program, shares the goal of expanding service to school age youngsters, but provides it through an indepth experience for a single group. Twenty youngsters from six schools in upper Manhattan and the Bronx came to the Museum two afternoons a week throughout

Ann Prewitt, left, and Janice B. Durant, Museum Instructors, examine African and Chinese artifacts from the Department of Education's teaching collections. Objects from the collections are used to educate adults and children. The department hosts week-

day visits by school groups, and produces weekend public programs in the Frederick H. Leonhardt People Center, the Alexander M. White Natural Science Center and the Discovery Room. Department programs and activities involved more than 200,000 visitors last year.

the school year for an intensive science curriculum.

This program, supported by the Christodora Foundation and by income from a gift by Mrs. Harold Boeschenstein, encourages these boys and girls to continue an interest in science in the hope that they will consider the possibility of a career in science. A planned outgrowth of the program has been to develop modular units for a science curriculum that would be useful to junior high schools generally. A dozen school classes came to the Museum with their teachers to test these curriculum units for future use in the schools.

Other community programming activities contributed to a total attendance figure of more than 55,000 adults and young people. These included performances, lectures and films on many themes. Musical traditions of the Caribbean, religious movements in that area, African influence in the western hemisphere and the family were topics. Workshops for adults and young people added other topics such as folktales, games, textiles and puppetry with African roots. The December Kwanzaa African-American celebration was the largest family-oriented community event of the year.

Part of the department's outreach activity is directed to groups of the visually and hearing impaired and classes of learning disabled youngsters. These activities are supported by a gift from the Vidda Foundation. This year more than 2500 people were served through these programs. This figure includes 95 special education classes from school and 44 groups of young people from other community organizations.

These programs are carried out in small groups because of the special needs of the individuals involved. The total figure, however, does include 200 persons who attended weekend performances of a theater piece designed for the hearing impaired.

Other Departmental Facilities The Alexander M. White Natural Science Center was host to 52,000 visitors, most of them on weekends and the majority in family groups. Like all the facilities of the department, it functions in multiple ways. On school day mornings it serves as a learning environment for classes in the New York City School system. In the afternoons and on weekends it is open to visitors. Most of the exhibit units it contains have interactive elements.

The Discovery Room is physically the smallest of the weekend interpretive facilities, but like the others it serves multiple functions. During the week it is the setting for special teaching programs for the visually impaired and learning disabled. On weekends from October through June it is open to visitors with youngsters from five to 10 years old. This year more than 6000 parents and children had the opportunity to investigate artifacts and specimens together in this learning space.

Special Programming Among the special programs this year were a nature film festival, a children's concert and a symposium on Korea held in conjunction with a special exhibition. Identification Day, an annual event at which several hundred visitors of all ages bring objects and specimens to be examined and identified by staff members, is also one of the special programs. This year a new program was begun. One hundred and fifty Girl Scouts participated in an overnight "Camp-In" at the Museum. They slept beneath the 94-foot-long whale in the Hall of Ocean Life, had science workshops in the evening and listened to staff members outlining career opportunities in science.

The annual Margaret Mead Film Festival continues to be the department's largest single public event. Over the course of four evenings, the 11th annual Mead Festival drew more than 7000 adults who watched documentary films and listened to the filmmakers and anthropologists who had made them. Increasingly international in scope, the Mead Festival began as a one-time celebration of the late anthropologist; it has become an ongoing tribute to her.

Publications:

Arth, M.J.
1987. The Margaret Mead Film Festival and the ethnographic documentary. *In* Art and Artisans: A Celebration of the Margaret Mead Film Festival, 7-9. New York: The American Federation of Arts.

Department of Exhibition and Graphics

Natural history museums today create increasingly complex exhibitions that present artifacts and scientific specimens as a means of interpreting the natural sciences. The Department of Exhibition and Graphics has the task of planning, designing and installing both special exhibitions and permanent halls utilizing the latest in visual and electronic techniques.

Special Exhibitions The major exhibition mounted by the department was "Carthage: A Mosaic of Ancient Tunisia." Drawn mainly from the collections of the Bardo Museum in Tunis, this comprehensive exhibition presented mosaics, bronzes, ceramics and other artifacts to tell the story of the Carthaginian civilization from 800 B.C. to the beginning of the Islamic period in the seventh century A.D. The Roman occupation and destruction of Carthage, and its eventual

rebirth, were illustrated by mosaics, maps and photographs. David Soren, professor of Classics and Archeology at the University of Arizona, was Exhibition Coordinator. "Carthage: A Mosaic of Ancient Tunisia" will travel to museums in Houston, New Orleans, Albuquerque and Los Angeles as part of a tour organized by the American Museum. The exhibition was supported by a major grant from the National Endowment for the Humanities, and the National Council on the Arts and Humanities indemnified the Tunisian collection.

In Gallery 1, two special exhibitions were presented. The first was "Dinosaurs Past and Present," a collection of visualizations of dinosaurs by various artists and sculptors. The exhibition was organized by the Los Angeles County Museum of Natural History. The other exhibition, "Tiffany: 150 Years of Gems and Jewelry," presented more than 100 objects illustrating Tiffany's use of gemstones in jewelry design. Mineral specimens in the exhibition highlighted the story of noted American Museum gemologist George F. Kunz, and the shared history of Tiffany and the American Museum.

"Ancient Ivories of the Bering Strait" and "In the Realm of the Wild: The Art of Bruno Liljefors of Sweden," two shows in the Naturemax Gallery, demonstrated the variety of subject matter included in the department's exhibition program. "Ancient Ivories of the Bering Strait," which was organized by the American Federation of the Arts and sponsored by Exxon, featured beautifully carved ivory artifacts made by Eskimos of the Bering Strait. The exhibition on the art of Bruno Liljefors was organized by the Gothenburg Art Gallery in Sweden. It presented the remarkable wildlife images of the Swedish painter who died in 1939. After closing at the American Museum, the Liljefors exhibition traveled to the Bell Museum of Natural History in Minneapolis.

Exhibitions presented in the Akeley Gallery included a pictorial representation of the architectural history of the American Museum of Natural History. "Architecture for Dinosaurs" featured old photographs, drawings and beautiful watercolor renderings. Another exhibition, "In Time of Plague," employed drawings, prints, paintings and cartoons to tell the story of social reaction to plagues and epidemics over the ages. The treatment of AIDS was included as well as social reaction to the disease.

Michael Rapkiewicz, Projectionist in the Department of Exhibition and Graphics, repairs a video cassette recorder. The department uses visual and electronic devises in audio-video presentations and computer displays in exhibitions. For example, video images were used to enlarge an 80-million-year-old fossil bee preserved in amber for an Arthur Ross Exhibit-of-the-Month. Video monitors are also used to display public information in the halls and to show videotapes and in exhibitions.

Timed to coincide with the Summer Olympics in Seoul, the exhibition, "The Once and Future Korea," was based on photographs of turn-of-the-century Korea taken by Museum explorer, Roy Chapman Andrews. The photographs were combined with modern images of Korea's dramatic transformation into an industrial power. The exhibit was partially funded by the Arthur Ross Foundation.

Several Exhibits-of-the-Month were sponsored by the Arthur Ross Foundation in Roosevelt Memorial Hall. These included "The World's Oldest Turtle," a replica of the skeleton of the original fossil found in Germany and believed to be 200 million years old. The annual Origami Holiday Tree was erected in Roosevelt Memorial Hall and attracted large numbers of visitors from late November to early January. Another Exhibit-of-the-Month presented a bee found in a block of amber from New Jersey. Identified by David Grimaldi as the "Oldest Known Bee," the fossil is believed to be 80 million years old. Video images of the tiny rotating amber specimen provided a greatly enlarged image for viewers.

Permanent Halls The Hall of South American Peoples was completed and was scheduled to open to the public in January, 1989. Work continues on the design and planning of the Hall of Human Biology and Evolution. Design and preparation work to refurbish the Osborn Hall of Late Mammals is also in progress.

Graphics The section designed a vast amount of material for the Education Department, the Office of Public Affairs, Discovery Tours and many scientific departments. Numerous brochures were produced. Booklets describing exhibitions such as "The Once and Future Korea" and the upcoming "From the Land of Dragons" were created. The section is also responsible for producing the Annual Report.

AudioVisual The AudioVisual section, under the guidance of Larry Van Praag, has made improvements to the Museum-wide video information system. New monitors were placed at various

A Rikbaktsá man, wearing ceremonial feather ornaments, plays a panpipe of harpy eagle quills. The Amazonian Indian is one of nine life-sized manikins in the Amazonian section of the Museum's 40th permanent exhibition hall, the Hall of South American Peoples, scheduled for public opening in January, 1989. The hall houses some

2300 objects and portrays the aboriginal cultures of South America, from Colombia to southern Chile. Among its projects, the Department of Exhibition and Graphics is also planning the refurbishment of the Osborn Hall of Late Prehistoric Mammals, which should be completed in 1990, and the Hall of Human Biology and Evolution, tentatively scheduled for 1991.

points throughout the Museum's public spaces, and a computer-controlled titling and still-frame playback system was installed. The AudioVisual section also produced and edited several videotapes for exhibitions, including "Carthage: A Mosaic of Ancient Tunisia" and "The Once and Future Korea," as well as an instructional tape on the making of acrylic mounts for artifacts.

Department of Library Services

The interrelationships being identified among the vast collections of the Library point to the wisdom of integrating its photographic, film archival, and art and memorabilia collections with traditional library monographs and serials. Together, these collections form a rich resource for an international community of scientists and scholars.

Integrating Collections Over the past decade, the Library has been sorting, inventorying and cataloging the various nonbook collections placed under its curation. Because of their format, nonbook collections, such as photographs, films, works of art, and paper archives and manuscripts, have been cataloged and maintained separately for preservation and for ease of handling and storage. Identifying and connecting the relationships among collections previously scattered through the Museum has been the recent objective of the Library. Because of this integrated approach, the use of special collections has increased significantly under the Library's curation.

Making such connections among disparate collections requires extensive research, detailed cataloging and the production of special finding aids. The Library is implementing programs to integrate its collections. It is investigating computerized systems, planning a more efficient physical arrangement of collections and more centralized services, and conducting extensive conservation of these irreplaceable materials. The Clark Foundation generously pledged $150,000 to provide crucial compact storage systems.

Grants Over the last 10 years, grants have helped provide the means to inventory, catalog and preserve the special collections placed under the Library's curation. The U.S. Department of Education Title II-C program two-year grant to microfilm and catalog important manuscripts and archives held by the Library and the Museum's scientific departments continues this year with a grant of $163,000. Eighty-five titles were microfilmed onto 877 reels, including 200,000 index cards for a catalog of the Ichthyology Department. The New York State Library Preservation/Conservation grant program provided funds to restore an album of 491 turn-of-the-century ethnographic photographs, mostly from the Pacific Northwest, and to design an environmental system for the main stack collection.

In addition, awareness of the Library's efforts to preserve and catalog natural history documentation and publications has led to the deposition of important collections that frequently add information to existing holdings.

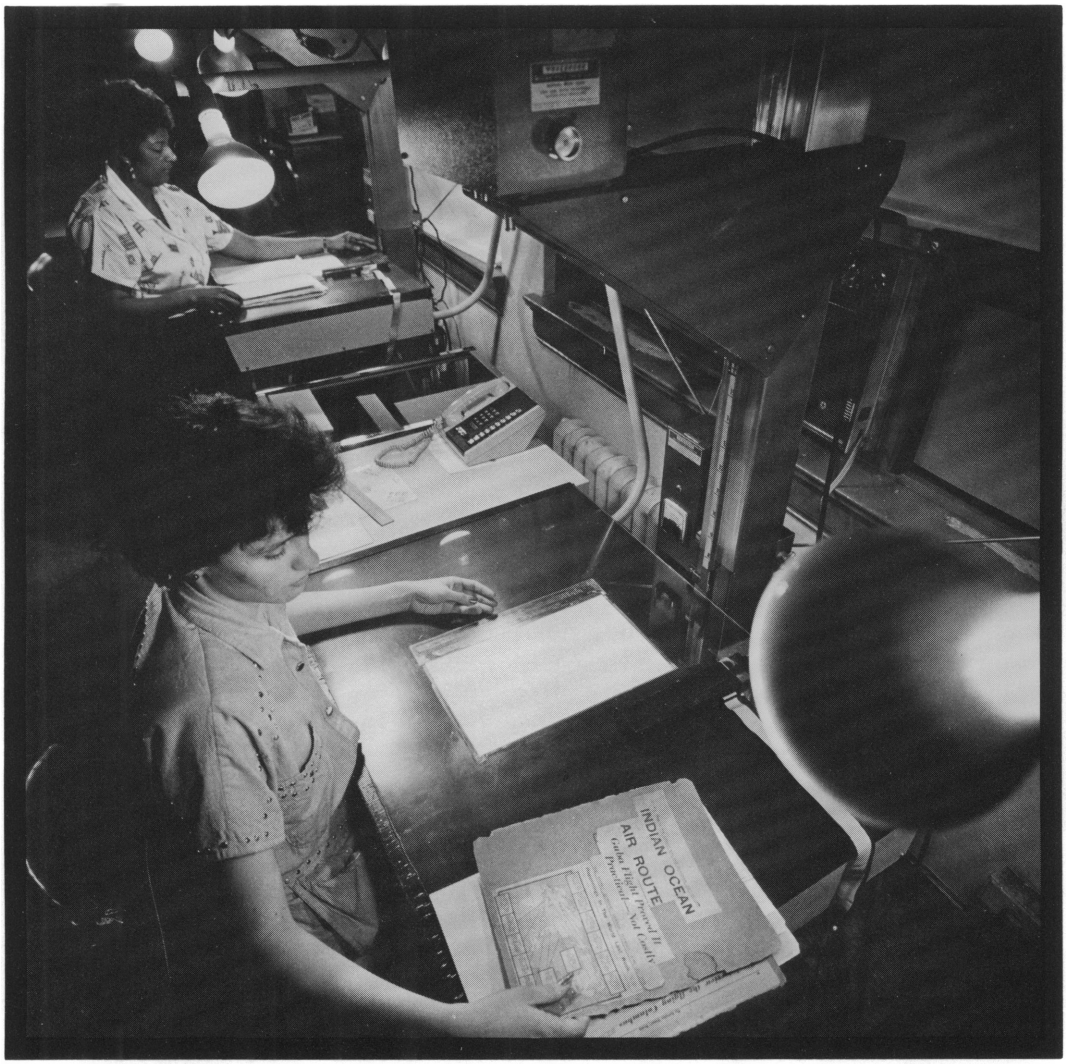
Exhibits and Loans "Architecture for Dinosaurs," an exhibition in the Akeley Gallery, showed the architectural development of the Museum through original architectural plans, photographs and paintings. The exhibition was a result of an ongoing long-term project of the Library and the Plant Manager's Office to restore and catalog the Museum's collection of historically valuable plans. Photographs and film footage from the Roy Chapman Andrews expedition to Korea were used in the exhibition, "The Once and Future Korea," in the Akeley Gallery. A large number of Northwest Coast turn-of-the-century ethnographic photographs were used in the book "From the Land of Totem Poles: The Northwest Coast Indian Art Collection at the American Museum of Natural History," by Aldona C. Jonaitis, Research Associate in the Department of Anthropology.

Two exhibits were mounted in the Library Gallery, "Bats, Bats, Bats" and "Australia: A Bicentennial Celebration, 1788-1988." In the Library's entryway, the exhibition, "Julian A. Dimock, Camera-Artist, 1873-1945," presented photographs of Florida, Seminole Indians, Carolina Gullahs and Ellis Island portraits.

Books and paintings by Titian R. Peale continued to travel with the Smithsonian exhibition, "Magnificent Voyagers: The U.S. Exploring Expedition, 1838-1842." Waldemar Jochelson photographs and memorabilia from the Jesup Pacific Northwest Coast collection were loaned for a Soviet-North American cooperative exhibit "Crossroads of Continents."

Collection Management The conservation of collections is a vital aspect of the Library's responsibility. Much of the conservator's time has been spent in combating humidity and mold, and in treating volumes affected by these conditions. Barbara Rhodes, Conservation Manager, has been conducting a condition survey of collections, a vital first step to long-range preservation planning. Ms. Rhodes rebacked, recased, repaired and made protective enclosures for hundreds

Technicians microfilm field journals from scientific departments and the Museum's archives. The materials were microfilmed for conservation purposes under a two-year grant from the U.S. Department of Education. Eighty-five titles were recorded onto



877 microfilm reels as part of the project. The library also received funds under a New York State Library Preservation/Conservation grant to restore an album of 491 turn-of-the-century ethnographic photographs, mostly from the Pacific Northwest.

of volumes and sent many others to a commercial binder. She also matted and hinged some 50 items for various exhibitions. Ms. Rhodes is the compiler of an important regional disaster workbook, "Hell and High Water," published this year, and has been a speaker at local conservation seminars. Valerie Wheat, Assistant Librarian for Reference Services, appeared on a PBS program, "Fighting Slow Fires," in April, produced by the New York State Department of Education. She described the conservation work accomplished by the Library with state conservation grants. Ms. Wheat is responsible for the management of the USDE Manuscript Microfilming grant and has devoted considerable time to overseeing the conservation of manuscripts and archives prior to being filmed. Nina Root, Chairwoman, served on the editorial committee for "Hell and High Water," and was a speaker at two disaster preparedness seminars.

The ongoing analysis and review of the collections were continued by Ms. Root and Library Associate Mary E. Genett. Ms. Genett is focusing on statistical analyses that will provide specific data on the breadth and depth of each subject area. This project will help determine the collection's strength vis à vis similar collections, and its ability to support the research of the scientific staff. Ms. Root has been concentrating on an evaluation of the rare book collection, as well as older and unique materials in the general collection. Their findings thus far indicate that the monograph collections are by far more valuable and unique than previously thought and require special handling and attention.

Services Over the past year the Library has added additional hours, thus giving access to more users. On Wednesday evenings, it is open until 7:30 p.m. year round, and it is open on Saturdays, from 10 a.m. to 3 p.m. during the academic year. More than 1500 patrons took advantage of the extra hours. The Library served more than 10,700 users, answered 22,824 reference questions, circulated 35,622 items, photocopied 17,400 pages for the public, filled 1651 interlibrary loan requests from other libraries and borrowed 469 items from other libraries. It processed 6295 photographic orders, realizing an income of $53,570, and granted gratis permissions worth $6,860. It filled 22 orders for film footage, realizing an income of $12,457, and sold 945 Museum slide packets.

The Library continued to participate in the New York Metropolitan Reference and Research Library Agency (METRO) retrospective conversion project by adding 1213 monograph titles and 1522 serial titles. To its own collection, the Library added 1611 monograph titles, 91 serial titles and 17,311 journal issues. The Library filed 18,362 cards into the public catalog, corrected 612 records in the OCLC database, and distributed 49,119 scientific publications and *Recent Publications in Natural History.*

Staff Activities Ms. Wheat participated in a New York Metropolitan Reference and Research Library Agency seminar in October during which she outlined the Museum's vast collections and study materials on Native Americans. Nina Root was elected to the board of trustees of the New York Metropolitan Reference and Research Library Agency and was the subject of an article in the *Wilson Library Bulletin.*

Publications:

AMNH Department of Library Services
1987. Recent Publications in Natural History 5(1) (2) (3).
1988. Catalog of color slides.

Genett, M. E., and M. Lawrence
1988. Conserving a Wied-Neuwied mammal type: an archival container. Curator 31(1): 53-60.

Rhodes, B. J. [comp.]
1988. Hell and high water: a disaster information sourcebook. METRO Miscellaneous Publications Series 35(ii). New York: N. Y. Metropolitan Reference and Research Library Agency.

Root, N.J.
1988. Natural history: from stacks to rare book room. AB Bookman 81(23): 2410-2419.

Tucher, C.
1987. [Review of] The Wetherills of the Mesa Verde: autobiography of Benjamin Alfred Wetherill. Recent Publications in Natural History 5(3): 4-5.

Collections Management

Transfer of the anthropology collections into new storage continues as a high priority of the Collections Management staff. The ethnographic collections are highly sensitive to environmental conditions and are the first to be processed for installation in climate-controlled storage. The rehousing of the African collections should be completed within 18 months. Processing of the Northwest Coast Indian collections will begin next year. The Natural Heritage Trust again provided funds for the purchase of additional trays for new storage.

Computer documentation is now integrated with the processes of inventory and the transferring of collections into new storage. In addition, a pilot project to add digitized computer images to text documentation is underway. This technology enhances the collection documentation and results in improved protection and management of objects.

William B. Weinstein, Assistant Registrar for Data Management, examines a digitized computer image of a mask from the Northwest Coast Indian collections. Images like this one are being used in the inventory process and are part of a pilot project that will improve

protection and management of objects. The Collections Management staff in the Department of Anthropology has also documented and photographed a collection of Mexican textiles in order to provide access to the collection while minimizing the handling of objects.

With a grant from the New York State Council on the Arts, a collection of Mexican textiles consisting of serapes and saltillos was cleaned, measured, documented and photographed. Three volumes of color prints now provide access to the collection for research and minimize handling of the objects. A new, large textile storage unit has been secured with the support of the Museum's Junior Committee. Large ethnographic textiles, such as serapes, may now be safely stored lying flat, and kept in the climate-controlled storage area. A survey of the condition of paper objects and specimens within the collections is being carried out with the support of funds from the New York State Council on the Arts. Such a survey precedes the securing of additional funding for conservation treatment and rehousing of the fragile materials.

More than 250 exhibition objects were loaned to 13 institutions, including museums in Spain and Canada. Before release, the objects were cleaned, conserved, photographed, appraised and documented. A major loan of 54 African objects was included in "Art/Artifact," an exhibit sponsored by the Center for African Art. Also, The China Institute borrowed 33 Asian specimens for exhibit.

Another priority of the Collections Management staff is the management and conservation of artifacts for exhibit. For the new Hall of South American Peoples, an additional 539 objects were conserved for installation, and more than 250 archeological textiles have been conserved and mounted. "Objects of Bright Pride," an exhibit of more than 100 Northwest Coast Indian artifacts from the Museum's collection, is now traveling to eight additional museums. All of the objects were reexamined, conserved and packed for the tour. Anthropological specimens were also prepared for "In Time of Plague," "The Once and Future Korea," "Ancient Eskimo Ivories of the Bering Strait" and "Pre-Columbian Art from the Ernest Erickson Collection."

A major exhibition, "Carthage: A Mosaic of Ancient Tunisia," was a primary planning and management responsibility of the Department of Anthropology. In addition, careful conservation was completed for the mosaics and other objects transported from Tunisia. "Crossroads of Continents," a collaborative exhibition planned by the Smithsonian Institution in conjuction with the Field Museum of Natural History, the Ottawa National Museum of Man, and the Moscow Institute of Ethnography, will open in September, 1988, in Washington, D.C. A major portion of the objects in the exhibit are from the American Museum's collections. The Anthropology Department's conservation staff supervised work on the objects and assisted in designing mannequins as well as the packing materials to be used when the exhibit travels. "Crossroads of Continents" is scheduled to open at the Museum in November, 1989.

"African Reflections: Art from Northeastern Zaire," an exhibition based on the Museum's collection, is in the planning and preparation stages. A grant from the Institute of Museum Services permitted the completion of conservation on 100 ceramics and musical instruments. The remaining conservation for more than 500 specimens will be completed with the support of a grant from the National Endowment for the Humanities.

An extensive textile project with F. Schumacher & Co. has been implemented by the Department of Anthropology. Peruvian archeological textiles have been selected for replication, with all phases of design and production supervised by the conservation staff. F. Schumacher & Co. will be marketing the designs in the form of woven and printed textiles as well as in wallpaper products.

The Department of Vertebrate Paleontology continued its improvement program of the storage facility for the fossil fish collection. Tracks were installed for a compact storage unit, which allowed for 60 percent more storage space. The project is supported by a grant from the National Science Foundation. The storage facility will house the current collection of some 50,000 fossil fish specimens. A computerized inventory system of species in the collection has been compiled. The system has enabled the department to rearrange the collection and allows for easy access to specimen location, taxonomy and loans.

The Department of Herpetology and Ichthyology completed the transfer of its fish collections into the storage facilities on the first floor. The facility provides 4500 square feet of space, more than doubling the storage space previously available. Through the use of compact shelving and mobile storage units, specimens that would previously have required 3000 square feet of storage space are now stored in a 1500-square-foot area of the new facility.

Interdepartmental Facilities

The Interdepartmental Facilities comprise the Museum's central computer system and Scanning Electron Microscope (SEM) laboratory. The computer facility is available to all departments via terminals and printers. The SEM is available by appointment to Museum staff.

Although originally installed to do word processing, the computer system today is also used for database management. Seven new database applications including an employee time sheet manager, an inventory control program, an

event scheduler, an index editor and several list management programs were added this year. The system now contains 36 database applications that are used by 17 departments. The central processing unit, which had reached its maximum capacity, was traded in for a new one. System, database and word processing software were also upgraded. These changes as well as anticipated upgrades in memory and disk storage will enable the system to meet current and future user needs.

The Scanning Electron Microscope (SEM) is used extensively by researchers from Invertebrates, Mammalogy, Entomolgy and Ichthyology, as well as Ornithology, Anthropology and Herpetology. The Education Department uses it as a teaching tool. Recent observations from the SEM include embryo fishes and fossil trilobites, many new species of foraminifera, the effects of drying on ancient rubber from Mexico and the various structures of avian skulls.

The SEM is in great demand throughout the year, but has been frequently in need of repair. For this reason, as well as its failure to meet all of the needs of researchers, a proposal for a new SEM and X-ray microanalysis system was submitted to, and approved by, the National Science Foundation. The new SEM will replace analog with digital processing, thus providing improved image resolution, a greater variety of specimens that can be studied, enhanced picture quality and a wider range of photographic and electronic recording techniques. In addition, a new microanalysis feature will enable researchers to study and identify elemental distributions in specimens, providing a deeper understanding of the nature of those specimens. Many projects are already planned for the new SEM including studying the symbionts of foraminifera, and observing ammonites, bryozoa, pomace flies, fungus gnats, mice, rats, termites, fish denticles, living and fossil sharks, tiny spiders and the mineralogy of jade and asbestos.

Grants and Fellowships

The base of scientific investigation is broadened and strengthened by the Grants and Fellowships programs. These programs support investigators in the focused pursuit of knowledge in the scientific disciplines represented in the Museum. Since its inception four years ago, the highly competitive Fellowship Program has already supported 22 postdoctoral scientists engaged in independent work either at the Museum or one of its field stations. The Doctoral Training Program, an educational partnership with selected universities, is dedicated to the training of Ph.D. candidates; agreements are with Columbia University, providing students opportunities in vertebrate and invertebrate paleontology and mineral sciences; Cornell University, in entomology; and City University of New York in the Evolutionary Biology Program and the Animal Behavior-Biopsychology Program. The Grants and Fellowships Programs reinforce the Museum's commitment to the education and training of scientists.

The Grants Program supported 170 predoctoral candidates and postdoctoral investigators. The program awarded 63 Frank M. Chapman Memorial Grants in Ornithology; 39 Lerner-Gray Grants for Marine Research; 58 Theodore Roosevelt Memorial Grants in North American zoology and paleozoology; seven Lincoln Ellsworth Grants for Exploration and Science in the Near Arctic; two Donn Rosen Grants in Ichthyology, and one Weatherhead Grant for Asian Studies.

Collection Study Grants, which enable students and recent post-doctoral investigators to visit the Museum's scientific collections, supported 15 researchers who visited the departments of Anthropology, Entomology, Herpetology and Ichthyology, Invertebrates, Mammalogy and Vertebrate Paleontology.

The Research and Museum Fellowship Program supports recent postdoctoral investigators, established scientists and other scholars, so they may carry out specific projects within a limited period of time, usually one or two years. This year, four Research Fellows were in residence. Frances J. Irish, appointed as Kalbfleisch Research Fellow in Herpetology and Ichthyology, investigated the relationships among Neotropical xenodontine snakes of the genus *Atractus* and its allies. Steven Leipertz, a Thorne Research Fellow in Herpetology and Ichthyology, conducted research on flatfishes, characterized by having a highly compressed, asymmetric body, one of the most remarkable evolutionary adaptations of any vertebrate.

Charles Griswold, a Kalbfleisch Research Fellow in Entomology, continued his study on the revisions of the spiders of the Subfamily Phyxelidinae (Araneae, Amaurobiidae). Christopher Fridrich, who began his second year as Kalbfleisch Research Fellow in Mineral Sciences, studied how volcanic action affects the formation of large copper deposits in the Sierrita Mountains in southeastern Arizona.

The Curatorial Fellowship

Program enables individuals holding doctoral degrees or equivalents to assume all the duties and responsibilities of members of the curatorial staff for a limited term appointment not to exceed five years.

Michael Smith completed his third year as Kalbfleisch Assistant Curator (Fellow) in Herpetology and Ichthyology. Field trips to the Antilles were aimed at resolving the relationships among freshwater fishes that have diversified on the islands. These relationships also shed light on the biogeography and geological history of the islands.

This year, James Miller began his appointment as Kalbfleisch Assistant Curator (Fellow) in the Department of Entomology. His work involves the revision of a Neotropical group of moths, the Dioptidae. Dioptidae is considered pivotal to an understanding of a much larger group of moths, the Noctuoidea, but has not been studied since 1918. Dr. Miller will also use his phylogenetic reconstructions to study the evolution of host-plant associations in these moths.

The Doctoral Training Program is supporting Cheryl Peach and Gregory Edgecombe, both of whom are Ph.D. candidates in the Department of Geological Sciences at Columbia University. Ms. Peach works with Edmond Mathez, Curator in the Department of Mineral Sciences, on the geochemistry of platinum group element deposits. Gregory Edgecombe is investigating the phylogenetic history of trilobites, an extinct class of marine arthropods. He is collaborating with Niles Eldredge, Curator, Department of Invertebrates.

The programs for Grants and Fellowships are made possible through the generosity of many donors to the following funds: Boeschenstein Fund, Frank M. Chapman Memorial Fund, Lincoln Ellsworth Fund for Exploration and Science, Greenwall Fund, the Junior Committee Fund, Franklin H. Kalbfleisch Endowment Fund, Lerner-Gray Fund for Marine Research, Theodore Roosevelt Memorial Fund, Donn Rosen Fund for Ichthyology, Thorne Fund and Weatherhead Fund for Asian Studies.

Publications, Membership and Marketing

Natural History In fiscal 1988, many of *Natural History*'s pages were devoted to classic and controversial theories explaining natural phenomena. "Sex ratio" research, a controversial new area of evolutionary biology, was the subject of "Daughters or Sons," which reported on unexpected factors (social rank, maternal health, ambient temperature) that influence the ratio of males to females in populations and even in offspring born to individual mothers.

In "The Biggest Chill," award-winning geochemist Wallace Broecker created a scenario in which increased carbon dioxide in the atmosphere stalls worldwide ocean circulation and therefore cools Europe.

Several biologist authors shed new light on previously unknown reproductive strategies of animals and plants. "The Wiliest Wildflower in the West" told of a Rocky Mountain plant that varies the color of its blossoms depending on whether hummingbirds or moths are the available pollinators. "Corruption and Deceit in the Blueberry Patch" related how an obscure fungus makes use of bees, flies and blueberries during its life cycle. "A Faithful, Fickle Hawk" explained why Florida's endangered snail kites may desert their mates in good times and remain in bad.

Other articles told of mysteries solved by fieldwork. The reason no entomologist had ever collected an adult sand-burrowing mayfly, for instance, is that the insect only exists in the adult form for two hours and those hours are in the predawn when the species swarms, mates and dies. "Trees of Trembling Earth" explained that Chile's long-lived giant beech trees are seldom seen in seedling or juvenile stages because their regeneration depends on earthquakes. Olga Kukal, intrigued by the puzzling appearances and disappearances of an arctic caterpillar on Ellesmere Island, found that in avoiding the cold climate and predation by parasitic wasps, the larvae were taking 14 years to metamorphose into moths.

Natural History articles also provided close-up views of threatened natural and cultural systems. In "Lapp Life after Chernobyl," anthropologist Sharon Stephens examined the devastating effects of the 1986 Soviet nuclear power disaster on the reindeer-dependent cultures of Scandinavia. Real estate development in New York State's pine barrens habitat, wrote Margaret Stewart and Claudia Ricci in "Dearth of the Blues," has meant that the habitat will no longer be regenerated by natural fires, a circumstance that almost certainly spells extinction for that unique postglacial ecosystem.

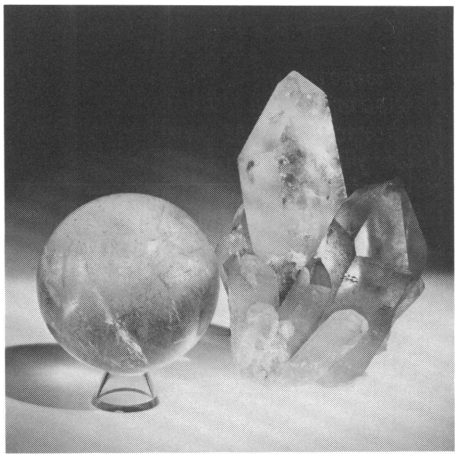
Conflicts of old and new values in contemporary culture dominated the contributions by anthropologists. George Gmelch reported on strife between native Tlingit and Caucasian salmon fishermen in Alaska in "Two Rivers, Two Cultures" and with his wife, Sharon Gmelch, wrote on England's gypsies in "Nomads in the Cities." "Friends by Day, Enemies by Night" contained Lincoln Keiser's firsthand observations of gun culture and blood feuds in a remote Pakistani village, while, in a lighter vein, "A Bride for Raman" by Manuel Moreno detailed the travails of a

modern young Indian seeking the perfect wife through the services of a matchmaker.

The year also marked the first appearance of "Nature's Infinite Book" by Jared Diamond, professor of biophysics, physiology and ecology at the School of Medicine, University of California at Los Angeles. His bimonthly column will range widely in subject matter. The first article in his column described the genetic phenomenon known as "founder effect," in which a population becomes genetically distinctive as a result of being founded by only a few individuals. Stephen Jay Gould, Raymond Sokolov, and Robert H. Mohlenbrock continued to write their immensely popular monthly columns on, respectively, evolution and the history of science, the culture of food and the national forests. Articles in "The Living Museum" covered Museum exhibitions as well as highlighting the activities of Museum scientists and anthropologists. And in the major feature "Scholars Amid Squalor," Museum anthropologists Stanley Freed, Ruth Freed and Laila Williamson chronicled the trials and tribulations of the far-flung fieldworkers who made a success of the Museum's Jesup expedition early in the century.

The continued growth and success of *Natural History* magazine's operations and Associate Membership was marked by total revenues which exceeded $10.5 million for the fiscal year.

Natural History's advertising revenues in 1987-88 were $5.4 million, as measured by The Publishers Information Bureau. Average paid circulation exceeded 520,000 in the June, 1988, report the Audit Bureau of Circulations. The magazine continues to serve as the primary advertising medium for Discovery Tours and Discovery Cruises, The Members' Book Program and other Museum activities. *Natural History* plays an important role in communicating with Museum members.



This quartz sphere and a quartz crystal specimen are among the many minerals available in the Museum Shop. Mineral specimens are among the most popular items for sale, and minerals are also available in the form of bookends, jewelry and carvings. The shop also offers ethnic crafts and reproductions and has one of the finest collections of natural history books in New York City. It achieved sales of more than $3.1 million, setting a record for the fifth consecutive year.

Discovery Tours and Cruises For the second year in a row, Discovery Tours and Discovery Cruises, the Museum's educational travel program, took Museum members and friends to *all* seven continents. Through the course of the year, 41 Museum and guest lecturers led more than 700 participants to 48 countries. There was one lecturer for every 15 participants.

There were many new Discovery Tours and Cruises. These included:

* A sailing program to the remote Marquesas, Tuamoto Archipelago, Tahiti, Bora Bora and Moorea in eastern Polynesia, including excursions during which Museum specialists guided members to ancient ceremonial centers, coral reefs and lush tropical valleys.

* A cruise along the coast of Peru and Ecuador traveling through the Panama Canal to Honduras, Guatemala and Mexico, during which members and lecturers visited ancient Incan and Mayan sites (such as Machu Picchu, Cuzco, Copan and Tikal), rain forests, tropical islands and the Andes Mountains.

* A cruise along the coast of west Africa to the Iberian Peninsula, visiting famed desert cities (such as Timbuktu and Marrakesh), bustling West African markets, local museums, wildlife areas (such as Coto de Donana) and historic Iberian cities (such as Seville and Lisbon).

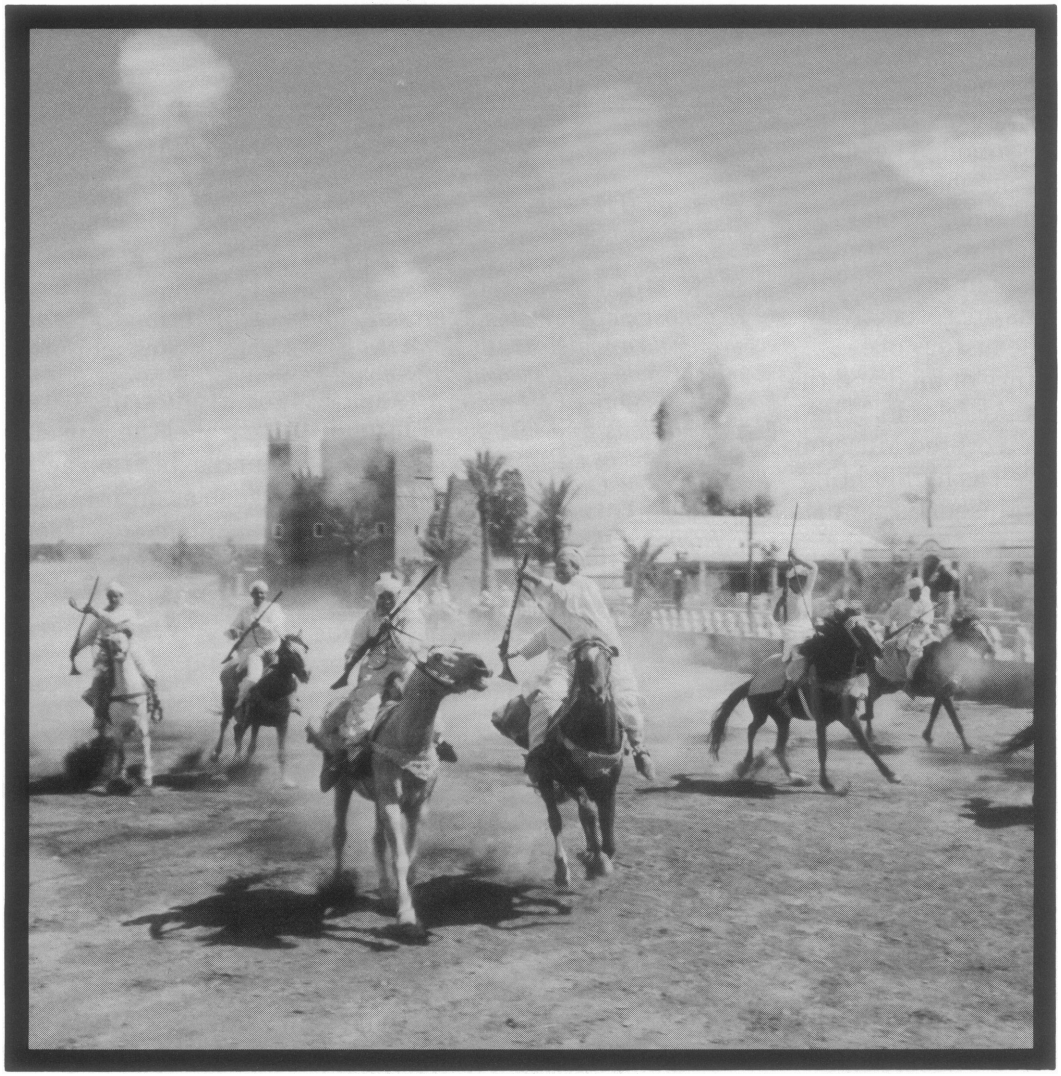
* A wildlife adventure to Venezuela was conducted by an ornithologist who had participated in the Museum's recent scientific expedition to Neblina, a remote "tabletop" mountain in Venezuela.

Study trips are designed to parallel the Museum's research and exhibition activities. Subjects such as anthropology, ornithology, mammalogy, geology and astronomy are central to the itineraries and lecture series.

Many new programs were planned for presentation in the coming year. These will include a cruise to ancient Roman and Carthaginian sites along the coast of North Africa, an archeo-astronomy trip to the Yucatan Peninsula during the Solar Equinox and a cruise to the breeding grounds around the Baja Peninsula at peak whale-watching season.

Membership The Membership Office continued its popular lecture series on developments in international scientific research. Highlights included a presentation by paleoanthropologist Richard Leakey, who discussed his views on human origins and his current fieldwork in Africa. Wildlife biologist Rodney Jackson described tracking the elusive snow leopard through the Himalayas of western Nepal, and David Soren, Exhibition Coordinator of "Carthage: A

Participants on a Museum Discovery Cruise enjoy a demonstration by Berber horsemen in Marrakesh, Morocco. Other places visited on this trip were Senegal, Gambia, Mauritania, the Canary Islands, Spain and Portugal. During the year, 41 Museum and guest



lecturers led 700 participants on Discovery Tours and Discovery Cruises to 48 countries. Other new tours and cruises included a sailing trip to the remote islands of Polynesia, a cruise to Inca and Maya archeological sites, and a wildlife trip to Venezuela. Photo by Stephen C. Quinn.

Mosaic of Ancient Tunisia," lectured on the history of the exhibition's extraordinary mosaics. Research on the social structure of baboons in Kenya and its implications for early human societies was described by anthropologist Shirley Strum.

The monthly *Rotunda* newsletter continued to keep members apprised of the Museum staff's activities. Features included a year-in-review that profiled ongoing fieldwork within each of the scientific departments; an article by research and exhibition assistant Peter Kvietok, who related his experiences as a teacher at a Chilean university and a pictorial review of the "Natural History Film Archives Catalog."

The Museum's scientific staff generously helped to coordinate behind-the-scenes tours of the Departments of Entomology and Vertebrate Paleontology and to present members' programs. Sidney Horenstein, Senior Scientific Assistant in the Department of Invertebrates, hosted a program that explored the history and future of New York City's water supply system. Michael Smith, Kalbfleisch Assistant Curator in the Department of Ichthyology, described his 10-year study of fish that inhabit the deserts of North America. Aldona Jonaitis, Research Associate in the Department of Anthropology, profiled the turn-of-the-century Jesup Expedition, which resulted in the Museum's priceless collections of Northwest Coast Indian art and ethnology.

The members' concerts under the stars, organized jointly by the Membership Department and the American Museum-Hayden Planetarium, included a performance of classical music by Michel Deneuve on La Crystal, a unique instrument made entirely of glass; holiday concerts of Renaissance music by the Ensemble for Early Music; and performances by the Paul Winter Consort of music that combines elements of classical, jazz and international folk traditions with themes drawn from nature. Also in collaboration with the Planetarium, the Membership Office sponsored a series of lectures by distinguished astronomers on the future of space exploration.

The Museum's numerous family programs included an audience-participation program about insects; a presentation of dinosaur songs and stories that offered an educational and amusing view of prehistoric life; an exploration of the ecology of owls illustrated by live birds of prey, and a multicultural lullaby program performed by representatives of New York City's ethnic communities.

The Members' Birthday Program, now in its third year, provides a valuable source of revenue. The year's 170 parties were attended by 2800 children, some returning for their second party.

The Participating and Donor Membership Program numbered more than 28,000 members, a 14 percent increase over last year. Total revenue from these classes of membership exceeded $1.3 million.

Museum Shop The Museum Shop achieved sales of more than $3.1 million, setting a record for the fifth consecutive year.

The public's increasing interest in the environment and the natural world make the Museum Shop an ideal place to visit. The balcony level houses one of the finest natural history book collections in New York City and allows visitors to further explore their favorite areas within the Museum. Items such as minerals and gems, reproductions and ethnic crafts and jewelry reflect the Museum's vast resources. In addition, visitors think of the Museum Shop as the source for special gift-giving, particularly during the holiday season.

Minerals in the form of specimens, bookends, jewelry and carvings are one of the most popular categories. Sales were strongly increased by the exhibition, "Tiffany: 150 Years of Gems and Jewelry."

The Museum Shop annex, next to Gallery 3 on the third floor, featured special merchandise for the exhibitions "The Chaco Phenomenon" and "Carthage: A Mosaic of Ancient Tunisia." For the Carthage exhibition, there were reproductions from the studio of the Bardo Museum, traditional and contemporary crafts and jewelry, and a wide selection of books, including a handsome catalog produced by the Museum's Special Publications Department.

Curator The cumulative index of the journal's first 30 years was published in December, 1987. Eight hundred and thirty-three papers are listed, representing the work of 727 contributors. Listings are by author, title and subject; the latter covering a broad range from accession and authentication to volunteers and zoos.

Not unexpectedly, demand for individual copies of the index issue has been considerable among libraries and other institutions. More surprising has been interest expressed by individuals turning to the publication as an invaluable reference for their own work. Increasingly, *Curator* articles are being used as source materials in museum training programs.

Articles provided information about "the big picture" in the museum world, as well as specific "how-to information." The authors represent major museums, as well as smaller organizations.

Among the more general articles published this year were papers describing "teacher training" for docents in a natural science center, maximizing "hands-on" behavior in children's discovery rooms and the development of new museum archives. Another paper of broad interest described business-sponsored blockbuster exhibitions, permanent science exhibits and the pros and cons of corporate and museum collaboration.

Circulation of the journal continues on a solid footing. There are approximately 1000 subscribers in this country and Canada, and 300 throughout South America, Europe, Africa, India, Australia and the United Kingdom. The majority of subscribers are institutions, purchasing the magazine for their staffs. Now entering its 31st year of publication, *Curator* serves as a channel through which museum professionals can communicate, inform and be informed by their colleagues worldwide.

Special Publications The department continued its program of producing and marketing fine quality publications and products for Museum members and friends.

One of the most exciting pubishing ventures was "From the Land of the Totem Poles: The Northwest Coast Indian Art Collection at the American Museum of Natural History." This monumental work was funded by the National Endowment for the Humanities and copublished by the Museum and the University of Washington Press.

The book relates the history of the Museum's premier collection of Northwest Coast Indian Art and is illustrated with more than 100 color photographs of the artifacts and numerous archival photos showing the objects in situ. The author, Aldona Jonaitis, is a Research Associate in the Department of Anthropology and one of the foremost scholars in the field. The photographs were taken by Stephen Myers.

Two exhibition catalogs were published. "Carthage: A Mosaic of Ancient Tunisia" was edited by David Soren, Exhibition Coordinator, and Aicha Ben Abed Ben Khader, director of the Bardo Museum in Tunis. The catalog contains essays by Tunisian scholars and a section of more than 100 photographs of artifacts and sites.

"Pre-Columbian Arts: The Ernest Erickson Collection" was published to honor Mr. Erickson's posthumous gift to the Museum of 420 artifacts and textiles. The catalog was written by N. C. Christopher Couch, Exhibition Coordinator.

Another highlight of the past year was the introduction of *Natural History* videos: an educational series of videotapes for family viewing. Narrated by actor Cliff Robertson, the videotapes combine films of the exhibits with footage shot in the field.

Two copublishing ventures were completed. "The Natural History Reader in Evolution" and "The Natural History Reader in Animal Behavior" were jointly published by the Museum and Columbia University Press. The Evolution Reader was edited by Niles Eldredge, Chairman and Curator the Department of Invertebrates. The Animal Behavior Reader was edited by Howard Topoff, Research Associate in the Department of Entomology. The Readers are anthologies of *Natural History* magazine articles designed for use as supplementary college textbooks.

"An Index and Guide to John James Audubon's Birds of America" was copublished by the Museum and Abbeville Press. The author, Susanne M. Low, has been associated with the Museum for 30 years, 15 of them as a Trustee.

The Members' Book Program continued to offer high-quality natural history books to the Museum's members and friends. For fiscal 1988, the catalog offered 100 items including books, the Museum's calendar, "John Gould's Exotic Birds," plus video and audio tapes.

Micropaleontology Press The publications of Micropaleontology Press serve academic and exploration paleontologists in their studies of microscopic fossils. These studies help to determine the age and environment of geological strata during the search for oil. Important contributions were received from Amoco Production and Research Company, Shell Oil Company and Mobil Oil Company. A new category of Corporate Sustaining Membership was introduced to provide a higher level of service to industry.

Four issues of supplementary pages to the world standard "Ellis and Messina Catalogues of Micropaleontology" were completed. These included 772 pages of the "Catalogue of Foraminifera," extracting type descriptions and original illustrations of 406 new genera and species, and 1222 pages (two issues) of the "Catalogue of Ostracoda," containing 681 new genera and species. The microfiche edition of the "Catalogue of Foraminifera" was sold out and a second printing ordered. The computerized "Key" to all 35,000 entries in the "Catalogue of Foraminifera" was indexed as a database.

The quarterly research journal, *Micropaleontology* and the monthly information service, *Bibliography and Index of Micropaleontology*, were published for their 33rd and 16th years, respectively. Also, the second of nine volumes of the "Handbook of Cenozoic Calcareous Nannoplankton" was published.

Scientific Publications The Office of Scientific Publications produces three serials, the *Bulletin of the American Museum of Natural History*, *American Museum Novitates* and *Anthropological Papers of the American Museum of Natural History*. These monographs have provided arenas for scientific discussion since 1881, when the *Bulletin* began to establish itself as an esteemed repository of research in the natural sciences. These publications continue to serve as prestigious forums for Museum scientists who disseminate the results of their latest findings in zoological systematics, human culture and evolutionary research.

The Museum's scientific publications have an established

reputation for excellent illustrative reproductions accompanied by detailed written descriptions. This year, the scientific evidence used by entomologists David A. Grimaldi, Assistant Curator, and Charles D. Michener, Research Associate, to determine the age and taxonomic position of the world's oldest fossil bee (discovered during the fall of 1987 in the Museum's amber collection) was recorded in the *Novitates*.

A 331-page account of the Asante culture of precolonial west Africa and its regional influence was published in the *Anthropological Papers*. It was assembled and edited by Enid Schildkrout, Curator in the Department of Anthropology, from papers presented at a symposium during the 1984 Asante exhibition at the Museum.

In all, 1987-88 saw the publication of four *Bulletin* articles totaling 589 pages, 37 issues of the *Novitates* totaling 1002 pages and three issues of the *Anthropological Papers* totaling 558 pages.

Progress continued in updating the editorial format of the scientific publications. A revision of the Museum's scientific style manual was distributed to Museum authors and editors.

Administration

Plant Operations, Construction, Maintenance and Building Services In addition to providing services for special exhibitions such as "Pre-Columbian Art from the Ernest Erickson Collection," and continuing to work on the Hall of South American Peoples, the Construction Department planned and implemented extensive interior and exterior renovations of the Museum complex.

The Construction Department managed the exterior refurbishment and restoration of the American Museum-Hayden Planetarium. This included a new roof, restoration of masonry, replacement of damaged decorative stones, lighting of the dome and installation of the Celestial Plaza—a sidewalk sculpture in front of the Planetarium made of cast bronze pieces—designed by sculptor Michelle Oka Doner.

Interior renovations included the corridor leading to the Employee Dining Room and the Volunteer Office. The metal and masonry shop, the heating, ventilating and air conditioning shop and the plumbing shop were relocated and renovated.

The department monitored the contractor's installation of the elevator for the handicapped in the Hall of Ocean Life, and the installation of the exterior lighting system for the Central Park West facade.

The fossil fish collection storage area was renovated and upgraded with a climate control system and new compact storage carriage system installed. Scientific and administrative office renovations included the Departments of Anthropology, Ornithology and Entomology, the Museum Shop's book storage room, the Junior Shop storage room and the Employee Credit Union facility.

Redesign and renovation of office space was planned for the Departments of Development, Public Affairs, Guest Services and Discovery Tours. In addition to plans for the restoration of the main auditorium, a space-feasibility and use study was conducted to determine how the building that housed the former power plant might accommodate storage of the Museum's wet collections as well as the staff offices of the Department of Herpetology and Ichthyology.

Designs for projects funded through the New York City Department of Cultural Affairs were reviewed by staff during the year. These included security and fire alarm consolidation, phase one of restoration of the Theodore Roosevelt Memorial Hall and restoration of the grand staircase and plaza on 77th Street. City construction projects begun during the year included construction of new fire stairs in the building housing the Hall of Pacific Peoples, reroofing several buildings, installation of an emergency generator and the cleaning and repointing of eight buildings, including the Theodore Roosevelt Memorial building.

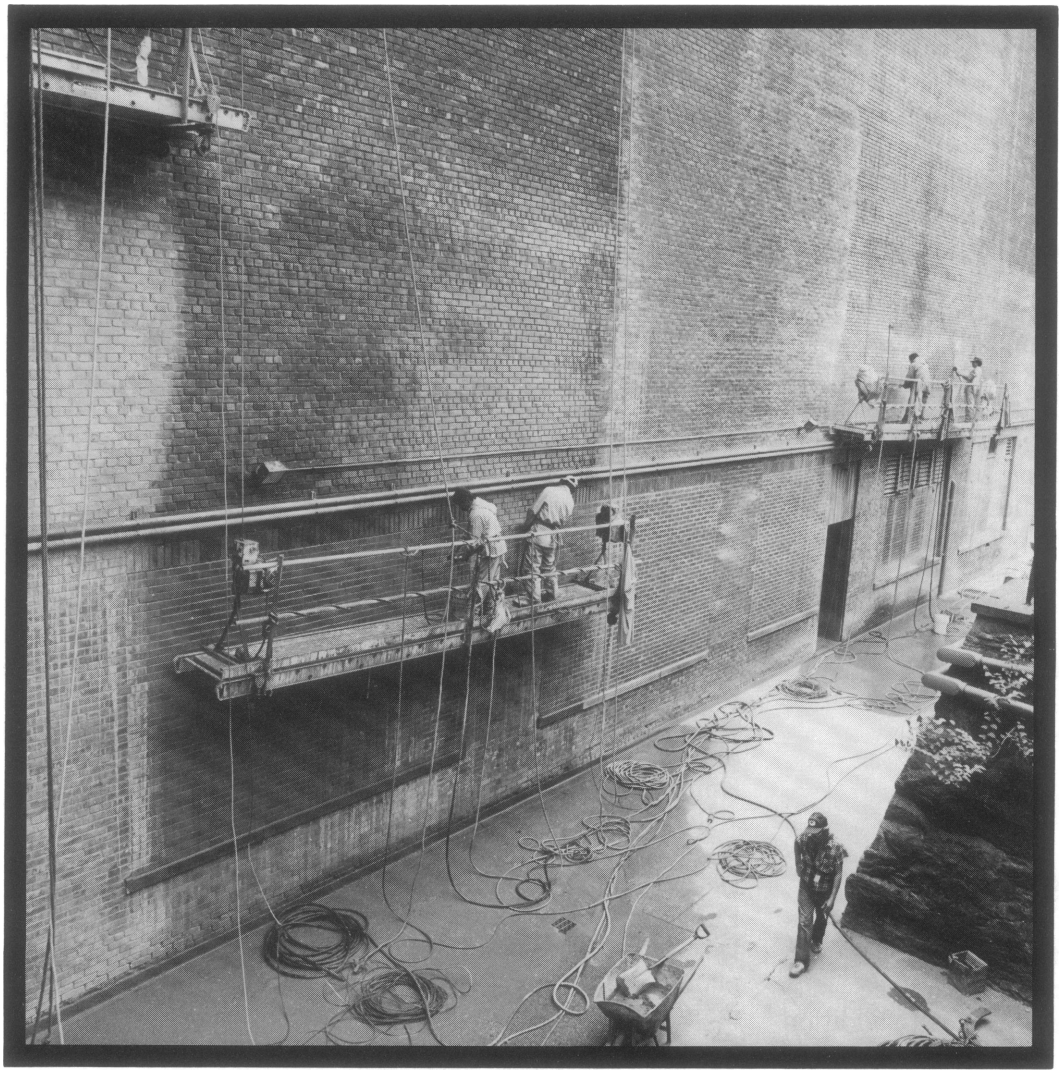
The Maintenance Department provided services in heating, ventilation, air conditioning, plumbing, cleaning and painting.

The designs, specifications, estimates and supervision for all new heating, ventilating, air conditioning and plumbing projects during the year were provided by the department in house without the necessity for additional work by outside consultants. New heating, ventilating and air conditioning systems were installed in the fossil fish storage area, the Volunteer Office and in space above the Blum Lecture Room in the Charles A. Dana Education Wing. The existing heating, ventilating and air conditioning system was upgraded in the Hall of South American Peoples to improve temperature and humidity control.

A landscaping program was implemented for lawn areas on 77th Street and along Central Park West. The quality of grounds maintenance was improved by the installation of new water lines and hose connections. Cold water lines in the building housing the administrative offices were also replaced to improve water pressure.

A comprehensive survey of the Museum's lighting was completed and will be computerized. The survey indicates types of lamps, annual consumption, lamp life and manufacturer for every exhibition

Contractors monitored by the Construction Department restore the masonry of the north facade of the Museum building that houses the Food Express fast food restaurant, the Hall of North American Mammals, the Akeley Memorial Hall of African Mammals and the Hall of Early



Dinosaurs. The department is also refurbishing and restoring the American Museum-Hayden Planetarium, including installation of a new roof, masonry repair and lighting of the dome. The work is part of extensive interior and exterior renovations of the 22-building Museum complex.

hall in the Museum. This is expected to improve efficiency of lamp replacement and cut costs through inventory control.

The Building Services Department worked with the New York City Departments of Cultural Affairs and General Services on plans to convert the Museum's present security system to a new multi-faceted computerized fire and intrusion alarm system.

Naturemax Theater "Grand Canyon: The Hidden Secrets" proved to be the most successful film since the Naturemax Theater opened in 1982. The excellent depiction of historical events concerning the exploration of one of the world's great natural wonders attracted more than 500,000 visitors in one year.

"Grand Canyon: The Hidden Secrets" also contributed to a 42 percent increase in the number of adult visitors to the theater, and a 15 percent increase in the number of school groups.

"Chronos," an IMAX film utilizing time lapse photography and presenting a surreal look at the development of western civilization, was shown with "Grand Canyon: The Hidden Secrets" as part of the Friday and Saturday evening double feature program.

Museum Attendance Museum attendance for the 1987-88 fiscal year totaled 3,115,451. This figure includes 2,513,223 to the Museum, and 602,228 to the Planetarium.

Development and Public Affairs

Working to expand communications, funding and services, the department carried out diverse activities.

Development The Development Office continued to broaden and expand the base of individual contributors. Special efforts were made to upgrade contributors to higher levels of support, and to upgrade Museum members to the contributor level. These donors were invited to a number of events, including a preview of "Carthage: A Mosaic of Ancient Tunisia," the Origami Holiday Tree Lighting and the opening of "Pre-Columbian Art from the Erickson Collection."

The support of Friends, who through their generous gifts demonstrate a particularly strong commitment to the Museum programs, is especially gratifying. Their interest is encouraged with a series of events throughout the year. These events give Friends the opportunity to meet the President, Trustees and the scientific staff, and to gain a firsthand view of work in progress. This year Friends came to an opening for the Tiffany exhibition, they attended a special showing of recent acquisitions and gifts-in-kind and they were invited to an opening celebration of the Carthage exhibition.

Devoted friends have made bequests to the Museum since its founding, and in the past decade an increasing number of bequests have been received. This year a program of active solicitation of bequests was begun. An advertisement appeared in *Natural History*, and special enclosures with gift acknowledgments now remind members to consider including a bequest in their wills.

The solicitation of bequests is the first phase of a comprehensive planned giving program which promises to be a major source of new support for the Museum. Income from charitable trusts established through bequests by Richard T. Shields and Leland T. Shafer continues to strengthen research, education and exhibition programs. An additional substantial gift to the George Willett Curatorship was received from his Estate. Especially generous bequests from James Madison Andrews IV, Arthur O. Choate, Jr., and Charles H. Ettl were placed into endowment funds to help assure future operations.

The corporate community continued to provide steadfast support, almost $1.5 million this year. More than 250 corporations gave funds and participated in the Museum's programs.

With the guidance of Trustee Donald C. Platten, leader of the Corporate Campaign, the Museum received increased support from a number of major corporate contributors including Bristol-Myers, American Standard and the Rockefeller Group. A core of corporate contributors that continues to form the linchpin of the corporate campaign includes Mobil Corporation, *Reader's Digest* (through the Wallace Funds), IBM Corporation, Chemical Bank, Chase Manhattan Bank, Citicorp/Citibank, Exxon Corporation and the Bank of New York.

The past year witnessed an increase in events for the employees of major corporate supporters. The highlight was an open house for "Tiffany: 150 years of Gems and Jewelry," which drew almost 700 employees from 40 corporations. Employee enthusiasm for the Museum was also demonstrated in the increase in matching gifts this year, up 27 percent over last.

Once again the Museum acquired new support for important projects and exhibitions. Bankers Trust Company, a

longtime friend, took on a five-year initiative to help fund a new elevator for the Hall of Ocean Life. With the addition of this elevator, all of the exhibition halls will be accessible to those visitors unable to use stairs. One of the most loyal corporate contributors, Mobil Corporation, continued to fund the Friday and Saturday Evening Free Admission Program for the general public with a generously increased contribution of $86,800.

Private foundation support made possible many advances. The Ambrose Monell Foundation, G. Unger Vetlesen Foundation and Helen Clay Frick Foundation gave the Museum much appreciated general support. The Howard Phipps Foundation generously funded the nine scientific departments and library with a total of $200,000 divided among them.

Visitors to the American Museum-Hayden Planetarium will now enjoy newly refurbished classrooms and an even more comfortable environment thanks to the Charles Hayden Foundation's grant of $260,000 for renovation. The Edward John Noble Foundation, which makes possible research projects which the Museum administers at St. Catherines Island, continued its support with gifts totaling $183,691. The Clark Foundation gave $150,000 over three years to the Museum's library; a crisis in storage will be alleviated by installation of a new compact storage system. The Arthur Ross Foundation once again granted $30,000 for Exhibits-of-the-Month.

Contributors to the Education Department funded community outreach and programs for elementary and high school students. These included Christadora, Inc., the Henry Nias Foundation and the Helena Rubinstein Foundation. The Vidda Foundation supported both community programs and the instructor for the handicapped. These programs draw hundreds of thousands of school children and adults to the Museum each year. In addition to supporting the Education Department, the Samuel and May Rudin Foundation gave $400,000 to the Endowment for undergraduate and graduate research programs.

The Museum's programs rely heavily on support from government sources. This year general operating support was received from the New York State Council on the Arts, the City of New York and the Institute of Museum Services.

The National Science Foundation awarded more than $450,000 for research in archeology, mineral sciences, ichthyology, vertebrate paleontology and entomology. NSF also granted $152,810 for a new generation scanning electron microscope.

The National Endowment for the Humanities, in one of its largest grants, awarded a $550,000 implementation grant for the upcoming exhibition, "African Reflections: The Art of Northeastern Zaire," to open in 1990. The Natural Heritage Trust, funded by the New York State Legislature, supported a new storage system for the anthropology collection.

The New York State Council on the Arts provided funds for "Carthage: A Mosaic of Ancient Tunisia," Black History Month, storage for the anthropology collection and the Margaret Mead Film Festival, along with a planning grant for "African Reflections." NYSCA also provided funds to the American Museum-Hayden Planetarium for an internship and the Celestial Plaza.

Benefit Events Thanks to the enthusiastic and generous participation and support of all the benefit committees, the year was extremely active and productive. The Children's Halloween Party, which again sold out, was held in the African Halls and Theodore Roosevelt Memorial Hall.

In December a special preview cocktail reception for the Carthage exhibition was held. Among the Tunisian officials attending were the Honorable and Mrs. Habib Bourguiba, Jr., and the Honorable Zacharia ben Mustupha, the Minister of Culture.

Mrs. Bruce Wilcox and Ms. Lisa Fine cochaired an amusing and very successful evening: "Bash in the African Bush." Four hundred arrived in various costumes and raised more than $28,000 for a special fellowship fund.

The Special Events Committee organized a private tour of the Carthage exhibition by exhibition coordinator David Soren.

The year culminated in a beautiful dinner dance celebrating "Tiffany: 150 Years of Gems and Jewelry." Pieces rarely seen were added to the exhibition just for this special occasion. The generous support of Tiffany & Company helped add to the success of the evening.

Public Affairs The Museum's visibility was enhanced and its programs were promoted through appearances in major print and broadcast media. Television, radio and print coverage resulted from the dissemination of press materials to the media and luncheon meetings with editors, writers and producers. More than a dozen press previews and special events were held. Established media contacts were strengthened and new media were introduced to the Museum.

The major exhibition, "Carthage: A Mosaic of Ancient Tunisia," received broad media attention. The exhibition was a feature on several TV news shows, including CBS Network's "Sunday Morning." News and feature stories appeared widely in daily newspapers including The New York Times. National magazine coverage

This may look like a scene in Macy's or Bloomingdale's, but it is actually a promotional event by Revlon coordinated by the Office of Guest Services in the Theodore Roosevelt Memorial Rotunda. The conceptual presentation of cosmetic bays is a new marketing technique. The event, which included a

presentation and a dinner, attracted 550 guests. Among the many other organizations that chose the Museum or its Planetarium as a setting for special events were Merrill Lynch, Pierce, Fenner & Smith; Exxon; Ortho Pharmaceutical Corporation; the American Institute of Professional Geologists; IBM and Tiffany & Co.

included *Newsweek, The New Yorker, Connoisseur, Elle* and *Archaeology*. Coverage in travel publications was extensive, including stories in *Travel & Leisure, Traveler* and *Travel-Holiday*, as well as the transit magazines, *USAir*, United's *Vis à Vis* and *Amtrak Express*.

Other exhibitions that received national media attention included "Dinosaurs Past and Present," "Ancient Eskimo Ivories of the Bering Strait," "In Time of Plague" and "Tiffany: 150 Years of Gems and Jewelry." Public Affairs placed these exhibitions in new media including medical, fine arts and jewelry trade publications.

Media contacts were established and advance publicity was generated for the new Hall of South American Peoples. Editors of national magazines were invited to luncheon meetings followed by tours of the hall. A number of special events and photo opportunities resulted in media placements on WABC-TV and Cable News Network, and in *The New York Times Magazine*, The New York Times, and Newsday.

The office began the fiscal year with heavy promotions for two new Naturemax films, "Grand Canyon: The Hidden Secrets" and "Chronos." Advertisements were placed in The New York Times and *New York Magazine* and a radio campaign was mounted. The advertising, plus extensive press coverage of the new presentations, helped lead to an attendance in the theater which exceeded that of previous years.

Public Affairs produces a radio series that is aired by more than 600 stations across the United States and in Canada. The series consists of 13 three-minute interviews that are produced three times a year. Museum researchers were interviewed by Dr. Nicholson, and one series also included interviews by *Natural History* Editor Alan Ternes with magazine authors.

The fourth annual "Legislators Night" took place in January for New York City and New York State legislators and their families. It was attended by some 600 people, who spent the evening dining and dancing, viewing exhibitions, seeing films and participating with their children in an educational and entertaining "Treasure Hunt."

The newly created position of staff science writer was essential in expanding the office's role in promoting and disseminating news of the Museum's scientific research. Research, including Dr. Landman's use of Carbon-14 in estimating age and growth rate of the chambered nautilus, and Dr. Grimaldi's discovery of the oldest fossil bee entombed in amber, were publicized in *Scientific American* and Scholastic's *Science World*. The stories were also covered in science columns of The New York Times, Newsday, International Herald Tribune and Washington Post. The science writer also helped generate a segment on NBC Network's "Today," which explored how children learn science and focused on the programs offered here.

Exhibitions and other programs were also extensively promoted through media ads produced by Ogilvy & Mather. Full-page advertisements highlighting special exhibitions and describing other features were supplemented by three-week and one-week radio ad campaigns, targeted toward a cross section of potential museum visitors. In one of the radio ads the well-known voice of Carol Channing promoted the "Tiffany" exhibition.

Guest Services Events that were planned and executed for outside groups ranged from a conceptual presentation by Revlon, to the introduction of a super-computer by Sun Microsystems and the National Basketball Association's draft lottery.

Corporations, scholarly institutions and other organizations that chose the Museum and its Planetarium as the setting for special events included: Committee on the Supreme Court of the New York Lawyers' Association, Ortho Pharmaceutical Corporation, Exxon, Merrill Lynch, Pierce Fenner & Smith, Inc., Tiger Management Company, The Chase Manhattan Bank, the New York Chamber of Commerce, Boone and Crockett Club, Showtime/ The Movie Channel, American Brands, Inc., Maurice Villency, Inc., the New York Fashion Council, Tiffany & Co., Proskauer Rose Goetz & Mendelsohn, the New York Blood Center, the New York City Board of Education, Ogilvy & Mather Advertising, Restaurant Associates, Graham Energy Resources, the New York Regional Association of Grantmakers, USDA Forest Service, St. Bernards, Federation of New York State Bird Clubs, American Institute of Professional Geologists, The John Hopkins University Center for the Advancement of Academically Talented Youth, the World Palaeochelonological Society, IBM Corporation, the American Littoral Society and the New York State Association of Museums.

Guest Services works closely with each corporation and organization to ensure the success of every event, many of which provided substantial support for the Museum and its Planetarium division. Plans to more actively market the excellent conference, social and special events facilities include paid advertising and a mail campaign to event planners.

Groups using the facilities for filming, taping and photography included the BBC taping a segment for a documentary about Broadway, PMC taping a segment for a television commercial to be shown in Japan and the "Kate and Allie" production staff taping a

prologue for the TV series.

Special memorial services were held here for two friends of the Museum who died during the year, Peter Gimbel and Joseph Campbell.

The American Museum Restaurant, now in its sixth year, served 58,580 members and other visitors, and Food Express an additional 651,910. The School Lunchroom was used by more than 287,810 school children and the Employees' Dining Room provided 86,570 meals.

The Museum Group Tour Package, introduced last year, is growing in popularity. The package includes a Museum Highlights Tour and lunch in the American Museum Restaurant. For the Carthage exhibition, Tunisian cuisine as well as a tour of the exhibition was featured.

Tourist outlets, such as convention and visitors' centers, airlines, bus lines, parks, Ys and community centers, are supplied with the Museum's general information brochure. Brochures are also supplied to auto clubs, tour operators and travel agencies nationally and internationally. Some 210,000 brochures in English and in five other languages were distributed.

Floor plans highlighted temporary exhibitions; 655,200 copies were distributed to visitors. The closed circuit television system was upgraded to increase graphic capacity. Recorded telephone information messages reached 175,500 potential visitors.

Volunteer Office Museum field stations involve volunteers in scientific research that advances today's science and encourages the young scientists of tomorrow. Volunteers are given a clear idea of their duties and responsibilities before they start working at the stations. Their efforts are monitored, evaluated and documented.

Volunteers worked at Great Gull Island studying the nesting habits of terns. They not only helped restore the island to its natural environment, but contributed to important long-term scientific research. The volunteers ranged in age from 16 to over 60. They were supervised by Helen Hays, Chairwoman of the Great Gull Island Committee.

Dr. Sherbrooke, Director of the Southwestern Research Station near Portal, Arizona, was a panelist at a session entitled, "Volunteers in the Field: Off-Site Volunteering," at the American Association of Museums' Annual Meeting in Pittsburgh. He spoke about volunteer research opportunities at the station.

The corps of 500 volunteers who work every day the Museum is open (363 per year) are a bulwark of the labor force. They contributed 113,405 hours in the fiscal year.

The Education Department involved 30 volunteers during its Camp-In, a learning experience for 160 girls, 9 to 12 years old. Volunteers assisted with registration, workshops and activities. During the school year, Education Department teaching volunteers worked closely with classes visiting the Museum. They introduced young people to exhibitions and the science behind them. Volunteers also work in the People Center, Natural Science Center and Discovery Room.

The Tiffany exhibition sparked 51 members' tours (a record number for a special exhibition) given by Museum Highlights Tour guides to 1,040 members. In addition to regularly scheduled daily tours, the guides also gave members' tours and prearranged fee-based tours to groups in the temporary exhibitions "Eskimo Ivories of the Bering Strait," "Dinosaurs Past and Present" and "Carthage: A Mosaic of Ancient Tunisia."

The work of the Museum Reproductions Team under the direction of Martin Cassidy in the Department of Exhibition and Graphics was honored at a City Hall ceremony hosted by Manhattan Borough President David N. Dinkins.

Those volunteers who have given 1000 or more hours of service received letters from the Director. They were recognized for their work in Ornithology, Invertebrates, Mammalogy, Ichthyology, Mineral Sciences and Education, and in the Membership and Volunteer Offices, the Library, at the Information Desks and as Museum Highlights Tour guides.

Mitzi Bhavnani, manager, continues her involvement with professional organizations such as the American Association of Museum Volunteers, the Association for Volunteer Administration, the Governor's Office for Voluntary Services and Volunteer Program Administrators in New York City Cultural Institutions. She spoke at meetings held by the Long Island Museums Association and Volunteer Committees of Art Museums. She developed the topics and recruited the speakers for three sessions on volunteerism for the American Association of Museums' Annual Meeting.

OFFICERS

PRESIDENT
George D. Langdon, Jr.

VICE PRESIDENTS
William T. Golden
Frederick A. Klingenstein
Plato Malozemoff
Henry G. Walter, Jr.

SECRETARY
L.F. Boker Doyle

TREASURER
Charles H. Mott

CHAIRMAN OF THE BOARD OF TRUSTEES
Robert G. Goelet

BOARD OF TRUSTEES

ELECTIVE

Class of 1988
William T. Golden
Arthur Gray, Jr.
Frederick A. Klingenstein
George D. Langdon, Jr.
Edward H. Meyer
Mrs. Ottavio Serena di Lapigio
Mrs. Constantine Sidamon-Eristoff

Class of 1989
Robert R. Barker
Thomas D. Barrow
Robert G. Goelet
Earl G. Graves
Mrs. John E. Hutchinson, III
Frank Y. Larkin
Donald C. Platten
Arthur Ross
Carroll L. Wainwright, Jr.

Class of 1990
L.F. Boker Doyle
Henry Clay Frick, II
Caryl P. Haskins
Frank G. Lyon
Plato Malozemoff
Barnabas McHenry
Edwin H. Morgens
Frederick Seitz
R. William Murray

Class of 1991
Philip F. Anschutz
Howard L. Clark
Mrs. Hart Fessenden
Elbridge T. Gerry
Jerome Kohlberg, Jr.
Marshall Manley
Frank A. Metz, Jr.
Charles H. Mott
Lawrence G. Rawl

Class of 1992
Charles J. Hedlund
Lansing Lamont
Mrs. John Macomber
William F. May
Gerard Piel
Jack Rudin
Alfred R. Stern
Oscar S. Straus, II
Henry G. Walter, Jr.

EX OFFICIO
Edward I. Koch, Mayor of the City of New York
David N. Dinkins, President of the Borough of Manhattan
Harrison J. Goldin, Comptroller of the City of New York
Henry J. Stern, Commissioner, Department of Parks and Recreation
Mary Schmidt Campbell, Commissioner, Department of Cultural Affairs
Richard Green, Chancellor, Board of Education, City of New York

HONORARY
William S. Beinecke
August Belmont
Robert E. Blum
Benjamin S. Clark
Joseph F. Cullman, 3rd
James S. Rockefeller
Edwin Thorne
Thomas J. Watson, Jr.

COUNSEL
Milbank, Tweed, Hadley & McCloy

COMMITTEES OF THE BOARD*

MANAGEMENT COMMITTEE

ELECTED MEMBERS
Robert R. Barker
Mrs. Hart Fessenden
Mrs. John E. Hutchinson, III
Frank Y. Larkin
Frank G. Lyon
Mrs. John Macomber
Barnabas McHenry
Arthur Ross
Mrs. Constantine Sidamon-Eristoff
Alfred R. Stern
Oscar S. Straus, II
Carroll L. Wainwright, Jr., Esq.

EX OFFICIO MEMBERS
L.F. Boker Doyle
Robert G. Goelet
William T. Golden
Frederick A. Klingenstein
Plato Malozemoff
Charles H. Mott
Henry G. Walter, Jr.
Mary Schmidt Campbell

AUDIT AND EXAMINING COMMITTEE
Frank G. Lyon, Chairman
Howard L. Clark
Arthur Gray, Jr.
Frank Y. Larkin
Frank A. Metz, Jr.
Charles H. Mott
Pauline G. Meisler, Ex Officio
Thomas D. Nicholson, Ex Officio

FINANCE COMMITTEE
Charles H. Mott, Chairman
Robert R. Barker
Elbridge T. Gerry
Jerome Kohlberg, Jr.
Oscar S. Straus, II
Carroll L. Wainwright, Jr.
L.F. Boker Doyle, Alternate

NOMINATING COMMITTEE
William F. May, Chairman
Howard L. Clark
Oscar S. Straus, II

COMMITTEES OF THE MUSEUM*

BUDGET COMMITTEE
Mrs. Hart Fessenden, Chairman
Jerome Kohlberg, Jr.
Frank Y. Larkin
Frank G. Lyon
Marshall Manley
William F. May
Charles H. Mott
Carroll L. Wainwright, Jr.
Henry G. Walter, Jr.
Pauline G. Meisler, Ex Officio
Thomas D. Nicholson, Ex Officio

SPECIAL ADVISORY COMMITTEES*

ANNUAL CORPORATE DRIVE COMMITTEE
Donald C. Platten, Chairman
Thomas D. Barrow
Howard L. Clark
Frank G. Lyon
William F. May
Jack Rudin

DEVELOPMENT COMMITTEE
Robert G. Goelet, Chairman
William T. Golden
Frederick A. Klingenstein
Frank Y. Larkin
Plato Malozemoff
Charles H. Mott
Jack Rudin
Mrs. Constantine Sidamon-Eristoff
Oscar S. Straus, II
Henry G. Walter, Jr.
William F. May, Ex Officio

EDUCATION POLICY COMMITTEE
Mrs. John Macomber, Chairman
Malcolm J. Arth
Charles J. Cole
Mrs. Hart Fessenden
Stanley A. Freed
William A. Gutsch, Jr.
Charles J. Hedlund
Mrs. John E. Hutchinson, III
Lansing Lamont
Neil H. Landman
Edwin H. Morgens
Gareth Nelson
Thomas D. Nicholson
Demetrius Pohl
Melanie Stiassny
Richard Tedford
Ethel Tobach
Judith Winston

EXHIBITION POLICY COMMITTEE
Frank G. Lyon, Chairman
Malcolm J. Arth
Norene L. Brooks
Eugene B. Bergman
George S. Gardner
George E. Harlow
Frank Y. Larkin
Mrs. John Macomber
Ann Breen Metcalfe
Gareth Nelson
Edward H. Meyer
Thomas D. Nicholson
Michael Novacek
Arthur Ross
Enid Schildkrout
Joseph M. Sedacca
Mrs. Ottavio Serena di Lapigio
Alfred R. Stern
Richard Tedford

PLANETARIUM POLICY COMMITTEE
Oscar S. Straus, II, Chairman
Malcolm J. Arth
Mrs. Hart Fessenden
Mrs. Maurice Goodgold
William A. Gutsch, Jr.
Dorritt Hoffleit
Mrs. James Magid
William A. May
Gareth Nelson
Thomas D. Nicholson
Richard T. Perkin
Daniel W. Seitz
Benjamin S. P. Shen
Henry G. Walter, Jr.
Mrs. Jacqueline Bograd Weld

SCIENCE POLICY COMMITTEE
Caryl P. Haskins, Chairman
Niles Eldredge
Mrs. Hart Fessenden
Henry Clay Frick, II
William T. Golden
Plato Malozemoff
Frank A. Metz, Jr.
R. William Murray
Guy G. Musser
Charles W. Myers
Gareth Nelson
Thomas D. Nicholson
Michael Novacek
Gerard Piel
Norman I. Platnick
Martin Prinz
Lawrence G. Rawl
Jerome G. Rozen, Jr.
Frederick Seitz
Mrs. Constantine Sidamon-Eristoff
Mrs. Constance Spahn
David Hurst Thomas
Robert S. Voss
Henry G. Walter, Jr.
Richard G. Zweifel

SPECIAL ADVISORY BOARDS*

FRANK M. CHAPMAN MEMORIAL COMMITTEE
Francois Vuilleumier, Chairman
George F. Barrowclough
A. H. Brush
James C. Greenway, Jr.
Wesley E. Lanyon
Frank Y. Larkin
Thomas D. Nicholson
Lester L. Short
Richard G. Zweifel

LERNER-GRAY FUND ADVISORY COMMITTEE
Arthur Gray, Jr., Chairman
Arland L. Carsten
R. Niles Eldredge
William K. Emerson
Nixon Griffis
Edwin H. Morgens
Thomas D. Nicholson
Jack Rudin
Frederick Seitz
Carol Simon
Michael Smith
Melanie Stiassny

SANFORD COMMITTEE
Lester L. Short, Chairman
Edward C. Childs
Thomas D. Nicholson
William F. Sanford

THEODORE ROOSEVELT MEMORIAL COMMITTEE
Arthur Ross, Chairman
Charles J. Cole
John Gable
The Hon. Theodore R. Kupferman
Lansing Lamont
Guy G. Musser
Charles W. Myers
Gareth Nelson
Thomas D. Nicholson
Donald C. Platten
Anna C. Roosevelt
Elizabeth Roosevelt
Jerome G. Rozen, Jr.
Frederick Seitz
Mrs. Constantine Sidamon-Eristoff
Richard Tedford
Ethel Tobach

*The President is an Ex Officio member of all committees.

THE STAFF
July 1, 1988

George D. Langdon, Jr., Ph.D., President
Thomas D. Nicholson, Ph.D., Director
William J. Moynihan, Ph.D.,
Executive Assistant to the President
Charles A. Weaver, Jr., B.A.,
Deputy Director for Administration
Pauline G. Meisler, M.B.A.,
Assistant Director for
Financial Operations
Walter J. Kenworthy, Ph.D.,
Executive Assistant to the Director
L. Thomas Kelly, M.B.A.,
Assistant Director and Publisher
Albert E. Parr, Sc.D., Director Emeritus

SCIENCE, EDUCATION AND EXHIBITION DEPARTMENTS

ANTHROPOLOGY

Craig Morris, Ph.D.,
Chairman and Curator
Robert L. Carneiro, Ph.D., Curator
Stanley A. Freed, Ph.D., Curator
Enid Schildkrout, Ph.D., Curator
Ian M. Tattersall, Ph.D., Curator
David Hurst Thomas, Ph.D., Curator
Laurel Kendall, Ph.D., Associate Curator
Harry L. Shapiro, Ph.D., Curator Emeritus
Jaymie L. Brauer, M.A., Scientific Assistant
Paula Dowling, M.A., Scientific Assistant
Joseph A. Jimenez, M.A., Scientific Assistant
Laila Williamson, M.A., Scientific Assistant
Judith Levinson, M.F.A., M.A., Conservator
Phillip C. Gifford, Jr., Ph.D., Senior
Scientific Assistant Emeritus
Amy T. Bushnell, Ph.D., Research
Associate
Gertrude E. Dole, Ph.D., Research
Associate
Helen Fisher, Ph.D., Research Associate
Ruth S. Freed, Ph.D., Research Associate
Donald K. Grayson, Ph.D., Research Associate
Richard A. Gould, Ph.D., Research Associate
John Hyslop, Ph.D., Research Associate
Aldona C. Jonaitis, Ph.D., Research
Associate
Curtis A. Keim, Ph.D., Research Associate
Shepard Krech, III, Ph.D., Research
Associate
Frederica de Laguna, Ph.D., Research
Associate
Clark Spencer Larsen, Ph.D., Research
Associate
J. Alan May, Ph.D., Research Associate
Rhoda Metraux, Ph.D., Research Associate
Anna Roosevelt, Ph.D., Research Associate
Paul Roscoe, Ph.D., Research Associate
Jeffrey H. Schwartz, Ph.D., Research
Associate
Colin M. Turnbull, M.A. (Oxon.), D.Phil.,
Research Associate
Paul Goldstein, Ph.D., Thorne Research
Fellow
Donald S. McClain, M.S., Field Associate
Carin Burrows, Associate

ASTRONOMY AND THE AMERICAN MUSEUM-HAYDEN PLANETARIUM

William A. Gutsch, Jr., Ph.D., Chairman
and Associate Astronomer
Franklyn M. Branley, Ed.D., Astronomer
Emeritus
Kenneth L. Franklin, Ph.D., Astronomer
Emeritus
David S. Roth, Planetarium Shop Manager
Peter Fenev, Assistant Manager
Joseph Maddi, Chief Technician
Lynne B. Azarchi, M.B.A., Public Affairs
Coordinator
Dennis Davidson, B.A., Astronomical Artist
Clinton W. Hatchett, B.A., Astronomical
Writer/Producer
Brian P.M. Sullivan, B.S., Production
Designer

ENTOMOLOGY

Norman I. Platnick, Ph.D., Chairman and
Curator
Lee H. Herman, Ph.D., Curator
Frederick H. Rindge, Ph.D., Curator
Jerome G. Rozen, Jr., Ph.D., Curator
Randall T. Schuh, Ph.D., Curator
David A. Grimaldi, Ph.D., Assistant Curator
James S. Miller, Kalbfleisch Curatorial
Fellow
Mont A. Cazier, Ph.D., Curator Emeritus
Willis J. Gertsch, Ph.D., Curator Emeritus
Sarfraz Lodhi, M.Sc., Senior Scientific
Assistant
Mohammad Umar Shadab, Ph.D., Senior
Scientific Assistant
Louis N. Sorkin, M.S., Senior Scientific
Assistant
Darlene Judd, B.S., Scientific Assistant
Eric Quinter, B.S., Scientific Assistant
Michael Schwartz, Ph.D., Scientific
Assistant
Marjorie Statham Favreau, Scientific
Assistant Emerita
Alice Gray, M.S., Scientific Assistant
Emerita
Daniel Bickle, Ph.D., Research Associate
Sixto Coscaron, D.Nat.Sc., Research
Associate
Frederick Coyle, Ph.D., Research Associate
James S. Farris, Ph.D., Research Associate
Richard L. Hoffman, Ph.D., Research
Associate
Kurt Johnson, Ph.D., Research Associate
Kumar Krishna, Ph.D., Research Associate
Charles D. Michener, Ph.D., Research
Associate
Mary F. Mickevich, Ph.D., Research
Associate
A. F. Millidge, Ph.D., Research Associate
Philip D. Perkins, Ph.D., Research
Associate
William A. Shear, Ph.D., Research
Associate
James A. Slater, Ph.D., Research Associate
Gary M. Stonedahl, Ph.D., Research
Associate
Howard T. Topoff, Ph.D., Research
Associate
Quentin D. Wheeler, Ph.D., Research
Associate
Raymond R. Forster, Ph.D., Thorne
Research Fellow
Raymond Mendez, Field Associate
James Reddell, B.A., Field Associate
R. T. Allen, Ph.D., Associate
Robert C. Dalgleish, Ph.D., Associate
Noel L.H. Krauss, Ph.D., Associate
Bryant Mather, D.Sc., Associate
Charles Mitter, Ph.D., Associate
John A. Murphy, M.Sc., Associate
John T. Polhemus, Ph.D., Associate
Kathleen A. Schmidt, M.S., Associate
Walter C. Sedgwick, B.A., Associate
John Stamatov, D.D.S., Associate

HERPETOLOGY AND ICHTHYOLOGY

Gareth Nelson, Ph.D., Chairman and
Curator
Charles J. Cole, Ph.D., Curator
Charles W. Myers, Ph.D., Curator
C. Lavett Smith, Ph.D., Curator

Richard G. Zweifel, Ph.D., Curator
Michael L. Smith, Ph.D., Kalbfleisch Assistant Curator (Fellow)
Melanie L. J. Stiassny, Ph.D., Assistant Curator
Lester Aronson, Ph.D., Curator Emeritus
James W. Atz, Ph.D., Curator Emeritus
Charles M. Bogert, A.M., LL.D., Curator Emeritus
M. Norma Feinberg, A.B., Senior Scientific Assistant
Michael W. Klemens, M.S., Senior Scientific Assistant
Margaret G. Arnold, B.A., Scientific Assistant
Barbara Brown, Ph.D., Scientific Assistant
Thomas J. Trombone, B.A., Scientific Assistant
Margaret S. Shaw, B.Mus., Assistant to the Chairman
Frances J. Irish, Ph.D., Kalbfleisch Research Fellow
Steven L. Leipertz, Ph.D., Thorne Research Fellow
Peter N. Reinthal, Ph.D., Kalbfleisch Research Fellow
Reeve M. Bailey, Ph.D., Research Associate
William Bemis, Ph.D., Research Associate
Roger Conant, Sc.D., Research Associate
Martha L. Crump, Ph.D., Research Associate
John W. Daly, Ph.D., Research Associate
Herbert C. Dessauer, Ph.D., Research Associate
Carl Gans, Ph.D., Research Associate
P. Humphrey Greenwood, D.Sc., Research Associate
Klaus D. Kallman, Ph.D., Research Associate
Richard Lund, Ph.D., Research Associate
Francisco Mago-Leccia, Ph.D., Research Associate
Linda R. Maxson, Ph.D., Research Associate
Sherman A. Minton, Jr., M.D., Research Associate
Peter Moller, Ph.D., Research Associate
John A. Moore, Ph.D., Research Associate
Lynne R. Parenti, Ph.D., Research Associate
Colin Patterson, Ph.D., Research Associate
Joseph W. Rachlin, Ph.D., Research Associate
Janis A. Roze, Ph.D., Research Associate
Wade C. Sherbrooke, Ph.D., Research Associate
Carol Ann Simon, Ph.D., Research Associate
James C. Tyler, Ph.D., Research Associate
Paulo E. Vanzolini, Ph.D., Research Associate
Richard P. Vari, Ph.D., Research Associate
P.J.P. Whitehead, Ph.D., Research Associate
Dannie A. Hensley, Ph.D., Field Associate
Victor Martinez C., Lic., Field Associate
Alfredo Paolillo O., Lic., Field Associate
R.L. Shipp, Ph.D., Field Associate
James Van Tassell, Field Associate
Itzchak Gilboa, B.A., Associate
Ernest A. Liner, B.S., Associate
Norman Macbeth, J.D., Associate
Anne B. Meylan, Ph.D., Associate
Andrew E. Sabin, B.S., Associate
Jacques Serrier, Ph.D., Associate
Carol R. Townsend, B.A., Associate

INVERTEBRATES
Niles Eldredge, Ph.D., Chairman and Curator
William K. Emerson, Ph.D., Curator
Neil H. Landman, Ph.D., Associate Curator
Judith E. Winston, Ph.D., Associate Curator
Norman D. Newell, Ph.D., Curator Emeritus
Harold S. Feinberg, B.A., Senior Scientific Assistant
Sidney S. Horenstein, A.B., Senior Scientific Assistant
Walter E. Sage, III, B.S., Senior Scientific Assistant
John Arnold, Ph.D., Research Associate
William A. Berggren, Ph.D., Research Associate
Donald W. Boyd, Ph.D., Research Associate
J. Kirk Cochran, Ph.D., Research Associate
Howard R. Feldman, Ph.D., Research Associate
Stephen Jay Gould, Ph.D., Research Associate
James D. Hays, Ph.D., Research Associate
Jeremy Jackson, Ph.D., Research Associate
John J. Lee, Ph.D., Research Associate
Linda Habas Mantel, Ph.D., Research Associate
Leslie F. Marcus, Ph.D., Research Associate
Harold B. Rollins, Ph.D., Research Associate
John D. Soule, Ph.D., Research Associate
Horace W. Stunkard, Ph.D., Sc.D., Research Associate
Elisabeth S. Vrba, Ph.D., Research Associate
Kirk Fitzhugh, Ph.D., Thorne Research Fellow
Marjorie Grene, Ph.D., Research Associate

MICROPALEONTOLOGY PRESS
John A. Van Couvering, Ph.D., Editor
Norman S. Hillman, M.S., Production Editor
Susan E. Carroll, M.S., Associate Editor

MAMMALOGY
Guy G. Musser, Ph.D., Chairman and Curator
Sydney Anderson, Ph.D., Curator
Ethel Tobach, Ph.D., D.Sc., Curator
Robert S. Voss, Ph.D., Assistant Curator
Karl Koopman, Ph.D., Curator Emeritus
Richard G. Van Gelder, Ph.D., Curator Emeritus
Marie A. Lawrence, M.S., Senior Scientific Assistant
Teresa Hernandez, M.S., Scientific Assistant
Michael D. Carleton, Ph.D., Research Associate
Marion Dagosto, Ph.D., Research Associate
Louise Emmons, Ph.D., Research Associate
Robert E. Goodwin, Ph.D., Research Associate
Arthur M. Greenhall, M.S., Research Associate
Thomas A. Griffiths, Ph.D., Research Associate
Stuart O. Landry, Jr., Ph.D., Research Associate
James N. Layne, Ph.D., Research Associate
M. Raymond Lee, Ph.D., Research Associate
Philip Myers, Ph.D., Research Associate
James L. Patton, Ph.D., Research Associate
Michael Rose, Ph.D., Research Associate
Esteban E. Sarmiento, Ph.D., Research Associate
George B. Schaller, Ph.D., Research Associate
Kathleen M. Scott, Ph.D., Research Associate
James L. Wolfe, Ph.D., Research Associate
Terry L. Yates, Ph.D., Research Associate
Thomas L. Blakemore, Field Associate
Audrone R. Biknevicius, M.A., Associate
Timothy J. McCarthy, Associate
Jose Ramirez-Pulido, Ph.D., Associate

MINERAL SCIENCES
George E. Harlow, Ph.D., Chairman and Curator
Martin Prinz, Ph.D., Curator
Edmond A. Mathez, Ph.D., Assistant Curator
Demetrius C. Pohl, Ph.D., Assistant Curator
Joseph J. Peters, M.S., Senior Scientific Assistant
Gregory J. Cavallo, B.S., Scientific Assistant
Michael R. Weisberg, M.S., Scientific Assistant
Christopher J. Fridrich, Ph.D., Kalbfleisch Research Fellow
Robert T. Dodd, Ph.D., Research Associate
Klaus Keil, Ph.D., Research Associate
Arthur M. Langer, Ph.D., Research Associate
C. E. Nehru, Ph.D., Research Associate
George R. Rossman, Ph.D., Research Associate
J. V. Smith, Ph.D., Research Associate
Thomas A. Peters, M.S., Associate
Anna S. Sofianides, M.S., Associate
Julius Weber, Hon. D.Sc., Associate

ORNITHOLOGY
Francois Vuilleumier, Ph.D., Chairman and Curator
Lester L. Short, Ph.D., Curator
George F. Barrowclough, Ph.D., Associate Curator
Dean Amadon, Ph.D., Sc.D., Lamont Curator Emeritus of Birds
Wesley E. Lanyon, Ph.D., Lamont Curator Emeritus of Birds
Ernst Mayr, Ph.D., Curator Emeritus
Mary LeCroy, B.S., Senior Scientific Assistant
Allison Andors, Ph.D., Scientific Assistant
Jonathan Becker, Ph.D., Chapman Fellow

Angelo Capparella, Ph.D., Chapman Fellow
Helen Hays, B.A., Chairwoman, Great Gull Island Committee
Robert Bleiweiss, Ph.D., Research Associate
Walter J. Bock, Ph.D., Research Associate
Jared Diamond, Ph.D., Research Associate
Robert W. Dickerman, Ph.D., Research Associate
Crawford H. Greenewalt, Sc.D., Research Associate
James C. Greenway, Jr., A.B., Research Associate
Cheryl F. Harding, Ph.D., Research Associate
G. Stuart Keith, M.A. (Oxon.), Research Associate
*William H. Phelps, Jr., B.Sc., Research Associate
Robert F. Rockwell, Ph.D., Research Associate
Mary McKitrich, Ph.D., Chapman Research Fellow
John Bull, Field Associate
John Eleuthere du Pont, Sc.D., Field Associate
Parker Cane, Ph.D., Associate
Sadie L. Coats, Ph.D., Associate
Ruth Trimble Chapin, Associate
Ruth DeLynn, Associate
Ben King, Associate
Richard Sloss, Associate

VERTEBRATE PALEONTOLOGY
Michael Novacek, Ph.D., Chairman and Associate Curator
Eugene S. Gaffney, Ph.D., Curator
Malcolm C. McKenna, Ph.D., Frick Curator
Richard H. Tedford, Ph.D., Curator
John G. Maisey, Ph.D., Associate Curator
Edwin H. Colbert, Ph.D., Sc.D., Curator Emeritus
Bobb Schaeffer, Ph.D., Curator Emeritus
Morris F. Skinner, Sc.D., Frick Curator Emeritus
Susan Koelle Bell, A.B., Senior Scientific Assistant
Charlotte P. Holton, B.A., Senior Scientific Assistant
John P. Alexander, B.A., Scientific Assistant
Ellen J. Garvens, M.S., Scientific Assistant
Donald Baird, Ph.D., Research Associate
Eric Delson, Ph.D., Research Associate
Robert Emry, Ph.D., Research Associate
John J. Flynn, Ph.D., Research Associate
Lance Grande, Ph.D., Research Associate
Max K. Hecht, Ph.D., Research Associate
Robert M. Hunt, Jr., Ph.D., Research Associate
Bruce J. MacFadden, Ph.D., Research Associate
Peter Meylan, Ph.D., Research Associate
Paul E. Olsen, Ph.D., Research Associate
John H. Ostrom, Ph.D., Research Associate
John H. Wahlert, Ph.D., Research Associate
Peter Lewis, Field Associate

COUNCIL OF THE SCIENTIFIC STAFF
Niles Eldredge, Ph.D., Dean
Michael Novacek, Ph.D., Assistant Dean
George Barrowclough, Ph.D., Secretary
The Chairmen of the Scientific and Educational Departments and Six Elected Members at Large

SOUTHWESTERN RESEARCH STATION
Wade C. Sherbrooke, Ph.D., Resident Director

EDUCATION
Malcolm J. Arth, Ph.D., Chairman and Curator
Kenneth A. Chambers, M.S., Assistant Chairman
Marcia White, B.A., Manager of Teaching Programs
Gloria Davis, B.A., Education Registrar
Ismael Calderon, M.A., Coordinator of Community Programming
Stephanie Penceal, B.A., Assistant Community Programs Coordinator
Nathaniel Johnson, Jr., M.A., Special Programs Coordinator
Marjorie M. Ransom, M.A., Supervising Museum Instructor
Paul J. Sanfacon, M.A., Senior Museum Instructor
Helmut W. Schiller, B.S., Senior Museum Instructor
Frances C. Smith, B.S., Museum Instructor
Lisa Breslof, B.S., Museum Instructor
Janice B. Durant, B.A., Museum Instructor
Mary Kim, B.A., Museum Instructor
Ann Prewitt, M.A., Museum Instructor
Gabrielle Tannor, B.A., Museum Instructor
Andrea M. Thaler, B.S., Museum Instructor
Elizabeth A. Guthrie, B.A., Associate in Nature Education
Robin Lehman, Associate in Photography

EXHIBITION AND GRAPHICS
George S. Gardner, B.I.D., B.F.A., Chairman

Exhibition
Ralph J.T. Bauer, B.F.A., Manager
Stephen Quinn, Assistant Manager
Eugene B. Bergmann, B.I.D., Senior Exhibit Designer
J. Willard Whitson, M.F.A., Exhibit Designer
Lawrence Langham, B.F.A., Assistant Designer
Lowell Dingus, Ph.D., Exhibition Coordinator
Kevin Coffee, B.F.A., Exhibit Maintenance Coordinator
Lauriston Marshall, M.F.A., Coordinator of Special Exhibitions

Graphics
Joseph M. Sedacca, B.A., Manager

Audio-Visual
Larry Van Praag, Chief Projectionist

LIBRARY SERVICES
Nina J. Root, M.S.L.S., Chairwoman
Miriam Tam, M.S.L.S., Assistant Librarian for Technical Services
Valerie Wheat, M.L.S., Assistant Librarian for Reference Services
Barbara Rhodes, M.S.L.S., Conservation Librarian
Diana Shih, M.S.L.S., Senior Cataloging Librarian
Carol W. Tucher, M.L.S., Senior Reference Librarian
Priscilla Watson, M.L.S., Senior Acquisitions Librarian
Andrea LaSala, M.L.S., Special Collections Librarian
Frank Chiu, M.L.S., Cataloging Librarian
Martin Shapiro, M.L.S., Reference Librarian
Russel Rak, M.A., Administrative Assistant
Mary E. Genett, M.L.S., Library Associate

PUBLICATIONS

Curator
Thomas D. Nicholson, Ph.D., Editor-in-Chief
Coleen Mehegan, Managing Editor
Nancy F. Creshkoff, Assistant Editor

Scientific Publications
Brenda E. Jones, B.A., Editor
Joseph M. Sedacca, B.A., Manager

DEVELOPMENT AND PUBLIC AFFAIRS
Ann Breen Metcalfe, B.A., Chairwoman
Marilyn Badaracco, Manager for Guest Services
Marjorie Bhavnani, B.A., Manager for Volunteers and Information Desk Services
Herb Kurz, B.A., Manager for Public Affairs
Marcia Schaeffer, B.A., Manager for Benefit Events
Henry Schulson, B.A., Manager for Devolpment
Margaret Fretz, Assistant Volunteer Manager
Judith Moreland, M.F.A., Assistant Volunteer Manager
Christopher C. Stromee, M.B.A., Assistant Manager for Development
Genevieve Wolf, Assistant Volunteer Manager
Diane M. Menditto, B.A., Administrator for Grants and Fellowships
David Crandall, B.A., Development Associate
Melvin Elberger, M.A., Public Affairs Associate
Doris Bull Kraus, Ph.D., Public Affairs Associate
Adele Meyer, M.A., Development Associate
Laura J. Mogil, B.A., Public Affairs Associate
Renee Perry, B.A., Development Associate

 *Deceased

Amy Rudnick, B.A., Guest Services Associate
Lorraine Airall, Contributors' Assistant
Laura Coleman, B.A., Development Assistant
Kathleen Erin McGrath, B.A., Public Affairs Assistant
Bernard Tato, Development Assistant
Naomi Weinstein, B.A., Guest Services Assistant

NATURAL HISTORY MAGAZINE
L. Thomas Kelly, M.B.A., Publisher
Alan Ternes, M.Ph., Editor
Ruth D. McCrea, Jr., M.B.A., General Manager
Cary Castle, B.B.A., Circulation Manager
Mark Abraham, B.A., Production Manager
Lee B. Ewing, M.B.A., Assistant Business Manager
Ellen M. Goldensohn, M.A., Managing Editor
Thomas Page, Designer
Florence Edelstein, Copy Chief
Rebecca Finell, B.A., Senior Editor
Sally Lindsay, M.F.A., Senior Editor
Bruce D. Stutz, B.A., Senior Editor
Vittorio Maestro, B.A., Associate Editor
Ernestine Weindorf, Assistant to the Publisher
Ramon Alvarez, B.A., Promotion Manager
Colleen Mehegan, B.A., Manager of Special Publications
Timothy Thom, B.S., Assistant Circulation Manager
Vivian Mahlab, B.S., Advertising Production Coordinator

DISCOVERY TOURS
R. Todd Nielsen, B.A., Manager for Discovery Tours
Richard Houghton, M.S., Discovery Tours Associate
Elizabeth DeGaetano, B.S., Tour Coordinator

MEMBERSHIP
Sheila Greenberg, M.S., Manager of Membership Services
Donna Bell, B.A., Membership Associate

MUSEUM SHOP
Martin Tekulsky, A.B., Marketing Manager
Craig Neglia, B.A., Operations Manager
Charles L. Hopkins, B.S., Assistant Manager
Charles Kanarick, B.A., Assistant Manager
Gloria Malafronte, M.A., Assistant Manager

ADMINISTRATIVE AND SCIENTIFIC RESEARCH SERVICES
Pearlie Tillman, B.P.S., Assistant to the Chairman of the Board of Trustees
Diane M. Menditto, B.A., Assistant to the Director
Robert M. Acker, B.S., Assistant to Deputy Director for Administration
Barbara Jacob, B.B.A., Internal Auditor
Janet L. Shipley, Administrative Secretary and Assistant Executive Secretary
Barbara M. Conklin, B.A., Collections Registrar
Paul F. Beelitz, M.A., Associate Collections Registrar
Joan Whelan, M.A., Interdepartmental Facilities Coordinator
Peling Fong, B.S., Scientific Assistant, Interdepartmental Facilities
Belinda Kaye, B.A., Assistant Registrar for Loans
William B. Weinstein, B.A., Assistant Registrar for Data Management

GENERAL SERVICES
Richard P. Sheridan, B.A., Manager
Adam H. Anik, B.F.A., Assistant Manager
Kenneth T. Hamilton, B.A., Assistant Manager

OFFICE OF THE ASSISTANT DIRECTOR FOR FINANCIAL OPERATIONS AND CONTROLLER
Pauline G. Meisler, M.B.A., Assistant Director for Financial Operations
Frances M. Dunleavy, B.S., Controller
Jason S. Lau, M.B.A., Assistant Controller
Donald R. Kossar, B.S., Chief Budget Accountant and Senior Grants Accountant
Fred R. Quijano, B.S., Associate to Controller
Jeanette Behr, M.B.A., Assistant to the Controller
Alfredo Guerrero, B.B.A., Assistant to the Controller
Gilbert Bramwell, B.S., Staff Accountant
Charles Urban, Manager, General Accounting
Ugo E. Marini, Assistant Manager, General Accounting
Maria A. Luna, B.S., Accounts Payable Supervisor
Audrey Yuille, Computer Coordinator
Robert Applebaum, Payroll Manager
Jeffrey Maer, B.A., Purchasing Manager
David E. Csuray, Purchasing Associate
Jerome Williams, M.A., Admissions Control Manager
Barbara Armond, Senior Assistant Manager, Admissions Control
Janet Mazeika, B.A., Assistant Manager, Admissions Control
Bernice Salik, B.A., Assistant Manager, Admissions Control
Rita Barclay, Assistant Manager, Admissions Control

PERSONNEL
Geraldine M. Smith, B.A., Personnel Manager
Lewis Vilensky, M.Ed., Senior Personnel Assistant
Susan L. Kroll, Personnel Assistant

PLANT OPERATIONS
Norene L. Brooks, B.B.A., Plant Manager

Construction
Richard Slawski, B.S., Construction Manager
Julio A. Correa, B.A., Assistant Manager
Albert Grenzig, B.E.E., Assistant Manager
Carl Hilgers, Assistant Manager
Klaus A. Wolters, Assistant Manager
William A. Graham, Assistant to the Manager

Maintenance
Bal Raj Vohra, B.E.E., M.B.A., Maintenance Manager
Andrzej M. Witek, M.S., Assistant Manager
Edwin Garcia, Assistant Manager
Mary Dillon, Cleaning Supervisor

Building Services
Charles L. Miles, Manager
Sankar Gokool, Associate Manager
Martha A. Meegan, B.A., Senior Assistant Manager
Joseph Arguinzoni, Assistant Manager
Timothy Flynn, Assistant Manager
Carol Grant, Assistant Manager
Robert B. Hill, Assistant Manager
Frank P. Masavage, Assistant Manager
Erin J. O'Reilly, B.A., Assistant Manager
Joyce Wallach, Assistant to the Manager
Trenton Chapman, Supervising Museum Attendant-Guard
Albert Pontecorvo, Supervising Museum Attendant-Guard

MEMBERS ELECTED BY THE BOARD OF TRUSTEES TO HIGHER CATEGORIES OF MEMBERSHIP

ENDOWMENT
Herbert R. Axelrod
Dr. and Mrs. Henry Clay Frick, II

BENEFACTOR
Joseph F. Cullman, 3rd

ASSOCIATE FOUNDER
Mr. and Mrs. Herbert L. Abrons

ASSOCIATE BENEFACTOR
Scott Blair

PATRON
Mr. and Mrs. Eugene Becker
Vincent Kosuga
Andrew Sabin

ASSOCIATE PATRON
Mrs. William B. Chappell, Jr.
Irene Diamond
Robert C. Dorion
Orrin M. C. Hein
Michael W. Klemens
Carol Hertweck Lowy
Ted Lowy
Dr. Chomingwen D. Pond
Melvin B. Robin

HONORARY LIFE MEMBERS
Charlotte P. Holton
C. Lavett Smith
Barbara F. Werscheck
John P. White

CORRESPONDING MEMBERS
David Attenborough, Richmond, Surrey, England
Ronald M. Bernier, Professor of Art History, University of Colorado, Boulder, Colorado
William G. Conway, General Director, New York Zoological Society, Bronx, New York
G. Arthur Cooper, Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.
Frank K. Edmonson, Astronomy Department, Indiana University, Bloomington, Indiana
Clifford Frondel, Department of Geological Sciences, Harvard University, Cambridge, Massachusetts
Caryl P. Haskins, Former President, Carnegie Institution of Washington, Washington, D.C.
Claude Levi-Strauss, 2 Rue de Marronniers, Paris, France
Benjamin S.P. Shen, Professor of Astronomy, University of Pennsylvania, Philadelphia, Pennsylvania
Ethelwynn Trewavas, British Museum (Natural History), London, England
T.S. Westoll, Department of Geological Sciences, University of Durham at King's College, Newcastle-upon-Tyne, England

CONTRIBUTORS
July 1, 1987-June 30, 1988

UNRESTRICTED GIFTS

INDIVIDUALS, FOUNDATIONS, AND CORPORATIONS

$50,000 and over
The Ambrose Monell Foundation
Chemical Bank
IBM Corporation

$25,000 and over
The Bank of New York
Bristol-Myers Company
Citicorp/Citibank
Exxon Corporation
Goldstar Electronics International
F. M. Kirby Foundation, Inc.
Joseph Klingenstein
Mr. and Mrs. Jerome Kohlberg, Jr.
Philip Morris Companies Inc.
Revlon Foundation, Inc.
The Scherman Foundation, Inc.
The G. Unger Vetlesen Foundation
Thomas J. Watson, Jr.

$10,000 and over
Anonymous
AT&T Foundation
Mr. and Mrs. Herbert L. Abrons
American Express Foundation
The Anschutz Foundation
J.M.R. Barker Foundation
Boone and Crockett Club
CIBA-GEIGY Corporation
Carter-Wallace, Inc.
Consolidated Edison Company of New York, Inc.
Joseph F. Cullman, 3rd
Du Pont Company
Engelhard Hanovia, Inc.
The Helen Clay Frick Foundation
General Foods Fund, Inc.
William T. Golden
Mr. and Mrs. Henry B. Guthrie
The Home Group, Inc.
Johnson & Higgins
Liz Claiborne Inc.
Mr. and Mrs. Frank G. Lyon
Marsh & McLennan Companies, Inc.
Maurice Villency Inc.
McGraw-Hill, Inc.
Mercedes-Benz of North America, Inc.
Merrill Lynch & Co., Inc.
Metropolitan Life Foundation
Milbank, Tweed, Hadley & McCloy
Morgan Stanley Foundation
J.P. Morgan & Co.
The William T. Morris Foundation, Inc.
Charles H. Mott
New York Telephone Company
New York Times Company Foundation Inc.
Ogilvy & Mather Worldwide, Inc.
Pfizer Foundation
Proskauer Rose Goetz & Mendelsohn
Sarah I. Schieffelin Residuary Trust
Shearman & Sterling
Showtime/The Movie Channel Inc.
The Starr Foundation
Time Inc.
United States Trust Company of New York
Warner Communications, Inc.
John Wiley & Sons, Inc.

$5,000 and over
Allied-Signal, Inc.
American Brands, Inc.
American-Standard Foundation
The Baird Family Fund
Helen W. Buckner
CBS Inc.
The Chubb Corporation Charitable Trust
The Coach Dairy Goat Farm
Colgate-Palmolive Company
Coopers & Lybrand
Dextra Baldwin McGonagle Foundation, Inc.
Irene Diamond
Mrs. Hart Fessenden
Allan H. Fine
GTE Foundation
Ann and Gordon Getty Foundation
Graham Energy Services, Inc.
Mary W. Harriman Foundation
Orrin M. C. Hein
Hoescht Celanese Corporation
The Henry Kaiser Family Foundation
Lansing Lamont
Lutin & Company
Manufacturers Hanover Trust Company
Frank A. Metz, Jr.
Edward S. Moore Foundation
New York Fashion Council, Inc.
New York Life Foundation
Newsweek
Ogden Corporation
The Procter & Gamble Fund
Rockefeller Group Inc.
James S. Rockefeller
The Salomon Foundation, Inc.
The Seth Sprague Educational and Charitable Foundation
Sterling Drug Inc.
Mrs. Arthur Hays Sulzberger
Dr. Judith P. Sulzberger
Texaco, Inc.
Union Pacific Foundation
Morris L. Wade
Lawrence A. Wien Foundation, Inc.
The H.W. Wilson Foundation, Inc.

$2,500 and over
Anonymous
Elga Andersen-Gimbel
Automatic Data Processing, Inc.
The Theodore H. Barth Foundation
The Howard Bayne Fund
Mrs. William Bemis
Mr. and Mrs. Alan J. Blinken
Bunge Corporation
CPC International Inc.
Capital Cities Communications, Inc.

Mr. and Mrs. William B. Chappell, Jr.
Cleveland H. Dodge Foundation, Inc.
The Dyson Foundation
Freeport-McMoRan, Inc.
Gulf + Western Foundation
Hoffman-LaRoche Inc.
Helen Imperatore
International Paper Company Foundation
Irving One Wall Street Foundation, Inc.
Mr. and Mrs. Bill G. Lambert
Thomas J. Lipton Foundation Inc.
Leon Lowenstein Foundation, Inc.
Mr. and Mrs. John D. Macomber
R.H. Macy & Co., Inc.
May Department Stores Company
Mobil Foundation, Inc.
Nabisco Brands Inc.
National Westminster Bank U.S.A.
Newmont Mining Corporation
Mr. and Mrs. Thomas M. Peters
Phelps Dodge Foundation
Price Waterhouse
Primerica
Restaurant Associates Industries, Inc.
S.H. and Helen R. Scheuer Family Foundation
Sony Corporation of America Foundation, Inc.
J.P. Stevens & Co., Inc., Foundation
Marion Peters Stine
Unilever United States, Inc.
Uris Brothers Foundation
Wertheim Schroder & Co.
Westvaco Corporation
The Widder Foundation, Inc.
Wyssmont Co., Inc.
The Xerox Foundation

$1,000 and over
Anonymous
Mr. and Mrs. Howard Alper
Mr. and Mrs. Arthur G. Altschul
Amax Foundation
American Diversified Enterprises, Inc.
American International Group, Inc.
American Re-Insurance Company
Ametek, Inc.
Arthur Andersen & Co.
The Honorable Walter H. Annenberg
Arthur Young and Company
Mr. and Mrs. Thomas D. Barrow
The Morris S. and Florence H. Bender Foundation, Inc.
Mrs. F. Henry Berlin
Robert B. Betts
John C. Bierwirth
Mrs. William R. Biggs
Margaret D. Bishop
Block Drug Company Inc.
Bloomingdale's
Mr. and Mrs. Robert E. Blum
Bowne & Company, Inc.
Joseph G. Bradley
Mr. and Mrs. Alfred Brittain, III
G. William Brown, Jr.
Joan Bull
Robert G. Bushnell, Jr.
Mr. and Mrs. Thomas P. Caine
Clabir Corporation Foundation
Mr. and Mrs. Howard L. Clark
Mr. and Mrs. Stephen M. Clement, III
Paul Gregory Clifford
Dr. and Mrs. David A. Cofrin
Frederick Cohen and Diane Feldman
Cynthia Green Colin
The Commonwealth Fund
The Constans Culver Foundation
Elizabeth Cressman
Michel David-Weill
The Honorable and Mrs. Douglas Dillon
R.R. Donnelley & Sons Company
Dr. and Mrs. Strachan Donnelley
Charles E. Dorkey, III and Phyllis A. Johnson
Mr. and Mrs. L. F. Boker Doyle
Drexel Burnham Lambert
The Dun & Bradstreet Corporation Foundation
Mr. and Mrs. Royal H. Durst
Mr. and Mrs. Robert G. Engel
The Equitable Life Assurance Society of the United States
Ernst & Whinney
Essex Chemical Corporation
The T.M. Evans Foundation
Federated Department Stores Foundation
Laurence and Laurie Fink
Andrea Finkelstein
The First Boston Foundation Trust
Ford Motor Company Fund
Albert Foster
Fribourg Foundation, Inc.
Mrs. Seaton Gales
Gannett Foundation
Mr. and Mrs. Richard L. Gelb
General Host Corporation
Mr. and Mrs. Elbridge T. Gerry
Mr. and Mrs. Richard J. Gilder, Jr.
Mr. and Mrs. Robert G. Goelet
Goldfarb & Fleece
Mr. and Mrs. S. Howard Goldman
Mr. and Mrs. William C. Graustein
Mr. and Mrs. Henry Bridgmen Griswold
Grow Tunneling Corporation
The Guardian Life Trust
Mr. and Mrs. Arnold Gumowitz
Mr. and Mrs. Melville W. Hall
Mr. and Mrs. Robert L. Hallock, Jr.
Mr. and Mrs. Ralph E. Hansmann
Joseph H. Hazen
Mr. and Mrs. Charles J. Hedlund
Robert Heilbrunn
The Henley League Ltd.
Mr. and Mrs. R. Allen Hermes
Margaret B. Hicklin
George C. Hixon
Home Life Insurance Company
The IFF Foundation Inc.
Mr. and Mrs. Peter Iselin
William K. Jacobs, Jr.
Jaros, Baum & Bolles
Mrs. B. Brewster Jennings
Joyce Leslie, Inc.
Kane Lodge Foundation, Inc.
Mr. and Mrs. Mark N. Kaplan
Mr. and Mrs. Robert W. Kean, Jr.
Mr. and Mrs. Stephen M. Kellen
Mrs. John L. Kemmerer
The Knapp Foundation, Inc.
Joseph Lapatin
Mr. and Mrs. Alexander M. Laughlin
Mrs. Thomas LeBoutillier
Mr. and Mrs. M. William Levy
Mr. and Mrs. Troland S. Link
Leonard Litwin
Mr. and Mrs. John L. Loeb
Loehmann's Inc.
Lord and Taylor
Laurence D. Lovett
The Macmillan Foundation
James A. Macdonald Foundation
Mr. and Mrs. James I. Magid
Joseph Magliocco
George W. Maker and Marion Berger
Mr. and Mrs. Plato Malozemoff
Mr. and Mrs. Hayward F. Manice
Marine Midland Bank, N.A.
Michael T. Martin
William F. May
Mr. and Mrs. Neil Michael McCarthy
Robert Earll McConnell Foundation
Mr. and Mrs. John F. McNiff
Melville Corporation
The Memton Fund, Inc.
Mr. and Mrs. Henry H. Meyer, Jr.
Mitsubishi International Corporation
The Leo Model Foundation
Benjamin Moore & Co.
Mr. and Mrs. James E. Moore
Mrs. Henry L. Moses
Mr. and Mrs. John C. Nelson
Neuberger & Berman
Herbert J. Neuman
Newsday Inc.
North American Reinsurance Corporation
OSG Foundation
Mrs. Donald M. Oenslager
Irene H. Perkins
Mr. and Mrs. Gerard Piel
Donald C. Platten
Mr. and Mrs. Alexander M. Power
Robert W. Purcell
Harold K. Raisler Foundation
Robert K. Raisler Foundation
Judith S. Randal
Lawrence G. Rawl
Reliance Group Holdings, Inc.
Mrs. William C. Ridgway, Jr.
Mr. and Mrs. David Rockefeller
Mrs. John D. Rockefeller 3rd
Mrs. Laurance S. Rockefeller
Mrs. Richard Rodgers
Rollins Burdick Hunter of New York, Inc.
Elihu Rose
Mr. and Mrs. Frederick P. Rose
Mrs. Axel G. Rosin
John Richard Royall
Saatchi & Saatchi DFS, Inc.
Sasco Foundation
The William P. and Gertrude Schweitzer Foundation, Inc.

Dorothy Schiff
Scudder, Stevens & Clark Ltd.
Sears, Roebuck and Co.
Mr. and Mrs. Norman M. Segal
Grethe Seim
Kira Sergievsky and Joseph Mische
Alexander B. Slater
Ada Slawson
The Smith, Barney Foundation
Constance Spahn
Doris Jones Stein Foundation
Martha Roby Stephens
Mr. and Mrs. Alfred R. Stern
Mrs. Gardner D. Stout
Mr. and Mrs. Oscar S. Straus, II
Mr. and Mrs. Arthur Ochs Sulzberger
Swiss Bank Corporation
Syska & Hennessy Inc.
Tambrands Inc.
Thomas & Betts Charitable Trust
The Oakleigh L. Thorne Foundation
Mr. and Mrs. Robert M. Topol
Mr. and Mrs. Eugene Tuck
USLIFE Corporation
Union Bank of Switzerland
Universal Leaf Tobacco Co. Inc.
Mr. and Mrs. John B. Watkins
The Weiler-Arnow Family
Mr. and Mrs. Josh Weston
Mrs. John Campbell White
Mr. and Mrs. James H. Wiborg
William E. Willis
Winfield Foundation
Robert Winthrop
The Robert I. Wishnick Foundation

$500 and over
Anonymous
The A. E. Fund
ADT Security Systems
AKC Fund Inc.
Mr. and Mrs. Walter R. Abbott, Jr.
Mr. and Mrs. Joseph C. Abeles
Mrs. Lester S. Abelson
Alexander's, Inc.
American Home Products Corporation
American List Counsel
Amstar Corporation
Harry B. Anderson
The William H. Anderson
Apple Bank for Savings
Atlantic Bank of New York
Mr. and Mrs. Ned W. Bandler, Jr.
William R. Berkley
Jerry Biegel
Mrs. George M. Bierly
Mr. and Mrs. Harry Payne Bingham, Jr.
Mr. and Mrs. Robert L. Bodor
Benjamin Brewster
Mr. and Mrs. Robert L. Bridges
Alfred P. Brooks
Mr. and Mrs. Shirley C. Burden
Mr. and Mrs. Owen B. Butler
W.P. Carey & Co., Inc.
Mr. and Mrs. John S. Carter, Jr.
Mr. Donald K. Clifford, Jr.
Columbia Foundation
Mr. and Mrs. William J. Constantine
Mr. and Mrs. Henry G. Corey
Louise B. and Edgar M. Cullman Foundation
Susan L. Cullman
Catherine Gamble Curran
Jo Ann Czekalski and James P. Stokes
Mr. and Mrs. Jean Paul Delmas
Discount Corporation of New York Foundation
Mrs. Robert N. Downs, III
Mr. and Mrs. Edmund C. Duffy
The East New York Savings Bank
Epstein Philanthropies
Bernard Fein
Donald M. Feuerstein
Elias and Bertha Fife Foundation
Forbes, Inc.
Edward H. Gerry
Benjamin D. Gilbert
Elizabeth B. Gilmore and Family
Mark A. Gordon
Mr. and Mrs. John Hudson Hall, Jr.
Handy & Harman Foundation
Mr. and Mrs. Gordon Hanes
David H. Hausmann
Mr. and Mrs. Jack R. Howard
Hans P. Huber
Mabel S. Ingalls
Mr. and Mrs. Henry J. Jacoby
Mr. and Mrs. E. Cooper Jacques
Mr. and Mrs. Edward H. Judson
Max Kade Foundation, Inc.
Dr. Joan A. Kedziora
Dr. and Mrs. Walter J. Kenworthy
Dr. and Mrs. Hoshang J. Khambatta
Lenox, Inc.
Marianne and Frank P. Lester
Susan E. Linder
Donna Wilson Long
Mrs. Adams Mandeville
Robert C. Marston
Sue McClary
Mr. and Mrs. A. Bliss McCrum, Jr.
Mrs. Kenneth H. McNeil
Steven Miller
Mitsui & Company (U.S.A.), Inc.
Michael A. Moran
Gerald F. Norcott
Mr. and Mrs. Walter H. Page
Ms. Creighton H. Peet
Mrs. George W. Perkins
Colin S. Phipps
William W. Reese
Mr. and Mrs. Willis L. M. Reese
Mr. and Mrs. Saul Rosen
Mr. and Mrs. Milton F. Rosenthal
Allan A. Ryan, III
Mrs. Charles M. Scott
Seaboard Surety Company
Mrs. Ottavio Serena di Lapigio
Frank C. Shattuck
Marilyn Hawrys Simons
Mr. and Mrs. Richard A. Sloss
Mrs. Witham Smith
Mr. and Mrs. Austin L. Smithers
Mrs. Sydney Snyder
John A. Sprague
Constance W. Stafford
John W. Straus
Sugar Foods Corporation
Mr. and Mrs. C. Harold Taylor
Mrs. James Eldric Teague
Travelers Companies Foundation, Inc.
Col. and Mrs. John A. Ulrich
Mr. and Mrs. Jeptha H. Wade
Dr. and Mrs. George E. Wantz, Jr.
Waring & LaRosa, Inc.
Pierre J. Wertheimer Foundation
Mr. and Mrs. Stephen K. West
Mr. and Mrs. Taggart Whipple
Mr. and Mrs. Ramsay Wilson
Mrs. Marillyn Wilson
Carl Zeiss, Inc.

RESTRICTED GIFTS

Donor
Project

$200,000 and over
Charles Hayden Foundation
Planetarium improvements
Howard Phipps Foundation
Scientific Research and Special Projects
Samuel and May Rudin Foundation, Inc.
Grants & Fellowships
Community Programming – Education
Internship program

$100,000 and over
Edward John Noble Foundation
St. Catherines Island Archaeology Project – Anthropology
Wallace Funds (established by the founders of *Reader's Digest*)
Roosevelt Hall Renovation Project

$50,000 and over
The Clark Foundation
Library Compact Storage Units
Exxon Education Foundation
Exxon Educational Training Program
Mr. and Mrs. Robert G. Goelet
Scientific Research, Acquisitions and Special Projects
Mobil Corporation
Friday and Saturday Evening Free Admission Program
Tiffany
"Tiffany: 150 Years of Gems and Jewelry"

$25,000 and over
Dr. Herbert R. Axelrod
Axelrod Fish Collection – Vertebrate Paleontology
Bankers Trust Company Foundation
Hall of Ocean Life Elevator
The Louis Calder Foundation
Louis Calder Laboratory Classroom – Education
The Chase Manhattan Bank, N.A.
Hayden Planetarium
General Information Brochure
The Eppley Foundation for Research, Inc.
Chile Paleontology Research – Vertebrate Paleontology
Mr. and Mrs. Plato Malozemoff
Economic Mineralogy – Mineral Sciences
Anne-Marie Goelet Fund
National Geographic Society
Panurgine Bees Research – Entomology
Lemur Research – Anthropology
Arthur Ross
Exhibit of the Month

$10,000 and over
Anonymous
Volunteer Office Support Fund
Christodora, Inc.
Junior High School Natural Science Program – Education
The Golden Family Foundation
Sybil and William T. Golden Fund
Karl F. Koopman
Taxonomic Research – Mammalogy
Henry Nias Foundation, Inc.
Community Programming – Education
Ortho Pharmaceutical Corporation
Hayden Planetarium
William F. Sanford
Ornithology Research – Ornithology
Tenneco, Inc.
"Carthage: A Mosaic of Ancient Tunisia"
Vidda Foundation
Community Programming – Education
Special Instructor – Education

$5,000 and over
Anonymous
Volunteer Office Support Fund
Amoco Foundation, Inc.
Micropaleontology Press Modernization
Dr. and Mrs. Melvin Belsky
Micromineral Exhibition Fund
The Cricket Foundation
Junior High School Natural Science Program – Education
Robert C. Dorion
Ichthyology Research – Ichthyology
Dr. Henry Clay Frick, II
Vehicle Purchase – Vertebrate Paleontology
Samuel H. Kress Foundation
Exhibition Catalog for "Carthage: A Mosaic of Ancient Tunisia"
Anne S. Richardson Fund
Great Gull Island Project – Ornithology
Helena Rubinstein Foundation Inc.
Community Programming – Education
Andrew E. Sabin
Herpetology Research – Herpetology
Shell Oil Company Foundation
Micropaleontology Press Modernization
The Sidney, Milton & Leoma Simon Foundation
Community Programming – Education
Texasgulf, Inc.
Economic Mineralogy – Mineral Sciences

$1,000 and over
Anonymous
Great Gull Island Fund
Amax Foundation
Economic Mineralogy – Mineral Sciences
Astra Alab AB
Poison-Dart Frog Research – Herpetology
Avon Products Foundation, Inc.
Community Programming – Education
Madolyn Babcock
Public Programming – Education
The Bay Foundation
Community Programming – Education
Mrs. William H. Bemis
Ichthyology Research – Ichthyology
Mrs. Junius Bird
Junius B. Bird Research Project – Anthropology
William P. Cane
Ornithology Research – Ornithology
Chemical Bank
Anne-Marie Goelet Fund
Chevron U.S.A. Inc.
Micropaleontology Press Modernization
Conoco Gabes Ltd.
"Carthage: A Mosaic of Ancient Tunisia"
Daewoo International (America) Corp.
"The Once and Future Korea"
John DeCuevas
Great Gull Island Project – Ornithology
Margarita V. Delacorte
Textile Conservation Fund – Anthropology
Robert W. Dickerman
Ornithology Research – Ornithology
Dr. and Mrs. Walter Barton Elvers
Fossil Fish Research – Vertebrate Paleontology
Exxon Company, U.S.A., Involvement Fund
Osborn Research Fund – Vertebrate Paleontology
Ruth and Stanley Freed
Anthropology Research – Anthropology
James C. Greenway, Jr.
Great Gull Island Project – Ornithology
The Griffis Foundation
Ichthyology Research – Ichthyology
Mr. and Mrs. Jay V. Grimm
Great Gull Island Project – Ornithology
John Hay
Great Gull Island Project – Ornithology
Lee H. Herman
Insect Research – Entomology
Hyosung (America), Inc.
"The Once and Future Korea"
Hyundai Corporation (U.S.A.)
"The Once and Future Korea"
Dr. and Mrs. F. Walker Johnson
Osborn Library – Vertebrate Paleontology
Mr. and Mrs. Frederick E. Landmann
Junius B. Bird Research Project – Anthropology
Anthony J. Lauro
Ornithology Research – Ornithology
Mrs. Alfred Lee Loomis, Jr.
Rare Book Room – Library
Lucky Goldstar
"The Once and Future Korea"
Mr. and Mrs. Hayward F. Manice
Great Gull Island Project – Ornithology
Mobil Foundation, Inc.
Micropaleontology Press Modernization
Mr. and Mrs. Charles W. Myers
Poison-Dart Frog Research – Herpetology

Jerome A. and Estelle R. Newman Assistance Fund, Inc.
Sibyl Golden Fund
Isabel Ireland O'Brien
Great Gull Island Project – Ornithology
The Palisades Educational Foundation, Inc.
Discovery Room – Education
Perkin Fund
Richard S. Perkin Library – Hayden Planetarium
Phelps Dodge Foundation
Economic Mineralogy – Mineral Sciences
Herman & Lenore Rottenberg Foundation
Special Courses – Education
Jerome G. Rozen, Jr.
Insect Research – Entomology
Samsung – America, Inc.
"The Once and Future Korea"
The Evelyn Sharp Foundation
Community Programming – Education
Lester L. Short
African Ornithology Research – Ornithology
Frank B. Smithe
Ornithology Research – Ornithology
Sangyong (U.S.A.), Inc.
"The Once and Future Korea"
Mrs. Gardner D. Stout
Gardner Stout Memorial Fund
Sunkyong International, Inc.
"The Once and Future Korea"
Texaco, Inc.
Micropaleontology Press Modernization
Unilever United States, Inc.
Hayden Planetarium

$500 and over
Columbia University
Special Courses – Education
George & Valerie Delacorte Fund
Textile Conservation – Anthropology
Harold A. Dundee
Herpetology Research – Herpetology
Mr. and Mrs. Henry B. Guthrie
Great Gull Island Project – Ornithology
Mrs. Eugene B. Hotchkiss
Ichthyology Research – Ichthyology
David F. Kroenlein
Theclid Research Fund – Entomology
Ann M. Lacy
Great Gull Island Project – Ornithology
Mary K. LeCroy
Great Gull Island Project – Ornithology
Mrs. Francis H. Low
Ornithology Research – Ornithology
Mr. and Mrs. Plato Malozemoff
Anne-Marie Goelet Fund
Beatrice B. Miller
Discovery Room – Education
Mrs. George G. Montgomery, Jr.
Alexander White Natural Science Center – Education
Moriches Bay Audubon Society
Great Gull Island Project – Ornithology
Mr. and Mrs. Gale G. Pasley, Jr.
Anthropology Research – Anthropology
Elizabeth E. Roosevelt
Theodore Roosevelt Memorial Fund
Theodore Roosevelt Association
Theodore Roosevelt Memorial Fund
Tiffany Dinner Dance

THE TIFFANY DINNER DANCE

Benefactors
Mr. and Mrs. Hart Fessenden
Mr. and Mrs. Robert G. Goelet
William T. Golden
Tiffany & Co.

Sponsors
Exxon Corporation
Mr. and Mrs. Arthur Gray, Jr.
Mr. and Mrs. Constantine Sidamon-Eristoff
Mr. and Mrs. Oscar S. Straus, II
Mr. and Mrs. Donald Zucker

Patrons
Mr. and Mrs. Wick Allison
Ambassador and Mrs. H. Ansury
Mr. and Mrs. Robert Bach
Mr. and Mrs. Robert R. Barker
Joan C. Benson
Arthur W. Bresciani
Brown & Wood
Guy Cary
Mr. and Mrs. Thomas M. Evans
Fiduciary Trust Company International
Dr. and Mrs. Henry Clay Frick, II
Goldman Sachs & Co.
Mr. and Mrs. John H. Gutfreund
Dr. and Mrs. John E. Hutchinson, III
Angela Kramer, Inc.
Mr. and Mrs. Frank Y. Larkin
Mr. and Mrs. Frank G. Lyon
Mr. and Mrs. James McEntee
Mr. and Mrs. Charles H. Mott
Mr. and Mrs. Richard L. Parish
Mr. and Mrs. Frank E. Richardson
Robb, Peck, McCooey Corporation
Mr. and Mrs. Arthur Ross
Jack Rudin
Mr. and Mrs. John T. Sargent
Mr. and Mrs. Richard Schmeelk
Mr. and Mrs. John A. Scrymgeour
Mr. and Mrs. Charles P. Stevenson, Jr.
Mr. and Mrs. Vance Van Dine
Mr. and Mrs. William M. Weaver, Jr.

Contributors
Mr. and Mrs. Charles A. Dana
Mrs. Winthrop Gardner
Mrs. Alfred L. Loomis, Jr.
Mrs. Alexander O. Vietor

GOVERNMENT GRANTS AND SUPPORT

Source
Amount/Purpose

Institute of Museum Services
$75,000/General Operating Support
N.A.S.A.
$94,086/Petrologic Studies of Meteorites – Mineral Sciences
National Endowment for the Humanities
$550,000/Exhibition Development – "African Reflections: Art from Northeastern Zaire"
National Science Foundation
$138,000/Collaborative China Research – Vertebrate Paleontology
$70,000/Archaeological Research on Marajo Island, Brazil – Anthropology
$70,000/Neogene Rocks and Faunas – Vertebrate Paleontology
$51,878/Platinum Group Elements – Mineral Sciences
$158,000/Scanning Electron Microscope
New York State Council on the Arts
$596,000/General Operating Support
$10,500/Student Internships – Planetarium
$10,000/Black History Month – Education
$10,000/"Carthage: A Mosaic of Ancient Tunisia"
$8,300/"Margaret Mead Film Festival"
$7,000/"African Reflections: Art from Northeastern Zaire" – Exhibition
$5,000/Celestial Plaza – Hayden Planetarium
$5,000/Mexican Serape Blankets – Anthropology
New York State Library, The State Education Department
$16,500/Preservation of Research materials – Library
$11,128/Preservation of Research material – Library
U.S. Department of Education
$199,661/Preservation Microfilming of Scientific Field Journals – Library

BEQUESTS
Estate of Ronald G. Adolph
Estate of James Madison Andrews, IV
Estate of Louly Baer
Estate of Arthur O. Choate, Jr.
Estate of Charles H. Ettl
Estate of Jan Negbaur
Estate of Vasilios T. Pagonis
Estate of Clara S. Peck
Estate of Richard T. Shields
Estate of Ruth B. Somerville
Estate of Edward F. Stanton
Estate of Margaret P. Stanton
Estate of George Willett

GIFTS-IN-KIND

Department of Anthropology
108 Pre-Columbian Artifacts; including ceramics: 21 vessels, one whistle; gold, silver, and copper artifacts: four ear ornaments, three tweezers, 17 nose ornaments, 16 disk ornaments, two knives, two masks, three human figures, one deity figure, two tumis, five plumes, nine animal figures, six vessels, two mace heads, three ornaments, one pectoral, one chisel; one stone llama figure; two shell feline figures; one gourd rattle; two silver, wood and feather plume holders; one gold detail from a nose ornament; one wood kero form; one shell and copper ornament; representing the following Andean Cultures: Paracas (700 – 100 B.C.); Vicus (500 – 100 B.C.); Moche (400 B.C. – A.D. 500); Cajamarca (250 B.C. – A.D. 800); Salinar (200 B.C. – A.D. 200); Gallinazo (200 B.C. – A.D. 200); Nazca (100 B.C. – A.D. 600); Wari (A.D. 600 – 1000); Middle Horizon (A.D. 600 – 1000); Lambeyeque (A.D. 1000 – 1532); Inka (A.D. 1450 – 1532); Peru; 60265
Frederick E. Landmann

Three Chairs and One Stool; composed of wood, leather, and brass; Asante People; Ghana; 19th Century; 60293
Dr. and Mrs. Eugene Becker

Mask Depicting a Human Face; copper; Moche culture (400 B.C. – A.D. 500); Peru; 60289
Louis Slavitz

Department of Entomology
2174 mounted and identified Moths (Lepidoptera); from the midwestern United States; 60337
George J. Balogh

63 Amber fossil flies; 60183
1454 butterflies, including 51 paratypes, three holotypes, and one allotype; from the Dominican Republic; 60323
Kurt Johnson

210 paratypes of Heteroptera: Veliidae; 60326
John T. Polhemus

431 Heteroptera, including 20 holotypes; 60325
James A. Slater

3178 Heteroptera; from the western United States; 60324
Gary M. Stonedahl

15,228 butterflies (Lepidoptera)
Paul R. Ehrlich

Department of Exhibition
Seven large brass decorative cylinders, suitable for planting landscaped materials
Madelyn Simon

Department of General Services
Office furniture
Jack Masla

Department of Herpetology and Ichthyology
69 books, one journal and approximately 1200 reprints
Mrs. Carmela B. Rosen

14 office desk diaries belonging to John T. Nichols
D. G. Nichols

914 preserved amphibians and reptiles; from New England, New York and Greece; 60295
Michael W. Klemens

877 preserved amphibians and reptiles; from New England, New York, New Jersey, Virginia and West Virginia; 60082
Michael W. Klemens

Department of Invertebrates
A worldwide collection of marine and terrestrial mollusks; 2447 lots; 60300
Morton L. Goodfriend

1717 lots of worldwide land and marine shells (mollusca); 42 shell books; 60333
Melvin B. Robin

Department of Library Services
Six films from Mozambique and Alaska; 60338
Mrs. Oshin Agathon

Numerous manuscripts, diaries, black metal trunk, lantern slide projector and tapes, and photographs pertaining to T. Donald Carter's trips to Africa, Asia, the Middle East and the Americas; 60200
Mrs. Thomas H. Kissinger

Notebooks, diaries, correspondence, photographs, manuscripts, etc. of General Frederick Butler, who accompanied Roy Chapman Andrews to Mongolia on the Third Asiatic Expedition; 60240
The Butler Family of San Francisco

12 reels of motion picture film, covering indigenous people, mammals and birds of East Africa, color slides of East African Wildlife, slides of Polar Bears, Ptarmigan, Snow and Canada geese; 60241
Mrs. Edith M. Ker

17 boxes containing photographic negatives and prints, catalogs, manuscripts, research files, published materials, films, personal papers, AMNH Central Asiatic expedition material, some memorabilia; French archeological photographs and North African photographs and journals; 60303
Dorothy L. Pond

Department of Mineral Sciences
11 faceted Imperial Topaz gems weighing 140.39 carats; from Minas Gerais, Brazil; 60332
Vincent Kosuga

Four specimens: Azurite, Allargentum, Huebnerite and Pyrargyrite; 59952
Carl Krotki

A Cat's Eye Chrysoberyl cabochon weighing 23.05 carats; Provenance: The Maharadja of Benares, India; 60334
Ted Lowy and Carol Hertweck Lowy

Department of Ornithology
Louis Agassiz Fuertes watercolor at Bear River marshes in Utah; 60078
Mrs. Alexander Wetmore

Office of Volunteer Services
Photocopying of training materials for the Museum Highlights Tour guide trainees
Ross & Cohen

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, 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 George D. Langdon, Jr., President, or Henry Schulson, Manager for Development, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024-5192. Telephone: (212) 769-5151.

COVER: This fragment of a cylindrical incense burner was one of the sculptures included in the special exhibition, "Pre-Columbian Art from the Ernest Erickson Collection." The spirals in the eyes and elements projecting from the mouth are associated with several Mayan deities. Found in the highlands of Guatemala, it was made of buff ceramic during the Late Classic, A.D. 600-900. The piece still has remnants of red, white and blue-green paint. Ernest Erickson (1893-1983), a prominent art connoisseur born in Finland, created collections for museums in New York throughout his lifetime. His pre-Columbian collection, which was on long-term loan to the American Museum for many years and forms the core of the Hall of Mexico and Central America, was presented to the Museum this year. It was displayed in a special exhibition starting in June. Gifts to the Museum, like the Erickson collection, broaden its scope, enabling it to expand research and present significant educational, cultural and scientific programs.