AMERICAN MUSEUM OF NATURAL HISTORY / 121st ANNUAL REPORT 1989/1990

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Annual Report of the Chairman of the Board of Trustees and the President and Chief Executive Officer

The American Museum of Natural History is a national and international treasure and resource; its collections are among the greatest in the world. It is our privilege and responsibility to submit this report for the fiscal year ended June 30, 1990, the 121st year of the museum, the first full year in office for the Chairman, and the second for the President and Chief Executive Officer.

In this introductory message, we will mention certain highlights. The museum has three major functions: science, education, and exhibitions. Details of the year's activities will be found in the departmental reports and financial statements that follow.

Long-term planning for the decades ahead is underway by a joint committee of trustees and staff, augmented by professional advisers. This study will produce a thoughtful set of objectives and desiderata to take the museum into the next century. It will, of course, like any such program, be subject to modification as we progress. The process will be evolutionary, as is appropriate for our museum.

This has also been a year of progress toward the goals of modernization, improvement, and greater service to the people of The City of New York, and scholars and visitors from across the nation and from abroad.

The first major project in the modernization program is the complete reconstruction and reprogramming of the exhibits in our four dinosaur and other fossil vertebrate halls, featuring the world's greatest and most varied collection of dinosaurs. Integrated with this will be the expansion and modernization of one of the most important natural history libraries in the world, with its 420,000 volumes and its notable collection of photographs. Work is already underway, in accordance with plans by the architects, Kevin Roche John Dinkeloo and Associates, and the exhibition designer, Ralph Appelbaum Associates.

Concurrently, modernization and brightening of buildings, long deferred, has been initiated. Plans to begin the refurbishing of the outside parts of the museum, including the grounds, the fencing, the sidewalks, and the lamp posts, have been developed with encouragement and financial support from The City of New York.

We are committed to developing a better system to provide information about the museum to our visitors, and we will be giving attention to lighting and signage in some of our exhibition halls. All of this is a big order and will require several years of effort. And it will be costly. We regard this program as of prime importance; initial progress should become evident in the year ahead.

The estimated capital cost of these first phase programs approximates $60 million, including certain relevant operating expenses. Fund raising starts at home, and the museum trustees have entered the capital campaign with confidence and outstanding generosity; the aggregate of their pledges thus far exceeds $14 million. These include two pace-setting pledges of $2.5 million each. Special mention should be made of the $2.5 million grant from the Exxon Corporation through its chairman and museum trustee, Lawrence G. Rawl. Initial support from New York City has been generous.

With trustees' contributions as a requisite starting point, the capital campaign will be announced publicly in the fall of 1990. Additional funding will be sought from The City of New York, and from New York State and Federal sources, as well as from corporations, foundations, and individuals.

Exhibitions The great majority of the three million annual visitors (including those to the Hayden Planetarium and the Naturemax Theater) come to see the exhibitions, both permanent and temporary. Visitors to the museum are diverse in ages, in interests, and in ethnic and educational back-

After a full day of fun and learning at the museum, a group of summer day campers leaves the museum. During the summer months, up to 800 children with adult supervisors come to the museum daily to tour its permanent halls and special exhibitions and take in a Naturemax movie or a planetarium Sky Show.

grounds. Approximately 60 percent are from New York City and the extended metropolitan area, but many come from all over the United States, and from more than 100 foreign countries.

Several special temporary exhibitions over the past year emphasized the human need to know more about life on earth in the past, the present, and the future. These included:

- "Treasures of the Tar Pits," which dealt with the cycle of entrapment and preservation of animals that began 40,000 years ago in California's La Brea Tar Pits.
- "Crossroads of Continents: Cultures of Siberia and Alaska," which brought to New York City the art and artifacts of the peoples of the Earth's northern rim, from Siberia to Alaska, and down to British Columbia.
- "Black Achievers in Science," which was organized and supported by Citibank and focused on the achievements of black Americans in science and technology.
- "African Reflections: Art from Northeastern Zaire," which was drawn primarily from the museum's extraordinary Lang-Chapin expedition of 1909-1915 to the Belgian Congo. An outstandingly beautiful and informative exhibition, it has attracted widespread attention and praise. It opened in June for a seven-month display, after which it will travel to the National Museum of African Art in Washington, the Denver Art Museum, the High Museum of Art in Atlanta, and the San Diego Museum of Art.

A videotape tour of the museum, that is in production, will enable the museum to use electronic technology to bring the wonders of its exhibitions to local, national and international audiences that are not able to visit us.

A striking component of the modernization program is the rejuvenation of the great rotunda of the Theodore Roosevelt Memorial Hall, the splendid entrance from Central Park West. When this reopens in late 1991, it will feature the dramatic emplacement of the world's only mounted *Barosaurus*, a dinosaur towering some 50 feet. This display should soon become one of the landmark attractions of New York City. It will serve as an introduction to the renovated halls of fossil vertebrates.

Plans were also advanced for major new exhibitions, both permanent and temporary. The new Hall of Human Biology and Evolution moved from the drawing board to the installation phase. Set to open in 1992, this 9,000-square-foot permanent exhibition will broaden understanding of humanity's place in nature in a comprehensive and attractive way. Design work also moved ahead for a major special 1992 exhibition on the potential long-term environmental consequences of global climate change. This will be an expression of the museum's increasing emphasis on environmental matters.

Science The nature of the museum's activities in biology, mineralogy and anthropology makes it an important gatherer, evaluator and disseminator of information on ecological systems. We attempt to shed light on the critical problems affecting the habitats of living things, including humans, by ordering and understanding evolutionary relationships. In keeping with this mission, during the year the museum sponsored a major symposium on biodiversity, and a museum scientist was named head of a tripartite global effort (with the World Conservation Union and the Durrell Institute of Conservation and Ecology) to save certain endangered species. After several years of planning, a well equipped molecular biology laboratory was established and staffed in the museum; its importance and support will grow as scientists incorporate genetic studies in their work in systematics and evolution.

Expeditions Science at the museum includes exploration and field work. In its 121-year history, more than 1,000 museum expeditions have trekked over the earth, searching for fossil and living specimens, and for artifacts evidencing the evolution of life and civilization on the planet. We are still at it, though today's search for the unknown might well be conducted by a scientist with a laptop computer and a videocamera, who is flown into the area by helicopter. Preparing for major field research in Mongolia and Cuba, teams of museum scientists traveled this past year to those areas to do preliminary work. The museum was alone among U.S. institutions invited to conduct field work in vertebrate paleontology in Mongolia, which has been virtually closed to U.S. researchers since Roy Chapman Andrews did his famous work there

for the American Museum of Natural History in the 1920s.

In the Cuba project, scientists from several departments of the museum will work in the nation where fauna, both known and undocumented, may be threatened by unique ecological problems.

Education The museum is a unique resource for the education and inspiration of children and adults of all ages. To this end, a seven-member visiting committee of independent educators, under the chairmanship of Allen Austill, retired chancellor of the New School for Social Research, has met to evaluate the educational program of the museum, and has rendered a report to the president.

The Americam Museum of Natural History is a major adjunct to the public and private school systems, and to the colleges and universities of New York City, and the extended metropolitan area of New York, New Jersey and Connecticut. The museum recognizes the challenges in continuing to adapt to the relentless pace of discovery in natural science and fostering a better understanding and appreciation of ethnic diversity. Mindful of the fact that there are virtually a million children in the New York City public school system alone, the museum has initiated promising talks with Chancellor of New York City Public Schools Joseph A. Fernandez and his staff of the Board of Education, looking toward an increasing role for the museum with teachers and students.

Planetarium The museum's programs not only encompass the wonders of the globe, they reach out to explore the depths of the cosmos. This year more than half a million children and adults visited landscapes never trod upon by human feet via the planetarium's sky shows.

Special events helped to disseminate the latest scientific discoveries about other worlds. In August, when the Voyager 2 spacecraft completed the last leg of its mission and transmitted the first clear pictures of Neptune, the planetarium arranged a computer link with the Jet Propulsion Laboratory in Pasadena so museumgoers could see the images live as they were broadcast to the Earth. Copies of the pictures were given to visitors, allowing them to take a bit of the historic encounter with them.

Membership Special programs for members serve the dual function of introducing the fruits of the museum's scientific research to a broad audience, and generating additional revenue for the museum. Many of the membership programs are open to the general public as well. Members took behind-the-scenes tours of the laboratories and met with scientific staff to experience direct exposure to the museum's research endeavors. Lectures by some of the world's preeminent researchers kept members attuned to the ferment of ideas and theories in the natural sciences. The monthly membership publication, *Rotunda*, is a major medium for the announcement of membership events and other museum programs.

Natural History magazine One of the premier publications in the natural sciences in this country, *Natural History* this year marked its 90th year of publication. Each month, its 520,000 subscribers were treated to articles delving into the world's most remote habitats, examining threats to the environment, and exploring the intricacies of human culture, all illustrated with exquisite photography.

Volunteers We take special pleasure in saluting the more than 570 devoted and invaluable volunteers, some of whom work at the museum's remote research stations. They serve effectively in many capacities. Their reward is the joy of service in this "wondrous and magical museum"—in the words of the late Gardner D. Stout, a former president and himself a volunteer. We are grateful to them.

Staff The museum's 715 staff members provide the essential vitality of the museum. We pay tribute to them for their loyalty and devotion to this institution.

Naturemax The IMAX theater that boasts the largest indoor movie screen in New York City, has proved to be of great popularity as a means of entertainment and education since its opening here in 1982. As a member of the newly established Museum Film Network, the museum this year was for the first time involved in the production of an IMAX film. Produced in conjunction with filmmakers known for their work with WBGH TV's "NOVA," the film "To the Limit" examines the workings of the human body as it performs feats at the height of its

capabilities. This new partnership of cultural institutions affords the museum an opportunity to use its tremendous research resources to reach an even greater national and international audience.

Museum Shops The museum's several specialized shops not only served as a significant source of income, they supplemented special exhibitions by making available publications and merchandise that further illuminate the subjects of temporary exhibitions. Special lines of games and puzzles played a role in the museum's efforts to encourage young people to develop an enduring interest in the sciences.

Discovery Tours The educational travel tours sponsored by the museum paralleled the field work undertaken by the museum's anthropologists and biologists. Members traveled with museum experts to destinations around the world to visit sites of breathtaking natural beauty and crucial scientific and cultural importance.

Trustees Trustee participation, essential to progress, has intensified in all areas. This has been rewarding to them, and encouraging to the scientific and administrative staffs. Board meetings have been more frequent and have been well attended. The trustee committee structure has been expanded and the committees (listed at the back of this report) have become more active and effective.

The efforts of Trustee R. William Murray to encourage financial support for the museum from the corporate community resulted in support for specific programs as well as for general museum operations. The Bank of New York, Bristol-Myers Squibb Company, and the IBM Corporation, among others, made generous contributions for unrestricted aid. Citibank supported educational programs related to the traveling exhibition, "Black Achievers in Science."

During the year, we were fortunate in having welcomed to our board several outstandingly able new members. They are: Daniel Brodsky, partner with The Brodsky Organization; Donald K. Clifford, Jr., head of Threshold Management; John N. Irwin, II, former ambassador to France; Helene L. Kaplan, chairman of the Board of Trustees of Barnard College; Franklin D. Raines, general partner in Lazard Freres & Co.; John S. Reed, chairman of Citicorp, and Constance Spahn, chairman of Down East Enterprises.

And after the close of the fiscal year our good fortune continued with the appointment to the board of equally noteworthy new members. They are: Lewis W. Bernard, a director of the Morgan Stanley Group; Melinda Blinken, who was co-chair of the Women's Committee of the museum from 1970 to 1980; David A. Hamburg, M.D., president of the Carnegie Corporation of New York, and Peter H. Vallone, majority leader and speaker of the New York City Council, who fills a newly designated ex-officio position.

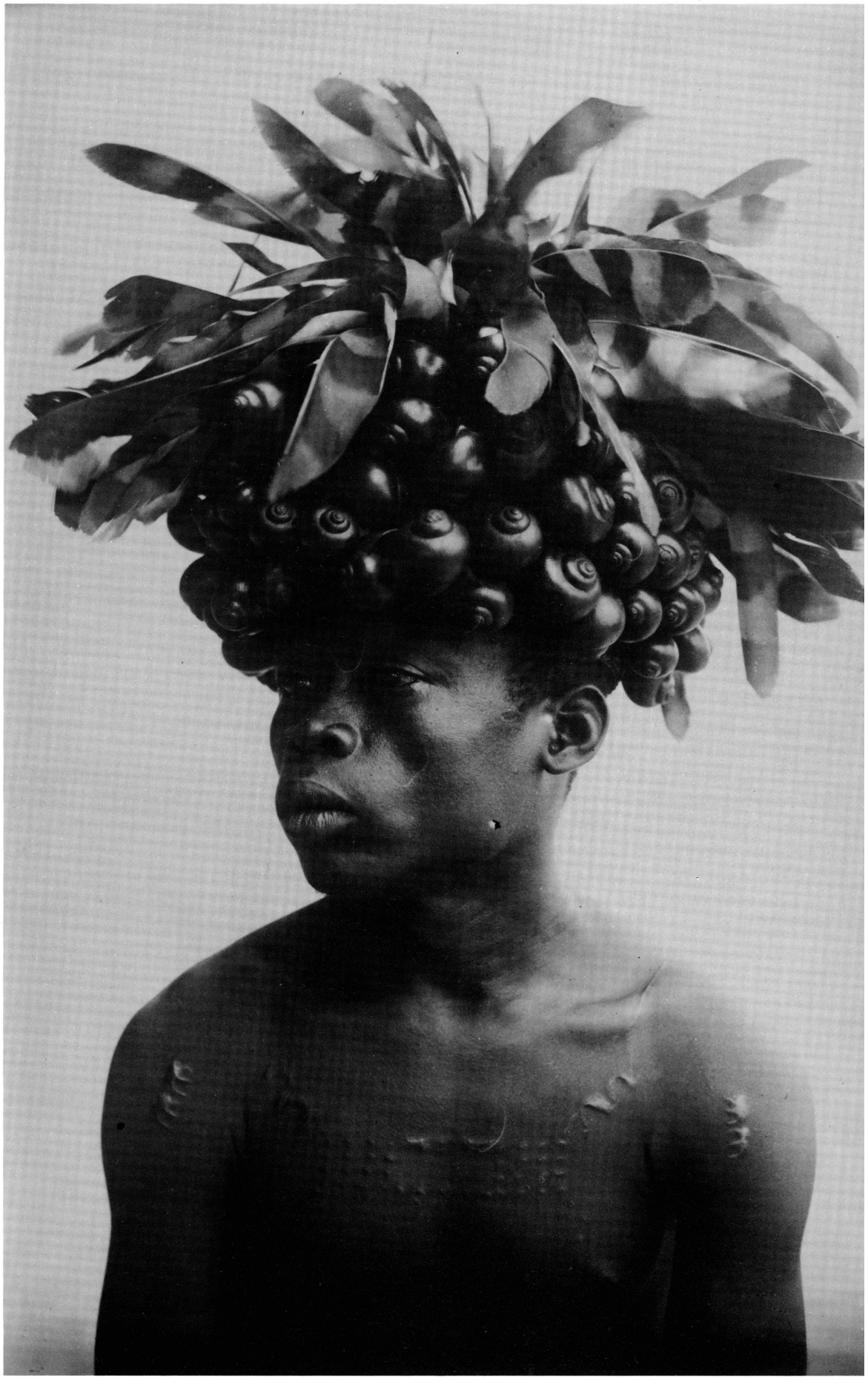
During the year, Charles J. Hedlund retired from the board after four years, and Marshall Manley retired after 13 years. They have our lasting thanks for their service to the board.

We conclude as we did last year. The American Museum of Natural History is a principal repository of the knowledge and understanding of the history of the system of life that distinguishes our small planet in the immensity of the cosmos. Only now, our species is recognizing that we, *Homo sapiens*, are the trustees of that system. It is the great mission of the museum to extend the understanding essential to the management of planet Earth, and to accelerate the recognition and protection of species (including our own) that are under threat from its mismanagement. All who come to our doors, from all parts of the world, are invited to join us in the advancement of learning and understanding necessary to progress toward our goals. There will be joy in this undertaking, and both spiritual and tangible rewards.

William T. Golden
Chairman of the Board of Trustees

George D. Langdon, Jr.
President and Chief Executive Officer

A Bangba man from northeastern Zaire, photographed in 1913, wears a ceremonial head covering made of water snails and eagle feathers. The cultures of the peoples of northeastern Zaire, including the Bangba, Azande, Mangbetu, and Barambo, are featured in the exhibition, "African Reflections: Art From Northeastern Zaire." It documents the art history of the people of that region from the time of their first encounters with Europeans to the present. The exhibition, drawn from the museum's 1909–1915 Lang-Chapin Expedition to the Belgian Congo, presents 450 artifacts, including, sculpture, furniture, musical instruments, hats, pottery, baskets, tools, weapons and jewelry. It opened on June 8, and will continue through Jan. 8, 1991.



Anthropology

An important activity of the department is the conception and preparation of exhibitions about other cultures. "African Reflections: Art from Northeastern Zaire," an outstanding exhibition assembled largely from the museum's collections, shows the contexts in which non-western art is created and used. Research conducted by the department covers much of the world, and extends from investigating the origins of the human fossil record and the study of ancient and modern cultures, to the clash of cultures brought about by the discovery and exploration of the Americas.

Exhibitions The major exhibition of 1990 is "African Reflections: Art from Northeastern Zaire." It presents 450 ethnographic artifacts and photographs collected during the museum-sponsored Lang-Chapin expedition to the Congo between 1909 and 1915. Enid Schildkrout, curator, compiled and analyzed background information for the exhibition. Curtis A. Keim, research associate, and Dr. Schildkrout co-authored a book documenting the history of the Congo expeditions and the first ethnographic accounts of the Mangbetu in relation to neighboring peoples of northeastern Zaire. The exhibition, catalog and associated film were funded by grants from the National Endowment for the Humanities and the New York State Council on the Arts. Dr. Schildkrout was associate producer of two films made in Zaire that will travel with the exhibition.

Curator Stanley A. Freed and Associate Curator Laurel Kendall were co-curators of the exhibition, "Crossroads of Continents: Cultures of Siberia and Alaska," an exhibition reflecting the cultural interchange that began 14,000 years ago when the first Siberians crossed into North America.

Dr. Kendall was curator for the traveling exhibition "Palms and Pomegranates: Traditional Dress of Saudi Arabia." The exhibition presented 30 rare Saudi Arabian clothing ensembles.

Pre-Inka History Craig Morris, chairman, directed the analysis and computer coding of pottery fragments excavated from La Centinela, the capital of a pre-Inka kingdom on the Peruvian coast. The study analyzed more than 7,000 shards and examined shapes and decoration of ceramic vessels. The artifacts reveal activities and sociopolitical customs of the ancient city. Dr. Morris analyzed the cultural dynamics of Inka architectural, textile, ceramic and metallurgical styles.

Quincentennial Activities Dr. Morris worked as curator of the Inka section for an exhibition, "Circa 1492," which will be presented at the National Gallery of Art in Washington. He was co-director of a summer program at Cornell University, "The Andean World: A Millennium of Achievements and Transformations," a quincentennial program sponsored by the National Endowment for the Humanities.

David Hurst Thomas, curator, organized a three-year program observing the upcoming Columbian Quincentenary. Nine "Columbian Consequences" seminars, held between 1988 and 1990, culminated with the publishing of three books by the Smithsonian Institution Press. The first volume, edited by Dr. Thomas, was selected "Outstanding Scholarly Book of 1989" by *Choice* magazine.

Human Biology and Evolution Curator Ian Tattersall and colleagues went to Kenya, Tanzania, France and Israel to obtain material for display in the Hall of Human Biology and Evolution. A grant from the Richard Lounsbery Foundation for the human creativity section of the hall was received. The section will include a full-scale replica of a decorated wall from the ice age cave of Lascaux in France.

Dr. Tattersall is investigating the application of species concepts to the human fossil record. He began a book exploring evolutionary theory and the ways in which prevailing modes of thought affect perceptions about the human fossil record.

Jeffrey Schwartz, Kalbfleisch Fellow, began extensive osteological analysis of material collected in Point

Hope, Alaska, from 1939-1941. Using museum collections, Drs. Schwartz and Tattersall investigated the evolutionary history of lemurs.

Dr. Tattersall and museum vertebrate paleontologists Michael Novacek and Mark Norell received a grant from the National Geographic Society to explore possible fossil sites in the Yemen Arab Republic on the Saudi Arabian peninsula.

Chiefdoms, Marriage Customs and the Supernatural Robert L. Carneiro, curator, reevaluated his previous theory about the evolution of chiefdoms. He proposes that sequences which characterize the evolution of chiefdoms: simple, compound and consolidated, replace his earlier theory of minimal, typical and maximal stages. The new theory reflects a qualitative rather than quantitative approach to the origins of chiefdoms.

Dr. Freed and Research Associate Ruth S. Freed analyzed data collected in the North Indian village of Shanti Nagar from 1950s through the 1980s. Their study deals with illness, curing, death and the supernatural in that culture.

Dr. Kendall researched contemporary Korean culture and traditions. She filmed an ethnographic account of a shaman's initiation ceremony. The project was supported by the Belo-Tannebaum Fund and the Committee on Korean Studies of the Association for Asian Studies.

Using experimental ethnographic techniques to analyze the dynamic, fast changing and sometimes contentious society, Dr. Kendall documented contemporary Korean wedding ceremonies.

The Luce Foundation funded a cataloging project for the Laufer Library of old and rare Chinese books. The catalog is being prepared by Research Associate Soren Edgren and introduces sinologists to a valuable collection made during the Jacob H. Shiff Expedition to China from 1901 to 1904.

Human Ecology Curator David Hurst Thomas studied human adaptations to social and environmental stress, In Monitor Valley, Nevada, a multiphase archeological study focusing on human adaptations to high altitudes was conducted. Dr. Thomas received a $10,000 grant from the U.S. Forest Service to publish the results of excavations at Alta Toquima Village, also in Monitor Valley, at an altitude of 11,000 feet.

A three-year Noble Foundation grant was received for investigations on social and ecological adaptations of the coastal Creek Indians of Georgia from A.D. 1450 to A.D. 1700.

Dr. Thomas was appointed a Founding Trustee of the new National Museum of the American Indian by the Regents of the Smithsonian Institution. For more on Dr. Thomas' research, see St. Catherines Research Station, page *44*.

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Notes:

1. In the bibliographies, the name 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.

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Astronomy and Planetarium

The American Museum-Hayden Planetarium presented programs that allowed visitors to travel live with the Voyager 2 spacecraft to Neptune, listen to some of the country's greatest astronomers discuss their latest scientific discoveries, and take a tour of the universe guided by the robots R2-D2™ & © and C-3PO™ & © from the "Star Wars"™ movie trilogy. Live concerts "under the stars" offered some of the best entertainment to be found in New York. These programs, and many others, presented something to intrigue and enlighten the star-gazing novice as well as the sophisticated astronomer.

Sky Shows and the Sky Theater Chairman William A. Gutsch, Jr., and the planetarium staff produced a variety of Sky Shows throughout the year.

"The Seven Wonders of the Universe," narrated by Burt Lancaster, traveled into the past to examine the seven wonders of the ancient world, and then moved into the cosmos to explore the greatest natural wonders of the universe.

"Frontiers: New Discoveries in Space," narrated by Mark Lenard of "Star Trek," examined work on the cutting edge of astronomical research, from solar system studies to imaging the universe with supercomputers. The annual favorite, "The Star of Christmas," drew holiday visitors.

Preschoolers enjoyed the interactive program "Wonderful Sky," featuring the Sesame Street Muppets*, and children six to nine learned about the planets in "The Secret of the Cardboard Rocket." High school and college students attended seven additional educational programs.

"The Skies of Summer," geared for summer camp groups, examined the stars, planets, and other celestial phenomena of the season.

In April, "Robots in Space with R2-D2 and C-3PO," premiered. Created in cooperation with Lucasfilm Ltd., the Sky Show was narrated by the robots from the "Star Wars" movie trilogy. Visitors learned how scientists use satellites and space probes to study objects in space, including distant planets and black holes.

"Robots in Space" is one of the first planetarium shows using computer-controlled optical laser discs and sound-synchronized images. The technology represents a revolution in the way visuals are prepared and projected, and will increase dramatically the realism and impact of future productions. The acquisition of the new equipment was due in part to a generous contribution from the Prospect Hill Foundation.

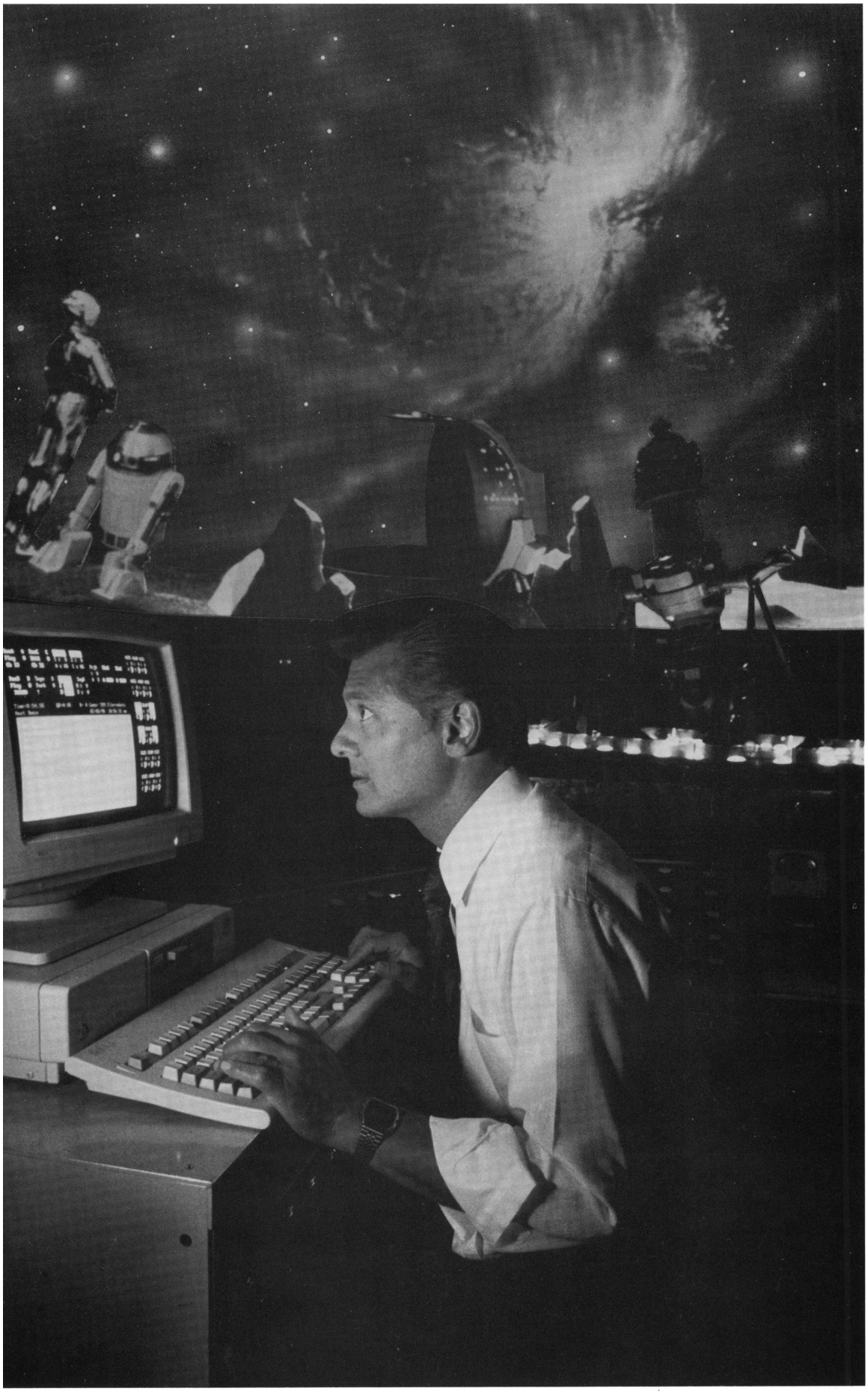
In June, approximately $400,000 of additional laser and audio equipment was installed in the Sky Theater, making new three-dimensional laser and sound imaging possible. This installation gives the Hayden the most sophisticated laser equipment of any planetarium in the world.

Planetarium attendance for the year was 532,869.

Courses Three terms of courses were presented for children and adults in areas ranging from astronomy and space science to navigation and meteorology. New courses examined non-optical astronomy and Einstein's theory of relativity.

Special Lectures and Educational Events Leading research astronomers gave talks on subjects from quasars to the Hubble Space Telescope in a new ten-part lecture series, "Frontiers in Astronomy and Astrophysics." Speakers included Rodger Thompson of the University of Arizona, Michael Skrutskie of the University of Massachusetts, and Richard Terrile of the California Institute of Technology's Jet Propulsion Laboratory.

The planetarium joined with Jet Propulsion Laboratory to bring live images of the Voyager 2 spacecraft's encounter of Neptune directly into the museum's Guggenheim Space Theater. Planetarium astronomers were on hand to explain the mission, answer questions, and give out complimentary copies



Using the planetarium's new computer controlled video projection system, Chairman William A. Gutsch creates a scene for the Sky Show, "Robots in Space." The new program, designed for children 8 through 12, shows the methods scientists use to study the universe via space probes. It was produced in conjunction with Lucasfilm Ltd.

of the Voyager images.

Dr. Gutsch gave daily updates on Voyager's findings directly from JPL. Within a week of the encounter, a new program opened in the Guggenheim Space Theater showing the best images of Neptune and its satellites.

In November, the planetarium was one of three U.S. sites for a science writers and students teleconference link with the 5th Annual Planetary Congress of the Association of Space Explorers, in Riyadh, Saudi Arabia. The ASE is the professional world society of astronauts. Discussions included the growing concern over the global environment.

The planetarium celebrated National Astronomy Day on April 28, with a full day of programs. Planetarium staff and David Helfand of Columbia University gave special lectures, and telescopes stood outside for viewing the sun near the peak of its 11-year sunspot cycle. Activities for children included building scale models of the solar system and having their pictures taken with the robot R2-D2, who made a special personal appearance for the opening of "Robots in Space."

In November and March, a series of special workshops introduced teachers to the latest developments in astronomy and space science, and demonstrated a wide variety of audiovisual teaching aids.

Live Concerts "Fly Me to the Moon," a live jazz concert "under the stars" in the Sky Theater, brought together seven jazz artists to perform a special program celebrating the 20th anniversary of the first manned landing on the moon.

The group, Music for Occasions, performed works by Vivaldi, Pachelbel, and J.S. Bach in December for the sixth annual holiday concerts.

Special Staff Activities In July, Dr. Gutsch attended a meeting of the Third European Planetarium Conference in Athens, Greece. In November, he traveled to India under the auspices of the Smithsonian Institution and the Indo-U.S. Sub-Commission on Education and Culture to conduct workshops and deliver lectures.

Dr. Gutsch created a series of astronomical features for ABC television's "Good Morning America."

In August, planetarium artists Brian Sullivan and Dennis Davidson participated in Planetfest '89 in Pasadena. Their works were displayed along with other leading space artists as part of a joint U.S.-Soviet tour.

Art Displays and Special Corporate Events From July through January, works of astronomical art by noted illustrator Ron Miller and astronomer William Hartmann were on view on the Art Wall. From February through June, a show of space art presented works by artists including Kim Poor, David Hardy, B.E. Johnson, Michael Carroll, Jon Lomberg and astronaut Alan Bean.

The planetarium helped organize and host special corporate events for Reader's Digest, the Literacy Volunteers of America, the American Psychiatric Society, and Brown University.

Richard S. Perkin Library A generous grant from The Perkin Fund enabled the library to install equipment needed to join the On-Line Computer Library Center (OCLC) computer networking system. The Perkin Library can now access other libraries's collections, participate in interlibrary loans, and catalog new materials with unprecedented speed.

Nearly $3,000 of new monographs were added to the existing collection of astrophysics journals.

The Perkin Library assisted in the research of a broad range of users, from the U.S. Naval Observatory and the Jet Propulsion Laboratory to Random House Inc., publishers and Lucasfilm Ltd.

Publications:

Gutsch, W.A.
1989-90 Sky Watch (daily column on astronomy, space science, and meteorology). The Westchester-Rockland Gannett Newspapers, White Plains, N.Y.

Entomology

As we learn more about the world's biodiversity crisis, the significance of the Department of Entomology's massive collections and wide-ranging monographic research on those collections becomes increasingly apparent. Talking about biodiversity is essentially equivalent to talking about arthropods, because these organisms may constitute more than three-quarters of the species on our planet. The department's collections, the fourth largest in existence, provide essential material for biodiversity studies conducted throughout the world.

Grant The department completed the first year of a three-year facilities grant from the National Science Foundation that will greatly increase the availability of the collections to researchers. Paramount among the projects involved is the reconstruction of the department's main collection storage area. The installation of a compactor system on two levels will more than double our collection storage capacity.

Spiders Chairman Norman I. Platnick collaborated with Thorne Research Fellow Raymond R. Forster and Jonathan Coddington of the Smithsonian Institution on a review of a newly recognized spider family, the Synotaxidae. Members of the family, which occur in South America, New Zealand, and Australia, had been widely separated in previous classifications; 63 species (of which 54 were new) were assigned to 12 genera, all but 2 of which were newly described. Synotaxidae was hypothesized to represent the closest relative of the families Theridiidae and Nesticidae, and some new generic groupings of theridiids were proposed.

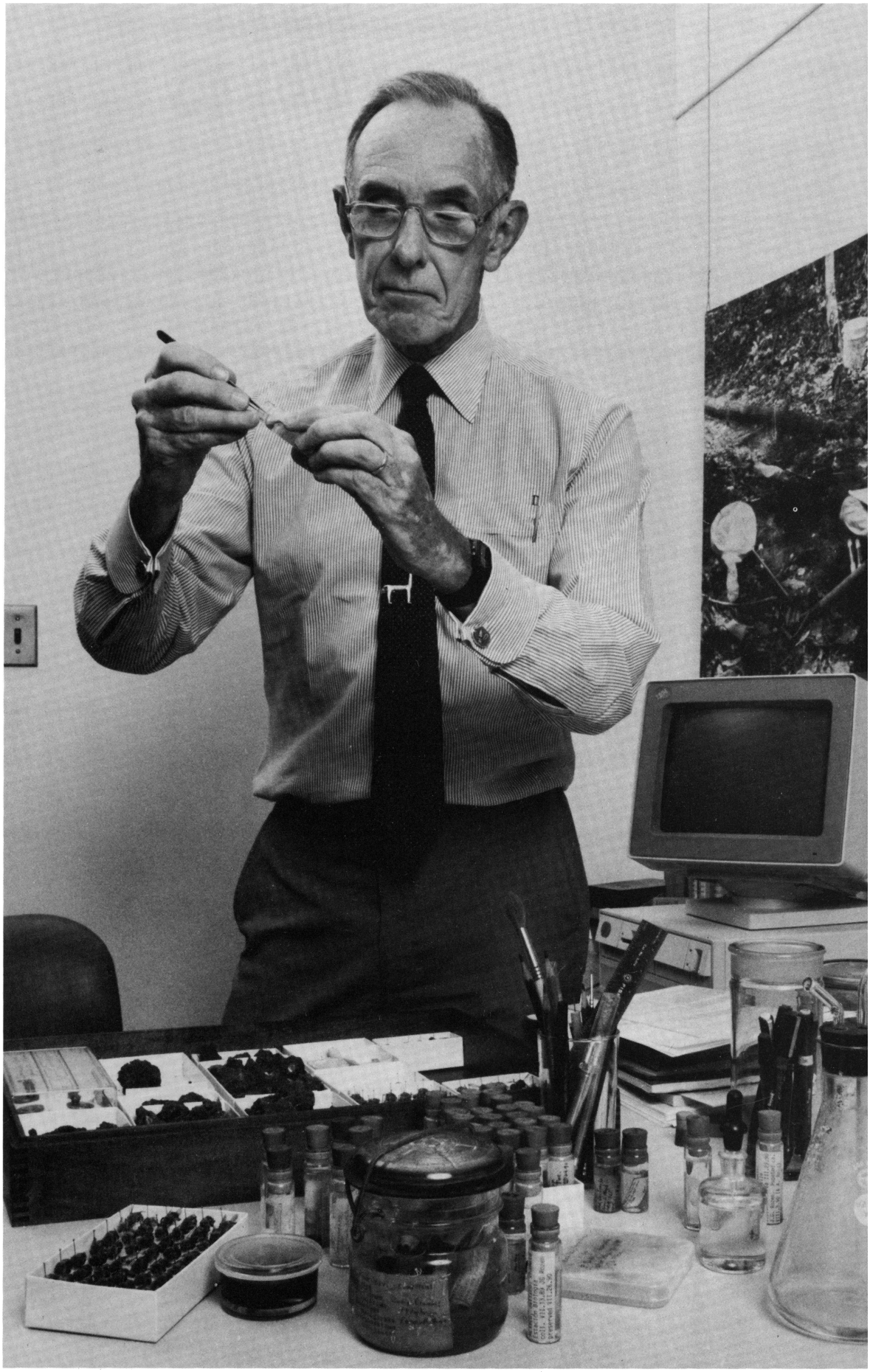
A second project used the museum's scanning electron microscope to survey the spinneret morphology of ground spiders (the superfamily Gnaphosoidea). Five different types of spigots were recognized, each of which apparently serves a different type of silk gland. Differences in spigot structure were used to reclassify the families of gnaphosoids. The large worldwide family Gnaphosidae was relimited to include only species with greatly enlarged and widened piriform gland spigots. Three subfamilies that had been considered gnaphosids were united instead in the family Prodidomidae because of their differently modified piriform gland spigots. The family Gallieniellidae, which was thought to be restricted to Madagascar and the Comoro Islands, was shown to have members in South Africa and Australia as well. The family Platoridae was newly synonymized with the Trochanteriidae; these spiders have greatly flattened bodies and live under bark or in narrow rock crevices. Several other genera were shown to be misplaced at the family level.

Beetles Curator Lee Herman continued his revision of the classification of tribes, subtribes, and genera of the Paederinae, a subfamily of the beetle family Staphylinidae. Dr. Herman dealt with 28 genera this year, bringing to 61 the number of genera he has redescribed and illustrated or found to be synonyms. To date, more than 200 species have been transferred among genera.

Dr. Herman also completed a revision of the Neotropical paederine tribe Cylindroxystini, a taxon with one genus and one species. Cylindroxystini was regarded by its original author as intermediate between the two larger tribes of the subfamily, the Paederini and Pinophilini. In the revision, the tribe is reduced to a subtribe of the Paederini, but is expanded to include two genera, *Cylindroxystus* and *Neolindus*. *Cylindroxystus* now has 14 species and *Neolindus* (which had 6 known species) now has 33. Most species of both genera are found in the lowland tropics, although a few are found at high elevations. Two species transferred into *Cylindroxystus* from *Lobrathium* occur in the Caribbean region.

Moths George Willett Curator Frederick H. Rindge continued long-range systematic studies of American geometrid moths. He completed a revision of the tribe Melanolophiini, including 15 genera (5

Forceps in hand, Jerome G. Rozen, Jr., curator in the Department of Entomology, reaches into a vial of preserved panurgine bee larvae, part of the museum's vast collection of immature bees. Dr. Rozen's studies, carried out from Argentina to Arizona, focus on the nesting behavior and developmental stages of bees. The study of bees in their early life stages is an untapped source of phylogenetic information. Dr. Rozen hopes to learn more about the evolutionary relationships among different groups of bees.



of them new), and almost 200 species (over 50 of them new), found from southern Alaska to southern South America. Dr. Rindge also studied Chilean material of the genus *Eupithecia* accumulated since his 1987 revision of the group was completed. Several new species and distributional information are being added.

Kalbfleisch Curatorial Fellow James S. Miller completed a monograph on the world Notodontidae, a moth family comprising some 3,000 species. The paper includes a detailed comparative study of adult and larval morphology, illustrated with 530 figures, as well as a newly proposed classification. Larval and adult characters were employed in determining taxonomic interrelationships, and for the first time, notodontid classification was treated on a world level. As an extension of the research, Dr. Miller and J. G. Franclemont of Cornell University are writing a monograph covering the 137 species of North American Notodontidae.

Dr. Miller also began a revision of the genus *Josia* (Notodontidae: Dioptinae), including approximately 100 Neotropical species of brightly colored moths whose caterpillars feed on passion vine (*Passiflora*). To date, adults of more than 70 *Josia* species have been surveyed for morphological characters, and a phylogeny for those taxa has been constructed. A completed phylogeny will form the basis for classifying *Josia* into discrete subgroups, and will aid in producing keys allowing accurate identifications.

Bees Curator Jerome G. Rozen, Jr. and Arturo Roig-Alsina, a graduate student at the University of Kansas, conducted two field trips to northwestern Argentina supported by grants from the National Geographic Society and an Undergraduate-Graduate Research award from the Greenwall Foundation. The purpose was to investigate the nesting biology and immature stages of the solitary bee subfamily Panurginae. These small, often colorful bees nest in the ground and are particularly abundant in arid regions. The panurgine fauna of northwestern Argentina proved more diverse than expected. Numerous new species and unnamed genera were discovered, and the nesting behavior and immature stages of at least 18 species were documented.

The discovery of a gigantic emerging nest site of the gregarious solitary bee *Centris caesalpiniae* near Tucson, Arizona, enabled Dr. Rozen and Stephen L. Buchmann, research entomologist at the Carl Hayden Bee Research Center, Department of Agriculture, to study the nesting biology and immature stages of this and a related species. The density at the site was remarkable: an estimated 1,600,000 bees emerged from an area of only 1,290 square meters!

Bugs Boeschenstein Research Fellow Pavel Stys of Charles University, Prague, Czechoslovakia, used the museum's scanning electron microscope to investigate tarsal structure in the Dipsocoromorpha. The museum has one of the finest existing collections of this group of ground-dwelling Heteroptera, which are generally between one and two millimeters in length. The studies revealed rich variation, showing that males and females (and even the three pairs of legs on a given specimen) often have different structures. Several new organs were discovered. They are apparently associated with the production or reception of chemical stimuli.

Curator Randall T. Schuh collaborated with Dr. Štys in analyzing the phylogenetic relationships of the 18 families of Cimicomorpha, a group that includes bed bugs and assassin bugs. The study confirmed the monophyly of the Cimicomorpha, although on a somewhat different basis than previously suggested. They also proposed a new classification for the group, clarifying the relationships of several families previously of uncertain placement.

Flies Assistant Curator David Grimaldi reclassified the world genera and subgenera of the family Drosophilidae. The group is well known because several of its species are used in genetic research. Those species have generally been placed in the large, nebulous genus *Drosophila*. However, in Dr. Grimaldi's revision, several subgenera and other taxa were removed from *Drosophila* in order to make the genus monophyletic. For instance, a very speciose group endemic to the Hawaiian islands has been returned to its original genus, *Idiomyia*. The reassessment of the relationships of the Hawaiian group has major implications regarding the relative age of one of the most spectacular instances of explosive radiation in animals.

Dr. Grimaldi completed the second part of a revision of the drosophilid genus *Zygothrica* wherein

13 new species were described, primarily from the Indopacific and Africa. The projected last part of the revision will be on a large assemblage of Neotropical species.

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Baranowski, R. M., and J. A. Slater
1989. The utilization of grasses as host plants by a species of *Oedancala* (Hemiptera: Lygaeidae) with the description of a new species from Florida and the West Indies. Florida Entomol. 72: 243-251.

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DeVries, P. J.
1989. Notes on *Panacea procilla* (Nymphalidae) from Costa Rica. J. Res. Lepid. 27: 141-142.

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*Goloboff, P. A. (Sponsor: N. I. Platnick)
1989. *Xenonemesia*, un nuevo género de Nemesiidae (Araneae, Mygalomorphae). J. Arachnol. 16: 357-363.
1989. Una nueva especie de Dipluridae (Araneae): *Chilehexops misionensis*. Rev. Soc. Entomol. Argentina 45: 77-83.

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1989. A revision of the South American hairstreak butterfly genera *Tergissima* and *Femniterga* (Lycaenidae: Theclinae). Insecta Mundi 3: 195-215.
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1989. Additional notes on type specimens of little-known Papilionidae. Papilio Int. 6: 451-470.

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1989. A study of *Protesilaus microdamus* (Burmeister) and the little-known *P. dospassosi* (Rutimeyer) and *P. huanucana* (Varea de Luque) (Papilionidae). J. Res. Lepidoptera 27: 83-95.

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1989. Redescription of *Platynus prognathus* Van Dyke (Coleoptera: Carabidae: Platynini) and circumscription of Lindroth's *decentis* and *hypolithos* groups. J. N. Y. Entomol. Soc. 97: 430-437.

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1989. Interspecific differences among swallowtail larvae (Lepidoptera: Papilionidae) in susceptibility to aristolochic acids and berberine. Ecol. Entomol. 14: 287-296.

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1989. A new genus and species of Helotrephidae from Iran and Afghanistan (Heteroptera: Nepomorpha). Vest. Cs. Spol. Zool. 53: 107-122.

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1989. Life history studies of the "primitive" panurgine bees (Hymenoptera: Andrenidae: Panurginae). Am. Mus. Novitates 2962: 27 pp.

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1989. A review of the late season Stenodemini of southwest North America, and a description of the new genus *Caracoris* from Brazil (Heteroptera: Miridae). Am. Mus. Novitates 2955: 36 pp.

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1989. [Review] Insects and flowers, the biology of a partnership, by F. G. Barth. J. N. Y. Entomol. Soc. 97: 118-120.

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1989. [Review] Lord of the flies: the systematist as study animal; Science as a process: an evolutionary account of the social and conceptual development of science, by D. L. Hull. Cladistics 5: 295-310.

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1990. [Review] Island faunas: Zoologia neocaledonica (new series), vol. 1, edited by S. Tillier. J. N. Y. Entomol. Soc. 98: 123-124.

1990. [Review] A new natural history dictionary: The Cambridge illustrated dictionary of natural history. J. N. Y. Entomol. Soc. 98: 126-128.

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1990. [Review] Spiders: webs, behavior, and evolution, edited by W. A. Shear. J. N. Y. Entomol. Soc. 97: 486-487.

Rindge, F. H.
1989. [Review] Portraits of South Australian geometrid moths, by N. McFarland. J. N. Y. Entomol. Soc. 97: 122-123.

1989. [Review] The Saturniidae of America: Ceratocampinae, by C. Lemaire. J. Lepidopterists' Soc. 43: 154.

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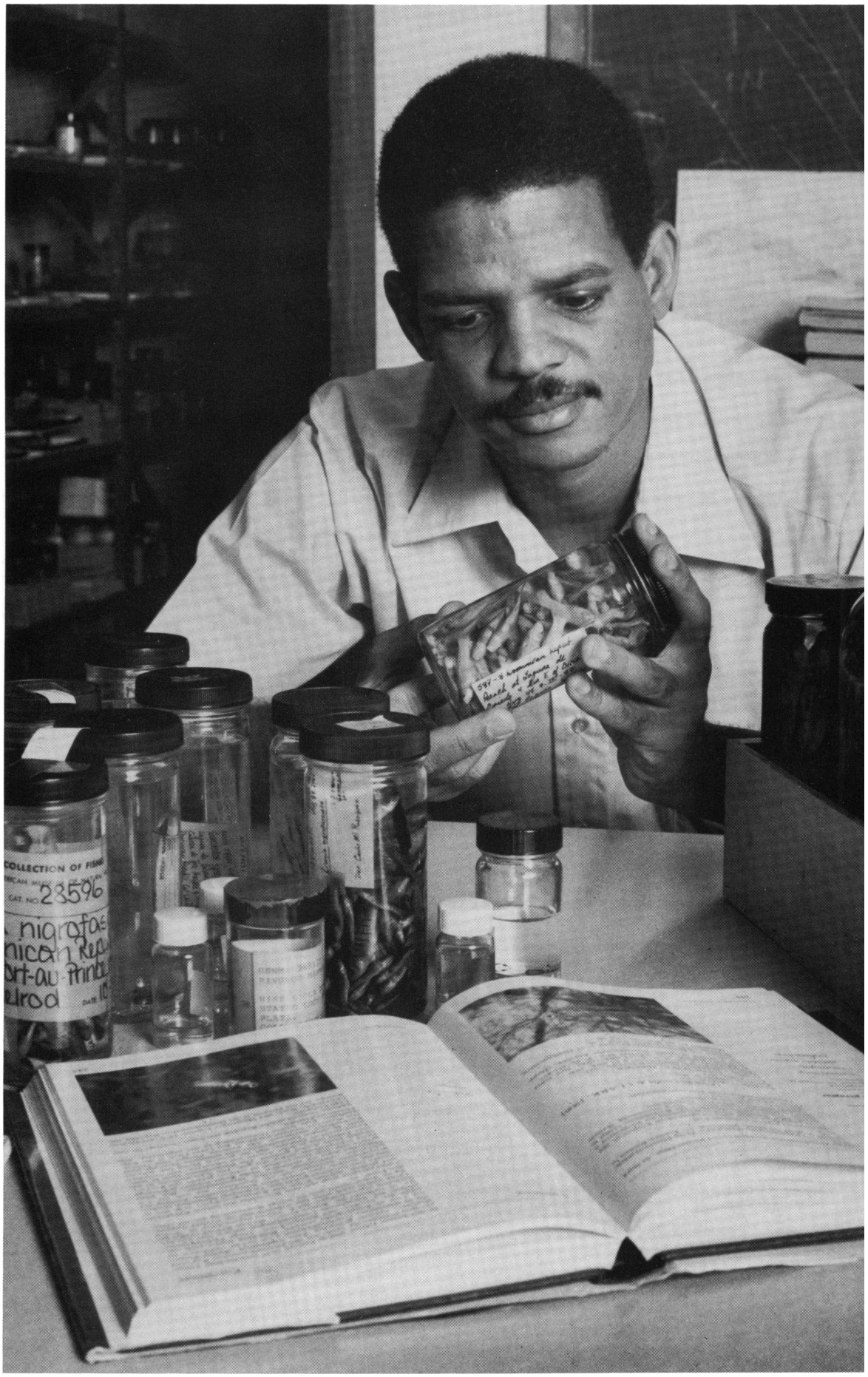
1989. Enicocephalomorphan and dipsocoromorphan fauna of Heteroptera of W Palearctic: affinities and biology. Abstracts, 3rd Int. Meeting on Rhynchota fauna of Balkan and Adjacent regions, Piran, 1 p.

Carlos Rodriguez, a graduate student from the Dominican Republic, examines freshwater fish specimens from Hispaniola. Mr. Rodriguez is working on a revision of the systematics and distribution of the genus Limia, *commonly found in Hispaniola's waters. Research efforts of the Department of Herpetology and Ichthyology focus on cold-blooded vertebrates, including reptiles, amphibians and fishes in threatened tropical habitats.*



Herpetology and Ichthyology

Cold-blooded vertebrates—reptiles, amphibians and fishes—are the province of the department's collecting, research and curatorial activities. Current emphasis is on understanding the life forms in the threatened tropical habitats of Africa, South America, Mexico and the Caribbean Islands. A new program is under way to promote the conservation of threatened freshwater turtles and tortoises.

Guaiquinima This year the museum again participated in a multidisciplinary expedition to the Venezuelan backcountry. Past exploration of the isolated mountains of Neblina and Tapirapeco on the Brazilian border was very fruitful, and led to the discovery of a number of new species.

The South American sponsor for the recent trips is FUDECI—the Caracas-based Fundacion para el Desarrollo de las Ciencias Fisicas, Matematicas y Naturales. Curator Charles W. Myers is the museum coordinator.

This year's zoological survey of Cerro Guaiquinima, an immense low-lying tepui (flat-topped mountain) in eastern Venezuela, recorded the life forms in this remote and pristine area.

A party of six museum scientists traveled to a low-elevation camp on the Río Carapo. Research Associate Carl J. Ferraris remained at the Carapo camp for the fish survey. Other party members, including Dr. Myers, and Research Assistant Maureen A. Donnelly went by helicopter to high-elevation camps on the summit of Guaiquinima. They collected snakes, lizards, frogs and fishes.

The expedition collected numerous specimens, including new species, at both low and high elevation camps. The specimens are under study in the museum and at the Instituto de Zoologia Tropical, Universidad Central de Venezuela, Caracas.

Global Turtle Recovery In January, the American Museum of Natural History, together with the World Conservation Union (IUCN) in Switzerland, and the Durrell Institute of Conservation and Ecology (DICE) in the United Kingdom, developed plans to protect and restore the world's endangered and depleted freshwater turtles and tortoises. The museum is the host institution for the program, headed by Michael W. Klemens, program director for turtle conservation.

In collaboration with organizations worldwide, the program will stimulate research and education as well as local turtle conservation projects. Areas covered in the program include New England, southern Europe, the Amazon basin, Madagascar, southeast Asia, and New Guinea.

Projects focus on developing workable conservation strategies, which are integrated into local economies and cultures. Plans are in place to preserve turtles and the livelihood of human inhabitants in areas where turtles are used as food, develop ecotourism to produce revenue and create an incentive to protect turtles, and provide on-site education and training to local inhabitants.

Sierra Leone Assistant Curator Melanie L. J. Stiassny, and Kalbfleisch Research Fellow, Peter N. Reinthal, began a survey of the fishes living in the Moa River and adjacent areas in Sierra Leone, Africa. They returned with both preserved and living specimens and will study the evolutionary relationships and behavior of the animals. Drs. Stiassny and Reinthal conducted their explorations in cooperation with the Ministry of Agriculture and the Conservation Society of Sierra Leone.

Cuba Michael L. Smith, Kalbfleisch Assistant Curator (Fellow), collected freshwater fishes in Cuba. His visits began a projected three-year survey of freshwater habitats to record the fishes living on the island and to establish a research collection. Dr. Smith anticipates that he will discover many new fishes on this large and geographically complex island, as yet not adequately surveyed with modern techniques. His work in Cuba is in association with the Museo

Nacional de Historia Natural in Havana.

Hispaniola Dr. Smith collected fishes for a survey of freshwater life of Hispaniola, an island that includes the countries of Haiti and the Dominican Republic. It is the largest of the Caribbean Islands with the exception of Cuba. The island provides striking contrasts between undisturbed and totally deforested habitats.

Dr. Smith worked to establish reference collections that will enable the otherwise well developed conservation activities of the Dominican Republic to protect aquatic life forms.

Mexico With support from the National Science Foundation, Dr. Smith visited the Ameca and Magdalena rivers, west of Mexico City, to collect Mexican livebearers, family Goodeidae, for scanning electron microscopical study. These fishes live in habitats threatened by the increasing human use of waterways.

Because of reports issued by the American Fisheries Society that one species, the opal allotoca (*Allotoca maculatus*), recently became extinct, Dr. Smith visited areas where he first discovered and described this distinctive fish. He found that all of the allotoca's natural habitat has disappeared, but that a population of the species still persists in a precarious shallow reservoir of a few acres of surface area water.

Argentina, Paraguay, Brazil Dr. Ferraris collected fishes from the Rio de la Plata, Río Paraguay and Río Paraná. After the Amazon, these rivers form the largest drainage system in South America. The system is undergoing significant change due to dam construction and other human activity. Up to now, fishes from this system had been virtually unrepresented in the department's collection.

Cataloged Collections During the year, 1,762 specimens (27 lots) were cataloged in herpetology; and 19,897 specimens (2,183 lots), including 9,719 skeletons, were cataloged in ichthyology.

Scientific Publications:

Atz, J.W., R. Lund, *T. Schmid* and *J. Sallay*
1989. Bibliography of Chondrichthyes, 1987-1988. Am. Elasmobranch Soc. Garden City, NY. 43 pp.

Burridge, M.E., D.J. Siebert, and C.J. Ferraris, Jr.
1990. *Acanthophthalmus* van Hasselt in Temminck, 1824 (Osteichthyes, Cypriniformes): proposed conservation, and proposed designation of *Cobitis kuhlii* Valenciennes in Cuvier and Valenciennes, 1846 as the type species. Bull. Zool. Nomencl. June 1990: 118-121.

Cole, C.J.
1990. When is an individual not a species? Herpetologica 46: 104-108.

Dessauer, H.C., and C.J. Cole
1989. Diversity between and within nominal forms of unisexual lizards. *In* R.M. Dawley and J.P. Bogart (eds.), Evolution and ecology of unisexual vertebrates. Bull. 466: 49-71. Albany: New York State Museum.

Donnelly, M.A.
1989. Demographic effects of reproductive resource supplementation in a territorial frog, *Dendrobates pumilio*. Ecol. Monogr. 59: 207-221.
1989. Reproductive phenology and age structure of *Dendrobates pumilio* in northeastern Costa Rica. J. Herpetol. 23: 362-367.
1989. Effects of reproductive resource supplementation on space-use patterns in *Dendrobates pumilio*. Oecologia 81: 212-218.

Donnelly, M.A., *C. Guyer*, and *R.O. de Sa*
1990. The tadpole of a dart-poison frog *Phyllobates lugubris* (Anura: Dendrobatidae). Proc. Biol. Soc. Wash. 103: 427-431.

Ellis-Quinn, B.A., and C.A. Simon
1989. Homing behavior of the lizard *Sceloporus jarrovi*. J. Herpetol. 23: 146-152.

Guyer, C., and M.A. Donnelly
1990. Length-mass relationships among an assemblage of tropical snakes. J. Trop. Ecol. 6: 65-76.

Hardy, L.M., C.J. Cole, and C.R. Townsend
1989. Parthenogenetic reproduction in the Neotropical unisexual lizard, *Gymnophthalmus underwoodi* (Reptilia: Teiidae). J. Morph. 201: 215-234.

Klemens, M.W.
1989. The methodology of conservation. *In* I.R. Swingland and M.W. Klemens (eds.), The conservation biology of tortoises. Occas. Papers IUCN Species Survival Commission (SSC) 5: 1-4.

Moller, P., J. Serrier, and *D. Bowling*
1989. Electric organ discharge displays during social encounter in the weakly electric fish *Brienomyrus niger* L. (Mormyridae). Ethology 82: 177-191.

Nelson, G.
1989. Cladistics and evolutionary models. Cladistics 5: 275-289.
1989. Phylogeny of major fish groups. *In* B. Fernholm, K. Bremer, and H. Jörnvall (eds.), The hierarchy of life: molecules and morphology in phylogenetic analysis. Proceedings from Nobel Symposium 70 held at Alfred Nobel's Björkborn, Karlskoga, Sweden, August 29-September 2, 1988. Excerpta Medica International Congress Series, no. 824: 325-336. Elsevier, Amsterdam.

Pinna, M.C.C. de* (Sponsor: G. Nelson)
1989. A new sarcoglanidine catfish, phylogeny of its subfamily, and an appraisal of the phyletic status of the Trichomycterinae (Teleostei, Trichomycteridae). Am. Mus. Novitates 2950, 39 pp.
1989. Redescription of *Glanapteryx anguilla*, with notes on the phylogeny of Glanapteryginae (Siluriformes, Trichomycteridae). Proceedings of the Academy of Natural Sciences of Philadelphia 141: 361-374.

Rachlin, J.W., *B.E. Warkentine*, and *A. Pappantoniou*
1989. The use of niche breadth and proportional similarity in feeding to stipulate resource utilization strategies in fish. J. Freshwater Ecol. 5: 103-112.

Randall, J.E., C.L. Smith, and M.N. Feinberg
1990. Report on fish collections from Rapa, French Polynesia. Am. Mus. Novitates 2966: 44 pp.

Reinthal, P.N.
1990. The feeding habits of a group of tropical herbivorous rock-dwelling cichlid fishes (Cichlidae: Perciformes) from Lake Malawi, Africa. Env. Biol. Fishes 27: 215-233.

1990. Morphological analyses of the neurocranium of a group of rock-dwelling cichlid fishes (Cichlidae: Perciformes) from Lake Malawi. Africa. Zool. J. Linn. Soc. 98: 123-139.

Schmidt, P.J., W.C. Sherbrooke, and *J.O. Schmidt*
1989. The detoxification of ant (*Pogonomyrmex*) venom by a blood factor in horned lizards (*Phrynosoma*). Copeia 1989: 603-607.

Serrier, J. and P. Moller
1989. Patterns of electric organ discharge activity in the weakly electric fish *Brienomyrus niger* L. (Mormyridae). Exp. Biol. 48: 235-244.

Sherbrooke, W.C.
1989. Seedling survival and growth of a Sonoran Desert shrub, jojoba (*Simmondsia chinensis*) during the first ten years. Southwest Nat. 34: 421-424.

1990. Rain-harvesting in a lizard, *Phrynosoma cornutum*, behavior and integumental morphology. J. Herpetol. 24: 302-308.

1990. Predatory behavior of captive Greater Roadrunners on adult horned lizards. Wilson Bull. 102: 171-174.

Sherbrooke, W.C. and *S.K. Frost*
1989. Integumental chromatophores of a color-change thermoregulating lizard, *Phrynosoma modestum* (Iguanidae: Reptilia). Am. Mus. Novitates 2943: 14 pp.

Smith, M.L.
1989. *Cyprinodon nichollsi*, a new pupfish from Hispaniola, and species characteristics of *C. bondi* Myers (Teleostei: Cyprinodontiformes). Am. Mus. Novitates 2953: 10 pp.

Swingland, I.R., and M.W. Klemens (eds.)
1989. The conservation biology of tortoises. Occas. Papers IUCN Species Survival Commission (SSC) 5: iv + 204 pp.

Vrijenhoek, R.C., R.M. Dawley, C.J. Cole, and *J.P. Bogart*
1989. A list of the known unisexual vertebrates. *In* R.M. Dawley and J.P. Bogart (eds.), Evolution and ecology of unisexual vertebrates. Bull. 466: 19-23. Albany: New York State Museum.

Zweifel, R.G.
1989. Calling by the frog, *Rana sylvatica*, outside the breeding season. J. Herpetol. 23: 185-186.

1989. Long-term ecological studies on a population of painted turtles, *Chrysemys picta*, on Long Island, New York. Am. Mus. Novitates 2952: 12 pp.

1989. New species of microhylid frogs from the Owen Stanley Mountains of Papua New Guinea and resurrection of the genus *Aphantophryne*. Am. Mus. Novitates 2954: 20 pp.

Abstracts, Reviews and Popular Publications:

Buckley, L.* (Sponsor: M.L. Smith), and M.L. Smith
1990. (Abstract) Interrelationships of goodeid fishes of the genus *Skiffia*. 70th Ann. Mtg. Am. Soc. Ichthyol. Herpetol., Charleston, SC.

Cole, C.J.
1989. [Review] Phylogenetic relationships of the lizard families: essays commemorating Charles L. Camp (R. Estes and G. Pregill, eds.). Rec. Publ. Nat. Hist. 7: 2-3.

Dessauer, H.C., and C.J. Cole
1989. (Abstract) Genetics of populations of *Cnemidophorus tigris* and *C. marmoratus* in a hybrid in southwestern United States. First World Congr. Herpetol., Canterbury, UK.

Ferraris, C.J., Jr.
1989. [Review] Freshwater and marine catfishes of the world (W.E. Burgess). Rec. Publ. Nat. Hist. 7: 3-4.

Ford, L.S., and *J.E. Simmons*
1990. (Abstract) Philosophy of the natural history collection builders and their practices: the heritage of Alexander G. Ruthven. 70th Ann. Mtg. Am. Soc. Ichthyol. Herpetol., Charleston, SC.

Klemens, M.W.
1989. (Abstract) Postglacial hybridization of *Ambystoma jeffersonianum* and *Ambystoma laterale* (Amphibia: Caudata) in the northeastern U.S.A. First World Congr. Herpetol., Canterbury, UK.

1990. Can Ninja Turtles help their real life cousins? [Editorial] *In* Viewpoints: Second opinion. Newsday, May 18: 91.

Nelson, G.
1989. [Review] Special issue on panbiogeography: space, time, form. (R. Claw and G. Sermonti, eds.). Syst. Zool. 38: 196-197.

1989. Preface. *In* W.R. Bird, The origin of species revisited: the theories of evolution and of abrupt appearance: xi-xiii. New York: Philosophical Library.

1989. [Review] Paléontologie et évolution en France 1800-1860: une histoire des idées de Cuvier et Lamarck à Darwin (G. Laurent). Syst. Zool. 38: 291-292.

1989. [Review] Reconstructing the past: parsimony, evolution, and inference (E. Sober). Syst. Zool. 38: 293-294.

1990. [Review] Drifting continents and shifting theories (H. LeGrand). Syst. Zool. 38:409.

1990. [Review] The phylogeny and classification of tetrapods (M.J. Benton, ed.). Syst. Zool. 38: 408-409.

Nelson, G., and *P. Ladiges*
1990. (Abstract) Vicariance biogeography, parsimony, and evolution in North American freshwater fishes: an alternative interpretation. 70th Ann. Mtg. Am. Soc. Ichthyol. Herpetol., Charleston, SC.

Pinna, M.C.C. de* (Sponsor: G. Nelson)
1990. (Abstract) Lower loricarioid relationships, with an example of the importance of additional taxa in phylogeny reconstruction (Teleostei, Siluriformes). 70th Ann. Mtg. Am. Soc. Ichthyol. Herpetol., Charleston, SC.

Rachlin, J.W., and *B.E. Warkentine*
1989. (Abstract) Spatial and seasonal distributions of groundfish in the coastal zone of the western arm of the New York Bight: ecological interactions. 45th Northeast Fish and Wildlife Conference, Ellenville, NY.

1990. (Abstract) Feeding strategies in a freshwater stream community. Proc. 119th Ann. Mtg. Am. Fish. Soc., Anchorage, AK.

1990. (Abstract) Winter diet of juvenile red hake (*Urophycis chuss*) in the New York Bight. 46th Northeast Fish and Wildlife Conference, Nashua, NH.

Reinthal, P.N.
1989. [Review] Fishes of Zimbabwe (G. Bell-Cross and J.L. Minshull). Copeia 1989(3): 809-810.

1990. The Living Jewels of Lake Malawi. Nat. Geog. Mag. 177: 42-51.

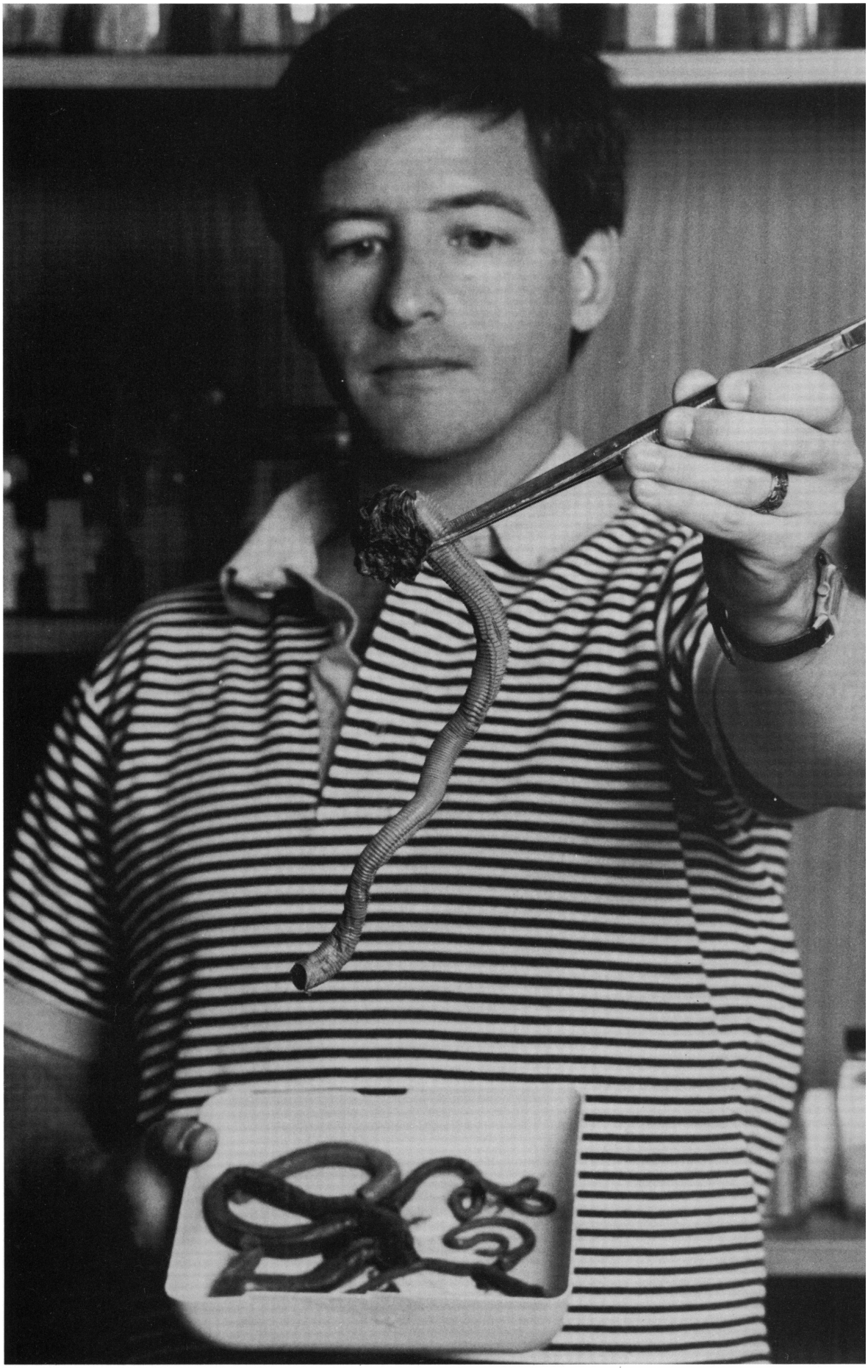
Rodriguez, C.M.* (Sponsor: M.L. Smith), and M.L. Smith
1990. (Abstract) Comparative anatomy of spermatozeugmata and male urogenital structures in the Goodeidae. 70th Ann. Mtg. Am. Soc. Ichthyol. Herpetol., Charleston, SC.

Smith, M.L.
1990. (Abstract) Felipe Poey y Aloy, father of Cuban natural history. 70th Ann. Mtg. Am. Soc. Ichthyol. Herpetol., Charleston, SC.

Warkentine, B.E., and J.W. Rachlin
1989. (Abstract) Winter occurrence and diet of fish from New York Bight. 45th Northeast Fish and Wildlife Conference, Ellenville, NY.

1990. (Abstract) Feeding patterns of the windowpane flounder. 46th Northeast Fish and Wildlife Conference, Nashua, NH.

Research Fellow Kirk Fitzhugh examines a segmented worm, Eudispyiia vancouveri, *commonly known as a fan worm, collected from north Pacific waters off Vancouver, British Columbia. Dr. Fitzhugh is studying the evolutionary relationships and geographic distribution of these marine worms, or polychaetes. Animals lacking backbones constitute the vast majority of the world's fauna, and scientists in the Department of Invertebrates study the biogeography and evolutionary history of these organisms, both living and extinct.*



Invertebrates

Invertebrates constitute the vast majority of the world's animal life. The Department of Invertebrates maintains a collection of some 8.5 million specimens, including fossil and Recent organisms. Bryozoan ecology and systematics, molluscan and arthropod evolutionary relationships, paleontology and biogeography, molecular systematics, and evolutionary theory are among the areas of research.

Molecular Systematics The molecular systematics laboratory was completed in June. Assistant Curator Ward C. Wheeler supervised equipping and construction of the sixth floor laboratory facilities. The laboratory, with a total floor space of 5,000 square feet, consists of two suites, each accommodating one curator and technical support staff. For interdepartmental use, an additional laboratory with a shared equipment room is available. The department provided two adjacent rooms for use as office space.

Molecular systematics has the potential to resolve many of the long-standing enigmas of invertebrate evolution. The fossil record of invertebrates began with the rather abrupt appearance of multicellular animals some 600 million years ago. All major divisions of animal life appeared at roughly the same time, but the fossil record is of little direct value in determining the evolutionary relationships among invertebrates.

Analysis of the relationships among annelid worms, arthropods, mollusks, echinoderms and other invertebrate groups has depended heavily on studies of the comparative anatomy and the embryology of living groups. There is evidence that highly conserved sequences of DNA that have remained stable for 500 million years, will shed further light on invertebrate evolutionary relationships—the major research priority of the department.

Evolutionary Theory Niles Eldredge, chairman, explored the nature of, and interactions between the genealogical and ecological hierarchies among invertebrates. With Research Associate Marjorie Grene, Dr. Eldredge completed the book "Interactions," which explores the ways in which social systems arise as amalgams of reproductive and ecological activities of organisms.

Dr. Eldredge helped organize the museum's symposium on the role of museums in the biodiversity crisis. To emphasize the importance of systematics research in understanding the ongoing extinctions of modern life-forms, the papers presented at the March symposium will be published with additional contributions. With graduate students Gregory Edgecombe and Bruce Lieberman, a long-term project on the evolutionary history of Silurian and Devonian trilobites from the southern hemisphere is near completion.

Mollusks William K. Emerson, curator, studied the systematics, ecology and zoogeography of prosobranch marine gastropods and scaphopods of the tropics. In one of his projects, he analyzed the distributional patterns of six species of the snail *Morum* on the regional lithospheric plates in the Indo-Pacific.

Neil H. Landman, associate curator, studied the evolutionary relationships of a group of minute ammonites, extinct relatives of the chambered *Nautilus*, from the Upper Cretaceous strata of South Dakota, Wyoming and Montana. The ammonites were similar to more average-sized forms in their early life history, but reached maturity at one-tenth the normal size. He also studied the embryonic development of *Nautilus*, the only living, externally shelled cephalopod. With Research Associate John Arnold, Dr. Landman documented the later developmental stages in the embryonic shell of *Nautilus belauensis*.

Arthropods, Bryozoans and Annelid Worms Dr. Wheeler investigated theoretical molecular systematics as it relates to museum research. He examined the effects of extinction in reconstructing evolutionary relationships based on molecular data. He began developing a method to combine information on DNA sequences with data

on the physical structures of organisms in order to clarify their evolutionary relationships.

Through a travel fellowship from the Smithsonian Institution, Judith Winston, associate curator, completed her studies on the effects of environmental change on physical characteristics of cheilostome bryozoan colonies, small colonial marine animals. The project took place at the Smithsonian Marine Station in Fort Pierce, Florida. The museum has an outstanding fossil bryozoan collection, but until recently, had only a small sample of Recent bryozoans. Through Dr. Winston's efforts, large collections of bryozoans were acquired from Caribbean, Antarctic and Northwest Pacific sites. With the help of volunteers, these collections are being cataloged and prepared for reference and research.

Research Fellow Kirk Fitzhugh, studied the evolutionary relationships among two families of polychaetes, segmented marine worms. With the Scripps Institute of Oceanography, he examined diversity patterns of deep sea polychaetes from manganese-rich nodule fields in North Pacific waters.

Permian Extinctions Curator Emeritus Norman D. Newell and Research Associate Donald W. Boyd, conducted field and laboratory research on the remarkable Permo-Triassic extinction event, about 230 million years ago, that eliminated more than 95 percent of the Permian marine species of animals. Research Associate Howard R. Feldman studied the evolutionary relationships of Jurassic brachiopods from the Ethiopian Province and Israel. Research Associate John J. Lee studied algae living within larger foraminiferans from the Red Sea. The patterns of symbiosis that Dr. Lee documented show intricate evolutionary interactions between the two major groups of unicellular organisms. Linda H. Mantel, research associate, studied the hormonal regulation of salt balance, and regeneration and molting in various species of crabs.

Losses The department notes, with great regret, the death of Horace W. Stunkard, renowned parasitologist and a research associate since 1921, who died at the age of 100. Mrs. Claire Stout, friend of the department, avid shell collector, and wife of former museum President Gardner D. Stout, also died during the past year. We shall miss them both.

Scientific Publications:

Chatterton, B. D. E., D. J. Siveter, G. D. Edgecombe, and *A. S. Hunt*
1990. Larvae and relationships of the Calymenina (Trilobita). J. Paleontol. 64: 255-277.

Edgecombe, G. D., and *B. D. E. Chatterton*
1990. *Mackenziurus*, a new genus of the Silurian *"Encrinurus" variolaris* plexus (Trilobita). Am. Mus. Novitates 2968: 22 pp.

Eldredge, N.
1989. Punctuated equilibria, rates of change, and large-scale entities in evolutionary systems. J. Social Biol. Struct. 12: 173-184.
1989. Punctuated equilibria and earth history: the value of time in evolutionary theory, *In* J. Hutton, Le conzecioni attualistiche a due secoli dalla "Theory of the Earth". Riflessioni su fondamenti e storia delle Scienze della Terra. Societa Geologica Italiana, Conv. Internaz. 45-47.
1989. Biological underpinnings of social systems. Behavioral and Brain Sciences. 12: 702.

Emerson, W. K.
1990. New records for western Pacific *Morum* (Gastropoda: Harpidae) with biogeographic implications. The Veliger 33(2): 145-154.

Emerson, W. K. and W. E. Sage, III
1990. *Distorsio ridens* (Reeve, 1884): A synonym of *Distorsio clathrata* (Lamarck, 1816) (Gastropoda: Personidae). The Nautilus 103(4): 131-135.
1990. A new species of *Latirus* from Philippine Islands (Gastropoda: Fasciolariidae). The Nautilus 104(1): 1-3.

Fitzhugh, K.
1989. Cladistics in the fast lane. J. New York Entomol. Soc. 97(2): 234-241.
1989. A systematic revision of the Sabellidae-Caobangiidae-Sabellongidae complex (Annelida: Polychaeta). Bull. Am. Mus. Nat. Hist. 192: 104 pp.
1990. Two new genera of the subfamily Fabriciinae (Polychaeta: Sabellidae). Am. Mus. Novitates 2967: 19 pp.
1990. A revision of the fabriciin genus *Augeneriella* Banse, 1957 (Polychaeta: Sabellidae). J. Nat. Hist. 24: 195-218.
1990. *Fabricinuda*, a new genus of Fabriciinae (Polychaeta: Sabellidae). Proc. Biol. Soc. Wash. 103(1): 161-178.

Honeycutt, R. L., and W. C. Wheeler
1990. Mitochondrial DNA: Variation in humans and higher primates. *In* S.K. Dutta and W.T. Winter (eds.), DNA systematics in humans and higher primates, 91-140. Boca Raton, Fla.: CRC Press.

Landman, N. H.
1989. Iterative progenesis in Upper Cretaceous ammonites. Paleobiol. 15: 95-117.

Landman, N. H., J. M. Arnold, and *H. Mutvei*
1989. Description of the embryonic shell of *Nautilus belauensis* (Cephalopoda). Am. Mus. Novitates 2960: 16 pp.

Landman, N. H., J. K. Cochran, *J. A. Chamberlain*, and *D. J. Hirschberg*
1989. Timing of septal formation in two species of *Nautilus* based on radiometric and aquarium data. Mar. Biol. 102: 65-72.

Lee, J. J.
1989. Foraminifera (Chapter 17). *In* L. Margulis, J. O. Corliss, D. Chapman (eds.), Protoctista. Boston, Mass.: Jones and Bartlett.
1990. Fine structure of the rhodophycean *Porphyridium purpureum in situ*. *In* Forskol and Batsch, *Peneroplis planatus* and *P. acicularis* and in axenic culture, J. Foram. Res. 201: 162-169.

Lee, J. J. and *C. Lawrence*
1990. First isolation of the endosymbiotic dinoflagellates from Sorites. *In* P. Nardon (ed.), Endocytobiology IV, 221-223. Inst. Itut. Natl. de la Recherche Agronomique.

Lee, J. J. and *R. E. Lee*
1990. Chloroplast retention in Elphidids (Foraminifera). *In* P. Nardon (ed.), Endocytobiology IV, 215-220. Inst. Itut. Natl. de la Recherche Agronomique.

Lee, J. J., *M. E. McEnery, B. Ter Kuile, J. Erez, R. Rottger, R. E. Rockwell,* W. W. Faber, Jr. and *A. Lagziel*
1989. Identification and distribution of endosymbiotic diatoms in larger foraminifera. Micropaleo. 35: 353-366.

Lee, J. J., and *X. Xenophontos*
1989. The unusual life cycle of *Navicula muscatinei*. Diatom Res. 4: 69-77.

Newell, Norman D. and D.W. Boyd
1990. Nacre in a carboniferous pectinoid mollusc and a new subfamily Limipectininae. Am. Mus. Novitates 2970: 7 pp.

Seeley, H., P. Van Demark, and J.J. Lee
1990. Microbes in action, (4th ed.) New York: W. H. Freeman and Co. 450 pp.

Wheeler, W. C.
1989. Evolution and systematics of insect DNA. *In* Bo Fernholm et al., (eds.), The hierarchy of life, 307-321. Amsterdam: Elsevier Press.

Winston, J.E. and *E. Hakansson*
1989. Molting by *Cupuladria doma*, a free-living bryozoan. Bull. Mar. Sci. 44(3): 1152-1158.

Abstracts, Reviews and Popular Publications:

Arnold, J.M., N.H. Landman, and *H. Mutvei*
1989. (Abstract) Development of the embryonic shell of *Nautilus*. *In* J.G. Carter (ed.), Skeletal biomineralization: patterns, processes, and evolutionary trends. Washington, D.C.: IGU: 323.

Boyd, D., *X. Chen*, and N. D. Newell
1990. (Abstract) Discovery of a Texas bioderm builder in the Permian of Idaho. 43 Annual Meeting Program, Rocky Mountain Section, Geol. Soc. Am. 22(6): 3.

Edgecombe, G.D.
1989. [Review] Heterochrony craze. *In* M. L. Mckinney (ed.), Heterochrony in evolution: a multidisciplinary approach. Bioscience 39: 821-822.

Eldredge, N.
1990. Hierarchy and macroevolution. *In* Briggs, D. and P. Crowther (eds.), Encyclopedia of palaeobiology, 124-129. Oxford: Blackwell Sci. Publ.

Eldredge, N., *D. Eldredge*, and *G. Eldredge*
1989. The Fossil Factory. Reading, Mass.: Addison-Wesley Publishing Co. 111 pp.

Emerson, W.K.
1989. A status report on the William E. Old, Jr. malacology fund, AMNH. N.Y. Shell Club Notes 312: 2.

Emerson, W.K. and *D. Raeihle*
1989. The Clare K. Stout Collection. N. Y. Shell Club Notes 313: 7.

Feldman, H., D. J. Feldman* (Sponsor: H. Feldman), *G. C. McIntosh, M. Connors, C. Davis, J. Fohrman, M. Kiwak, M. O'Dwyer,* and *J. Portman.*
1989. (Abstract) Devonian brachiopod paleocommunities across an east-west transect in New York State. Geological Society of American Northeastern Section Meeting, New Brunswick, N.J.: 14.

Fitzhugh, K.
1989. (Abstract) The systematic and phylogenetic assumptions of the Woodin and Merz anchor-function hypothesis. 3rd International Polychaete Conference, Long Beach, Calif.

Horenstein, S.
1990. Computerzation of the fossil invertebrate collection at the American Museum of Natural History. The New York Natural History conferences. Abstract of poster presentation, contributed paper, and symposia papers June 20-22, 1990 at the New York State Museum, Albany: 17.

1990. Index to the invertebrate collection at the American Museum of Natural History using Bright Bill Robert's hyperpad. The New York Natural History conferences. abstract of poster presentation, contributed paper, and symposia papers, June 20-22, 1990 at the New York State Museum, Albany: 17-18.

1990. Making maps. Faces 6(6): 11-13.

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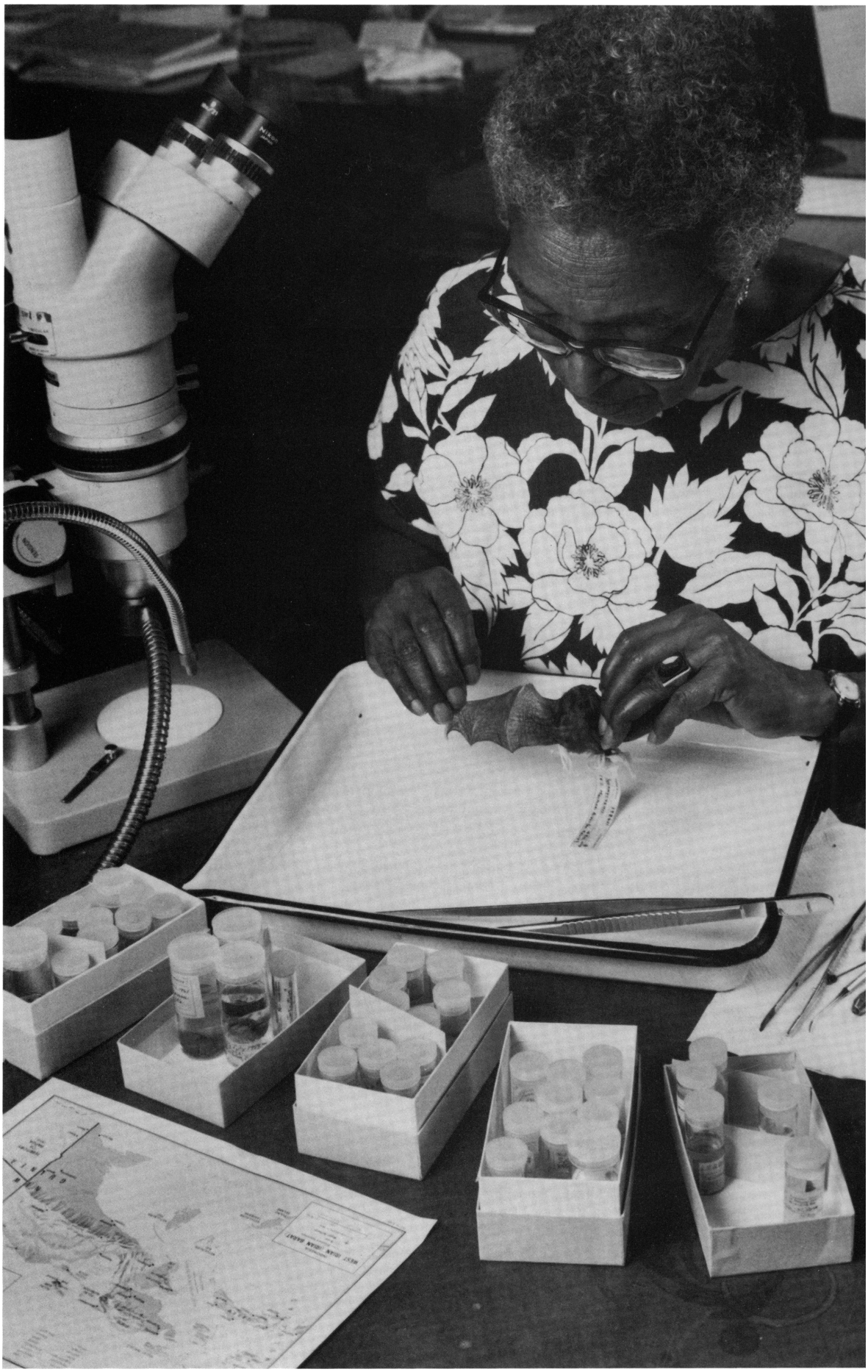
In the Department of Mammalogy, Marie A. Lawrence, senior scientific assistant, examines the wing membrane of a rarely-studied small fruit bat from New Guinea, Syconycteris australis papuana. *Drawing data from the department's comprehensive research collection, scientists investigate the origins, diversity, distribution and extinctions of the world's mammals.*



Mammalogy

A collection of more than 265,000 mammals forms a reservoir of primary research materials from which scientists draw data to improve our understanding about the origins, diversity and extinctions of the world's mammals. This material is at the foundation of museum research on South American mammals, and island-dwelling mammals in the West Indies, Indonesia and Madagascar.

South American Mammals Curator Sydney Anderson advanced his research on the geographic distribution and evolutionary relationships of Bolivian mammals with several publications. In collaboration with Nancy Olds of The Morris Museum in New Jersey, he published a report on phyllotine rodents, a group that includes many species of South American mice. He submitted manuscripts on the caviomorph rodents, a group of New World rodents that includes guinea pigs, chinchillas and porcupines. The National Science Foundation gave a $210,000 grant that will cover the cost of the Bolivian surveys for the next three years.

Chairman Guy G. Musser, in collaboration with Michael D. Carleton of the Smithsonian's National Museum of Natural History, examined the evolutionary relationships of the small-bodied and long-tailed arboreal mice in the genus *Oecomys*. So far, they have described the geographic ranges and physical characteristics of more than 10 species. The study is part of an endeavor to understand the diversity and evolutionary history of Neotropical oryzomyine rodents, commonly known as New World rice rats.

Rodent Evolution Robert S. Voss, assistant curator, conducted field and laboratory investigations of the evolutionary relationships of South American muroid rodents. Dr. Voss's laboratory research concerns the genetics of the morphological evolution of South American field mice in the genus *Zygodontomys*. These rodents are easily raised in captivity where inheritance of anatomical characteristics can be studied statistically.

As part of his revisionary research on the classification of these animals, Dr. Voss is completing a monograph on the genus *Zygodontomys* and began a revision of the South American cotton rats, genus *Sigmodon*. In the latter project, Dr. Voss works with Scientific Assistant Victoria Mayer. Research on the evolutionary relationships of fossil rats and mice excavated from Brazilian caves is also in progress.

The common theme of Dr. Voss's laboratory and museum research is the description and analysis of mammalian diversity in South America. Since rodents did not experience the drastic extinctions that reduced the diversity of larger mammals at the end of the Pleistocene 10,000 years ago, these and other small mammals provide excellent opportunities to understand how evolutionary processes and ecological factors interact to create and maintain diverse faunas in the South American tropical rainforests.

Island Biogeography Island mammal communities are the focus of the research efforts of several staff members. Curator Ross D. E. MacPhee explores the evolutionary history of primates, insectivores, and caviomorph rodents. He studies historical biogeography and the extinctions that occurred during the most recent period of earth history.

With funding from the National Science Foundation, Dr. MacPhee and his colleagues study the diversity of mammals in Madagascar and what caused recent extinctions on the island.

During the last year he worked on a monographic revision of the living and recently extinct members of the insectivore group, Tenrecomorpha, that is a significant part of the island's fauna. The group includes tenrecs, primitive shrew-like creatures unique to Madagascar.

Madagascar has undergone substantial environmental alteration during the last several thousand years. There is debate over whether the destruction is primarily due to natural causes or is the result of human activity, but it is not a matter of argument that the island's forest environments, where nearly all of the mammal species live, are under duress.

Studies are critical to understanding the evolutionary diversity of Madagascar's mammals, since much of the life on the island is now threatened. Significant work to document the diversity of animals and plants is underway, but nearly all of the efforts to study mammals are directed toward lemurs. The insectivores received little attention until now, and their natural behavior, distribution and ecology remain poorly understood.

Dr. MacPhee, Scientific Assistant Audrone R. Biknevicius, and their colleagues are studying the anatomy, evolutionary relationships, and extinction of the bear-sized rodent *Amblyrhiza*, from Anguilla, in the West Indies. The Percy Sladen Fund supported further work on mammal extinction in Anguilla. Dr. MacPhee also received research clearance and Leakey Foundation support for investigations of the extinct primates of Cuba and Hispaniola.

He submitted a proposal to the Indonesian scientific authorities to conduct field research on Timor and adjacent islands in eastern Indonesia to reconstruct the history of mammals in the region.

Bats and Rats Dr. Musser and Curator Emeritus Karl F. Koopman conducted research on the mammals of Sulawesi, an island just east of Borneo. Nearly half its indigenous animals are rodents.

Dr. Musser is documenting the anatomical characteristics, distribution, natural history, and evolutionary relationships of several groups of the rodents. He examines living animals as well as fossil material from regions where the native mammals have disappeared due to deforestation by humans.

A report on the diversity, distributions, and ecologies of the bats of Sulawesi occupied much of Dr. Koopman's research efforts during the last year. The finished report will reflect both Dr. Koopman's significant expertise on the classification of bats, and Dr. Musser's three years of research on Sulawesi.

Dr. Musser's documentation of the anatomical and evolutionary diversity of murid rodents on the island of Flores, Indonesia, is nearly ready to be published. The report will add important information to the understanding of present and past diversity of native mammals on the island.

Most of the murid rodents on Flores are now represented only by fossils, but the same species probably still live where suitable habitat remains. One species, *Paulamys naso*, described earlier by Dr. Musser, was recently found living on the island.

Social/Emotional Behavior Curator Ethel Tobach, who retired at the end of June after 33 years at the museum, conducted behavioral observations. She studied spiny mice (*Acomys cahirinus*), laboratory rats (*Rattus norvegicus*), and primates (*Pongo pygmaeus abelii*, *Nasalis larvatus*, and *Homo sapiens*).

A research team studied spiny mice in laboratories at the museum and at Wichita State University. These mice have unusual behaviors that include jumping and somersaulting. At the museum, mice increase jumping when staff enter the room, rather than in response to changes in the lighting cycle. At Wichita, the presence of vertical partitions enclosing narrow spaces is a major factor in promoting jumping.

Scientific Assistant Teresa Hernandez aided investigations on the serotonin receptor sites in the brains of fawnhooded rats and their taste sensitivities.

Dr. Tobach conducted studies with orangutans and proboscis monkeys. A group of orangutans was presented with images of themselves and other orangutans. The responses to these stimuli were found to be related to the social relationships of the animals.

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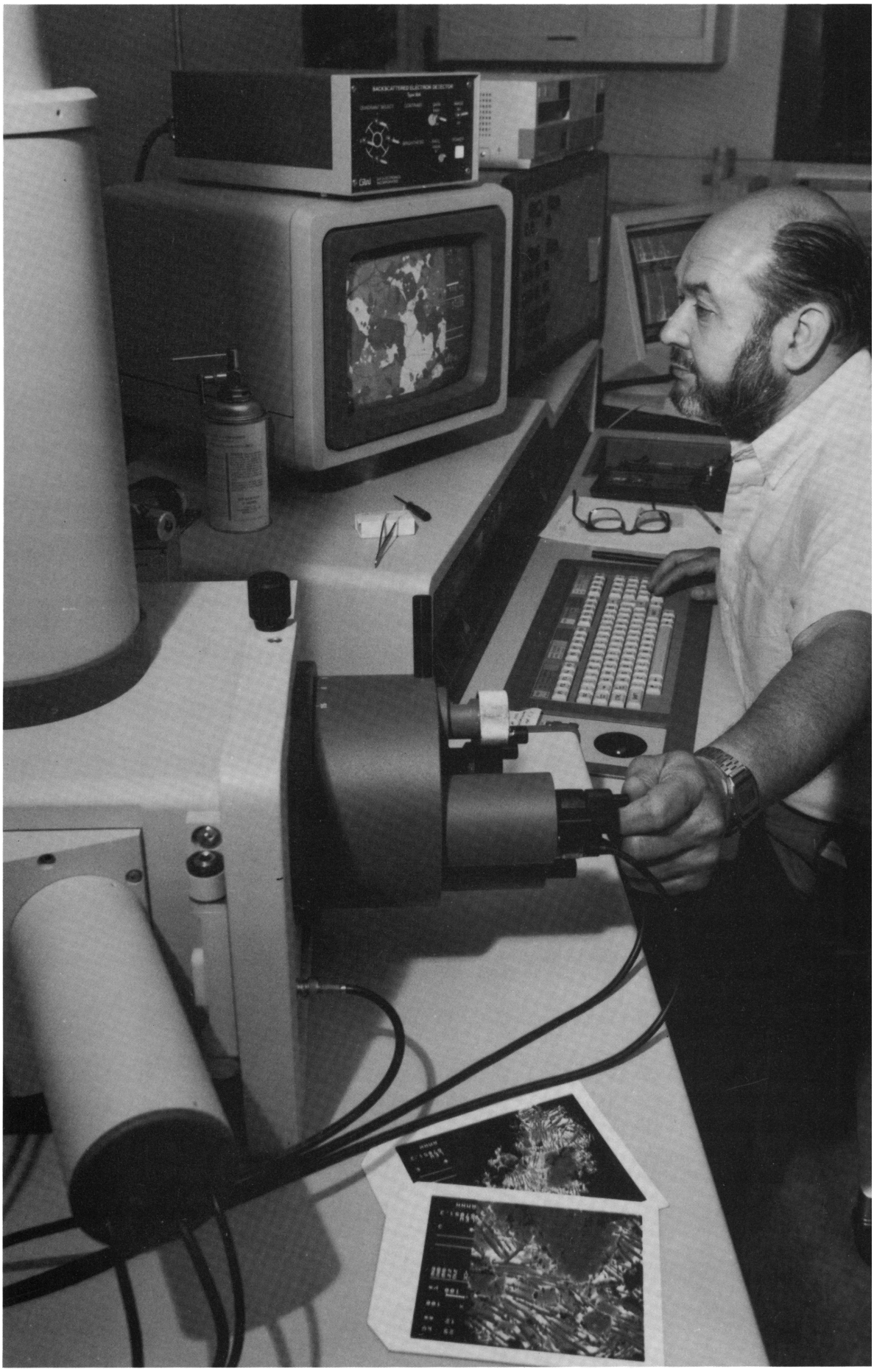
Curator Martin Prinz uses a scanning electron microscope and energy dispersive system to analyze mineral compositions in Angrite meteorites. Studying the chemical properties of these rare calcium-aluminum-rich meteorites (only three samples have been found on Earth), Dr. Prinz hopes to further understand the earliest history of the solar system and how the planets evolved.



Mineral Sciences

The Department of Mineral Sciences encompasses the fields of mineralogy, petrology, mineral deposits, meteoritics and gemology. Research focuses on developing an understanding of the geochemical processes operating in the Earth and the solar system. The department's exhibits and education programs shed light on those processes and the materials in its collections.

The Collections The mineral and gem collections grew by 192 specimens (79 by donation, 3 by exchange and 110 by purchase). Significant gifts include more than 70 gemstones from world-wide sources donated by Milton and Pearl Unger; two gold nuggets from the El Foco/San Miguel area (Venezuela) from George E. and Mary Ann Curtis; and crystallized descloizite from Abenab, Grootfontein (Namibia) from Norman and Roslyn Pellman.

Important purchases include many Chinese minerals, mostly from Leiyang, Hunan Province; a collection of Soviet minerals; and a suite of 44 nephrite and jadeite samples. Specimens were lent to 11 institutions, including a collection of Fabergé carvings to the San Diego Natural History Museum.

The meteorite collection grew by 27 meteorite samples and 4 varieties of tektites, represented by 26 samples. The new meteorites include Maralinga, a rare carbonaceous chondrite (Australia), and Birimon, a recent fall from Mali, West Africa. Other new samples are Kainsaz (USSR), Eagle (Nebraska), Moorabie (Australia), Isna (Egypt), Murchison (Australia), two new pieces of Peña Blanca Springs (Texas) and two pieces of Zagami, a meteorite believed to be from Mars (Nigeria). New tektite samples include Indochinites from Thailand, and Irghizites from the Zhamanshin crater (USSR). Seventy-six meteorite samples were loaned for research.

Pyroxene Studies In collaboration with Dr. David R. Veblen at the Johns Hopkins University, Chairman George E. Harlow studied potassium in pyroxene crystals recovered as inclusions from diamonds. Dr. Harlow examined crystal fragments using the analytical transmission electron microscope at Johns Hopkins. He concluded that the pyroxene is uniformly rich in potassium and that the pyroxene structure is the host, a result that contradicts conventional mineralogical wisdom.

Dr. Harlow continued studies on the occurrence of jadeite (another pyroxene) rock, albite rock and altered basalts from the Motagua Valley of Guatemala. He focused on their unusual mineralogy, geochemistry and origin along a tectonic plate boundary.

Diamonds With Jim Blacic and Carl Maggiore at Los Alamos National Laboratory, Assistant Curator Edmond A. Mathez studied the light trace elements in diamonds to understand the conditions under which they form. The researchers developed a technique to analyze oxygen from regions of about one-tenth of a millimeter across on a diamond.

The technique is known as nuclear reaction analysis (NRA) and involves bombarding a diamond with a high energy beam of helium ions. The helium and oxygen nuclei react to create a radioactive isotope of fluorine. (Its decay activity is proportional to the initial oxygen content.) The trio demonstrated that oxygen concentrations as low as approximately 10 parts per million can be detected using NRA and that some diamonds contain a considerable amount of oxygen. Dr. Mathez's studies were funded by the National Science Foundation (NSF).

Platinum Group Elements and Layered Intrusions Dr. Mathez continued NSF-supported work on the geochemistry of platinum group elements. With former student David Nicholson, he completed a study on the origin of the Merensky Reef of the Bushveld Complex. Located in South Africa, the Merensky Reef is a layered igneous intrusion from which most of the world's platinum comes. A theory was developed that water played an important role in a remelting event in the reef after most of the magma solidified. The researchers are investigating whether or not the fluids could also have trans-

ported the platinum group elements into the reef.

Angrites In January, 1869 a three-pound meteorite fell near Angra dos Reis in Brazil. It was soon found to be a unique planetary sample. After a series of investigations published in 1977, the meteorite's unusual nature was better understood, but not its origins. No similar samples were known until two small related meteorites were discovered in Antarctica: a 6.9 gram piece found in 1986, and a "crumb" (0.6 gram) in 1987. Curator Martin Prinz and colleagues, funded by the National Aeronautics and Space Administration, studied all three Angrites and found highly unusual aspects resulting from calcium-aluminum-rich primitive components. No sample of a metallic core or silicate mantle has been found for their parent planet, whose origin is enigmatic. The Angrites illustrate that there are wide differences in planetary compositions and that planetary origins are difficult to determine from three samples.

Chondrules in Meteorites Chondrites are among the oldest materials known, dated at 4.5 billion years old, and are records of the various components and processes in the early solar nebula. These meteorites derive their name from chondrules (crystallized melt droplets) that they contain.

Research Fellow Craig A. Johnson and colleagues studied the "type II" variety of chondrule by examining the chemical compositions of the constituent mineral chromite, an iron chromium oxide. Chromite composition is sensitive to the conditions of mineral growth, and the data reveal differences in the thermal history and composition of chondrules from different meteorite groups. Results show that the primordial nebular dust from which the chondrules formed varied in chemical composition and that, after forming in flash heating, the chondrules were later reheated during assembly into small planets.

CR Chondrites Scientific Assistant Michael K. Weisberg worked in collaboration with Robert N. Clayton and T.K. Mayeda, University of Chicago, and Dr. Prinz on a new group of primitive meteorites known as the CR chondrites. This year Mr. Weisberg focused on the calcium-aluminum-rich inclusions in the CR chondrites. These millimeter-sized objects formed at very high temperatures, and some are believed to be primary condensates from the birth of the solar system. The intricate mineral relationships were examined using the new Zeiss Scanning Electron Microscope.

Granite-Hosted Mineral Deposits Assistant Curator James D. Webster joined the department in January. He studies rhyolites and granites associated with ore deposits of tin, molybdenum, tungsten, and many other metals. While visiting Arizona State University (ASU), Dr. Webster conducted experiments to determine the effects of fluorine and chlorine on the crystallization behavior of granites. The experimental products and natural samples were chemically analyzed with the ASU ion microprobe. This state-of-the-art instrument can measure the concentration of most elements at the parts-per-million level in a spot as small as 20 micrometers. Dr. Webster is developing a high pressure-temperature experimental laboratory in the department.

Fluids and Base Metals Curatorial Fellow Eugene Ilton, funded by the U.S. Department of Energy, studied chemical reactions that occur when water interacts with minerals. Aqueous fluids can selectively dissolve or precipitate the chemical constituents of minerals, including ore-forming metals. Such processes, coupled with fluid flow, can eventually lead to the formation of ore deposits. Dr. Ilton developed a model that describes how base metals behave as a fluid flows through various kinds of rock. His experiments and transmission electron microscopy elucidated how minor concentrations of metals were incorporated by host minerals.

Exhibition and Education The Howard Lee Belsky Memorial Exhibit, inaugurated in the Hall of Minerals in May, enables visitors to view microscopic minerals on a television monitor via an automated microscope. The interactive exhibit, developed by Dr. Harlow, is supported by the Howard Belsky Memorial Fund. Dr. Prinz is creating a new video program and theater for the Arthur Ross Hall of Meteorites. A new moveable seismology exhibit is being developed by Dr. Mathez.

Dr. Harlow and Associate Anna S. Sofianides wrote "Gems & Crystals from the American Museum of Natural History." The book was completed

in time to celebrate the centennial of the gem collection, which began with the 1890 gift of the first Tiffany-Morgan Collection. The book features more than 140 new color photographs of treasures from the museum's collections. Senior Scientific Assistant Joseph J. Peters and Charles Pearson, a volunteer, completed two papers chronicling figures important in the history of the mineral collection.

Dr. Mathez ran the first annual American Museum of Natural History/Columbia University field trip in geology in March. The trip to Baja California, Mexico, included faculty members and students from the museum, Columbia University and Arizona State University.

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Senior Scientific Assistant Mary LeCroy demonstrates the beautiful courtship plumes of the Raggiana Bird of Paradise. Ms. LeCroy specializes in examining courtship behavior of this exotic family of birds from New Guinea. The Department of Ornithology has long been at the forefront of bird conservation. To support these efforts, museum ornithologists study avian diversity, including the evolution of faunas, behavioral patterns, geographical variation and fossils.

Ornithology

The Whitney Wing, which houses the Department of Ornithology, celebrated its 50th anniversary. The anniversary occasioned a retrospective look at the department's activities and reflections about its future. The department's collections contain 99 percent of all known species of birds. Today, basing their work on the collections, department scientists study several aspects of avian diversity, including the evolution of faunas, behavioral patterns, geographic variation and fossils.

50th Anniversary The department marked the 50th anniversary of the official opening of the Whitney Wing with a series of special events coordinated by Senior Scientific Assistant Mary LeCroy and Chairman François Vuilleumier. Five temporary exhibits opened: "Bringing Art to Life: How the Whitney Dioramas Were Made;" "Oceanic Birds of South America," an exhibit of oil paintings by Francis Lee Jaques, who painted the background murals for the dioramas in the Hall of Oceanic Birds; "A New Wing for Birds: 50th Anniversary of the Whitney Building," historical photographs of the construction of the wing and of members of the Whitney and Sanford families who contributed to the department; "Lord Rothschild's Birds: The Tring Collection," an exhibit examining the collection purchased for the museum by the Whitneys in 1932, and "Island Bounty: The Whitney South Sea Expedition," photographs from the museum's expedition that carried out the most comprehensive survey of Pacific birds.

Other programs included lectures by Curator Emeritus Ernst Mayr and Research Associate Jared Diamond, and special tours of the Audubon Gallery, which houses more than 150 paintings by celebrated bird artists and is rarely open for public viewing. A special event was held to honor living members of the Whitney and Sanford families.

Forest Bird Faunas Patches of temperate rainforests dominated by false beeches of the genus *Nothofagus* occur in southern South America, Australia and New Zealand. Similar forests are also found in cool mountain regions of the tropical islands of New Guinea and New Caledonia. These environments are usually thought to represent remnants of Gondwana, the ancient southern supercontinent.

Dr. Vuilleumier and Jiro Kikkawa of the University of Queensland, Brisbane, Australia, are cataloging all species of birds living in these forests prior to an analysis of the origins of these avian communities.

To trace the evolution of these faunas, Dr. Vuilleumier will need not only to understand relationships among the birds, but will also need to analyze the ecological utilization of the forests. To gather data, he visited *Nothofagus* forests in Papua New Guinea, Victoria (southern Australia), and Tasmania. Early results indicate there may be convergences in how unrelated taxa of birds exploit the forests in South America and the southwest Pacific.

Dr. Vuilleumier also visited two rainforest sites in the Tongass National Forest of southeast Alaska to compare the bird species found in south-temperate and north-temperate rainforests. Alaskan rainforests, like their counterparts in the southern hemisphere, have few species of birds. This poverty may be a characteristic of all high-latitude temperate rainforests.

African Honeyguides Lamont Curator Lester L. Short, and Jennifer F. M. Horne, fellow at the National Museums of Kenya, studied three species of honeyguides in Kenya. Working with nearly 700 color-banded birds, they followed radio-tagged breeding male Scaly-throated Honeyguides for 55 days, observing interactions among males competing for prime breeding sites. In addition, they recorded sexual interactions between males and females and were able define breeding strategies of the two sexes.

Dr. Short and Ms. Horne are tracking honeyguides and gauging the influence of genetic factors in determining which birds assume dominant social positions in the population.

Junco Variation Associate Curator George F. Barrowclough completed fieldwork on geographic

variation in part of the genus *Junco*. He collected specimens of *Junco hyemalis* at approximately 200-mile intervals across a broad tract of northern forest from Manitoba, Canada, to Fairbanks, Alaska. The material is being used in computer analysis of skeletal measurements, analysis of feather color, and biochemical studies of proteins. Dr. Barrowclough's extensive and ongoing investigation of *Junco* will update seminal work on the birds done in the 1940s, and will broaden the scientific understanding of this group.

Extinct Birds Senior Scientific Assistant Allison Andors and Storrs L. Olson of the Smithsonian's National Museum of Natural History, organized an expedition to collect fossil specimens of *Presbyornis*, the oldest known duck, from Eocene deposits in the Green River Basin of Wyoming. Bones of this peculiar long-legged wading bird were recovered from sediments near the margins of two former lakes, Fossil Lake and Lake Gosiute, that covered a large area of southwestern Wyoming approximately 50 million years ago. Especially complete material was obtained from a sandstone and volcanic ash horizon that has been estimated to contain thousands of *Presbyornis* skeletons. Two large slabs of this spectacular mass mortality layer were collected.

Conservation Biology The department has a long tradition in bird conservation. Graduate student Rosemarie Gnam, who is sponsored by Dr. Short, received the prestigious Chevron Conservation Award for her research on the endangered Bahama Parrot.

Dr. Vuilleumier is vice-chairman, and graduate student Patricia Escalante-Pliego is a member of the board of the Pan-American Section of the International Council for Bird Preservation. Dr. Short and Research Associate Stuart Keith are members of the council's U.S. section. Dr. Short is also chairman of the council's Piciformes specialist group.

Dr. Barrowclough, long interested in the theoretical aspects of conservation biology, initiated a review of research in conjunction with the museum's spring symposium, "Conserving Life on Earth: The Role of Museums in the Biodiversity Crisis."

Awards The Frank M. Chapman Fund, an important source of support for ornithological research worldwide, awarded grants to researchers throughout the year. Three Chapman Fellows have been in residence this year: Jean-Louis Martin; Richard O. Prum, and C. Jeffery Woodbury.

International Congress The department is preparing to take an active role in the 20th International Ornithological Congress, to be held in December, 1990, in Christchurch, New Zealand. The meetings, held once every four years, permit ornithologists from all over the world to exchange ideas.

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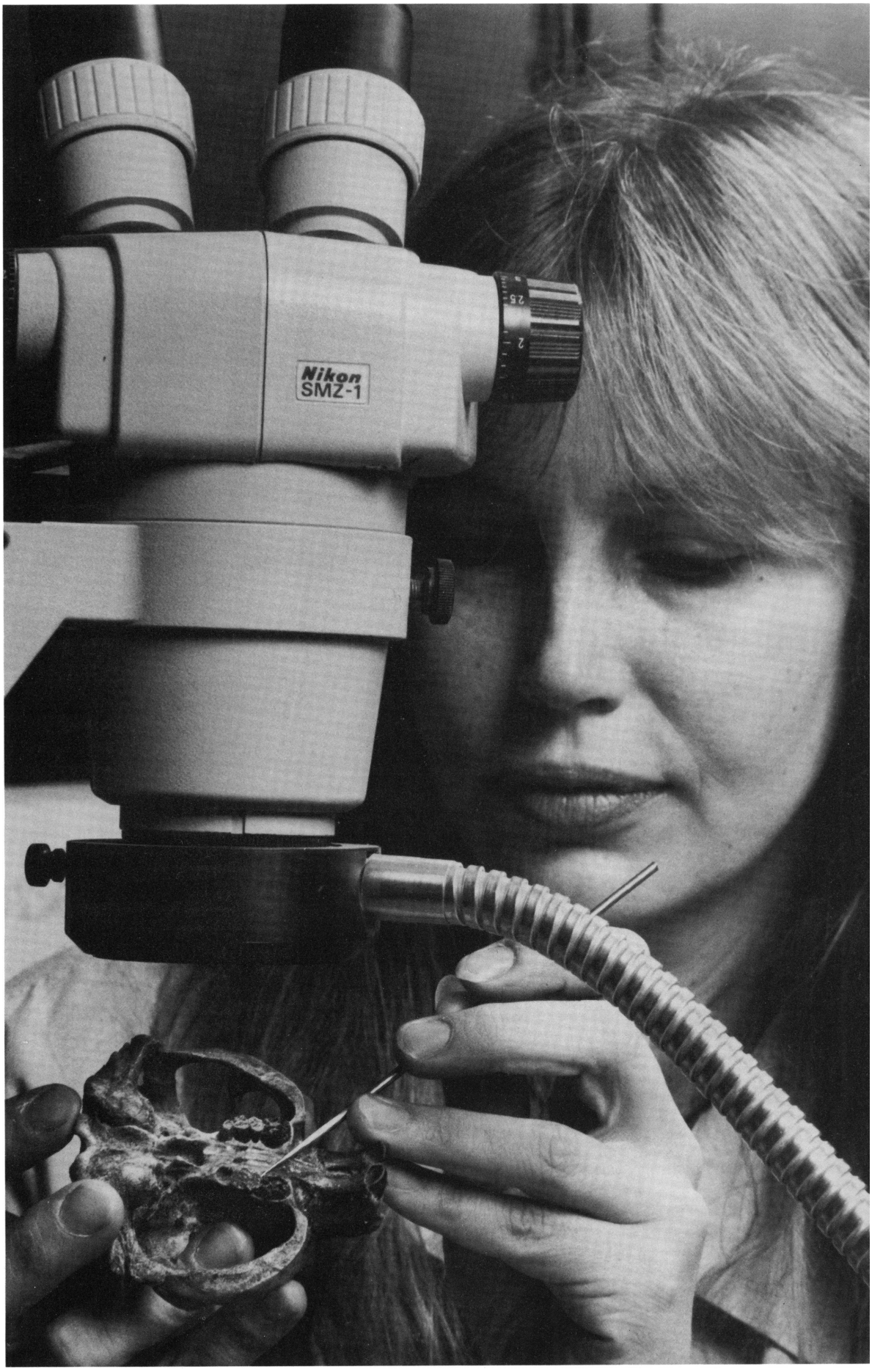
Separating fossil material from its surrounding matrix is a delicate procedure that often requires the aid of a high-resolution microscope. Jeanne Kelly, supervising exhibition assistant, gently scrapes away five-million-year-old sediment surrounding the skull of a fossil rodent. The Department of Vertebrate Paleontology holds one of the prime research collections of fossil vertebrates, including more than 2,000 dinosaur specimens, ranging from teeth to entire skeletons. Its fossil mammals, reptiles and fishes were collected from virtually every part of the globe, including such remote areas as the Gobi Desert and the Andes Mountains.



Vertebrate Paleontology

The Department of Vertebrate Paleontology's diverse field program sent scientists to the farthest reaches of the globe. They did work in Yemen on the Saudi Arabian peninsula and began investigations in Cameroon and Nigeria. In South America, expeditions traveled to Patagonia, Argentina, and sites in the Andes and the Atacama in Chile. Trips to Mongolia and Cuba initiated studies in scientifically important areas that have been closed for decades to western paleontologists. All these ventures were made possible by forging cooperative research projects with colleagues in host countries. Such programs reflect the international scope of the department's contribution to the study of the world's fossil vertebrates.

To Asia Again! After a hiatus of 70 years, the museum has rekindled its research program in eastern Asia. Chairman Richard H. Tedford, Research Associate Larry J. Flynn of Harvard University, Zhanxiang Qiu from the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing, and other Chinese and American colleagues, completed the first phase of their National Science Foundation-funded project in the Yushe Basin of Shanxi Province.

This work successfully charted the succession of mammal species living in the area from about six to two million years ago. The research gave insights into how animals responded to the climatic change that culminated in the first continental glaciation of the northern hemisphere.

In June, Curator Malcolm C. McKenna, Assistant Curator Mark Norell, Vice President and Dean of Science Michael J. Novacek and Vice President for Public Programs Aldona Jonaitis traveled to Mongolia for discussions with the Mongolian Academy of Science regarding joint research and exhibition work.

Drs. McKenna, Norell, Novacek and Mongolian colleagues then traveled to the Gobi Desert and other sites in Mongolia to conduct research and excavate fossils.

Their visit was the first trip to the region made by American researchers since the museum's explorer Roy Chapman Andrews led the famous Central Asiatic Expedition in the 1920s. Andrews's expedition captured the public imagination, and brought back a treasure trove of fossil vertebrates as well as the first dinosaur eggs ever found.

Cooperative projects that will take place over the next three years were initiated between the museum and the Mongolian Academy. It is hoped that these agreements will result in a long-term program of exhibition and research.

Mammalian History Dean Novacek, Dr. McKenna and Fred Szalay of Hunter College, organized an international symposium on the classification of mammals that was hosted by the museum in late May. This highly successful gathering brought the principal workers in comparative anatomy, paleontology and molecular biology together to discuss the status of knowledge of the relationships of mammals. All the paleomammalogists of the department participated, as did several research associates.

Dr. McKenna refined his work on the classification of mammals. He focused on the relationships of rodents, rabbits, elephant shrews and the significance of *Anagale*, a fossil from China, in the history of these groups.

Dr. Tedford did research on carnivores, with an emphasis on those from China. With Research Associate Robert M. Hunt Jr., he reviewed knowledge of the history of the cat, civet, mongoose, and hyena group of carnivores.

Dean Novacek and Curator Ross D. E. MacPhee of the Department of Mammalogy summarized evidence for insectivore relationships.

Turtles and Crocodiles Curator Eugene Gaffney published his monograph on the oldest well-preserved turtles, *Proganochelys*, from the German

late Triassic (200 million years ago). Study of this primitive turtle completes 10 years of work on the comparative skeletal anatomy of modern turtle groups and their nearest fossil relatives.

With Research Associate Peter J. Meylan, Dr. Gaffney studied the side-necked turtles including *Proterochersis*, which lived more than 200 million years ago and is the most primitive member of the side-necked turtle group.

Dr. Norell joined the museum this year from Yale University where he was a lecturer in the Department of Biology, and a co-lecturer in molecular evolution. He studies crocodiles, using both information on skeletal anatomy and biochemical techniques (mitochondrial DNA sequencing) to analyze their evolutionary relationships.

Field work in Gondwana Dr. Norell, John Van Couvering, editor of Micropaleontology Press, and French colleagues conducted field work in Cameroon, and in Sokoto, Nigeria, a region laid down 65 million years ago at the end of the era dominated by the dinosaurs. They explored the feasibility of conducting long-term research in this area on primitive mammals that co-existed with the last dinosaurs.

Dean Novacek and Dr. Tattersall of the Department of Anthropology journeyed to Yemen on the Saudi Arabian peninsula for a fossil site reconnaissance trip.

Dean Novacek, Dr. Norell, Dr. McKenna, Research Associate John Flynn of the Field Museum in Chicago, and Andre Wyss, University of California, Santa Barbara, explored South American fossil deposits. The team worked in Andean Chile not far from Santiago and in coastal Atacama to determine the different types of animals living in the region 40 to 50 million years ago during the Eocene epoch.

Dr. McKenna joined Argentine colleagues in Patagonia to scout for fossil-bearing sites.

Brazilian Fishes Curator John Maisey completed editing a comprehensive study of the life forms preserved 140 million years ago in the early Cretaceous Santana Formation of northeastern Brazil. This work includes contributions by 19 authors including Dr. Maisey and Stanley Blum, Axelrod Fellow, on fishes; Dr. Gaffney and Dr. Meylan on turtles; Dr. Grimaldi of the Department of Entomology on insects; and Research Associate Max Hecht of Queens College on crocodilians.

Exhibition Plans to revise the four fossil vertebrate halls on the fourth floor are underway. The new exhibition will use the department's comprehensive collections to present the physical evidence from which the evolution of vertebrate life is known. The entire department has been involved in exhibition planning, selecting specimens, cleaning, preparation, casting and other work for the project.

New mounted specimens will be prepared, including the giant bear-dog *Amphicyon* and a spectacular dinosaur group with an adult and juvenile plant-eating *Barosaurus*, and the predator *Allosaurus*.

Some existing specimens will be remounted to reflect modern knowledge and present more dynamic poses.

As part of the project, a new hall devoted to the early history of vertebrates is planned. It will present the actual skeletons that show the transition from fishes to the first land animals.

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Robbins, T. P., C. Jychian, M. A. Norell, and *S. L. Dellaporta*
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Researchers from the University of Tennessee seek spiders at the museum's Southwestern Research Station in Portal, Arizona. They are comparing the genetics and behavior of two populations of a species of desert predatory spider, Agelenopsis aperta. *The Southwestern Research Station is one of four museum research sites that attract scientists and students from the world over. At the stations, they are provided with opportunities to conduct short- or long-term investigations in geological, archeological and biological sciences.*

Research Stations

The museum's four research stations attract scientists and students from the world over. Resident and visiting scientists study a wide range of animal and plant life in diverse ecological habitats. Graduate and undergraduate students may take advantage of these research sites for long-term investigations in geological, archeological, zoological and biological sciences.

Southwestern Research Station Located in Portal, Arizona, the Southwestern Research Station provides museum and other scientists rich opportunities for field research in the zoological, botanical and geological sciences. Its desert valleys, rocky hillsides, canyon streams, and mountain forests have served as a base for numerous long-term investigations, including doctoral and master's degree dissertations. The station has been in operation in the Chiricahua Mountains since 1955. The Chiricahuas are a mecca for research biologists from the U.S. and around the world. More than 700 scientific papers have resulted from research at the station.

Wade C. Sherbrooke, resident director, discovered a mechanism of "rain harvesting" by Texas horned lizards in which the animals use their skin's surface to catch and transport raindrops to their mouths for drinking. Dr. Sherbrooke also studied a similar water capture and transport adaptation in the skin of a convergently evolved lizard from central and western Australia, the thorny devil. Back in Arizona, Dr. Sherbrooke studied various defensive behaviors used by horned lizards against potential predators.

Through funding by the National Science Foundation the station will have a new laboratory complex. The facility will expand the technical capabilities of the station and permit more sophisticated study.

Nearly 1,400 people visited the station. Of those, 117 researchers studied the biota. Classes from nine universities and two high schools, tours from 15 organizations, and 674 others visited the station. Resident scientists presented 43 seminars and slide shows for the station community and the public.

Ten young scientists received support for their research at the station from the Theodore Roosevelt Memorial Fund, the Frank M. Chapman Memorial Fund, and the Southwestern Research Station Support Fund. A 1989 museum award recipient, Erick Greene, received the 1990 Theodosius Dobzhansky Prize of the Society for the Study of Evolution.

The station's volunteer program has an international flavor, with participants from Brazil, Canada, and Italy. Working closely with scientists on research projects they evaluate their own career development and goals. The 23 volunteers worked on maintenance projects in exchange for room and board.

Dr. Sherbrooke was elected to a two-year term on the executive committee of the Organization of Biological Field Stations, and became adjunct professor in the Department of Physiology and Cell Biology at the University of Kansas. He continued as a research associate in the Department of Ecology and Evolutionary Biology at the University of Arizona at Tucson. A new species of land snail, *Holospira sherbrookei* Gilbertson, was named after Dr. Sherbrooke.

Great Gull Island In 1989, more than 6,000 pairs of Common Terns nested on Great Gull Island, located 17 miles northwest of Montauk Point in Long Island Sound. Since the project began in the 1960's, the colony has grown dramatically. In addition to the introduction of *Microtus pennsylvanicus* in 1981, efforts at creating new nesting sites for the terns continue to be successful. Piles of dry vegetation spread on bare concrete areas of the island proved to be a perfect invitation for more than 300 pairs of terns.

In addition to Common Terns, more than 1,500 pairs of endangered Roseate Terns nested on the Island. In cooperation with the New York State Department of Conservation, the project is attempting to establish a colony on nearby Little Gull Island.

Due to a delayed nesting during last year's season, peak hatching occurred between June 29 and July 4. With such a late peak, most of the birds remained on the island until late August.

A grant for the computerization of field data was renewed for another year. Data collected during the past 20 years should be in the computer by the fall.

The past year saw the sad, unexpected loss of Michael Harwood, naturalist, writer, and special friend of Great Gull Island. In addition to being an active participant in the Birdathon each year, Mike's book, "The View From Great Gull" and his article in *Smithsonian* magazine played an important role in publicizing Great Gull Island and helped to attract students and other volunteers to work on the project.

St. Catherines Island Research conducted on St. Catherines Island, a barrier island off the Georgia coast, includes archeology, ecology, and evolutionary biology. David Hurst Thomas, curator in the Department of Anthropology, is the museum's principal investigator in the archeology program.

Dr. Thomas and colleagues completed excavating the remains of the 17th century church and the cocina/convento complex of Santa Catalina. Analysis of materials collected from the excavations is underway. Dr. Thomas is writing two books describing the excavations, and recently finished another evaluating the island's prehistoric human ecology.

A three-year Noble Foundation grant was received to study the adaptations of coastal Creek Indians of Georgia from A.D. 1450 through A.D. 1700. The research will examine what life was like before, and the changing social environment brought about by the arrival of Spanish settlers.

Placing the contact-period excavations on St. Catherines into the context of the upcoming Columbian Quincentenary observances, Dr. Thomas completed nine interdisciplinary "Columbian Consequences" seminars, culminating in three books published by the Smithsonian Institution Press.

Archbold Biological Station Scientists at the Archbold Biological Station, located in south central Florida, conduct research in the areas of ecology, evolutionary biology, biogeography and animal behavior. The station's 4,800 acres provide an important refuge for threatened and endangered species. Recent discoveries of rare plants such as *Dicerandra*, scrub mint, focused national attention on the rapidly disappearing scrub surrounding the station.

Except for a few small protected areas, the unique scrub community characterizing the southern Lake Wales Ridge, where the station is located, has virtually disappeared. Growth of human population and the rapid spread of citrus agriculture threaten the existence of large numbers of distinctive, locally endemic plants. Efforts of the Archbold Biological Station are directed toward studying the problem, educating the public and preserving the scrub.

More than 50 visiting scientists and resident staff investigated plant and animal ecology at the station. David B. McDonald is a new postdoctoral research associate who specializes in population genetics. He is studying the genetic structure and biogeography of animals endemic to the Florida scrub. Dr. McDonald is using allozyme and DNA analysis to examine patterns of differentiation in Florida scrub jays, red widow spiders, grasshoppers and other endemic species. Mark A. McPeek joined the staff as a postdoctoral research associate. Dr. McPeek, an aquatic ecologist, is studying competition among and interaction between the different species of fish in Lake Annie, an 80-acre lake at the station.

Among the research projects conducted by the station's executive director John W. Fitzpatrick and staff were: the biogeography of scrub arthropods, the pollination biology of rare endemic scrub plants, and the effects of spring lightning fire on Scrub Jay territory use. An inventory of the flora and fauna of the MacArthur Agro-Ecological Research Center, a division of the station, was started.

A new environmental education program for elementary school students was begun. "Florida Ecology—Getting to Know the Real Florida," provides a scientific introduction to environmental studies, while emphasizing the scrub ecosystems at the station. The curriculum includes films, a half-day visit to the station and classroom activities.

A 25-acre marsh on Lake June was donated by longtime friends, Malcolm and Jeanne Watters.

In April, the station sponsored the first annual meeting of the North American Dipterists' Society, and organized a conference on the preservation of Lake Wales Ridge scrub sites in November.

Dr. Fitzpatrick was elected a trustee of the Florida chapter of The Nature Conservancy.

Education

The department's goals are to provide and enhance learning opportunities for people of all ages, with a focus on deepening public knowledge of the museum's exhibited collections, research, and conservation activities. The department also addresses important contemporary issues, ranging from ecology to intercultural understanding.

Continuing Education More than 5,000 adults participated in the department's workshops, local field trips, summer cruises, and 32 lecture series. The series covered topics from "Bees and Ants" to "Earth Beauty, Earth Crisis," and attracted more than 3,500 persons. Morning bird walks in Central Park drew 400 participants. The summer geology cruises in New York harbor registered 1,400 adults. Local weekend field trips, one for birding enthusiasts, another for whale watchers, provided 75 participants with spectacular nature experiences.

The department continued its program of semester-long college accredited courses for New York City schoolteachers in cooperation with the City University of New York; 239 teachers were enrolled.

The 13th annual Margaret Mead Film Festival was the department's largest single adult event. Over the course of four evenings, nearly 5,000 people viewed documentary films and listened as an international group of filmmakers and anthropologists discussed their work.

A joint program with Tibet House, New York, presented monks from the Namgyal Monastery performing ritual dances. Their striking masks and ritual costumes were viewed by 900 people at three sold-out performances.

Free Adult Programming "Conserving Life on Earth," a free three-day symposium on the crisis in biological diversity, drew 1,700 people. The keynote address was given by Thomas E. Lovejoy, assistant secretary for external affairs at the Smithsonian Institution. Another highlight was a program presented by Denis Hayes, chairman of Earth Day 1990, which was attended by more than 500 people.

The department celebrated the 50th anniversary of the Whitney Wing with a lecture by ornithologists Ernst Mayr and Jared Diamond, a public program on raptor conservation, and through film. Nearly 700 people participated in the free activities.

In conjunction with the exhibition, "Palms and Pomegranates: Traditional Dress of Saudi Arabia," traditional weaving was demonstrated, and a lecture on Saudi dress and custom was presented, along with a series of documentary films.

Each month from October through June, the Frederick Leonhardt People Center focused on a different region or cultural tradition. Indian, Korean, African, Caribbean, Latin-American and Asian-American themes were highlighted with live performances of music and dance, as well as slide talks and crafts demonstrations. More than 22,000 people visited the weekend programs.

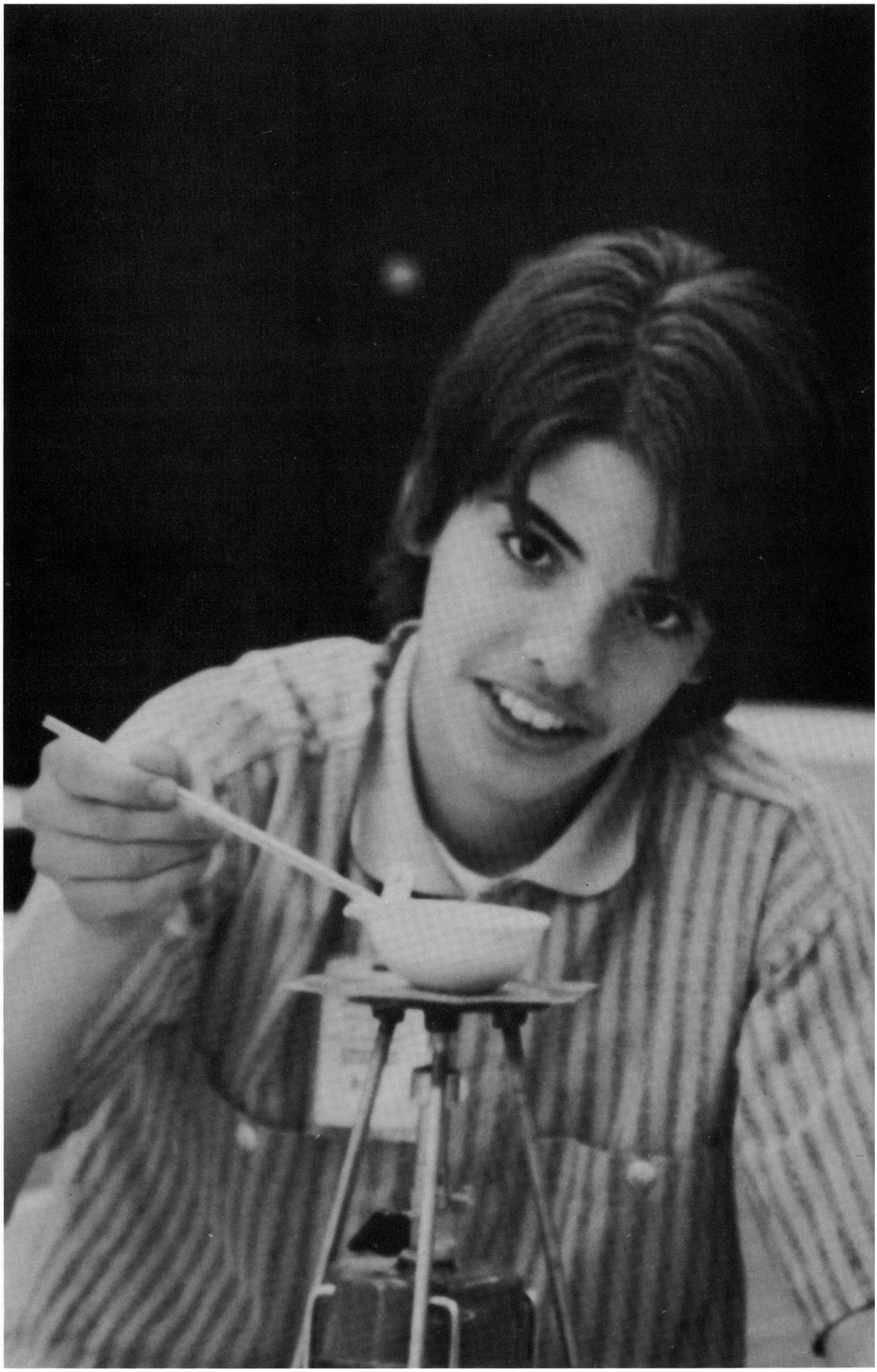
Other public programs for adults included a festival of award-winning dance film documentaries and a three-day program of feature films from Asia co-sponsored by Asian Cinevision.

Services To Schools The department's clerical staff took telephone reservations for some 6,200 school classes (representing more than 160,000 children) to visit the museum independently with their teachers. Eleven hundred additional classes, representing 22,000 New York City children, participated in programs taught by museum instructors. The most popular areas among teachers were the halls of Dinosaurs, Ocean Life, Eastern Woodlands & Plains Indians, and African Peoples.

Special education activities were supported by gifts from the Vidda Foundation and the Samuel and May Rudin Foundation. Programs for visually and hearing impaired and learning disabled youngsters were available, as well as regular school programs in which the children participated. More than 100 special education classes and other groups took part, serving 1,400 people.

The museum also works with junior high school pupils at their schools. This year, ecology talks were given to more than 1,500 students by a senior instruc-

Junior high student Xavier Hernandez conducts an experiment to determine the salinity of a water sample. He is one of 25 students from Harlem and the Bronx participating in the Department of Education's Junior High School Natural Science Program. They meet with museum scientists, design their own research projects, and take field trips. The program, which runs for an entire academic year, is supported by Christadora Inc., and the Samuel and May Rudin Foundation. The curriculum includes environmental and earth studies, biology, and museology.



tor from the department.

Department teaching volunteers were stationed in several exhibition halls, providing short, informal learning experiences for school groups visiting the museum independently. This year, 61 volunteers served some 17,600 youngsters and their teachers.

The department continues to offer the most extensive Black History Month program of any cultural institution in New York State. During that one month 12,000 school children attended participatory craft workshops, folktale programs, music, dance and film programs. Nearly 5,000 more attended weekend and evening programs for adults or families.

Children's Programming Nearly 400 children, ranging from pre-kindergarten to seventh grade, participated in weekend workshops such as "Chinese Brush Painting," "Microscopic Adventures," and "Rainforest Expedition."

Two hundred and fifteen Girl Scouts participated in the third annual overnight Camp-In program. An equal number of Boy Scouts also camped out at the museum for a night of science study.

In a new collaborative project with the City of New York Department of Cultural Affairs, two programs were offered for children living in temporary shelters. In a week-long series of art and anthropology workshops, one group of youngsters focused on African cultures. Another group explored the subject of light and optics in a 10-week hands-on science program.

Community Programming Hundreds of students experienced science through participatory workshops offered in conjunction with the special exhibition "Black Achievers in Science," which was made possible by a grant from Citibank. A trio of "explainers" stationed in the exhibition area assisted more than 15,000 visitors during the course of the 10-week exhibition. A series of film programs and lectures highlighted the scientific accomplishments of African-Americans. A standout was a talk by Walter E. Massey, vice president for research at Argonne National Laboratory. A career day provided an opportunity for junior and senior high school students to meet physicists, physicians, microbiologists, and other professionals involved in the sciences.

Two four-evening lecture/performance series funded by the New York State Council on the Arts drew large audiences. One series traced the use of folk songs as a form of social protest. The second traced nuances of Rastafarian culture and the strength of the movement throughout the Caribbean and the United States. Over the course of eight evenings nearly 4,000 people were in attendance.

The Junior High School Natural Science Program provided opportunities for a select group of 25 students to explore the rich resources of the museum. Its year-long science curriculum was directed toward highly motivated youngsters who receive only limited science training at their schools in Harlem, East Harlem and the Bronx.

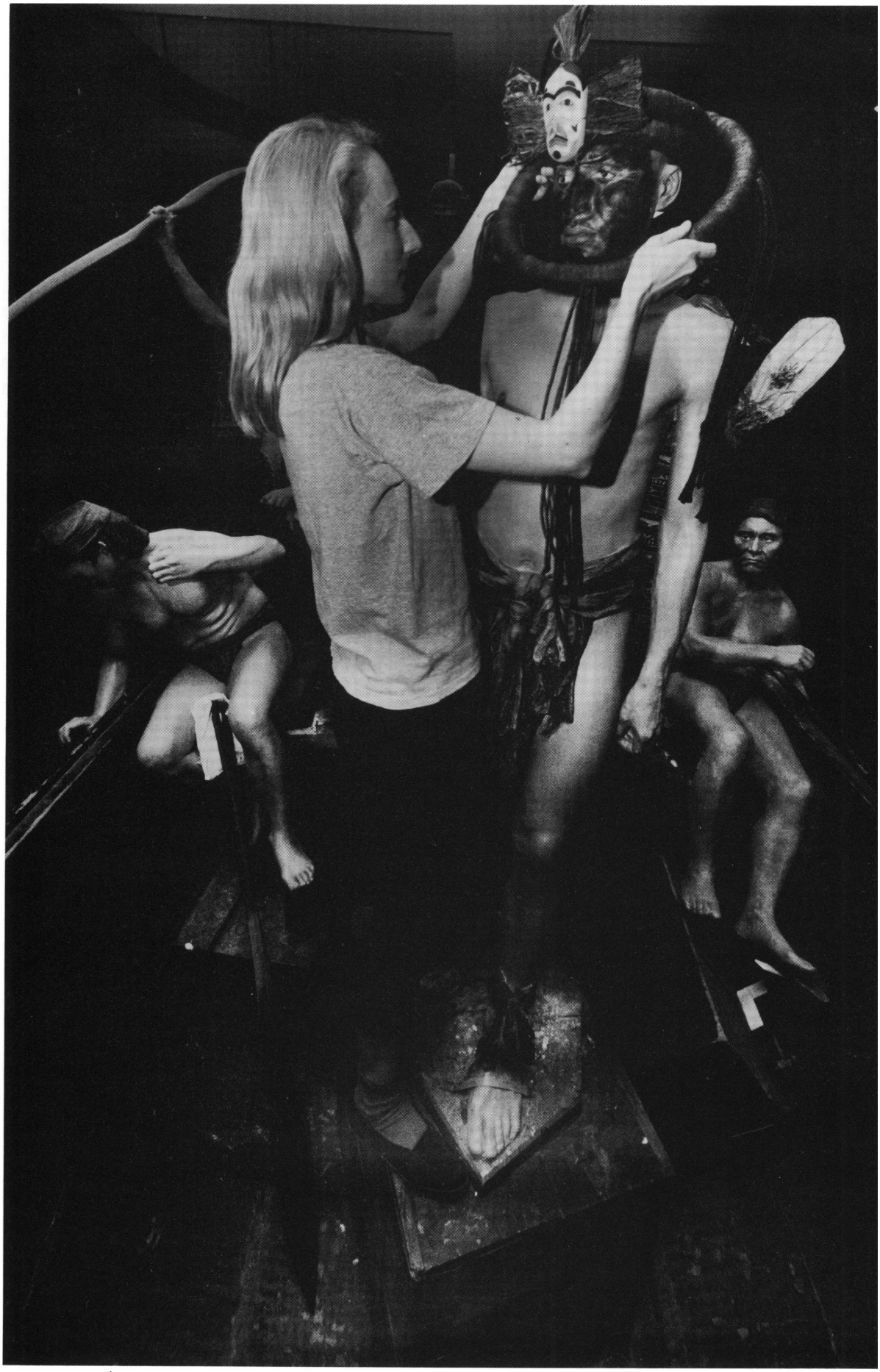
As part of an increased outreach to metropolitan communities, programs directed toward Asian-American populations were expanded. A two-month Asian/Pacific-American celebration and Korea Month actively engaged Asian specialists in the arts, media, anthropology and sociology.

A new arts-in-education program in global studies for ninth graders was instituted with funds from the New York State Council on the Arts and the New York City Board of Education. Cross-cultural components encompassed Caribbean and Asian cultures, and the program involved teacher training workshops, as well as direct teaching of school classes.

Interpretive Activities The Discovery Room and the Alexander M. White Natural Science Center are designed for youngsters between 5 and 10 years of age. Both facilities provide special learning opportunities and are open on weekends from October through July on a first-come-first-served basis. The Natural Science Center focuses on urban ecology and includes many interactive elements. Most of the center's 40,000 visitors this year came on weekends and in family groups. More than 5,000 parents and children investigated artifacts and specimens in the Discovery Room on weekends. During the week it was also the setting for teaching programs for the visually impaired and learning disabled, serving more than 1,000 additional youngsters with special needs.

A total of nearly 200,000 visitors, young and old, had direct contact with lecturers, workshop leaders, demonstrators, explainers, or others presenting programs for the public.

Preparator Audrey Jakab puts a Hamatsa ceremonial neck ring on one of the 17 sculptured figures in the museum's famed Haida Canoe exhibit. The plaster figures, representing Northwest Coast Indian tribes, were the focus of an extensive restoration project by the Department of Exhibition and Graphics. Some of the figures were rebuilt and all were repainted. The project itself became a popular attraction, with museum workers answering questions from visitors who came to watch the restoration work on the landmark exhibit.



Exhibition and Graphics

The Department of Exhibition and Graphics endeavors to reach a diverse audience through its program of special exhibitions. Museum exhibitions travel across the U.S. and other countries to educate and delight people. Two exhibitions helped achieve this goal: "African Reflections: Art from Northeastern Zaire," designed by the American Museum of Natural History, and "Crossroads of Continents: Cultures of Siberia and Alaska," produced by the Smithsonian Institution.

Special Exhibitions "African Reflections: Art From Northeastern Zaire," in Gallery 3, included more than 450 exquisitely crafted art objects created by the Mangbetu people of Zaire. The artifacts were collected during a turn-of-the-century American Museum of Natural History expedition to what was then the Belgian Congo. Many of the artifacts had never before been publicly displayed.

After its run at the museum, "African Reflections" will travel to the Smithsonian's National Museum of African Art, the High Museum of Art in Atlanta, and the San Diego Museum of Art.

The museum displayed pieces from the Jessup collection of Northwest Coast ethnographic material in "Crossroads of Continents: Cultures of Siberia and Alaska," in Gallery 3. The Smithsonian Institution organized and curated this exhibition, which also contained material from the Smithsonian's National Museum of Natural History and museums in the Soviet Union. The exhibition will travel to five cities in the United States and Canada and will be presented in four museums in the Soviet Union.

Exhibitions in Gallery 77 included "Palms and Pomegranates: Traditional Dress of Saudi Arabia," which presented bridal and ceremonial costumes; and "Treasures of the Tar Pits," organized by the Los Angeles County Museum of Natural History.

While the museum exhibited "Tar Pits," the Los Angeles County Museum presented "From the Land of Dragons," designed by the American Museum of Natural History. "From the Land of Dragons" illustrates the evolutionary relationships of dinosaurs, reptiles and mammals with spectacular fossils from China and other countries.

Exhibits-of-the-Month Akeley Gallery was the site of "Oceanic Birds of South America," an exhibition featuring 15 paintings by Francis Lee Jaques. The exhibition, funded by the Arthur Ross Foundation, was part of the celebration of the 50th anniversary of the Whitney Wing. The Whitney Wing houses the Department of Ornithology.

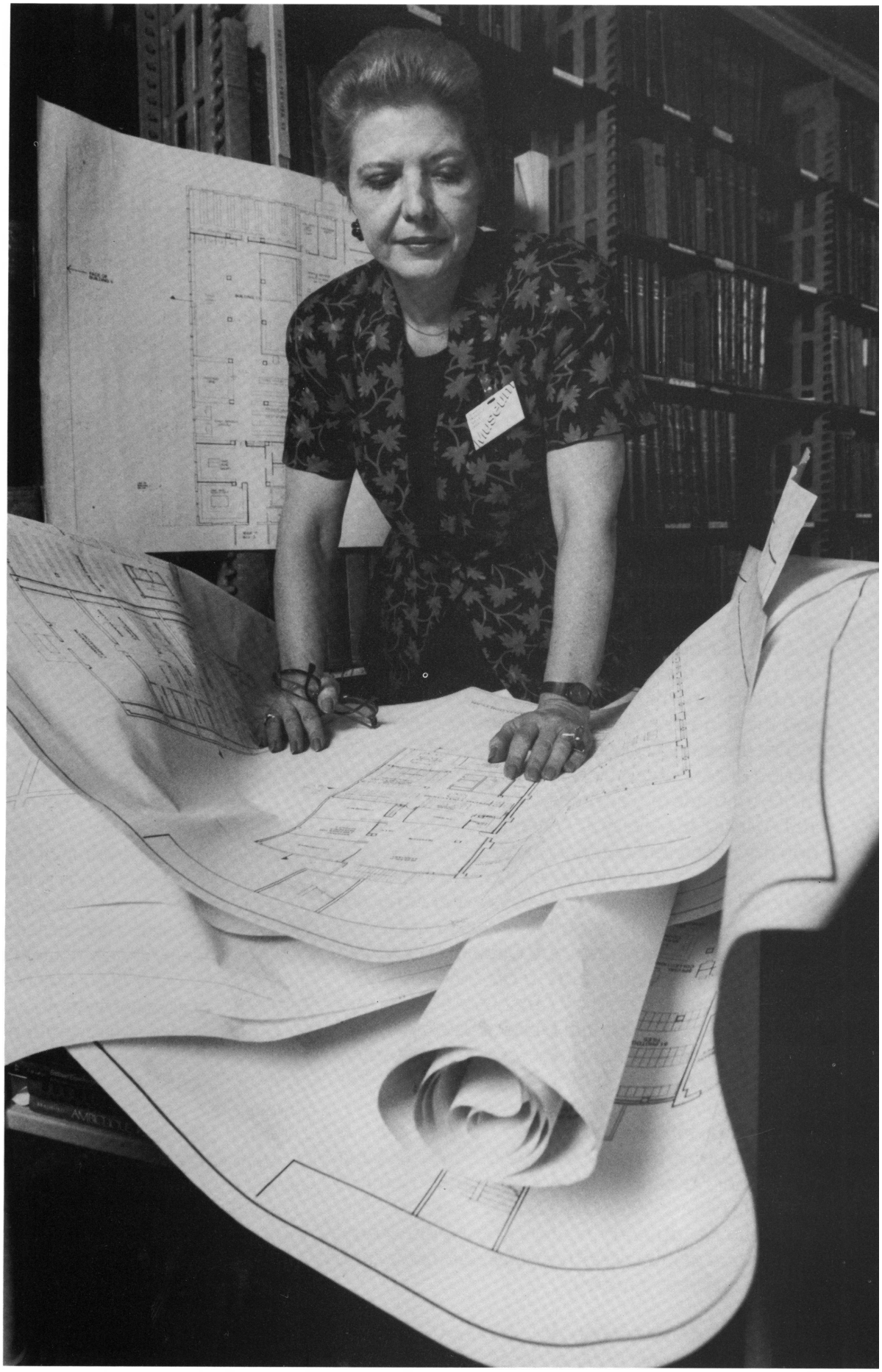
Other Exhibits-of-the-Month supported by the Arthur Ross Foundation included a "New Wing for Birds"; "The Skull of *Apatosaurus*: A Case of Mistaken Identity?"; a memorial to the late Harry Shapiro, curator emeritus in the Department of Anthropology; the exhibit "Horseshoe Crabs: Bluebloods of the Sea," and the popular Origami Holiday Tree.

Works in Progress Design and preparation of exhibits for the new Hall of Human Biology and Evolution are in progress. Video and computer technologies are being evaluated for use in the new hall. Completion of the hall is scheduled for 1992.

The production of a major special exhibition of Northwest Coast Indian artifacts from the museum's collection is underway. "Chiefly Feasts: the Kwakiutl Indian Potlatch," will document the sumptuous feasts designed to validate a chief's status. The exhibition is being planned in cooperation with Native American Indian advisors. It will travel to the Royal British Columbia Museum, the California Academy of Sciences, the Smithsonian's National Museum of Natural History and the Seattle Art Museum.

Planning and design of a traveling exhibition on global warming is also in progress. The Environmental Defense Fund will co-sponsor the project which will open in Gallery 3 in spring, 1992. An advisory panel of leading scientists in the fields of geology, paleontology, atmospheric physics and environmental science will work with the exhibition designers.

Preliminary architectural plans for a new eight-story building that will house the extensive collections of the Department of Library Services are examined by Nina J. Root, library chairwoman. With some 420,000 books and serial publications, 600,000 photographs and 1,000 films, the museum's library has outgrown its current space. Seven floors of the new building will be designated for stack space, and one floor will contain administrative offices.



Library Services

The deterioration and disintegration of library materials is a national problem, and the collections of the museum's research library are subject to the same perils. Age, environment and use have taken their toll on the library's invaluable resources. A long-range program to survey and conserve the collections began this year.

Conservation Programs Based on the general condition survey completed last year by Conservation Manager Barbara Rhodes, the library began a long-range program to conserve its collections. Four Columbia University student conservators examined, dusted and recorded the condition of every volume in the Rare Book Room. Fragile volumes were boxed or wrapped pending full treatment. The work was supported by a grant from the New York State Department of Libraries.

Another grant from the same agency provided funding to convert several important collections of nitrate negatives to safety film. Nitrate negatives are subject to irreversible deterioration and to spontaneous combustion. The work will save rare photographic documentation of early 20th century American Museum of Natural History expeditions to Africa, and make these materials available for research.

In preparation for a possible move to new quarters, fragile materials are being protected to safeguard them from damage and to facilitate moving. With the help of museum volunteers, a major "protective enclosure" project began. Some 51,000 loose issues of periodicals, too brittle to bind, will require about 12,750 enclosures. Fragile archival and photographic collections are being protected in a similar manner.

The condition survey brought to light rare historical bindings in the collection. Due to past budget stringencies, many paper-bound items were never rebound in hardcovers. Because such volumes were rarely left in their original state, the library's items have become valuable artifacts. They, too, will be placed in enclosures. Similarly, valuable 19th century scientific monographs with elegant publishers' Victorian bindings will be repaired or wrapped.

Scientific journals and badly worn monographs were rebound as the first line of defense in conservation. Heavily used monographs will be photocopied onto acid free paper and bound, providing usable copies.

Materials requiring restoration or mending are treated by the conservator in the library's conservation laboratory. An experimental process of coating materials with parylene, a polymer that strengthens objects without changing their appearance, holds promise for treating decayed leather bindings.

The Special Collections Librarian, Andrea LaSala, completed an inventory and condition report of the film collection, which identified fragile films to be transferred to videotape, deteriorated splices and torn sprockets. All rusty dented film cans were replaced during the inventory, and a program to clean and repair the rare films began.

The library received a grant from the National Endowment for the Arts to inventory and prepare a condition survey of the paintings and sculptures held by the museum. An art historian will be hired to conduct the inventory.

Exhibits, Loans and Programs For the 50th anniversary of the Whitney Wing, the area of the museum that houses the Department of Ornithology, the library presented two exhibits: "Lord Rothschild's Birds: The Tring Connection," in the Library Gallery, and "Island Bounty: The Whitney South Sea Expedition" in the library entrance. An exhibit on paper bindings, "The Not-So-Plain Brown Wrapper," was also presented in the library entrance.

To commemorate the quincentennial of Columbus's discovery of America, a series of six exhibits, "American Discovery," will be mounted in the Library Gallery. The first exhibit, "The Colonial Period," opened in June, and the last, "Columbus: How It All Began," will be presented in October, 1992.

A video produced for the Whitney anniversary, "Birds of South America," used footage from film collection archives, as did a video in an exhibit commemorating the late Harry Shapiro, curator emeritus in the Department of Anthropology.

Materials from the library collections were loaned to the exhibition "African Reflections: Art from Northeastern Zaire," and Waldemar Jochelson memorabilia traveled with "Crossroads of Continents: Cultures of Siberia and Alaska."

"To The Ends of The Earth," a 19-minute video documenting the museum's Central Asiatic Expedition of the 1920s, premiered in the U.S. at the museum's Margaret Mead Film Festival. It premiered internationally at the Society for the History of Natural History meeting in London.

Services As the library plans for the future, it is analyzing and evaluating the services it provides. In addition to its primary functions of supporting the scientific research of the museum, assisting exhibition and public programs, and providing information and services to the museum community, it also serves a large number of scientists, scholars, students, and others outside the museum.

Among the requests the library fulfilled were to help Jim Henson Productions with a book on large mammals; to assist Russian anthropologists with research on Siberian eskimos; to provide photographs of dinosaur skeletons to the Universita di Modena in Italy; and to provide footage from the film collection for documentaries including "Angkor Wat," a journey through the ruins of the famous Cambodian temple, and "John Daniel," about a domesticated gorilla who lived with a wealthy woman in the 1920s.

The library served 11,135 patrons, answered 34,305 reference questions, circulated 34,500 items, photocopied 18,102 pages for the public, received 1,522 interlibrary loan requests from other libraries, borrowed 367 items for the staff, and performed 98 database searches. It processed 5,641 photographic orders realizing an income of $57,960 and granted $3,475 in gratis permissions. It filled seven orders for film footage, realizing an income of $10,613.

Additions to the collections included 1,606 monograph titles, 31 serial titles and 16,100 serial issues. The staff selected 220 volumes for transfer to the Rare Book Room, filed 24,838 cards in the public catalog, and distributed a combined total of 21,981 issues of scientific publications and *Recent Publications in Natural History*.

Staff Activities Ms. Rhodes was asked to serve as a consultant to the Western New York Library Resources Council. Nina Root, chairwoman of Library Services, was invited to serve on the Board of Directors of the Players, Walter Hampden/Edwin Booth Theatre Library. Valerie Wheat, assistant librarian for Reference Services, screened footage from the Morden-Clark Asiatic Expedition at the Film and Television Archives Advisory Committee annual conference.

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Collections Management

Collections management and conservation of artifacts in the Department of Anthropology were strengthened significantly by the generous support of the Andrew W. Mellon Foundation. Aware of the critical importance of conservation in the long-term preservation of museum collections, the foundation provided the funds to secure a professional staff of conservators and assistants.

Preparing for "African Reflections"

The many procedures involved in caring for the African collections demonstrate the multiple facets of collections management. Ethnographic collections from Africa were the first materials processed for installation in the new storage facility.

African objects were inventoried, vacuumed and transferred to a climate-controlled facility. Preparation for the exhibition "African Reflections" was facilitated because the Zaire collections had already been processed into new storage.

African artifacts made of organic materials like wood, bone, horn, hair, and hide are especially vulnerable to insect infestation. All the African objects were inspected and, if required, given a deep-freeze treatment before their transfer to new storage.

Data entry for the African inventory was completed, and provides a rich resource for research, as well as a system for quickly retrieving and storing artifacts.

In addition to preparation of the African materials for storage, other projects included the processing of Eskimo and Northwest Coast Indian ethnographic collections, following the same procedures used for the African collection.

Materials Research and Exhibition

Conservation often calls for special investigation into particular problems to find innovative and appropriate treatments. To conserve the Zaire specimens, a method was developed to stabilize certain details of artifacts that were made from a mixture of palm oil and redwood. Through research, a treatment for oil-induced corrosion in copper alloy materials was developed.

Collections management also reviews the condition of materials in permanent exhibition halls. Working with the exhibition maintenance staff, exhibit cases were cleaned, necessary conservation completed and label copy was corrected.

Interdepartmental Facilities

The Interdepartmental Facilities are comprised of a shared central computer system and a scanning electron microscopy (SEM) laboratory. Technical support is provided to the museum community by two staff members.

Last fall, a MacIntosh computer, a document scanner, and optical character recognition (OCR) software were added to the computer facilities. This equipment allows text, maps or drawings to be scanned and stored as graphics files. The OCR software converts images of text into editable word processing documents.

In the spring, the Financial Office began to switch its computer operations from an outside agency to the museum system. To accommodate the increased demands this will place on the system, a number of upgrades were performed. These included a memory upgrade, the addition of an unattended tape backup system and a high speed 454 megabyte disk drive.

New uses of the computer system included the creation of a mammalogy library catalog, and catalog databases for the Departments of Mineral Sciences and Ornithology. Special programs were designed for the Office of Development and Discovery Tours.

The SEM laboratory includes a scanning electron microscope, an attached microanalysis system and specimen preparation equipment. The video printer attached to the SEM was replaced with a color video copy processor. The copy processor is capable of producing prints of SEM images in two sizes and requires minimal brightness and contrast adjustments.

To encourage museum staff to use the instrument without operator assistance, John Lee, research associate in the Department of Invertebrates, presented a five-week SEM course. The course covered SEM specimen preparation, as well as SEM design and operation.

Diane Bynum, administrator of the museum's grants and fellowships programs, discusses grant opportunities with a newly appointed research fellow. The programs expand the museum's base of scientific investigation and strengthen its commitment to the education and training of scientists. With funding from the National Science Foundation, a new program, Research Experiences for Undergraduates, introduced eight college students to an interactive research environment emphasizing evolutionary biology.

Grants and Fellowships

The Grants and Fellowships Programs broaden the museum's base of scientific investigation and reinforce its commitment to the education and training of scientists. Since its inception six years ago, the highly competitive Fellowship Program has supported 35 postdoctoral scientists engaged in independent work 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; City University of New York in the Evolutionary Biology Program and the Animal Behavior-Biopsychology Program.

The Grants Program supported 172 predoctoral candidates and postdoctoral investigators. The program awarded 44 Frank M. Chapman Memorial Fund grants in ornithology; 53 Lerner-Gray Fund for Marine Research grants; 70 Theodore Roosevelt Memorial Fund grants in North American zoology and paleozoology; and 5 Southwestern Research Station Student Support Fund grants.

Collection Study Grants, which enable students and recent postdoctoral investigators to visit the museum's scientific collections, enabled 28 researchers to study in the departments of Anthropology, Entomology, Herpetology and Ichthyology, Invertebrates, Mammalogy, and Vertebrate Paleontology.

The Research and Museum Fellowship Program funds the research projects of recent postdoctoral investigators, established scientists and other scholars within a limited period of time, usually one or two years. This year 11 research fellows were in residence. Linda Ford was appointed Kalbfleisch Research Fellow in the Department of Herpetology and Ichthyology, and examined the interrelationships of the dart poison frogs (Dendrobatidae) based on osteology and myology. Nancy Greenwald, a Kalbfleisch Research Fellow in the Department of Mammalogy, conducted research on the morphology of the ear ossicle system in bats, including implications for phylogeny and the evolution of echolocation.

Kirk Fitzhugh began his second year as a Thorne Research Fellow in the Department of Invertebrates, and continued investigations on the transformation, distribution and patterns of relationships of the marine worm. Robert Fogel, Boeschenstein Research Fellow in the Department of Mineral Sciences, worked on the solubility of carbon in magma (molten rock) in order to understand the role of gases in volcanism. Gavin Naylor, Kalbfleisch Research Fellow in the Department of Vertebrate Paleontology, worked on reconstructing the evolution of a genus of sharks by inference from DNA sequence differences among living representatives.

Kalbfleisch Research Fellow Peter Reinthal began his second year appointment in the Department of Herpetology and Ichthyology, and continued work on the evolutionary relationships of the rock-dwelling cichlid fishes of Lake Malawi, Africa. Pavel Štys, senior scientist at Charles University in Czechoslovakia, accepted a four-month appointment as a Boeschenstein Research Fellow in the Department of Entomology. He devoted his time to the cladistic analysis of higher-group relationships within the true bugs. Jeffrey H. Schwartz, a Kalbfleisch Research Fellow in the Department of Anthropology, studied the osteology, paleopathology and relationships of the Ipiutak, a group of Arctic people from Point Hope, Alaska.

Three Chapman Research Fellows were appointed in the Department of Ornithology. Richard Prum investigated phylogeny and behavioral evolution in two families of neotropical birds, manakins (Pipridae) and cotingas (Cotingidae). He examined variation in vocal apparatus and molecular characters. Jean-Louis Martin studied avian geographic variation in the palearctic by noting variation in mensural characters in 10 species complexes. Jeffery Woodbury explored evolutionary relationships between families and orders of birds by examining their central nervous systems.

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 began his fifth year as Kalbfleisch Assistant Curator (Fellow) in the Department of Herpetology and Ichthyology. A National Science Foundation (NSF) grant supported a project on the relationships of goodeid fishes based on osteological and female reproductive characters. In addition, Dr. Smith developed a program for the preservation of Caribbean biodiversity. Graduate students in the

Dominican Republic are being trained for professional conservation positions in their country. In Cuba, the museum is collaborating with the Natural History Museum in Havana on an inventory of fishes throughout the length of the island.

James Miller continued his appointment as Kalbfleisch Assistant Curator (Fellow) in the Department of Entomology. Dr. Miller's work involves revisionary research on a neotropical group of moths, the Dioptidae. Although the group is considered pivotal to an understanding of a much larger group of moths, the Noctuoidea, Dioptidae had not been studied since 1918. Dr. Miller will also use his phylogenetic reconstructions to study the evolution of host-plant associations in the moths.

The Doctoral Training Program supports the training and education of graduate students enrolled in Ph.D. programs at universities where the museum is participating in a joint museum/university program. Seven students were supported by the program this year. Gregory Edgecombe and Bruce Lieberman worked with Niles Eldredge in the Department of Invertebrates; Sherri MeGehee conducted her project in vertebrate paleontology under the supervision of Curator Michael Novacek; Cheryl Peach was supported by an NSF grant to Assistant Curator Edmond Mathez of the Department of Mineral Sciences. All are doctoral candidates in the Department of Geological Sciences, Columbia University, and conducted their research at the museum. Pablo Goloboff, enrolled at Cornell University, and Priantha Wijesinghe of City University of New York, worked with Curator Norman Platnick of the Department of Entomology. Patricia Escalante worked on a doctorate at City University of New York under the guidance of Curator François Vuilleumier of the Department of Ornithology.

The new Research Experiences for Undergraduates Program immersed eight students in a highly interactive research environment centered around the discipline of evolutionary biology. Supported by a NSF grant to Assistant Curator Melanie Stiassny, Department of Herpetology and Ichthyology, the summer internship program gave students direct exposure to the life of a research scientist and helped them make critical career decisions.

The programs for Grants and Fellowships are made possible through the generosity of many donors and grants from funding agencies: Boeschenstein Fund, Frank M. Chapman Memorial Fund, Greenwall Fund, Hoffman Research Fund, Franklin H. Kalbfleisch Endowment Fund, Lerner-Gray Fund for Marine Research, the National Science Foundation, Theodore Roosevelt Memorial Fund, Donn Rosen Fund for Ichthyology, Rudin Grants and Fellowships Fund, Ruth and S. Samuel Fund, Southwestern Research Station Student Support Fund, Thorne Fund, and the Anthony and Madeline W. Traina Fund.

Publications Membership and Marketing

Natural History The year 1990 marked *Natural History* magazine's 90th anniversary. The milestone was noted with a special May issue devoted to the ecology of waste and recycling. Biologists, geochemists and anthropologists offered scientific and cultural perspectives on how humans dispose of garbage, described the effects of waste on the ecosystem, and outlined ecologically sound directions for the future.

To celebrate its anniversary, the magazine sponsored the *Natural History* 90th Anniversary Photographic Competition. Readers sent in more than 10,000 entries and the winning photographs were displayed over 14 pages of the June issue.

Another of the year's milestones was the 20th anniversary of the first Earth Day. In "Earth Day 1990: Threshold of the Green Decade," environmental activist Denis Hayes, a veteran of the original event and organizer of the 1990 reprise, reviewed the successes and failures of the environmental movement's past two decades.

One year after the great Yellowstone National Park fires, the magazine examined the role of "natural" and "managed" fires in a wild ecosystem. Carol A. Shively, a ranger and naturalist at Yellowstone, took the position that the park's limited "let-burn" policy was the correct one, while award-winning historian Stephen J. Pyne delivered a provocative critique of the park's decision.

On an international scale, insights into possible causes and effects of global warming were provided by Warren M. Washington, Ernest H. Williams, Jr., and Lucy Bunkley-Williams.

Climate models developed by Dr. Washington, director of the Climate and Dynamics Division of the National Center for Atmospheric Research, incorporate the effects of ocean circulation and suggest that greenhouse gases will warm some areas of the earth and, paradoxically, cool others.

Drs. Williams and Bunkley-Williams, researchers at the Institute of Marine Sciences at the University of Puerto Rico, attribute recent bleaching of the world's coral reefs to warming trends.

Articles on contemporary culture included "Death Without Weeping," by anthropologist Nancy Scheper-Hughes, which took a hard look at the ubiquity of infant death in Brazil; "Manhood," by anthropologist David D. Gilmore, on the preoccupation with the achievement of machismo; and "Images of Justice," by reporter and author Dorothy Harley Eber, on some unusual judicial handling of cases that involved the clash of traditional Inuit values and Canadian law.

Other articles ranged from medical entomology with a story on "The Lyme Disease Invasion," to the physics of falling felines in "How Cats Survive Falls from New York Skyscrapers," to paleontology with, "Dinosaur Eggs: The Inside Story."

Special articles ran in conjunction with museum exhibitions. "Russia's American Adventure," by anthropologist Lydia T. Black, related history relevant to "Crossroads of Continents: Cultures of Siberia and Alaska." "Art of Africa" by Curator Enid Schildkrout of the Department of Anthropology, and Curtis A. Keim, research associate at the museum and professor of history at Moravian College in Pennsylvania, described the Mangbetu sculpture on display in "African Reflections: Art from Northeastern Zaire."

Long-time columnists Stephen Jay Gould, Raymond Sokolov, Robert Mohlenbrock, and Director Emeritus Thomas D. Nicholson wrote pieces for the magazine throughout the year.

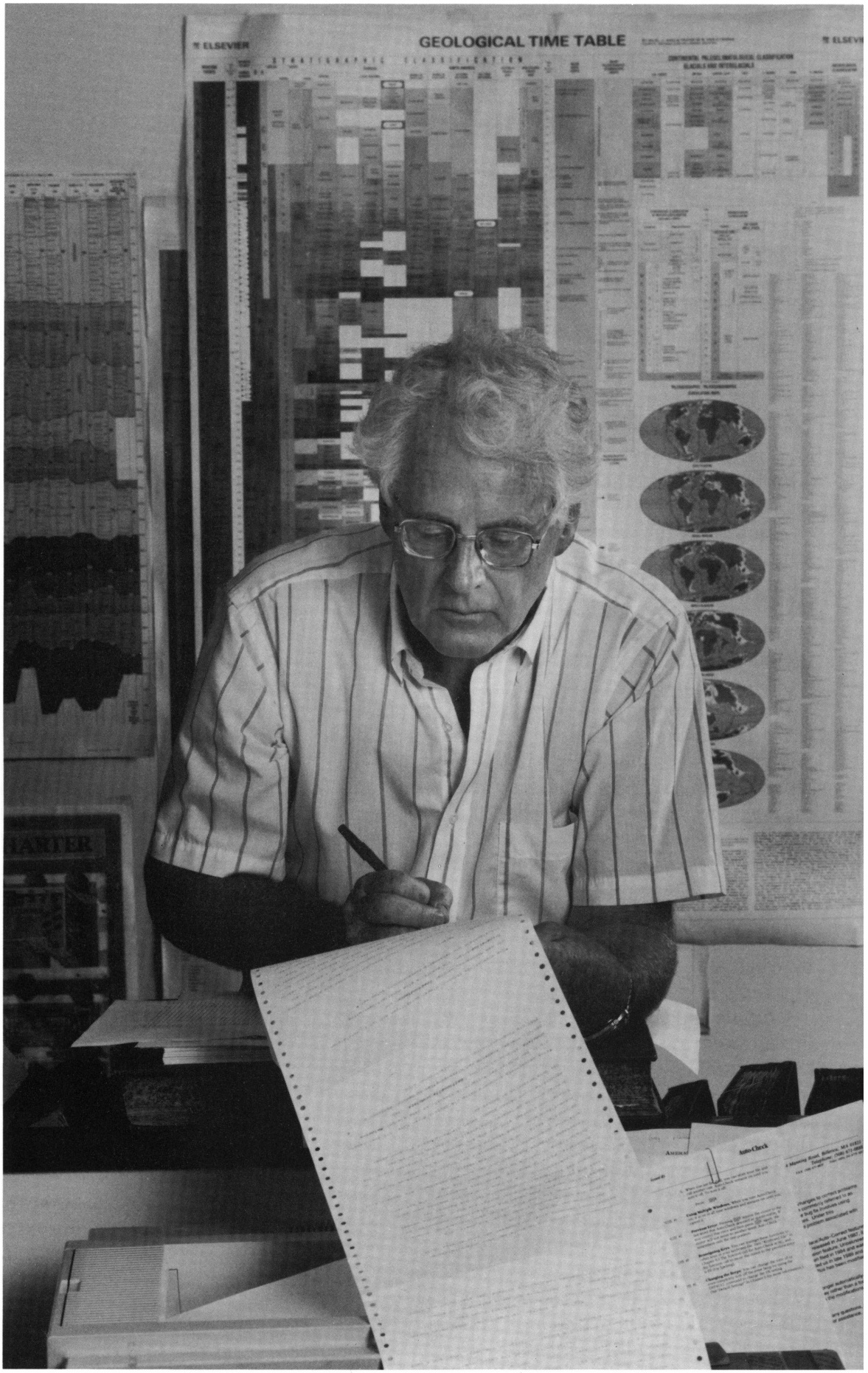
Natural History's advertising revenues in 1989-90 were $6.5 million, as measured by the Publishers Information Bureau. Average paid circulation exceeded 510,000 in the June report of the Audit Bureau of Circulation.

The magazine plays an important role in communicating with museum members and represents the main medium for advertising Discovery Tours and Discovery Cruises, the Members' Book Program and other museum activities.

Discovery Tours and Cruises Nearly 1,000 museum members explored the world with more than 70 museum and guest lecturers on the museum's travel study programs. They journeyed to 40 countries guided by experts in geology, astronomy, natural history, art, and anthropology. The programs parallel the museum's research and exhibition activities, visiting the world's greatest wildlife areas, archeological sites, and cultural centers. A few of the year's highlights included:

* Face-to-face encounters with endangered mountain gorillas in Africa's oldest national park. The Parc

John A. Vancouvering, editor of the museum's Micropaleontology Press, reviews the manuscript for the 92nd volume of the Catalogue of Foraminifera. *The annual publication is useful to oil exploration geologists and paleontologists to whom microfossils reveal information about subterranean oil-bearing structures and the age of the earth's sediments. The Press publishes three micropaleontology catalogs annually, as well as monthly and quarterly research publications. Its materials are used by government agencies, universities, and independent researchers.*



National des Volcans was created in 1925 through the efforts of the museum's explorer, Carl Akeley.

* Viewing pre-historic art at the original Lascaux and other world famous caves in France's Dordogne Valley.

* Traveling to the Antarctic peninsula to visit research stations where scientists study wildlife, geology, meteorology and many other subjects.

* Studying the life of Buddha as described on the 1,200 panels encircling the enormous mandala of Borobudur in Java.

* Journeying to Egypt's "Valley of the Kings" to descend into the tombs of Pharohs which are lined with hieroglyphs from the Book of the Dead.

* Searching for lemurs on Madagascar, where a unique ecology evolved over the island's 60 million years of isolation.

Membership Human curiosity about the questions "Where have we come from?" and "Where are we going?" draws visitors to the museum and excites their support for the museum's scientific inquiries. The Membership Office addressed these concerns with diverse programs that explored topics from ancient human cultures to the lives of baby dinosaurs, and presented perspectives beyond our own planet including a 20th anniversary commemoration by former astronaut Michael Collins of the first lunar landing.

Many programs explored the threats to the global environment, and examined projects working to assure the preservation of our fragile planet.

The dangers of deforestation were discussed by tropical ecologist Daniel Janzen, who has mounted an attempt to preserve the wildlife of Costa Rica's forests. NASA representative Estelle Condon discussed the causes and effects of the depletion of the ozone layer and zoologist Amy Vedder described efforts to save Africa's mountain gorilla from extinction. World-wide efforts to preserve biodiversity were explored by wildlife biologist George Schaller, who reported on his work in the pristine wilderness of the Tibetan Plateau.

The museum is active in world conservation and special programs hosted by museum research staff brought this work to the attention of the public. Research Assistant Maureen Donnelly discussed her work with dart-poison frogs in Costa Rica; ornithologist Rosemarie Gnam described her efforts to save the endangered Bahama Parrot, which has the unusual behavior of nesting in caves.

Other programs explored the museum's research on the history of human cultures. Curator David Hurst Thomas described his excavations of the oldest known Spanish mission in the United States; and Research Associate Anna Roosevelt discussed her studies of the Marajoara, an extinct prehistoric Amazonian culture.

Paleoanthropologists Donald Johanson and Richard Leakey spoke to sell-out crowds about their latest research on human evolution. Equally popular were limited-enrollment programs such as the "Dinosaurs for Adults" workshop, in which participants learned the latest theories about dinosaur evolution and examined fossil specimens from the museum's incomparable collection.

Members learned of these programs and all museum events through the monthly newsletter *Rotunda*, which has an international circulation of 37,000.

Total revenue from the museum's Participating and Donor Membership Program exceeded $1.5 million.

The Museum Shop Permanent and temporary exhibitions inspired the introduction of new merchandise. In Gallery 3, special items were offered for the exhibitions "Madagascar: Island of the Ancestors," "Crossroads of Continents," and "African Reflections."

Middle Eastern motif jewelry and clothing, and fossil reproductions, posters and books were available to complement and provide more information on the exhibitions, "Palms and Pomegranates" and "Treasures of the Tar Pits."

The renovation of the adult and Gallery 3 shops provided refurbished settings to display the museum's variety of merchandise.

A number of new designs exclusive to the museum were developed for use on posters, stationery, ties, totes, T-shirts, caps, mugs and umbrellas.

The Junior Shop expanded the merchandise offered specifically for young people, adding a new line of very popular educational games and kits.

The Book Balcony carried many new titles as well

as audio and video cassettes, posters and note cards all featuring natural history subjects. To address the public's increased interest in the environment, the shop purchased additional books exploring ecological issues.

Gross sales and royalty income approached $3 million.

Micropaleontology Press The Micropaleontology Press is the world's major source of reference data on the microscopic fossils used in oil exploration. It is supported by subscriptions from oil companies, geological surveys and universities.

The Press delivered three volumes of the *Ellis and Messina Catalogues of Micropaleontology*, including vol. 91 of Foraminifera, vol. 56 of Ostracoda, and vol. 7 of Diatoms. Support from major oil companies aided in developing a computerized text/image delivery system for the Catalogues. Also published during the year were vol. 35 of the quarterly research journal *Micropaleontology*, vol. 18 of the monthly *Bibliography and Index of Micropaleontology*, and vol. 3 of the *Handbook of Cenozoic Calcareous Nannoplankton.*

Special Publications "African Reflections: Art from Northeastern Zaire," by Curator Enid Schildkrout and Research Associate Curtis A. Keim, was co-published with the University of Washington Press as a lavishly illustrated companion to the exhibition of the same name. Working with the museum, the publisher, Universe, produced an "African Reflections" wall calendar illustrated with objects from the exhibition.

Harry N. Abrams published a 1991 "Wildlife" wall calendar created from the "Natural Moment" feature of *Natural History.*

"Gems and Crystals of the American Museum of Natural History" published by Simon and Schuster and written by Chairman George E. Harlow and Associate Anna S. Sofinaides, both of the Department of Mineral Sciences, explored the museum's renowned collection of gems and minerals.

Alan Ternes, editor of *Natural History*, wrote the forward for "The Natural History of North America," a volume that will be distributed by Gallery Books.

A video tour of the museum produced by Wave Inc., and distributed by Videotours, Inc., is in its final stages of production and will be available in the fall of 1990.

The Members' Book Program annual catalog offered a collection of selected natural science books and related merchandise to museum members.

Curator, the quarterly publication of the American Museum of Natural History by and for museum professionals, examined topics from collection management to education to fundraising.

Scientific Publications The professional papers and monographs of the curators and other scientists associated with the museum are made available to a wide audience through three scientific serials: the *Bulletin of the American Museum of Natural History*, the *American Museum Novitates*, and the *Anthropological Papers of the American Museum of Natural History.*

These publications disseminate the results of laboratory work conducted at the museum, as well as fieldwork carried out throughout the world by museum scientists and their colleagues. The principal areas of focus are zoological systematics, evolution and anthropology.

Research papers are submitted for publication through the chairpersons of the scientific departments, and are subjected to peer review both inside and outside the museum before final acceptance for publication. The published papers reflect a tradition of well-illustrated and precisely detailed data collection and analysis. They are distributed to the authors' colleagues and to libraries throughout the country by interlibrary exchange with the museum's library, and by subscription.

This year, 31 issues totaling 855 pages of the *Novitates*, and five *Bulletins* totaling 705 pages, were produced.

Administration

Construction For the first time, the museum worked with a construction management firm, Lehrer McGovern Bovis, to manage two major capital projects, the new fifth floor molecular systematics laboratory and new office space for development.

As part of a museum-wide upgrading and relocation of administrative offices, the department handled the in-house construction of six permanent and four temporary offices.

The department supervised the work of outside contractors in the renovation of the Calder Laboratory and the planetarium classrooms and lobby. Preparation of architectural and engineering plans for construction of the following major projects was supervised by the department: construction of a new mezzanine, installation of compact storage equipment, new administrative offices and the Hall of Human Biology and Evolution.

The department oversaw several rehabilitation projects funded by the City of New York through the Department of Cultural Affairs and General Services, including the restoration of the Theodore Roosevelt Memorial Hall and construction of a new firestair tower at the northwest end of the museum. Designs were completed for structural repairs to the building which houses the Department of Exhibition and Graphics, the Department of Ichthyology, administrative offices, laboratories and storage facilities.

Maintenance New climate control systems were installed in the Food Express, Gallery 3 Annex, the fifth floor computer facilities and the Museum Shop. A 20-ton compressor for the air conditioning system in the Hall of Pacific Peoples was replaced, and climate control for the Kaufmann and Linder Theaters was upgraded. Preventative maintenance limited breakdowns in the heating, ventillation and air conditioning systems.

Preparations were made to implement a $5.7 million asbestos abatement program, funded by the City of New York, which includes upgrading of water lines, steam and condensate lines and water tanks.

Building Services To enhance communication between the security control center and security personnel, a new state-of-the-art radio base station was acquired. An electronic system was installed to record visits by security personnel to checkpoints throughout the museum.

General Services General Services experienced tremendous growth. New equipment, including a collating machine and additional photocopy machines, was purchased to efficiently handle the museum's growing needs. The photo studio processed more than 25,000 images, and the print shop completed more than 700 in-house printing projects.

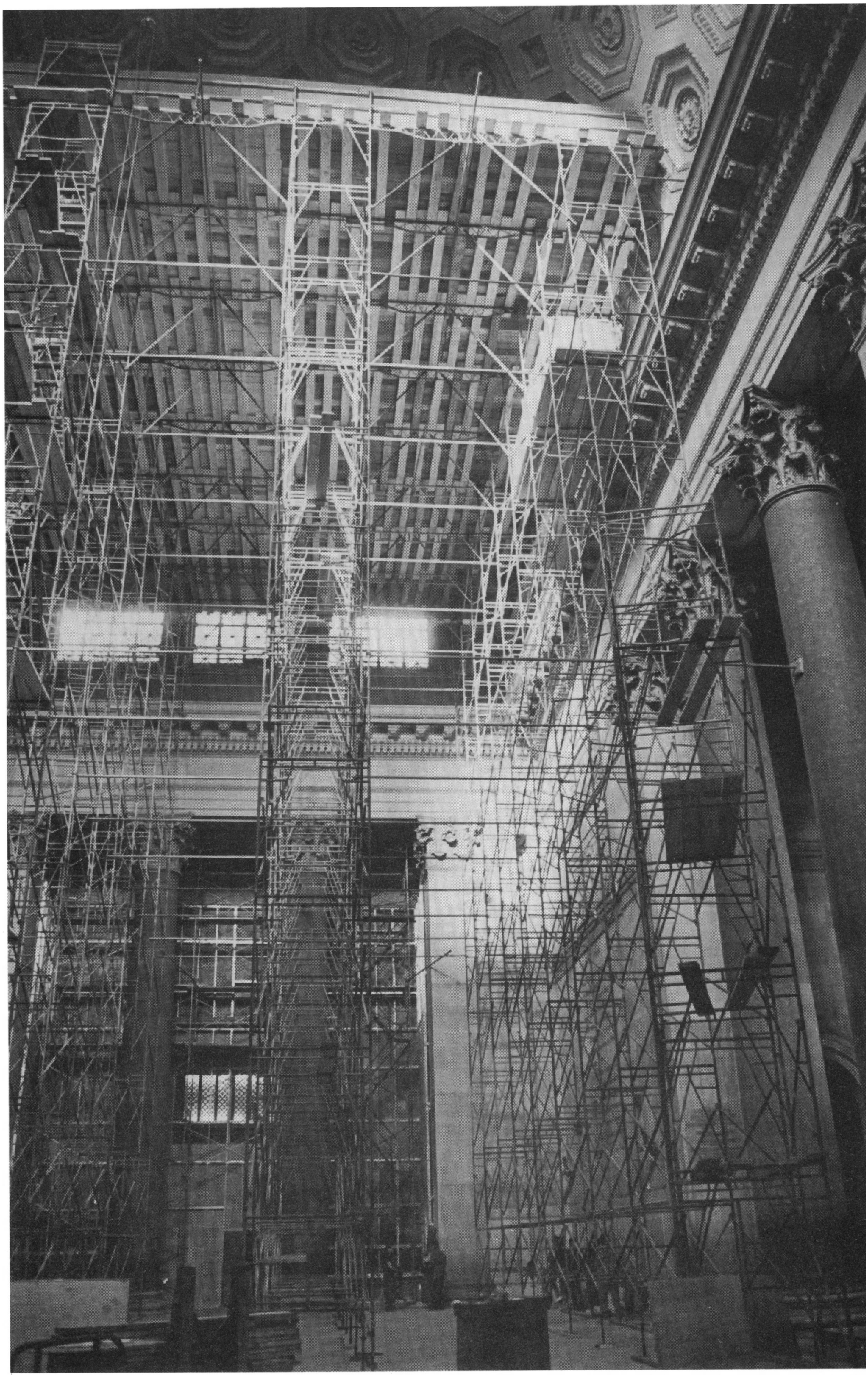
Naturemax "To The Limit," an IMAX film produced by McGillivry Freeman Films, the Museum Film Network and NOVA/WGBH, Boston, opened in July. The Museum Film Network is an organization of 14 cultural institutions that funds and produces films specifically for IMAX/Omnimax Theaters. "To The Limit" was the first film produced by the network. It shows how the human body adapts to rigorous activity, by showing as examples, olympic running, ballet dancing, rock climbing and downhill skiing. The film was praised for its educational and entertainment value.

In August, the museum was the site of the first public IMAX film festival in the United States. The museum hosted the festival which was held in conjunction with the annual conference of the Space Theaters Consortium. The STC is an international organization of cultural institutions and filmmakers that produces films in the giant-screen format. Twenty-four IMAX films were viewed by more than 300 participants from four continents during the six-day conference.

"The First Emperor of China" was included in the Naturemax schedule beginning in January. A co-production of the National Film Board of Canada, the Canadian Museum of Civilization and China's Xi'an film studio, the film told the dramatic story of China's unification in 221 B.C., by its first emperor, Qin Shihuang.

Museum Attendance Attendance for the 1989-90 fiscal year totaled 2,933,311. This figure includes 2,400,442 to the museum and 532,869 to the planetarium.

Scaffolding reached 100 feet to the vaulted ceiling of the museum's Theodore Roosevelt Memorial Hall, during the first phase of a major renovation project. The renovation work in the hall, which is popularly known as the Rotunda, includes the installation of new lighting and an air conditioning system. The project is funded by the City of New York through the Department of Cultural Affairs and the Department of General Services.



Development and Public Affairs

Development In 1989-90, major strides were made toward building the kind of fund raising program that is necessary if the museum is to enlarge upon its leadership position among cultural institutions in New York and around the world. A largely new development staff has evaluated and restructured many existing programs, created others, and set strategy and goals for future fund raising efforts. The key focus is a four-year, $60 million campaign that officially began July 1, 1990.

This campaign is a broad based effort seeking support for the renovation of the museum's famed dinosaur and other fossil vertebrate halls, the construction of a new natural history library, worldwide research expeditions including fieldwork in Mongolia and Cuba, environmental programs such as an exhibition on global climate change, and museum operational needs.

The most encouraging aspect of the past year was the generous response by museum trustees who had committed, as of the June 30 end of the fiscal year, more than $11 million in gifts and pledges to the campaign.

Several corporations and foundations had also responded generously to early campaign appeals. The Exxon Corporation set a high standard by pledging $2.5 million. The Mobil Foundation added a campaign pledge of $400,000. Leadership foundation support included $1.5 million from the Phipps Foundation, $500,000 from the Edward John Noble Foundation, $250,000 from the Prospect Hill Foundation, and $150,000 from the Ambrose Monell Foundation.

All told, by the end of the fiscal year, commitments through trustees, foundations, and corporations amounted to more than $14 million toward the campaign goal of $60 million.

During the past year, the museum received increased support from new contributors, while strengthening ties with all levels of current donors. Individuals, corporations, foundations, and government agencies contributed nearly $9 million, a 44 percent increase over the previous year. Individuals responded to the museum's appeals with more than 1,000 additional gifts.

The annual corporate program, headed by trustee R. William Murray, raised more than $900,000 in unrestricted support from more than 200 companies. Major gifts came from The Bank of New York, Bristol-Myers Squibb Company, and the IBM Corporation. The corporate sector also provided funds for specific projects. Citicorp/Citibank supported educational programs related to the traveling exhibition, "Black Achievers in Science." Bankers Trust contributed funds for the elevator in the Hall of Ocean Life, and Chase Manhattan Bank provided funds for community programming. In addition, the corporate matching gift program saw increases over the previous year both in dollar amounts and number of donors.

Foundation support played a vital role in enhancing, sustaining and creating numerous museum projects, ranging from community outreach programs to library cataloging. Nearly 50 foundations awarded grants totaling more than $2 million for special projects. With the generous support of the Edward John Noble Foundation, archeological research continued at St. Catherines Island. The Wallace Funds-N.Y. Community Trust provided funds to help upgrade the Hall of Northwest Coast Indians, plan the renovation of the fossil halls, and construct the Hall of Human Biology and Evolution, scheduled to open in 1991.

The museum also benefited greatly from the generous support of government agencies. The New York State Council on the Arts provided more than $600,000 for the general operation of the museum. The Margaret Mead Film Festival was supported by a $25,000 grant from the Natural Heritage Trust. The museum received $75,000 in unrestricted support from the Institute of Museum Services. The National Endowment for the Humanities awarded a major grant in support of "Chiefly Feasts: The Persistence of the Kwakiutl Indian Potlatch," a traveling exhibition to open at the museum in 1991.

Complementing corporate, foundation, and individual giving are museum events that recognize and encourage donor support. Highlights of 1989-90 included several opening receptions and viewings for two major exhibitions, "Crossroads of Continents: Cultures of Siberia and Alaska" and "African Reflections: Art from Northeastern Zaire."

The museum has long been fortunate to have volunteers organize and conduct other special events. In 1989-90, two such events stood out: the glamorous December benefit held to open the "Crossroads of Continents" exhibition that raised more than $250,000, and the spring party, "A Night in Rio," netting more than $50,000.

The desire to establish a comprehensive special events program that links the needs of the museum with the interests of volunteers led to the formation this year of a new organization, the "Friends of the American Museum of Natural History." Its first president, Trustee Mrs. Constantine Sidamon-Eristoff, its executive committee, and the new "Friends" membership hope to generate continuing interest in the museum and increased philanthropic support.

The museum also received contributions totaling more than $350,000 for endowment, operating, and restricted funds through bequests, trusts, and estates.

Public Affairs Over the past year, awareness of the museum, its special programs, research and exhibitions was heightened in the public and the scientific community through major media coverage. Print and broadcast media were contacted through comprehensive and carefully targeted publicity campaigns. Press previews, luncheons and special tours strengthened relationships with members of the press, and established ties with new media.

The museum hosted Mayor David N. Dinkins at the opening of the special exhibition, "Black Achievers in Science," in March. The Mayor's visit was recorded by the press and was featured on the WABC and WCBS television evening news, the WCBS TV noon news, WPIX TV's "Best Talk on Location," and "In the Black," on WWOR TV.

Other special exhibitions, such as "Crossroads of Continents," "Treasures of the Tar Pits," "Palms and Pomegranates," and "African Reflections," were also the subjects of national and local media attention.

The ongoing refurbishment of the museum drew additional coverage. Photographs of the restoration of the Haida Canoe appeared in newspapers across the country, and the project garnered local television attention. A new, specialized campaign of weekly advertisements was developed this year to encourage more frequent visits to the museum. The first ads in this new program appeared in June.

The ads, aimed at the tri-state area audience via The New York Times and the Daily News, are in the form of post cards that greet the reader from different locations in the museum and planetarium, highlighting attractions in a humorous way. The campaign was designed and produced by the Ogilvy & Mather advertising agency, of which the museum is a public service client.

Proving the perennial popularity of dinosaurs, the museum hosted two network television broadcasts from the dinosaur halls. NBC's "Sunday Today Show" featured an interview with Michael J. Novacek, vice president and dean of science. Frick Curator Malcolm C. McKenna of the Department of Vertebrate Paleontology was interviewed live on "CBS This Morning."

The museum's four national radio series were distributed to 750 radio stations. Each of the four seasonal series is composed of 13 three-minute segments.

Guest Services

Guest Services coordinates the use of museum facilities both by museum departments and outside groups and provides the necessary personnel to support these activities. The museum's diverse spaces are used for meetings, performances, school visits, group tours, press and promotional events, corporate entertaining and lectures. Museum events coordinated by the Office of Guest Services included a three-day symposium on biological diversity, members' behind-the-scenes tours of scientific departments, the Black History Month presentations, the Margaret Mead Film Festival and ID Day

The lecture "Are We Having Fun Yet? Science for the Next Millennium," given by theoretical physicist Walter E. Massey, and a five-day international symposium on mammal phylogeny were also arranged by the office. Events surrounding the openings of the temporary exhibitions, "Palms and Pomegranates: Traditional Dress of Saudi Arabia," "Crossroads of Continents," "Treasures of the Tar Pits," "Black Achievers in Science," and "African Reflections: Art from Northeastern Zaire," were also handled by Guest Services.

The unique exhibition halls are popular with corporations to host special and promotional events. HeadStart Technologies introduced their new computer "Explorer" in the planetarium's Sky Theater; Motorola used the planetarium's Guggenheim Space Theater to announce a $2.3 billion global cellular telephone satellite network, and General Foods USA held an all-day marketing event in the Main Auditorium which included cooking demonstrations and a lecture by renowned graphic designer Milton Glaser.

Broadway and television star, Patti LuPone, performed for 600 guests of the Greater New York Hospital Association, and during a dinner held by McIntosh Hamson, a subsidiary of Security Pacific Bank, guests were addressed by Australia's treasurer via a live satellite hook-up. Entertainer Peter Allen concluded the evening by performing in the Hall of Ocean Life.

Reader's Digest, Mobil Oil Corporation, The City of New York, The Association of Space Explorers, Johns Hopkins University, The New York Academy of Sciences, American Brands, Brown University Club, Citibank, the New York Fashion Council, the Mid-Atlantic Association of Museums, Avon Products, Inc., and the Art Directors Club were among the many outside organizations that held special events at the museum.

Guest Services made all arrangements for Walt Disney Pictures to film the sequel to "Three Men and a Baby" at the museum's Central Park West entrance. The film, "Three Men and a Little Lady," stars Tom Selleck.

To reach a wide audience, Guest Services distributes general information brochures, printed in six languages, to visitor bureaus and other tourist agencies. The American Museum Restaurant served 40,895 meals to members and other visitors. The Food Express provided an additional 665,465, and introduced the "Dinosaur Special" a lunch that includes dinosaur-shaped fries. The Employees' Dining Room served 93,970 employee meals.

Volunteers

More than 650 volunteers, nearly as many volunteers as the number of staff, work both in the museum and in the field at the museum's research stations. This year volunteers gave more than 100,000 hours of service, and contributed to every aspect of the museum's activities from scientific research to tours of special exhibitions.

Of those volunteers at the museum, 55 percent worked with the public and 45 percent worked behind the scenes. Bachelors degrees or above are held by 63 percent of the volunteers, 41 percent are employed. Most applicants decide to apply because of encouragement from other volunteers or publicity generated in museum publications and flyers.

New posts included positions assisting the team responsible for the renovation of the fossil halls, and working with the coordinator of environmental public programs, the library conservator, *Natural History* magazine's picture editor, and the coordinator of the magazine's 90th anniversary photographic competition.

Awards and Recognition The Volunteer Office support team of Rae Kassner, Minna Sprung and Margaret Tobin received a certificate of appreciation from then Manhattan Borough President David N. Dinkins, in a ceremony at City Hall. These volunteers tabulate the hours given by museum volunteers, suggest and implement database programs, and assist in other Volunteer Office work.

Two magazines featured articles on the American Museum-Hayden Planetarium's volunteer two-year archiving project. The stories appeared in *The One Person Library*, a newsletter for librarians, and in the *Journal of the International Planetarium Society*.

Walter B. Elvers, a former employee of Bristol-Myers and a volunteer in the Department of Vertebrate Paleontology, was featured in *Alumni News*, a publication of Bristol-Myers, for his work in developing improved techniques for fossil preparation.

Highlights Tours Museum Highlights Tour guides gave a total of 3,015 tours to 38,829 people. The volunteers played an important role in the special exhibition "Bringing Art to Life," which showed how the dioramas in the Hall of Oceanic Birds were constructed. Volunteers were on duty at all times to answer questions on exhibition techniques.

Museum Highlights Tour guides gave Members' Tours of the exhibitions, "Bringing Art to Life," "Palms and Pomegranates" and "Crossroads of Continents: Cultures of Siberia and Alaska." Guides also presented a new type of tour, daily half-hour gallery talks on special exhibitions. "Crossroads of Continents," was the first exhibition featured in the series.

June Myles, Museum Highlights Tour guide, developed a slide presentation on "Crossroads of Continents" for use outside the museum and delivered the show at institutions in Connecticut.

Other Activities Volunteers put in 366 hours over three months surveying members as they entered the museum. The study will help the museum develop membership policies.

Volunteers also helped in research. Charles L. Pearson, Jr., volunteer in the Department of Mineral Sciences, co-authored articles on the museum's mineral collections with Joseph J. Peters, senior scientific assistant. The articles appeared in *The Mineralogical Record* and *Matrix*.

Volunteers Monica Schwarz and Philip B. Dahlen solicited money for the museum from Mutual of New York and Hoffmann-La Roche Inc., respectively, companies that have volunteer incentive programs. Donations were made to the museum in memory of Harry Tannenbaum, Information Desk volunteer, and to the Osborn Library in the Department of Vertebrate Paleontology in memory of F. Walker Johnson, a retired petroleum geologist who worked as a volunteer in the department until his death.

Marjorie Bhavnani, manager for Volunteers and Information Desk Services, was a panelist on volunteer recruitment at the National Docent Symposium in Washington, DC. She served as a consultant to the New York Junior League on a proposed pilot program to help smaller museums recruit volunteers, and participated in workshops for entry level volunteer administrators. Ms. Bhavnani was named a member of a task force formed by the Governor's Office for Voluntary Service to discuss how that organization can strengthen its relations with volunteer agencies and cultural institutions.

Financial Statements

American Museum of Natural History
121st Annual Report 1989/90

Treasurer's Report

The American Museum of Natural History ended the year in a strong financial position, with total assets of $219.4 million, an increase of 10 percent over 1989. Operating revenues exceeded expenses by more than half a million. A new plant fund was established to reflect revenues raised for the major capital program the museum is initiating. The museum capitalized assets in response to the new Financial Accounting Standards Board requirements, and depreciation expenses are reflected in the Plant Fund as well. The year reflects positive changes in revenues, due both to generous donor contributions and positive earnings in the endowment.

Operating Results The Operating Funds reflect a surplus of $539,477. While less than last year, the surplus is not insignificant given a year of substantial growth in operating expenses. This growth was necessary to advance the museum in numerous areas, such as constructing and outfitting new labs, updating equipment, undertaking studies to assess program and revenue needs, and selective additions to staff, primarily in the sciences.

Increases in revenues occurred fairly evenly across the board: City appropriations grew four percent, endowment distribution five percent, Natural History magazine six percent. Although City support for staffing declined somewhat, energy costs grew and the City matched these costs. The City contributes 18 percent of the museum's revenues.

Membership increased a healthy eight percent due to increased promotion. Visitor contributions increased by three percent, which was less than originally planned. This smaller growth resulted from a slight decline in attendance during fiscal 1990, offset by an increase in the suggested admission from $3.50 to $4. The Other Revenues category grew significantly, from $2.2 million in 1989, to $2.6 million in 1990. This was due primarily to proceeds received from the U.S. Postal Service for the sale of calendars using the museum's fossil collection as models.

Auxiliary activities were up overall, due primarily to an increase in Discovery Tours, and to the successful benefit event held in fiscal 1990 (no event held in 1989). These gains were offset somewhat by a decrease in Museum Shop revenues, and guest services, due largely to lower attendance. Gifts, bequests and grants were down eight percent between 1990 and 1989; however, (as noted below) contributions to the Plant Fund increased dramatically, from $0.4 million in fiscal 1989, to $3.9 million in fiscal 1990. Grants remained at last year's level, as funds were received from the National Endowment for the Humanities, the National Science Foundation, and the National Aeronautics and Space Administration.

Operating expenses rose by 10 percent, as the museum continued to upgrade the scientific department salaries and staffing levels, and establish necessary management positions. Construction of the new molecular systematics lab began, and vice presidential positions were filled in development, finance, public programs, and science to oversee programs in these areas. In recognition of the importance of continued improvement in the sciences, the core of museum activities, the greatest increase in expenses was in scientific and educational activity, which rose 21 percent, from $11.2 million in 1989, to $13.6 million in 1990. Although the exhibition expense budget did not grow, the department completed several temporary exhibitions, including "Treasures of the Tar Pits" and "African Reflections." Work continued on the new permanent Hall of Human Biology and Evolution, with those costs reflected on the balance sheet. Administrative cost increases were held at five percent. Guardianship, maintenance and operating costs increased by 11 percent, as overtime costs grew for additional plant maintenance work necessary throughout the museum.

The increases in expenses of Natural History magazine and auxiliary activities approximated inflation, while membership expenses increased approximately 16 percent, due largely to increased promotional efforts that produced increased revenues, which should grow further next year.

Endowment Funds The endowment had a total return of 12 percent last year. Interest and dividends were down slightly from last year; gifts, bequests and grants to the endowment were also less. Income allocated from the Endowment Fund to operating expenses was five percent more than last year. The income allocated is based on five percent

Revenue 1989-90
$48,063,865

23% Natural History Magazine

20% Endowment & Related Funds

18% City of New York

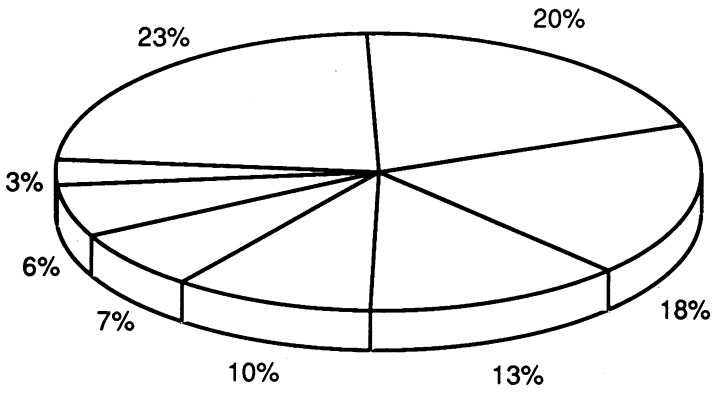
13% Auxiliary Activities

10% Corporate & Individual Contributions

7% Visitor Contributions

6% Other Revenue

3% Membership



Expenses 1989-90
$47,524,388

32% Scientific Research, Education & Exhibition

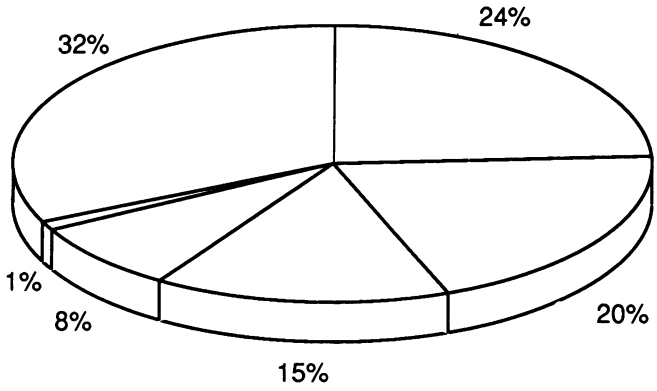
24% Natural History Magazine

20% Plant Operation & Maintenance

15% Administrative & General

8% Auxiliary Activities

1% Membership



of the average market value of the endowment over a rolling three year average. The movement of $7.4 million in current operating funds to the Endowment Fund resulted in an increase in the Endowment Fund balances.

Plant Funds As noted above, the museum statement includes a Plant Fund this year. In conformance with the Statement of Financial Accounting Standards #93, the museum adopted the policy of capitalizing building improvements and equipment, and depreciating them over their useful lives. The effect of the change was to record in a newly established Plant Fund the cost of all plant and equipment which had remaining life at July 1, 1988, amounting to $21.5 million, net of accumulated depreciation of $5.5 million.

Due to the increased efforts of a restructured development office, the museum received $3.9 million in contributions for capital expenditures. While the outlook for City funds is unclear, as the City faces difficult financial times, the museum is exploring increased revenue opportunities in admissions, membership, and the Museum Shop.

As increased donor support for the institution is sought, and new exhibitions are completed, the museum expects to sustain a positive revenue picture.

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, 1990 and 1989, and the related statements of revenue and expenses of Operating Funds and statements of 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 audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audits 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 audits provide 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, 1990 and 1989, and the results of its operations and changes in its fund balances for the years then ended, in conformity with generally accepted accounting principles.

As discussed in Note 1 to the financial statements, in 1990 the Museum adopted the policy of capitalizing certain property and equipment expenditures and depreciating them over their useful lives, and also changed its financial statement presentation to reflect total Operating Funds and the creation of a Plant Fund. Amounts in the 1989 financial statements have been restated to conform to the 1990 presentation.

Coopers & Lybrand

New York, New York
October 2, 1990

American Museum of Natural History Balance Sheets June 30, 1990 and 1989

Assets:	
Cash	
Receivable for securities sold	
Accrued interest and dividends receivable	
Accounts receivable, less allowance for doubtful accounts of $286,000 and $248,000, respectively	
Investments — Note 2	
Due from Endowment — Note 3	
Merchandise and Paper Inventories — Note 4	
Planetarium Authority Bonds — Note 5	
Prepaid expenses and other assets	
Plant & equipment, less accumulated depreciation — Notes 1 & 6	
Total Assets	

Liabilities and Fund Balances:	
Accounts payable and accrued expenses	
Accrued employee benefit costs	
Payable for securities purchased	
Due to Operating Funds — Note 3	
Unearned membership income	
Fund Balances — Note 7	
Total Liabilities and Fund Balances	

Operating Funds		Plant Fund		Endowment Funds		Total	
1990	1989	1990	1989	1990	1989	1990	1989
$ 1,380,746	$ 370,897			$ 104,483	$ 95,820	$ 1,485,229	$ 466,717
				130,654	689,272	130,654	689,272
74,238	141,780			1,212,983	1,035,935	1,287,221	1,177,715
1,790,253	2,951,448					1,790,253	2,951,448
12,497,154	31,327,160	$ 690,730		168,616,538	144,097,627	181,804,422	175,424,787
8,100,000						8,100,000	0
1,417,706	1,071,305					1,417,706	1,071,305
425,000	425,000					425,000	425,000
1,094,837	1,100,793	15,119				1,109,956	1,100,793
		21,818,144	$ 16,265,936			21,818,144	16,265,936
$ 26,779,934	$ 37,388,383	$ 22,523,993	$ 16,265,936	$ 170,064,658	$ 145,918,654	$ 219,368,585	$ 199,572,973

$ 4,625,919	$ 5,339,996	$ 1,427,177		$ 136,430	$ 246,884	$ 6,189,526	$ 5,586,880
3,112,286	2,678,090					3,112,286	2,678,090
				551,778	1,920,104	551,778	1,920,104
				8,100,000		8,100,000	0
7,755,320	8,446,449					7,755,320	8,446,449
11,286,409	20,923,848	21,096,816	$ 16,265,936	161,276,450	143,751,666	193,659,675	180,941,450
$ 26,779,934	$ 37,388,383	$ 22,523,993	$ 16,265,936	$ 170,064,658	$ 145,918,654	$ 219,368,585	$ 199,572,973

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

American Museum of Natural History

Statements of Revenue and Expenses of Operating Funds for the Years Ended June 30, 1990 and 1989

	1990	1989
Revenue:		
The City of New York:		
Appropriated Funds	$6,835,505	$6,601,201
Value of energy services and contributions to pension costs — Notes 8 & 11	1,937,876	1,892,316
Gifts, bequests and grants	4,818,336	5,207,731
Distribution from Endowment Funds — Note 9	7,012,032	6,671,283
Interest and dividends	2,647,868	2,521,996
Visitors' contributions	3,155,269	3,056,075
Natural History magazine	11,267,502	10,582,508
Membership	1,532,109	1,417,144
Other revenue	2,645,189	2,170,483
Auxiliary activities — Note 10	6,212,179	6,176,108
Total Revenue	48,063,865	46,296,845
Expenses:		
Scientific and educational activities	13,560,444	11,191,136
Exhibition	1,577,814	1,660,287
General & administrative	7,224,174	6,864,619
Guardianship, maintenance & operating costs — Notes 8 & 11	9,373,281	8,484,052
Natural History magazine	11,198,772	10,590,310
Membership	677,358	582,978
Auxiliary activities — Note 10	3,912,545	3,769,886
Total Expenses	47,524,388	43,143,268
Excess of Revenue over Expenses	$ 539,477	$ 3,153,577

Statements of Changes in

Balances, beginning of year as previously reported
Adjustment for the cumulative effect of capitalizing and depreciating plant & equipment — Note 1
Balances, beginning of year as adjusted
Additions:
Gifts, bequests and grants
Interest and dividend income
Net gain on sale of investments
Excess of revenue over expenses
Total Additions
Deductions:
General and administrative expenses
Contributions to pension — Note 11
Depreciation expense
Total Deductions
Interfund Transfers:
Net funds returned to endowment for investment — Note 3
Transfers due to capitalization and funding special projects
Total Transfers
Balances, end of year

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

Fund Balances for the Years Ended June 30, 1990 and 1989

Operating Funds		Plant Fund		Endowment Funds		Total	
1990	1989	1990	1989	1990	1989	1990	1989
$ 20,923,848	$ 19,518,779			$ 143,751,666	$ 138,566,251	$ 164,675,514	$ 158,085,030
		$16,265,936	$15,972,511			16,265,936	15,972,511
20,923,848	19,518,779	16,265,936	15,972,511	143,751,666	138,566,251	180,941,450	174,057,541
		3,876,592	425,165	199,913	691,293	4,076,505	1,116,458
				827,891	1,046,270	827,891	1,046,270
				10,102,232	3,987,486	10,102,232	3,987,486
539,477	3,153,577					539,477	3,153,577
539,477	3,153,577	3,876,592	425,165	11,130,036	5,725,049	15,546,105	9,303,791
				751,648	693,110	751,648	693,110
				309,969	324,717	309,969	324,717
		1,766,263	1,402,055			1,766,263	1,402,055
0	0	1,766,263	1,402,055	1,061,617	1,017,827	2,827,880	2,419,882
(7,456,365)	(700,000)			7,456,365	700,000	0	0
(2,720,551)	(1,048,508)	2,720,551	1,270,315		(221,807)	0	0
(10,176,916)	(1,748,508)	2,720,551	1,270,315	7,456,365	478,193	0	0
$ 11,286,409	$ 20,923,848	$ 21,096,816	$ 16,265,936	$ 161,276,450	$ 143,751,666	$ 193,659,675	$ 180,941,450

American Museum of Natural History
Notes to Financial Statements

1. Summary of Significant Accounting Policies:

Fund Accounting—The accounts of the American Museum of Natural History ("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 assets, liabilities and fund balances of the Museum are reported in fund groups as follows:

- Operating Funds, which consist of unrestricted and restricted funds, represent funds available for support of the Museum's operations. Restricted funds are restricted by donors for particular operating purposes such as specific research projects, acquisitions or expeditions.
- Plant Funds represent resources restricted for plant acquisitions and funds expended for plant. Operating Funds used for plant acquisitions are accounted for as transfers to the plant fund.
- Endowment Funds include permanent endowment and quasi-endowment funds. Permanent endowment funds are funds subject to the restrictions of gift instruments requiring that the original principal be invested in perpetuity and only the income may be used for unrestricted or restricted purposes. Quasi-endowment funds are subject to restriction by the Museum's Board of Trustees.

Investments—Investments are carried at cost, or if acquired by gift, at fair value at date of acquisition. Purchases and sales of securities are reflected on a trade-date basis. Realized gains and losses on sales of securities are based on average cost. Interest and dividend income on Endowment Funds is distributed to Operating Funds based on a formula adopted by the Board of Trustees as described in Note 9.

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

Plant & Equipment—Change in Accounting Policy—During the year ended June 30, 1990, the Museum adopted the policy of capitalizing expenditures for exhibition hall construction, leasehold improvements, and equipment, furniture and fixtures and depreciating them over their useful lives. The new method of accounting was adopted to conform with the Statement of Financial Accounting Standards No. 93 which requires the recording of depreciation on long-lived tangible assets for all not-for-profit enterprises. Previously, all plant and equipment expenditures had been charged to operations in the period in which they were incurred. The financial statements for the year ended June 30, 1989 have been restated to apply the new method retroactively. The effect of the change was to record, in a newly established Plant Fund, the cost, amounting to $21,510,047, of all plant and equipment which had remaining useful life at July 1, 1988, net of accumulated depreciation of $5,537,536.

Plant and equipment are stated at cost, with depreciation calculated on a straight-line basis over the estimated useful lives of the assets.

The land and buildings occupied by the Museum are owned by the City of New York ("City") and are not reflected in the financial statements.

Financial Statement Presentation—In 1990 the Museum changed its financial statement presentation to reflect total Operating Funds and the creation of a Plant Fund. Amounts in the 1989 financial statements have been restated to conform with the 1990 presentation. The total excess of revenue over expenses of current funds for the year ended June 30, 1989 as presented in the prior year's Statement of Revenue and Expenses of Current Funds was $1,883,262; as restated in this year's Statement of Revenue and Expenses of Operating Funds it is $3,153,577. The difference of $1,270,315, which is due to the capitalization of plant and equipment expenditures previously written off, now appears as an interfund transfer from Operating Funds to the Plant Fund.

Collections—In conformity with accounting policies generally followed by museums, the value of collections and other holdings of the Museum is not included in the balance sheets.

Membership—Membership income is recognized ratably over the membership term which ranges from one to three years.

2. Investments:

Cost and market values of investments at June 30 are as follows:

	1990		1989	
	Cost	Market	Cost	Market
Plant Fund	$ 690,730	$ 695,940		
Operating Funds	12,497,154	12,494,584	$ 31,327,160	$ 34,525,693
Endowment Funds	168,616,538	184,904,811	144,097,627	159,835,806
Total Investments	$181,804,422	$198,095,335	$175,424,787	$194,361,499
Short term obligations	$ 41,398,087	$ 41,398,087	$ 24,772,000	$ 24,772,000
Fixed income securities	56,982,317	56,363,553	62,973,114	66,302,950
Common and preferred stocks	79,397,513	96,478,613	83,531,808	99,397,712
Other investments	4,026,505	3,855,082	4,147,865	3,888,837
Total Investments	$181,804,422	$198,095,335	$175,424,787	$194,361,499

The Museum temporarily loans certain endowment fund securities to brokerage firms through its custodian bank. The Museum retains all rights of ownership to the securities loaned and, accordingly, receives all related investment income plus compensation for lending the securities. Under the terms of the lending agreement, the Custodian has agreed to indemnify the Museum against any loss resulting from a borrower's failure to return securities. At June 30, 1990 and 1989, the market values of securities loaned amounted to approximately $8,761,000 and $8,597,000, respectively.

3. Due From Endowment:

In May 1990, the Board authorized the transfer of $15,292,966 of Operating Funds to the Endowment Fund. Of that amount, $7,192,966 was a permanent transfer of specific operating fund balances and is reflected under interfund transfers and $8,100,000, which represents the investment of surplus unrestricted operating funds with the endowment managers, is reflected as a receivable from the Endowment Fund. In addition, other transfers between the Endowment and Operating Funds totalling $263,399 were made during the year.

4. Merchandise and Paper Inventories at June 30 consist of:

	1990	1989
Natural History Magazine paper	$ 810,772	$ 590,565
Museum Shop merchandise	606,934	480,740
	$1,417,706	$1,071,305

5. Planetarium Authority Bonds:

The Museum 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 each of the years ended June 30, 1990 and 1989 interest on these bonds (at 4½ %) of $25,650 was received and is included in Operating Funds revenue.

6. Plant and Equipment as of June 30 consist of:

	1990	1989
Exhibition halls	$13,110,020	$13,110,020
Leasehold improvements	8,446,567	5,609,305
Equipment, furniture and fixtures	3,775,249	2,534,993
Construction-in-progress	5,192,159	1,951,206
Total	30,523,995	23,205,524
Less: Accumulated depreciation	8,705,851	6,939,588
Net investment in plant and equipment	$21,818,144	$16,265,936

7. Fund Balances:

Included in Operating Funds balances are approximately $3,557,000 and $5,077,000 in fiscal 1990 and 1989 respectively, restricted by donors for specific purposes.

Included in Plant Fund balances is $690,730 which is unexpended at June 30, 1990. There was no unexpended fund balance as of June 30, 1989.

Endowment Funds balances consist of:

	1990	1989
Permanent Endowment Funds, income available for:		
Restricted purposes	$ 66,421,414	$ 61,707,237
Unrestricted purposes	21,210,228	19,536,558
Quasi-endowment (funds functioning as endowment), principal and income available for:		
Restricted purposes	33,414,773	28,988,377
Unrestricted purposes	40,230,035	33,519,494
	$161,276,450	$143,751,666

8. Guardianship, Maintenance and Operating Expenses:

Guardianship, maintenance and operating expenses in fiscal 1990 and 1989 include the value of energy services supplied by the City of $1,655,500 and $1,609,313, respectively. In addition, the City appropriates funds for the renovation, improvement and alterations of the buildings occupied by the Museum. These funds are not reflected in the financial statements since they do not flow through the Museum's books. Funds expended by the City for these capital projects in fiscal 1990 and 1989 amounted to $2,674,747 and $2,259,252, respectively.

9. Distribution from Endowment Funds:

Total interest and dividend income earned by the Endowment Funds for fiscal 1990 and 1989 amounted to $7,839,923 and $7,717,553, respectively. The policy adopted by the Board of Trustees provides for distributions to unrestricted and restricted funds within the Operating Funds at five percent of the average of the market value of the Endowment Funds for the three preceding years. The distributions are allocated among funds on a unit basis which reflects the ratio of the related funds invested in the pooled portfolio to the total market value. The distributions were:

	1990	1989
Unrestricted Funds	$ 5,952,597	$ 5,657,850
Restricted Funds	1,059,435	1,013,433
	$ 7,012,032	$ 6,671,283

The excess income was retained in the Endowment Fund. Of this amount, $309,969 and $324,717 in fiscal 1990 and 1989, respectively, were allocated for pension support to the Cultural Institutions Retirement System Plan ("CIRS Plan"), based on the five percent formula.

10. Auxiliary Activities:

Revenue and expenses for auxiliary activities in fiscal 1990 and 1989 were:

	1990		1989	
	Revenue	Expenses	Revenue	Expenses
Museum Shops	$ 2,903,957	$ 2,247,998	$ 2,955,040	$ 2,313,439
Discovery Tours	915,289	612,932	719,541	551,368
Naturemax	745,605	479,756	702,025	433,331
Other	1,647,328	571,859	1,799,502	471,748
	$ 6,212,179	$ 3,912,545	$ 6,176,108	$ 3,769,886

11. Pension Plan:

The Museum participates in the CIRS Plan, which consists of an employer funded defined benefit plan and an employee contributory 401K savings plan. It is a multi-employer plan and the actuarial present value of vested and unvested accumulated plan benefits and net assets available for plan benefits are not determinable on an individual institution basis.

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. Total pension costs for eligible employees, including Planetarium personnel, amounted to $998,901 and $938,535 in fiscal 1990 and 1989, respectively. Of this amount $282,376 and $283,003 were paid by the City directly to CIRS in fiscal 1990 and 1989, respectively, and $309,969 and $324,717, 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 $168,429 and $161,295 in fiscal 1990 and 1989, respectively.

12. Post-retirement Benefits:

The Museum provides health insurance for all retired employees and life insurance for certain retired employees. These costs are summarized below:

	1990	1989
Health insurance	$444,605	$388,173
Life insurance	82,878	82,281
	$527,483	$470,454

13. 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 $194,708 and $176,764 in fiscal 1990 and 1989, respectively. The Museum also received approximately $55,700 and $60,500 in fiscal 1990 and 1989, respectively, for vistors who entered the Museum from the Planetarium.

14. 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.

15. Subsequent Events:

At a meeting in July 1990, the Trustees approved the issuance of tax exempt bonds to finance major capital improvements, including the complete renovation of the dinosaur/fossil halls and the construction of a new library facility. The amount of the bond issue, the issuing agency and the nature of the financing have not been finalized but the amount is not expected to exceed $55 million. The Trustees also approved the initiation of a major four year fund raising campaign.

Financial Statements

American Museum of Natural History Planetarium Authority (Hayden Planetarium) 121st Annual Report 1989/90

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, 1990 and 1989, and the related statements of activity and fund balances. 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 audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audits 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 audits provide 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, 1990 and 1989, 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 2, 1990

American Museum of Natural History Planetarium Authority
Balance Sheets
June 30, 1990 and 1989

	1990	1989
Assets:		
Cash	$ 299,374	$ 215,085
Investments — Note 2	1,657,266	1,650,461
Receivables and other assets	34,456	28,103
Planetarium shop inventory	55,739	55,747
Building, at cost	1,019,210	1,019,210
Building improvements and equipment:		
Building improvements, at cost	1,397,798	1,310,892
Zeiss Planetarium instruments, at cost	221,928	221,928
	1,619,726	1,532,820
Less: Accumulated depreciation	(877,721)	(791,560)
Net building improvements and equipment	742,005	741,260
Total Assets	$3,808,050	$3,709,866
Liabilities, Contributed Capital and Fund Balances:		
Liabilities:		
Accounts payable and accrued expenses	$ 103,722	$ 115,451
Accrued employee benefit costs	115,050	89,593
4½% Refunding Serial Revenue Bonds, past due — Note 3	570,000	570,000
Accrued interest past due	315,450	315,450
	1,104,222	1,090,494
Contributed capital:		
Charles Hayden	156,869	156,869
Charles Hayden Foundation	429,455	429,455
The Perkin Fund	400,000	400,000
	986,324	986,324
Fund Balances — Note 4	1,717,504	1,633,048
Total Liabilities, Contributed Capital and Fund Balances	$3,808,050	$3,709,866

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

American Museum of Natural History Planetarium Authority Statements of Activity and Fund Balances for the Years Ended June 30, 1990 and 1989

	1990	1989
Revenue:		
Admission fees, net	$1,288,152	$1,361,671
Planetarium shop sales	278,671	299,644
Special lectures and course	60,791	62,655
Gifts, bequests and grants	76,000	159,584
Income from investments	152,299	138,546
Other revenue	71,496	80,143
Total Revenue	1,927,409	2,102,243
Expenses:		
Preparation, presentation and promotion	655,116	596,099
Operation and maintenance	360,435	374,797
General and administrative	221,935	202,935
Planetarium shop expenses	231,426	226,236
Special lectures and courses	44,976	46,279
Special purpose programs and projects	32,075	33,272
Laser program expenses	185,179	211,832
Interest on past due 4½ % Refunding Serial Revenue Bonds	25,650	25,650
Total Expenses Before Depreciation	1,756,792	1,717,100
Excess of Revenue Over Expenses Before Depreciation	170,617	385,143
Depreciation Expense	86,161	74,820
Excess of Revenue Over Expenses	84,456	310,323
Balances, beginning of year	1,633,048	1,322,725
Balances, end of year	$1,717,504	$1,633,048

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

American Museum of Natural History Planetarium Authority
Notes to Financial Statements

1. Summary of Significant Accounting Policies:

Fund Accounting—The accounts of the American Museum of Natural History Planetarium Authority ("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, for reporting purposes in the accompanying financial statements, all funds have been combined.

Building Improvements and Equipment—Major building improvements and equipment purchases are capitalized and depreciated by the straight-line method over their useful lives.

The land utilized by the Planetarium was donated by the City of New York ("City"). In the event the Planetarium discharges all its liabilities, including bonds, the real property reverts to the City. Because of this provision, it is deemed unnecessary to depreciate the building.

Investments—Investments are stated at cost, or if acquired by gift, at fair value at date of acquisition.

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

Financial Statement Presentation—The Planetarium changed its financial statement presentation in 1990 by combining all fund groups. Amounts in the 1989 financial statements have been combined to conform with the 1990 presentation.

2. Investments: Investments at June 30, 1990 consist of short-term obligations in the amount of $1,152,530 and fixed income securities in the amount of $504,736. The aggregate market value approximates cost.

3. Revenue Bonds: The Planetarium's 4½ % Refunding Serial Revenue Bonds are owned by the American Museum of Natural History ("Museum"). The Charles Hayden Foundation contributed $200,000 to the Museum toward the purchase of such bonds.

4. Fund Balances: Included in fund balances are approximately $137,000 and $199,000 in fiscal 1990 and 1989, respectively, restricted by donors for specific purposes.

5. Related Party Transactions: The Planetarium and the Museum are separate legal entities which share the same Board of Trustees ("Trustees") and Officers.

The Museum provides certain services, such as insurance, accounting and maintenance, to the Planetarium. The aggregate charges for these services in fiscal 1990 and 1989 were $194,708 and $176,764, respectively.

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 $168,429 and $161,295 in fiscal 1990 and 1989, respectively. The Planetarium also paid the Museum approximately $55,700 and $60,500 in fiscal 1990 and 1989, respectively, for visitors who entered the Museum from the Planetarium.

6. 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.

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New York City Mayor David N. Dinkins greets local elementary school children during the opening ceremony for the exhibition, "Black Achievers in Science." The exhibition's numerous interactive displays highlighted the contributions to science and technology of more than 100 prominent black Americans. In conjunction with the exhibition, a career day for junior high school students was held, and a lecture was delivered by physicist Walter E. Massey, vice president for research at the Argonne National Laboratory. He was one of those profiled in the exhibition, which was organized by the Museum of Science and Industry in Chicago and supported by Citibank.

COVER: These colorful scallop shells from the family Pectinidae are part of the collection of some 2.5 million shells in the museum's Department of Invertebrates. There are nearly 400 known species of scallops in waters ranging in depth from intertidal shallows to 20,000 feet. While most scallops (their shells vary in color from grey or cream to brilliant lavender, red and orange) are tropical, some species are found in polar waters. They are among the organisms studied by scientists from the Department of Invertebrates, who focus on the biogeography, evolutionary history, and paleontology of living and extinct invertebrates. The department's investigators are members of the museum's staff of some 200 researchers and their assistants whose findings are disseminated through publications, and in exhibitions and educational programs.