THE FIELD MUSEUM

COLLECTIONS AND RESEARCH

FEBRUARY 1997

ACADEMIC AFFAIRS

CENTER FOR EVOLUTIONARY AND ENVIRONMENTAL BIOLOGY (CEEB)

CENTER FOR CULTURAL UNDERSTANDING AND CHANGE (CCUC)

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Introduction to Collections and Research at The Field Museum

The Field Museum was founded to house the biological and anthropological collections assembled for the World's Columbian Exposition of 1893. These objects form the core of the Museum's collections, which have grown through world-wide expeditions, exchange, purchase and gifts to more than twenty million specimens. Through more than a century of dedication by Museum staff and commitment by Museum supporters, the collections of The Field Museum now comprise an irreplaceable part of the world's knowledge-base for the sciences, humanities and arts. The collections in the Departments of Anthropology, Botany, Geology and Zoology, together with an outstanding library, provide the foundation of the Museum's research, exhibition and education programs.

Today, The Field Museum is a unique institution of public learning that utilizes its extraordinary collections, world-class researchers, and internationally renowned exhibits and educational programs to increase public knowledge and appreciation of the world in which we live. Our particular focus on cultural and biological diversity positions us in the center of two great issues of our time - the challenge of balancing growth with responsible stewardship of the environment, and the challenge of creating mutual respect and understanding among cultures.

In early 1996, as part of our attempt to inventory and increase the use of the Museum's resources, the staff in Academic Affairs attempted to summarize, in a single document, the scope and strengths of The Field Museum collections. Many of these data had been compiled for grant submissions or departmental summaries, but they had never been brought together to provide an overview of the history and current status of the Museum's collections. This report completes and updates the preliminary survey prepared in 1996. It also provides an overview of current research projects and summarizes the scholarly interests of The Field Museum's resident researchers. Internally, this document provides valuable data to inform our planning. Externally, we hope that it will increase knowledge of the collections, expertise and other resources available at The Field Museum, and thereby expand the services we are able to provide to our diverse publics.

Peter R. Crane
A. Watson Armour III Curator
Vice President, Academic Affairs and Director

THE FIELD MUSEUM - MISSION STATEMENT

Preamble: **Serving The Public As Educator**

The Field Museum is an educational institution concerned with the diversity and relationships in nature and among cultures. It provides collection-based research and learning for greater public understanding and appreciation of the world in which we live. Its collections, public learning programs, and research are inseparably linked to serve a diverse public of varied ages, backgrounds and knowledge.

Subject Matter Focus: **Living Together On The Living Earth**

Combining the fields of Anthropology, Botany, Geology, Paleontology and Zoology, the Museum uses an interdisciplinary approach to increasing knowledge about the past, present and future of the physical earth, its plants, animals, people, and their cultures. In doing so, it seeks to uncover the extent and character of biological and cultural diversity, similarities and interdependencies so that we may better understand, respect, and celebrate nature and other people.

Collections: **World-Wide Knowledge Database**

The Museum holds encyclopedic collections of biological and geological specimens and cultural objects as the data needed to understand the nature of — and conditions affecting — environmental and cultural change. In support of these collections, we also hold significant collections of books, periodicals, photographs, illustrations, computer data, archival and instructional material. Like a great research library, our collections of more than 20 million items are a crucial part of the world's knowledge database for the sciences, humanities and the arts. The Museum holds the collections in trust for future generations. Over time, new knowledge is gleaned from the collections. Accordingly, the Museum must manage the collections to provide for both long-term conservation and access and make strategic additions to the collections pursuant to clearly defined objectives. In discharging its collection trusteeship, the Museum recognizes the special relationship it has with the people whose cultures and habitats are represented in the collections. We will nurture these special relationships so together we can enhance greater understanding of cultural traditions and environmental surroundings for the benefit of all humankind.

Public Learning: **Offering Greater Understanding About Environments And People**

Unlike schooling, learning in a museum is self-motivated, self-directed, and can be lifelong. Unlike print and electronic media, information is communicated primarily through real, tangible objects. Museum learning usually takes place during leisure time and without the direction of a teacher. The exhibit is the principal avenue of learning. Exhibits are augmented by people-mediated programs and a visitor-oriented museum-wide staff which reaches out to assist all visitors. Services to schools and communities extend the museum experience to people beyond our walls. To stimulate a public sense of inquiry, curiosity and delight, our exhibits and programs are not only informative, but also entertaining and inspiring. We focus on critical environmental and cultural issues which are engaging and relevant to the public's daily lives and civic responsibilities. We must be a vital educational and recreational destination for both our local and world-wide communities.

Research: **Explaining The Patterns And Processes That Shape The Living Earth**

The Museum maintains a vital program of basic research that continually stimulates active and pioneering uses of the collections. Seeking new knowledge and deriving new syntheses about the dynamic physical, biological and cultural patterns and processes that shape the living earth, Museum research centers on anthropology and the natural sciences of evolutionary and environmental biology and geology. All of the research programs are focused on the interrelationships among the earth, its environments, life and cultures and how they change over time. Our research methods use advanced technologies and encourage an interdisciplinary approach which combines the Museum's disciplinary

breadth and small research staff into a uniquely imaginative and focused whole. Our basic research has direct linkages to research about conservational, ecological, biomedical and multicultural issues. The Museum and its staff communicate our research findings and ideas about the history of the planet by means of scholarly and general papers, oral presentations to scientific and public audiences, public exhibits and other learning programs.

Publics: **Reaching Out**

Field Museum serves diverse publics ranging from children, adults and families to the national and international research community. We reach out to our diverse publics and their changing educational needs. We have a special responsibility to reach out to the people of Chicago, neighboring communities and the State of Illinois. Our visitors should reflect the cultural, educational and economic diversity of the Chicago metropolitan area. We must work collaboratively and sensitively with the people in our locality, country and world whose cultures and habitats are represented in our collections, research and public programs. In reaching out, the Museum must build on its long-standing tradition of "outreach" which takes its resources and programs to schools, parks, and communities.

Linkages: **Working With Others**

The Field Museum is a unique educational institution in a network of nearby and international educational institutions. We must work closely with neighboring schools, colleges, universities and research institutions to strengthen the quality and effectiveness of our collection-based research and public learning. We need to collaborate with other museums, environmental, cultural and recreational groups and organizations to fulfill our educational mission. The Museum has an obligation to seek out and collaborate with researchers and teachers who reside in the areas from which our collections come.

Center Of Understanding And Mutual Respect: **Listening To Each Other**

The Museum subject matter directly relates to the great issues of the present and future: environmental and cultural diversity and their interrelationships. There are differing scholarly and public viewpoints on these concerns. While the Museum does not take institutional positions on these issues, it must serve as a center of free inquiry, a marketplace for multiple points of view on these matters. In doing so it serves as a forum where relevant controversy can be aired. In this way the Museum can be a "door in the wall" of our differences and inspire greater knowledge, understanding and respect for our varied natural environments and cultural heritages.

Public Service: **Our Commitment**

We — the trustees, staff and volunteers of The Field Museum — are dedicated to public service. Together and individually we share a commitment to provide services and opportunities to our many publics. As an institution devoted to the study of diversity and relationships, we will practice diversity in our public contacts and staffing. We will nurture an environment of mutual respect which will extend to the public we serve. We will act ethically in our relations with the public and with each other. Collectively and individually we are committed to the mission of the Museum and our public service responsibilities.

INTRODUCTION TO THE FIELD MUSEUM

Founding—The Field Museum was incorporated in the State of Illinois on September 16, 1893 as the Columbian Museum of Chicago with its purpose the "accumulation and dissemination of knowledge, and the preservation and exhibition of objects illustrating art, archaeology, science and history." In 1905, the Museum's name was changed to Field Museum of Natural History to honor the Museum's first major benefactor, Marshall Field, and to better reflect its focus on the natural sciences. In 1921 the Museum moved from its original location in Jackson Park to its present site on Chicago Park District property near downtown where it is part of a lakefront museum campus that includes the John G. Shedd Aquarium and the Adler Planetarium. These three institutions are regarded as among the finest of their kind in the world and together attract more visits annually than any comparable site in Chicago.

Collections—The Field Museum was founded to house the biological and anthropological collections assembled for the World's Columbian Exposition of 1893. These objects form the core of the Museum's collections which have grown through world-wide expeditions, exchange, purchase, and gifts to more than twenty million specimens. The collections form the foundation of the Museum's exhibition, research and education programs, which are further informed by a world-class natural history library of more than 250,000 volumes.

Public Learning—As an educational institution the Field Museum offers multiple opportunities for both informal and more structured public learning. Exhibits remain the primary means of informal education, but throughout its history the Museum has supplemented this approach with innovative educational programs. The Harris Loan Program, for example, begun in 1912, provides educational outreach to children, bringing artifacts, specimens, audiovisual materials, and activity kits to Chicago area schools. The Department of Education, begun in 1922, offers a changing program of classes, lectures, field trips, museum overnights and special events for families, adults and children. Professional symposia and lectures, such as the annual Spring Symposium, presents the latest scientific results to the international scientific community as well as the public at large.

Research—The Museum's curatorial and scientific staff in the departments of Anthropology, Biology, Geology, and Zoology conducts basic research in the fields of systematic biology and anthropology, and also has responsibility for collections management, and collaboration in public programs with the Departments of Education and Exhibits. Since its founding the Field Museum has been an international leader in evolutionary biology and paleontology, and archaeology and ethnography, and has long maintained close links, including joint teaching, students, seminars, with local universities - particularly the University of Chicago and the University of Illinois at Chicago.

Building—Since 1921, the Field Museum has been located in a massive neoclassical structure designed by Daniel Burnham to house vast collections, contain large public exhibit spaces and include special research facilities. Its main central axis, Stanley Field Hall, offers visitors a grand open space, comprising the full length and height of the building. The Museum's tiered exhibit structure locates introductory exhibits immediately adjacent to Stanley Field Hall to engage visitors and draw them into the exhibit galleries. Resource centers are positioned more peripherally to serve visitors who have explored the larger, thematic exhibits and desire a more in-depth learning experience. Based on a measured survey of its facility, the Museum comprises 915,950 square feet (sf) of functional space spread over five floors. Public Learning functions occupy 352,131 sf (38%) which includes exhibit areas, meeting rooms, Education, and Design and Production (including exhibit preparation space, workshops, silk screen areas, and a photography laboratory). Research facilities occupy 118,912 sf (13%) and include the scientific offices and a variety of laboratories (e.g., biochemical lab, scanning electron microscope lab, geomagnetics lab, image analysis lab, rock and fossil preparation labs, anthropology conservation lab, two general Botany labs, bird and mammal preparation lab, histology lab, and a fluid preparation lab). Collections Storage occupies 172,087 sf (19%). The Library occupies 20,574 sf (2%) and includes the main and departmental libraries. Administrative areas, earned income functions, public services, common areas and facilities planning and operations occupy the remainder of the space.

Audience and Attendance—The Field Museum serves a large and diverse public including school children, teachers, families, and adults - casual visitors, tourists, students, collectors, amateur scholars and the national and international scientific community. Since 1927, more than one million people annually have visited the Field Museum from Chicago, Illinois, the nation, and abroad. In 1996 total attendance reached 1,212,477 visitors, including 243,514 children in school groups. Most visitors to the Museum were residents of Chicago and the surrounding suburbs: 42% from the City of Chicago, 21% from the surrounding suburbs including Cook, Dupage, Will, Kane, Lake and McHenry Counties, 2.5% from other Illinois counties, 31.5% from other states, and 3% international visitors. In 1996, the collections were made available to 2,644 scientific visitors, and 56,605 specimens were loaned to other institutions for research and exhibits.

Schedule for the Public —The Field Museum is open from 9 a.m. to 5 p.m. daily; closed New Year's Day, Thanksgiving and Christmas. Admission is free for Illinois school groups, teachers, museum members, the active military, and, pursuant to Illinois law, for all visitors on Wednesdays. The Harris Educational Loan Center is open Tuesday to Saturday to accommodate community educators. The Rice Wildlife Research Station, Webber Resource Center of Native Peoples of the Americas, and Africa Resource Center are open daily, 10 a.m. to 4:30 p.m. The Museum Library is open to the public Monday to Friday, 10 a.m. to 4:30 p.m.

Serving Chicago—Visits to the Museum are free on Wednesday, and all Chicago school groups, plus all Chicago Park District and other community groups are admitted without charge. In 1996 the Museum distributed c. 52,000 free family passes to Chicago children, including c. 26,000 passes distributed through Chicago Park District summer camps. The Museum also provides free use of facilities for meetings of teachers and staff of the Chicago parks and schools.

School Programs and Outreach—School tours remain a major part of Field Museum programs. In 1996, the Museum provided 42 training programs for 1,656 teachers. The Museum's Community Outreach Program works in city neighborhoods to develop links to community agencies, such as boys' and girls clubs', Y's, branch libraries, preschool and after school day care centers, senior centers, settlement houses, day camps, recreation centers, playgrounds and park programs. In 1996 The Museum's Educational Loan Program sent 5,769 materials and mini-exhibits to 2,324 elementary educators. The Museum is working to expand the number of women and minorities in the sciences through several internal and externally funded internship programs.

Use of the Collections—All of the Museum's collections are available for exhibition, education, research, and loan. Use is limited only by space, staffing levels, and the established care and security needs of the collections and collections records. The collections are also used extensively for research by Museum staff and in 1996, the Museum's scientific staff published more than 150 scientific books and papers, and presented at 77 national and international research seminars. Fieldiana, the Museum's scientific journal, publishes on research based at the Museum, and has a circulation of 1,200 institutions and libraries. Less than 1% of the Museum's vast collections are on public display at any given time, but access to the collections is routinely granted to qualified scientists and scholars. In 1996 the collections were used for research by 2,644 visiting scientists, research associates, and students (by visitor days). In 1996, the Museum also loaned 56,605 specimens for scientific and/or exhibit purposes in 670 loan transactions, and borrowed 7,729 specimens. Exhibit loans have been made to many Illinois institutions including Malcolm X College, the Oriental Institute, the Museum of Science and Industry, and the Art Institute of Chicago as well as to other institutions including the Apache County Historical Society and the Metropolitan Museum of Art.

Staff —Staffing at The Field Museum is guided by the Museum's mission statement which includes, "as an institution devoted to the study of diversity and relationships, we will practice diversity in our public contacts and staffing." As of January 13, 1997, the Field Museum employs 428 staff, of which 389 are full-time; 42% represent people of color, and 48% are female. The Senior Administrative Staff consists of the President (John McCarter, MBA); Vice President, Academic Affairs and Director (Peter R. Crane, Ph.D.); Vice President, Museum Affairs (Laura Gates, MBA); Vice President, Institutional Advancement (Willard White, Ph.D.); and Vice President, Finance and Administration (James Croft,

MS). John W. McCarter, Jr. became the Museum's seventh President in October 1996, succeeding Willard L. (Sandy) Boyd, who retired after 15 years' service to the museum community. McCarter has significant local, national and international experience in both the public and private sectors, having served as Senior Vice President at the business consulting firm Booz-Allen & Hamilton, as Chairman of Chicago Public Television (WTTW), and as a trustee of the University of Chicago. Academic Affairs employs 140 staff members (many supported by grant funds): 35 Ph.D. curators and 105 Scientific Professional Support staff. Of the support staff, 40% hold Bachelor degrees, 26% Masters, and 16% Ph.D.'s.

Volunteers and Honorary Appointments—Field Museum staff are significantly augmented by a large and dedicated group of regular (474) and seasonal (46) volunteers who contributed 62,277 hours of service in 1996. Volunteers are recruited through community outreach, referrals, public festivals, and mailings. Placement interviews match volunteer skills with the Museum's needs. Education volunteers undergo extensive formal training to become exhibit hall interpreters, tour guides, and research center facilitators for school and community groups and general visitors. Non-education volunteers are trained by their supervisors to assist with collections management, research, and other behind-the-scenes work. In addition, to recognize and encourage close working relationships with the scientific community, the Museum offers several honorary appointments (certain categories provide facilities and financial support), including Emeritus Curator, Adjunct Curator, Research Associate, Field Associate, and Associate. In 1996, 200 honorary appointees supplemented the efforts of the Museum's scientific staff.

1986 Strategic Plan—In 1985 and 1986, looking to its centennial in 1993 and 1994, the Museum developed a strategic plan - Centennial Directions - that highlighted the dual mission of the Museum - as a research institute and public museum - and recognized the clear need for institutional support services to carry out both missions. As a research institute, the Museum looked to maintain and build its collections, while making them more accessible both for research and public education. It sought to strengthen the Museum's capacity to conduct collection-based research of the highest international caliber and to increase curatorial participation in graduate and undergraduate education. In the public museum, the strategic plan called for an innovative new approach to exhibits that encompassed informal interactive exhibits, major thematic exhibits and resource centers for in-depth study. This exhibit program paralleled a major marketing initiative as well as expansion of the Museum's school and community outreach efforts. Centennial Directions also sought to increase support for the Museum through targeted constituency development, expanded earned income from increased visitation, and improved food services, visitor services, Museum stores and special events.

Outcomes of the 1986 Strategic Plan—Resulting from Centennial Directions, the Museum adopted a new organizational structure with four administrative units: Collections and Research, Public Programs, Development, and Finance and Museum Services. A three-year capital campaign raised $43 million to provide for the Museum's endowment, develop new exhibits and programs, strengthen research capacity, provide necessary building repairs, improve collection facilities, and contribute to operating support. By the end of 1994, the Museum had renewed 139,000 square feet of exhibit space, including several major new exhibits, such as **Egypt**, **Traveling the Pacific**, **Africa**, **Life over Time**, **Messages from the Wilderness**, and **What is an Animal?** Three resource centers were established for in-depth study. A variety of new outreach programs were implemented to serve Chicago's neighborhoods, parks and schools. A Visitor Services Program was established to respond more effectively to visitor needs. 56,000 square feet of exhibit space was converted to provide much-needed collections, research and storage space. A new collections facility (28,000 square feet with capacity for compactorization) was constructed. Additions to the research infrastructure included a new scanning electron microscope, a new computing center, biochemistry laboratories, a functional morphology laboratory, and a paleomagnetics laboratory. Strengthened scientific programs were reflected in increased research productivity and expanded support from the National Science Foundation and other agencies for collections and research. Collaborative research and education programs with area universities and other institutions were expanded. Visitation and earned income were both increased, and the Museum maintained a deficit-free budget.

1992 Strategic Plan—With the 1986 Strategic Plan approaching completion, in 1992 the Museum engaged in a renewed institution-wide program of strategic planning to set a course that would sustain the Museum into the next century. The 1992 Strategic Plan recognizes that to ensure an appropriate and efficient interdisciplinary and integrated approach, the Museum must operate horizontally across traditional and functional boundaries, while maintaining strengths in its areas of specialty. Specifically, the plan calls for: shared concentration on producing superior public service; integrated approaches to learning for the Museum's diverse public; a unifying intellectual theme for all Museum programs; strong curatorial presence in collections, research and public learning; effective processes to provide interdisciplinary programs (among anthropology, geology and biology - within biology - among collections, research and public programs); and mutual respect for the contributions of staff in all areas of the Museum. These fundamental principles are embodied in a new Mission Statement that articulates a vision of a unique institution of public learning concerned with diversity and interconnections, both in nature and among cultures. The initial stages of the 1992 Strategic Plan required changes in organizational structure and procedures, and especially the implementation of a matrix approach.

Implementing the 1992 Strategic Plan—Two interdisciplinary centers - the **Center for Evolutionary and Environmental Biology** and the **Center for Cultural Understanding and Change** - have been established to provide the unifying curriculum and intellectual rallying points for all Museum programs. These centers are not administrative units but cut across all Museum departments to articulate and facilitate a museum-wide approach to basic environmental and cultural issues that confront local and worldwide communities. **The Science Advisory Council** is charged with articulating the significance of the Museum's research to national priorities (e.g., global warming, biodiversity, conservation, multicultural issues), expanding the Museum's research output and promoting the use of the collections. **The Public Learning Council** is designed to provide an integrated forum for the development of the Museum's public learning agenda that makes effective use of financial and human resources and meets the need to generate increased revenue and produce timely and changing educational exhibits. **The Public Services Matrix** is charged to address a variety of outstanding issues in Visitor Services, Security, Housekeeping and A/V, including improving maintenance schedules and off-site staff training in customer service techniques. It also works to maintain a close working relationship with the Chicago Police Department, the Chicago Fire Department and the Chicago Park District.

A Vision for the Future—An institution is only as strong as its vision of the future and strong vision is the foundation for developing strategies and priorities that guide day-to-day decisions. As The Field Museum enters its second century, the concept of interconnectedness is reshaping society's approach to cultural and environmental issues. To position the Museum for a leadership role in addressing these issues–arguably the central issues of our time–The Field Museum's Strategic Plan calls for us to embrace a new vision and change the way we approach our mission. We are adopting a vision of "connecting" and emphasizing "total habitat" in everything from cultural understanding to endangered species to museum operations. Our vision is of an institution concerned with the interconnections in nature and among cultures. Our vision is of an institution that connects internally across departmental lines to make wise use of collections and human and financial resources. Finally, our vision is of an institution that establishes creative, more vital links with funding sources to gain the financial support required to support its strategy.

(Organizational Chart)

ACADEMIC AFFAIRS STAFF LIST

(as of February 17, 1997)

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PERSPECTIVE - BIODIVERSITY IN THE METROPOLIS

During 1993 and 1994 the Field Museum celebrated its centenary. In the sixty years before the Field Museum was founded, Chicago grew from a settlement of 50 people to a city of 1.5 million, and in the next 100 years that number almost doubled. We now stand at the center of a vast conurbation that is home to more than 8 million people. As William Cronon documents in "Nature's Metropolis" Chicago's boom was made possible by the vast natural resources of the mid-continent -- the deep fertile soils of the prairies and the dense forests of Michigan, Wisconsin and Minnesota.

The ecological consequences of the plough and the "cutover" were felt throughout the mid-continent, but paradoxically some of the best prairies and other natural communities persisted in the Chicago area itself. In part this was exceptional foresight by planners such as Frederick Law Olmstead, Dwight Perkins and Jens Jensen, but it was also simple good fortune related to property speculation and other causes. Together these factors have given the citizens of our modern metropolis an extraordinary legacy in one of the most biologically diverse areas of North America - an area of lake-side wetlands, where the western prairies meet the feather-edge of the eastern deciduous woodland, and where southernmost elements of boreal forests meet the hardiest elements of southern swamps.

In the greater Chicago area, perhaps more than anywhere else in the nation, we have the jarring juxtaposition of massive heavy industry and urban sprawl, with astounding biological diversity, albeit now distributed among a patchwork of fragmentary prairie, woodland, dune and wetland systems. This juxtaposition raises many questions as to the long term stability and conservation of these communities and the organisms that comprise them -- but it also presents extraordinary opportunities to show how this archipelago of remnant natural ecosystems can enrich the lives of us all. In a global context, Chicago's biological heritage also presents a straightforward challenge -- how can we urge the population of São Paulo or other tropical cities to conserve their natural resources unless we commit to do likewise?

Biological Diversity and Ecological Principles

In the minds of many the term biodiversity is virtually synonymous with the destruction and conservation of tropical rainforests. What is less clearly appreciated is that North America itself is a substantial reservoir of biological diversity, and in some respects we are as ignorant of biological diversity in our own backyard as we are of biological diversity in the tropics. There is no acre on the planet for which a complete biodiversity inventory exists, and even in Illinois while we have guides and identification manuals for many of the most conspicuous native organisms (e.g., plants, birds), we have no comparable treatments for fungi and most groups of insects -- let alone soil microorganisms such as mites and other arthropods, protozoans, bacteria, and so on.

At a global level more than 1.4 million species of organisms have been recognized and classified by systematic biologists but current estimates of the total biological diversity of the planet range from a conservative 10 million to over 100 million. In insects alone 950,000 species have been described but there may be anything from 8 to 100 million in total. The huge variance in these estimates illustrates the depth of our current ignorance. We simply do not know, even within an order of magnitude, how many species exist on this planet.

Against this background, the task facing systematic biologists is well beyond the scope of personnel and other resources that are currently devoted to it both nationally and internationally. The reasons to preserve biodiversity are ethical, aesthetic and perhaps even emotional but they are also readily framed in economic terms around issues such as human health, plant breeding, fisheries resources and ecotourism. As the Vice President of Archer Daniel Midland commented in a recent editorial in the Chicago Tribune, "We live in a world where fewer than 20 plant species provide 90% of the food supply, and we live in a country where over 90% of the commercial crop acres are planted with plant species introduced from foreign countries. When you walk into a store, one out of every four drug-related items that you pick off the shelf is derived from a living organism." He went on to point out the value

of resistant strains of crop plants in combating diseases and pests. In his words "The products affected cover every shelf in a grocery store from beverages to bakery goods. United States consumers will profit from a biological diversity insurance policy, one we have so far failed to provide."

At a deeper level, the value of biological diversity may also reside in its contribution to ecological stability. Much, perhaps most, of the undocumented biological diversity of the globe is among the small organisms that inhabit the soil -- precisely the environment in which many of the Earth's basic recycling processes and most crucial geochemical processes take place. These processes are crucial to maintaining the Earth's life support systems -- they affect the composition of our atmosphere and they clean our water. There is also increasing evidence that complex ecosystems are generally more stable than simpler systems, and more resistant to the stress of external perturbations.

The relation between biological diversity and ecological stability highlights the linkages that occur among the organisms in an ecosystem, and this leads inevitably to conservation efforts focused on natural communities rather than on individual species. The Endangered Species Act and other early approaches have placed in the spotlight last-ditch efforts to save single, and often charismatic species, but the interconnectedness of ecosystems requires a more holistic approach. The spotted owl is merely the icon for a broader issue -- the preservation of old growth forests in the Pacific Northwest. The need for a more ecosystem-oriented approach to conservation, and more accurate and systematically collected data, are clear priorities.

Biological Diversity and Habitats of the Chicago Area

In the Chicago area, the patchwork of local ecosystems owes its existence to a particular combination of existing climatic conditions, together with the late glacial history of the region over the last 14,000 years. The result is an extraordinarily diverse biota. The Indiana Dunes National Lakeshore for example, is home to about 1,400 native plant species and ranks third on the list of botanically most diverse national parks -- behind the Great Smoky Mountains and the Grand Canyon -- despite the fact that it has less than a 30th the acreage of either of these parks. The native flora of the Indiana Dunes National Lakeshore is about the same size as the native flora of the entire British Isles. Birds, amphibians and reptiles also show impressively high levels of diversity in northeastern Illinois.

In the wetlands of northeastern Illinois, the Illinois plant information network records 500-600 native species, while in Illinois forests there are about 700 forest associated species and about 100 species of native trees. By comparison, the number of species of trees in the British flora even at a generous estimate is about 30. The Chicago region is also richly endowed with an exceptional variety of globally endangered prairie types that are home to 400-500 native plant species.

With the information currently available we have to accept that the high diversity of plants, birds and other vertebrate animals provides a good indication of the diversity of other organisms in the region. This is probably a safe working assumption but it is nevertheless illustrative of our ignorance. Even for Illinois -- one of the most intensively surveyed states in the nation -- comparable data for organisms such as insects and fungi, are simply not available. Ironically, many of these groups may be more sensitive indicators of environmental health than the larger and more conspicuous plants and birds.

For example, one of the projects currently underway at the Field Museum is an intensive effort to develop a computerized data base and check list of Illinois macrofungi -- based on the extensive collections at the Field Museum and elsewhere. Because fungi are crucial to many vital processes in the soil they provide a useful index of ecosystem health, and in Europe there is a recent well-documented decline in fungal populations. No comparable data exists in North America despite the fact that fungi through their mycorrhizal associations with root systems are critical to the health and survival of many Illinois tree species. Increased knowledge of trends in the fungal flora will be useful for monitoring trends in soil, airborne and groundwater pollutants.

The Changing Environment of Northeastern Illinois

Given this diversity of habitats and organisms, what then is the current status of biological diversity in northeastern Illinois? The National Biological Service is in the process of completing a status and trends report on the biological diversity of the nation, but the State of Illinois has just completed its own analysis of trends in the Illinois Environment with the publication in late 1994 of "The Changing Illinois Environment: Critical Trends."

This report is an outcome of Governor Edgar's Critical Trends Assessment Project undertaken by the Illinois Department of Energy and Natural Resources and the Nature of Illinois Foundation. It drew three conclusions:

i) the amount of regulated pollutants dispersed into the Illinois environment, particularly from point sources, has declined over the last 20 years.

ii) the condition of natural ecosystems in Illinois is rapidly declining as a result of fragmentation and ongoing stress.

iii) data designed to monitor to compliance with environmental regulations, or to assess the status of specific species are insufficient to assess ecosystem health statewide. In terms of ecological systems and biological diversity the report concludes that: "Illinois is moving from complex natural systems toward simple ones, from stable systems toward unstable ones, from native species toward non-native ones, from integrated systems toward fragmented ones, and from self-sustaining systems toward managed ones."

In terms of overall land use, the predominant historical pattern in Illinois is from unmanaged complex systems to managed simpler systems. Instead of rich woodlands, prairies and wetlands we have agricultural monocultures that are ecological deserts, and instead of the complexity of natural rivers and streams we have the simplicity of canalized, leveed and dammed watercourses. With increasing simplicity of habitats, animals and plants that are ecological specialists have disappeared, and over most of the state we have the development of a "generic" Illinois biota dominated by carp, starlings, deer and generalist weeds.

For those natural habitats that do remain in northeastern Illinois the greatest threat is further habitat fragmentation, as urbanization increasingly competes with agriculture for available land. In northeastern Illinois these problems are particularly acute, and the automobile is accelerating the movement of the population into what the United States census calls "urbanized areas" on the fringes of cities. In 1990, 37% of the State's population lived in these urbanized areas -- a number more or less equal to the population living in central cities. In the 1950's and 1960's the population of Chicago's collar counties showed a 61% and 35% increase in population respectively. Growth rates declined to about 18% in the 1980's but in the two decades 1970 to 1990 the Northeastern Illinois planning commission estimated that the combined population of Cook, DuPage, Lake, Kane, McHenry and Will counties grew by 4%, while the area of urbanized land expanded by 51% -- a net land consumption of more than 360,000 acres. Through the same period the number of vehicle miles driven in Illinois increased nearly 50% from 55 billion to 81 billion. Modern urbanization shows a striking trend towards more driving and more space per person.

These patterns of land use are merely the continuing manifestation of a long established trend of large-scale natural habitat reduction and fragmentation in the mid-continent. In 1820, at least 60% of Illinois land area was grassland -- now, barely 2,400 acres remain and the parcels of land are generally small. 80% of the State's 253 prairie remnants are smaller than 10 acres, and 30% are smaller than one acre.

The pattern is similar with woodlands. In 1820, 30% of Illinois was covered by forests -- a total of 13.8 million acres. Today only 11,600 acres -- less than 1% of the pre-settlement forests -- are left. Again, those that survive are typically in small lots -- on average around 20 acres or less. In wetlands, it is estimated that about one tenth of the original Illinois land area remains.

The consequences of such reductions in natural habitats have been severe. 117 of the 497 plant species considered endangered or threatened in Illinois occur on prairies, and this number includes plants such as the prairie white fringed orchid (*Platanthera leucophaea*) that are threatened or endangered at the Federal level. Similarly, 60% of Illinois birds and 80% of Illinois mammals and amphibians need forested land for at least part of their life cycles. 28 of the 37 species of snakes in Illinois occur in wetlands.

Overall, the effect of fragmenting natural ecosystems has negative implications for biological diversity at many levels. Most obviously, many plants and animals, such as the bison, may need relatively large areas for completion of their life cycle, and reduced population size also increases the probability that particular species will be extirpated by chance natural events. However, there are also more subtle negative effects of small habitat size. The effects on the genetic structure of populations of Illinois organisms is largely unknown. Many natural processes, such as lightning-induced fires, need large areas in which to operate in a self-sustaining way, and managed burns may themselves affect the structure and composition of prairie communities in ways that are not always desirable.

Perhaps most significantly, reduction in size, increases the ratio of community edge to community area. Increased edge effects make ecosystems more vulnerable to invasion by exotic species, especially non-native plants and animals. They also increase the vulnerability of conserved areas to non-biotic factors such as agricultural run-off, dumping of waste, and changes in drainage patterns. It is not difficult to find examples.

Most prairie ecosystems are nitrogen limited, and in general, areas that are deficient in nutrients for at least part of the year support a higher diversity of plants than more nutrient rich locales. Nitrogen pollution that artificially elevates nutrient status -- either as a result of run-off from agricultural fertilizers or wind dispersal of nitrogen hydrides or oxides -- alters the competitive balance between species and allows a few species to dominate at the expense of many others.

Similar problems apply to fens and bogs in the Chicago area, both of which depend on the maintenance of specific water chemistry (alkaline and acid respectively) to assure the survival of the specialized and often small and isolated populations of plants and animals that occur in these habitats.

In northeastern Illinois there are also many examples of the devastating ecological effects of non-native species. In Lake Michigan itself, for example, the opening of navigation channels to the Atlantic Ocean allowed the introduction of the alewives and the parasitic sea lamprey. The lamprey decimated the natural predators and led to the massive explosion in populations of alewives in the 1950's. The combined effect was to devastate the indigenous fish fauna.

Similar problems occur in terrestrial habitats. Daylilies (*Hemerocallis fulva*) and teasels (*Dipsacus laciniatus*) are problems on many prairie sites, and in both prairies and woodlands the common buckthorn (*Rhamnus cathartica*) is a pernicious weed that is difficult to control. In local wetlands, purple loosestrife is rampant. In 1955 loosestrife was known only from five Illinois counties but by 1985 it had spread to at least 25. Nationwide, the annual estimated cost of loosestrife to wildlife management and agriculture is estimated at about $45 million. All of these non-native plants alter the structure and composition of natural communities, they choke out native species and they reduce overall biological diversity. Similar effects may be mediated by exotic animals. Examples include various introduced insect pests such as the gypsy moth, elm bark beetle, and the pine shoot beetle. The decline in populations of prairie-chickens is also widely attributed to the introduction of ring-necked pheasants.

Conclusions

The issues raised here impinge directly on questions of public policy, including transportation and planning issues which are outside the expertise of Field Museum science. However, from an ecological perspective there are three clear conclusions:

i) The future emphasis of conservation efforts needs to be on ecosystems rather than individual species, and as this approach is adopted it is important to keep in mind several basic ecological principles. Natural systems are open and continuously changing -- they never reach equilibrium as organisms themselves unwittingly modify their own environment. Therefore, approaches to conservation that are intolerant of change are doomed to failure, and knowledge of the history of a site will contribute immeasurably to understanding current status. If the aim of a conservation strategy is to hold an ecosystem in a more or less constant state for any length of time it will require a continuous, ongoing, management effort.

ii) Linkages are extensive in ecological landscapes and do not respect administrative boundaries that we construct for our own convenience. No ecosystem is an island and interconnectedness occurs at a variety of scales ranging from organisms to ecosystems. Because of these linkages indirect effects can be as significant as direct effects in the functioning of ecosystems -- and thus perturbations at one level can frequently have unforeseen consequences through a cascade of intermediate effects.

iii) Decisions on conservation priorities and strategies need to be made on better data that is systematically collected and that provides clear insights into the status and trends of the biota. In particular, because the first signs of environmental stress are frequently detectable at the level of populations, acquiring quantifiable, standardized, population data should be an important priority. Such data are rarely available--even for those groups of organisms that have been studied most intensively.

The City of Chicago, and ultimately the surrounding areas, were built on the biological wealth of the midwest -- especially its fertile soils and its extensive forests. Over the last 170 years most of the natural environments in the metropolitan area have been taken - but there is still much that is worth conserving within a 50 mile radius of Grant Park. The pressures that threaten destruction are still there, but there is also the hope that the modern metropolis is ready to give something back. Accessible and healthy ecosystems and natural communities are a key component of a healthy society. The Field Museum is committed to the development of a sustainable relationship between modern society's needs and the natural communities of the region to enrich the quality of life for all citizens in the Chicago area.

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PERSPECTIVE - ANTHROPOLOGY AT THE FIELD MUSEUM

Anthropology at The Field Museum is seeking to re-define the curriculum of museum anthropology to encompass the growing needs of contemporary society, ranging from education to entertainment. In keeping with this ambitious agenda, its staff includes seven curators, with eighty-eight adjunct curators and research associates; several million objects with 600,000 catalogued items in its collections; and seventy-five interns and volunteers. It has an excellent conservation and collections management team with a registrar in charge of records keeping. In addition, through the Museum's Center for Cultural Understanding and Change (CCUC), the Department has an ongoing relationship with a highly diverse public. The Department of Anthropology undertakes scholarly research in the field and with collections, trains students, guides exhibit development, and provides programs of the highest quality to captivate its audience and educate them on the diversity of world cultures.

1. INTRODUCTION - ANTHROPOLOGY MUSEUMS IN THE MODERN WORLD

The Field Museum is a leader in defining the new roles of anthropological museums in the modern world. While people still come to museums to see the world's cultural wonders, today museums also help make the diversity of the world's peoples more relevant and more directly intelligible in terms of their visitor's lives. The emphasis is less on a catalogue of exotic, and often extinct, ways of life and more on culture as a process manifested in networks of connections among humans, and humans and environments. Museums have the responsibility to use their collections and research to illuminate milestones in human history, to explain human diversity, to explore cultural differences and similarities and to map connections across space and time. While many objects in museum collections may be enjoyed for their artistic qualities alone, many others need to be placed in a broader context for their significance to be appreciated. An important way to develop such a context is through collaboration with the people whose ways of life are directly connected to the objects museums exhibit. In this manner collections may better tell meaningful stories and, in so doing, serve as a vehicle for a richer understanding of the human condition.

Anthropological museums, such as the Field Museum, can play a vital role in the modern world, in which the social fabric is being strained by rapidly changing global patterns in settlements, economics, demography and technology. Anthropology has insights to offer from both the past and the present as people from all walks of life struggle to better understand and cope with changes around them. Contemporary anthropological research covers an impressive array of important contemporary subjects including family violence, poverty, homelessness, population growth, deforestation and ethnic warfare. Cultural anthropology shows how identities (national, racial, ethnic) for which people are willing to fight wars are not inherent in society. They are created in response to a multiplicity of circumstances through a selective operation of historical and cultural factors premised on boundaries and exclusions. Archaeology shows how migration has long been one of the cornerstones of cultural change and provides an important historical perspective in current debates on immigration. Given that pluralism is a modern day imperative, anthropology has important lessons for a world needing education and seeking to redefine modern citizenship. This is a powerful mission for The Field Museum, enabling it to build on the strengths of a marvelous venue where a broad cross section of the public comes to learn about the diversity of the world's peoples.

2. THE ORIGIN AND EVOLUTION OF ANTHROPOLOGY

The beginnings of scientific anthropology lie at the encounter between European and non-European societies. In the era of global exploration and European colonialism, Europeans were astonished at the diversity of human societies they came across in their travels. The discipline of anthropology was created to study these unknown societies. Early anthropologists were inspired by the mission of recording the customs, beliefs and material artifacts of each society. Their descriptions added chapters to the encyclopedia of human life they were compiling. When anthropologists saw the rapid changes

these societies experienced through contact with Europe, their mission gained additional impetus. Soon they were recording ways of life that were fast becoming extinct.

These are the early foundations of anthropology. There now is a rich store of snapshot views of societies in history. However, anthropology has since become a more sophisticated discipline within the social sciences and humanities. This sophistication has come with the understanding that the adaptability of human behavior is more important to the continuation of society than discrete customs, beliefs or artifacts. It is the unique interaction of humans with social environments and natural habitats that creates different life ways. Furthermore, humans adapt to change, modifying their societies with their changing practices.

Anthropology now studies these changing life ways, understood as "cultures," that humans create in their natural and social habitats. Its central goal is no longer the encyclopedic recording of peoples and lifestyles. Instead it seeks to provide explanations for human cultural and biological diversity and change. The greatest strength of the discipline is its comparative approach - its ability to look across cultures and across time to understand the similarities and differences among human societies. The division of anthropology into physical anthropology (study of human biology and origins), archaeology (study of past cultures), linguistics (study of language in social context) and social anthropology (study of contemporary and historical peoples) has divided this mission into manageable tasks.

Anthropology at The Field Museum emerged within this context. Starting with the Colombian Exposition of 1893 when the Field Museum was created to conserve natural and cultural treasures for the future, the Department of Anthropology has evolved into a dynamic center of research. Museum anthropologists now study cultures as they interact and change across space and time. In addition, the Department continues to be responsible for stewardship of the Museum's collections and for use of these collections in both teaching and research. The Department also remains committed to using the Museum as a forum for communicating anthropology to the broadest possible audience.

2. ANTHROPOLOGY AT THE FIELD MUSEUM

2.1 History

Anthropology has been a core science at The Field Museum since the Colombian Exposition of 1893. Frederic Putnam, the father of American archaeology and the driving force behind the Exposition, passionately argued that the Exposition would be a "perfect exhibition of the past and present peoples of America and thus make an important contribution to science . . . which will be the first bringing together on a grand scale of representatives of the peoples who were living on the continent when it was discovered by Columbus." The Colombian Exposition fulfilled Putnam's vision of a grand exhibition of cultures from the Americas and beyond, illustrating the archaeology, and social and physical anthropology of the world's peoples. As a result, Putnam persuaded prominent Chicagoans to take advantage of the collection of cultural and natural treasures in their city by building a museum to preserve and showcase them.

At the time of the 1894 opening of the Field Colombian Museum the anthropology collections consisted of approximately 50,000 objects, most of which came from the Americas. In the following decades the collections swelled through regular expeditions and further acquisitions of objects by Museum curators. In the early part of the twentieth century the Department of Anthropology became firmly established as a major center of research on cultures of the New World. It simultaneously expanded its geographic scope with a series of research and collecting expeditions to such diverse parts of the world as China, Iraq, Madagascar, Angola, the Philippines, and the Southwest Pacific. A major result of this long tradition of collecting and fieldwork is an enormously rich and scientifically significant anthropological collection at The Field Museum. It currently numbers 600,000 catalogued items representing several million artifacts from the American Southwest, Midwest, and Northwest Coast, as well as Alaska, Mexico, Central America, the Andes, East Asia, Southwest Asia, the Middle East,

Oceania and Africa. Today the collection is the focus of research by the Museum's curators and a wide array of outside scholars, historians, artists and craftspeople.

The role of The Field Museum as a leader in 20th century anthropology is perhaps best illustrated by the work of Paul Martin, Curator of American Ethnography and Archaeology for nearly fifty years. Martin led a series of field expeditions from the 1920s to the 1970s during which he conducted a succession of major surveys and excavations to define the ancient cultures of the American Southwest. His many publications in Fieldiana stand today as definitive background resources for archaeologists working in the area. Martin's research program was notable not only for the depth and quality of his field work, but also for the students he trained. Working closely with the University of Chicago, Martin trained a cohort of young archaeologists in the 1960s who pioneered a revolution in the discipline. The "New Archaeology" shifted the focus of archaeology as it was then practiced from the narrow study of ancient artifacts to the study and explanation of the evolution of past cultural systems. Martin's field program served as a laboratory for testing and proving the basic tenets of the "New Archaeology" and in many ways still serves to define the central core of archaeological theory.

The present generation of anthropologists at the Field Museum, following in the tradition of Martin, is also actively involved in formulating and testing contemporary theories of human behavior and offering insights into human history. Their research is best grouped under the four leading questions of anthropology.

What is Culture?
Although anthropologists study "culture," the term is difficult to rigorously define. Indeed, two famous anthropologists once counted 158 definitions of culture in use by social and behavioral scientists. Nonetheless, culture is a crucial concept to grasp in order to understand the social processes at work in our lives. A central tenet of culture is that there is a system to the beliefs, feelings and survival strategies each human group develops in response to needs of livelihood and expression. Parts of each system are passed down from generation to generation as guides for living life within a particular human group and habitat. While we may be conscious of some parts of this system, and these may be manifested in our material culture, it is mostly implicit in our behavior. Moreover, cultural systems give our lives predictability and a degree of continuity with those who came before us. However, cultural forms are not fixed and changeless, nor do they converge on universally accepted patterns of behavior. Each society includes people with contradictory viewpoints, competing values and diverse ways of behaving. In trying to work through these differences, people continually re–work their way of life — both perpetuating culture and changing it through their social actions.

As a result, Field Museum anthropologists pay close attention to human interactions, both in the past and the present. In particular, though, they are especially concerned with objects and materials from past and present cultures that document tremendous social interaction and exchange. Through the study of material culture, Museum anthropologists contribute important perspectives on questions of why and how human groups produce particular ways of life within their particular settings.

What is the relationship of Culture to Nature?
Understanding the relationship between cultural systems and their natural environment is one of the primary goals of anthropology, but this is a particularly important research topic in a biologically-oriented museum. In the same way, Field Museum biologists are equally concerned with cultural issues as they relate to contemporary concerns about environmental stewardship. As the world faces rapid loss or degradation of natural resources, it is important to understand and explain more fully the complex relationship between humans and the natural world around them. One must be careful not to assume simple deterministic links between culture and nature. Culture is not solely "determined" by the natural environment, as similar conditions have given rise to different cultures. However, environmental variables, such as, climate, geography, local flora and fauna may strongly influence cultural development. By assuming a two-way relationship between culture and nature, anthropologists study the cultural ways by which humans utilize nature. The questions posed by Field Museum anthropologists include: what part does environment, particularly the availability of resources, play

in the creation of particular life ways? how is the environment changed through human activity? how do humans change their ways of life to cope with environmental change?

Why does Culture Change?
Modern *Homo sapiens* have existed for more than 200,000 years. For the first 185,000 of those years, all of humanity was organized into fairly simple and small groups of hunters and gatherers. As the population increased in size, and the environment changed at the end of the last glaciation, human cultural systems began to evolve. Economic systems changed as hunting and gathering gave way in many areas to agricultural lifestyles with the domestication of plants and animals. As people settled, they formed villages which later coalesced into cities. Consequently, societies became more populous, divisions and specialization in labor increased, and political systems emerged. Thus, over a relatively short period of time, global patterns of cultural evolution can be discerned as individual societies changed and adapted to varying historical, environmental and demographic circumstances. In some areas, the nomadic lifestyle of hunting and gathering continued to be highly successful, having thrived for millennia, although it too was altered through interaction with settlements. In other areas, local conditions encouraged the development of more complex societies that culminated in the emergence of the early civilizations of in Mesopotamia, China, Egypt, India, Mesoamerica and Peru.

In the past, scholars placed these societies on a single, evolutionary trajectory, from simple to complex, and located each on a gradient somewhere between rude savagery and Western civilization. However, as in interpretations of biological evolution, such evaluative perspectives are now rejected as scientifically unsound. Diverse cultural systems and diverse organisms cannot be ordered into a linear sequence that represents "progress" in any objective sense; rather, each is but one alternative in a very broad evolutionary spectrum.

In contrast to biological evolution where natural selection predominates as the engine of change, cultural evolution entails directed change through human action. The study of the long term development of cultural complexity is the focus of much of the research undertaken by anthropologists at The Field Museum. Museum anthropologists study the growth of complex cultural systems in North and South America, Africa, China and Oceania. Within each of these areas, their research is addressing a broad range of issues, such as the impact of environmental change on human society, the changing patterns of political economy, the causes and consequences of warfare, and the persistence of some cultural systems in the face of change in others.

How Do We Understand Cultural Similarities and Differences?
To understand human history, we must understand how a way of life evolves and is maintained. Towards that end we study human behavior, the interaction between humans and nature, and processes of change. However, even this multi–faceted approach provides only a piecemeal understanding of culture. What is needed is an intellectual framework to help bring these parts together and allow culture to be understood as a dynamic process. The approach of the Museum's new exhibit "Living Together: Common Concerns, Different Responses" provides the framework for all anthropological research at The Field Museum. It allows Museum anthropologists to use similarities and differences among peoples as the means to convey culture as a process to Museum visitors. In so doing they bring anthropology to a broad public audience with the overall aim of reducing the gap that visitors place between themselves and the cultures on exhibit at The Field Museum.

Museum anthropologists start with the assumption that all human beings have common concerns, such as the need for food and shelter, the need to establish their identity, and the need for social organization to accomplish tasks. Different environments permit a range of different life ways while these environments are continually changed through human interactions and applications. Furthermore, each human group has a guide for living life provided by those who have come before them. People draw on their changing environments and their cultural histories in meeting their day-to-day and longer term concerns, thereby, both perpetuating culture as well as molding it to the specifics of their lives. The spatial and temporal particularities of this common process give rise to both cultural differences and similarities.

Field Museum anthropologists would like visitors to keep this framework in mind as they walk through The Museum's exhibit halls. This simple but powerful set of linkages aims to encourage viewers to see how they themselves are part of the cultural process, that is, how their everyday lives produce and change culture, while seemingly "exotic" practices elsewhere address familiar concerns.

2.2 Researchers

Ben Bronson, Curator of Asian Archaeology and Ethnology, studies the evolution of technology and trade in ancient Asia. He has collaborated with other specialists in studying early metallurgy in southeast Asia and China. Along with **Chuimei Ho**, Adjunct Curator, he has analyzed excavations conducted by The Field Museum and the Thai Fine Arts Department at ancient seaports in southern Thailand. Bronson and Ho are currently involved in a three-year project in Southeast China studying early ceramic and metal industries. This project includes work on Museum collections such as Chinese and Japanese bronze objects dating between AD 1400-1900, East and Southeast Asian textiles, and early glass and glaze chemistry. Through his work, Bronson is uncovering ancient trade routes and connections between widely separated societies.

Jonathan Haas, MacArthur Curator of North American Anthropology, and his colleague, **Winifred Creamer**, Adjunct Curator, study the evolution of cultures in the American southwest. They are looking at the effects of European contact and colonialism on the Pueblo peoples of northern New Mexico between about AD 1500-1600. Headquartered in Santa Fe, New Mexico for the past ten years, they have been mapping and excavating large Pueblo ruins occupied just before and after the arrival of the Spaniards in 1540. By examining the archaeological and ethnohistorical records of the area, they are gaining new insights into the effects of Old World disease and regional warfare on the Pueblo peoples - the factors influencing cultural change at the interaction of two complex societies. As part of this research effort Haas has begun a long term project to inventory, catalog, and analyze the Paul Martin collections from the American Southwest housed at the Museum.

Chapurukha Kusimba, Assistant Curator of African Archaeology and Ethnology, studies the influence of technology, trade and urbanism on the pre-colonial Kenyan Coast, specifically on the development of complex Swahili polities in the East African coast between AD 700-1500. With a focus on iron production, Kusimba is showing how early Indian Ocean trade was the conduit for the transfer of technologies among East African, Middle Eastern, and South Asian peoples. Interaction through trade provided the stimulus for technical innovations and economic profit for these societies and considerably transformed the social and cultural landscape of the African coast. His research tests the role of technology in the expansion of local craft production and, subsequently, in the acquisition of power by elites within Swahili polities. Kusimba has also begun intensive collection–based studies of the African collections at The Field Museum.

David Reese, Adjunct Curator of Archaeozoology, has several projects focused in the Mediterranean. One major project is the analysis of bones and shells from American excavations on the East Palatine, near the Coliseum and Roman Forum. Another is the completion of papers on the shells and fish from Pompeii and Herculaneum. His ongoing work includes research on faunal remains from Greece, Italy, Cyprus, Jordan, Syria, Lebanon, Egypt, Iraq, Iran and Kenya.

Anna Roosevelt, Curator of Archaeology, works on human ecology and cultural evolution in Amazonia, particularly the changing relationships of humans with their environments. Since 1983, she has conducted extensive, multi-disciplinary research in the Brazilian Amazon uncovering a long sequence of human occupation there. Roosevelt and her colleagues found that the first humans to have arrived there some 11,000 years ago were cave painting Paleoindians who subsisted on forest fruits, fish, shellfish and game. As farming started, by AD 1000 they had settled in towns and built large earthworks. These people were also engaged in long distance trade of their fine crafts and struggles over political control. Roosevelt's work has revised our understanding of Amazonian prehistory and has provided insights for conservation and planning in tropical rain forests by revealing how high density populations managed to use its fragile ecosystem sustainably.

Charles Stanish, Associate Curator of Middle and South American Archaeology and Ethnology, studies the evolution of complex societies in the Andean highlands, specifically the Lake Titicaca Basin of southern Peru and Bolivia. He currently oversees two projects, one on the Peruvian side of the lake and the second on the Island of the Sun, on the Bolivian side. His research team has discovered more than 1,000 archaeological sites in the past six years and has excavated almost one dozen of these. This work is contributing to the understanding of the evolution of complex agricultural systems, the rise and collapse of ancient empires, the development of imperial ritual centers, and the interaction of humans and environment in the region - particularly through the impact of settlement patterns, agriculture and horticulture on local ecosystems. As part of his work, Stanish is also conducting research on several collections of Inca and older materials in the Museum.

John Terrell, Curator of Oceanic Archeology and Ethnology, studies the human biogeography of Pacific Island societies in collaboration with **Robert L. Welsch**, Adjunct Curator of Melanesian and Southeast Asian Ethnology, and a multidisciplinary research team - The Field Museum's New Guinea Research Program. Using the A.B. Lewis materials, a major Field Museum collection from 1910-1913, as baseline data to study variation and change over time in the Sepik coast of New Guinea, Terrell and his colleagues have challenged conventional perceptions of the isolation of Melanesian cultures. They have shown that despite their linguistic diversity, Sepik communities have had close and frequent communication with one another through trade relations and patterns of "inherited friendships," probably since pre-historic times. Terrell and Welsch have also collected several thousand cultural objects that have been added to the Museum's extensive Pacific collections.

Alaka Wali, Associate Curator of Circum–Caribbean and Central America, and Director of the Center for Cultural Understanding and Change (CCUC), studies the impact of global economic restructuring on the ways in which people organize themselves and constitute their social identities. As an applied anthropologist, Wali uses the results of her research to formulate more humane solutions to social problems. In Central and South America, she studied how indigenous peoples confronted massive disruption to their use of land and resources as a result of national development projects. In the United States, through a collaborative project in Harlem, New York, Wali researched the obstacles to health services for economically disadvantaged groups. In both projects Wali has made novel use of the techniques of cultural ecology to suggest ways in which local social forms and cultural strategies can be incorporated into grass-roots empowerment programs. Currently Wali is investigating women's artistic vision in textiles from Panama and Guatemala in the Museum's collections.

2.3 Collections Management and Conservation

The Department of Anthropology holds extensive collections of archaeological and ethnographic materials from all over the world. These collections are used for research, exhibit, and educational purposes. They are cared for by a highly trained staff of collection managers and conservators.

Collections management is responsible for ensuring the Anthropology collections are properly maintained and accessible for research and exhibit purposes. Working closely with curators and conservators, the collection management staff oversees the handling, storage, movement and inventory of all objects, as well as the maintenance of appropriate conditions in the storerooms. Their duties include maintaining an extensive computer database so that objects may be easily located.

Research and exhibit use can often result in damage to artifacts. Unless they are in good condition, objects cannot be handled, loaned, or exhibited without resulting in further deterioration. It is the responsibility of the curators and the conservation staff to oversee the well-being of objects and to ensure their preservation while at the same time encouraging their use. Although such maintenance involves repairing damage, more frequently it involves preventing damage by providing ideal environmental conditions and housing for objects.

Catherine Sease, Head of Conservation and Collections Management, is an archaeological conservator who has worked on numerous excavations throughout the Mediterranean and the Middle East. Her current writing project draws on her extensive field research in defining the ethics, philosophy and

methodology of archaeological conservation that together with her previous publications, will serve as an invaluable reference for conservators and archaeologists. Within the Museum, Sease works with ethnographic, as well as archaeological objects. Her research focuses on the nature of materials and the technology involved in turning them into artifacts. She is currently involved in a major study of filiform sulphide corrosion on Tibetan silver. Exhibit-related conservation issues form another aspect of her research. Recent projects include the development of two new technologies to ensure the appropriate environmental conditions for objects on exhibit.

2.4 Registration

The Registrar is responsible for overseeing the policies and procedures relating to the acquisition, movement and disposition of the Museum's collections. In dealing with acquisitions, it is important not only to physically identify the objects with the appropriate record system, but to create and maintain the intellectual and legal documentation that is necessary to make the collection usable by staff and outside researchers. In processing loans of objects in and out of the Museum, the Registrar's Office handles all contractual arrangements, as well as insurance, packing and shipping of the loan objects. This involves the use of specialized materials and techniques to ensure the well-being of the Museum's irreplaceable collection. The Registrar is also involved in providing information from the collections records and archives for researchers. She has been active in formulating the Museum's response to the Native American Graves Protection and Repatriation Act (NAGPRA), and other repatriation requests (see 3.2, below).

Janice Klein, Registrar, has an academic background in prehistoric European archaeology and has been involved in field work in various parts of Great Britain. More recently she has been involved in developing and disseminating museum professional standards for collections care. She serves as Chair of the National Registrars Committee, a Standing Professional Committee of American Association of Museums (AAM) and as Chair of the Standing Professional Committee Council, which acts in an advisory capacity to the AAM's Board of Directors.

3. OUTREACH AND EDUCATION

3.1 Academic Programs

In 1987, discussions were initiated concerning the possibility of The Field Museum's Anthropology Department working more closely with its counterpart at the University of Illinois at Chicago (UIC) to engage an unusually wide spectrum of ethnic and social groups in anthropological research. These discussions resulted in UIC's anthropology department requesting authority from the University and the State of Illinois to set up a joint Ph.D. program. Close cooperation with The Field Museum, specifically training by Museum anthropologists and research on collections, was offered as a primary reason why this program would fill a unique niche in the world of university education. In January 1995, the Illinois Board of Higher Education granted permission for the program to be established. Currently, The Field Museum's anthropology curators have adjunct professorial status at UIC and may head doctoral committees. In a reciprocal arrangement, interested anthropologists at the University may have adjunct curatorial status at the Museum.

The Field Museum Department of Anthropology continues to maintain close ties with other Chicago-area universities, and Museum anthropologists are adjunct faculty at several of these institutions. Concurrently, students from a variety of universities work as interns in the Museum. However, the new collaborative effort with UIC enables the Museum to play a central role among anthropologists in the Chicago area in helping to redefine how anthropology can better address local social and environmental concerns.

Based on the expertise of its staff, The Field Museum Department of Anthropology has defined four tracks of training for interested students of anthropology:

Complex Society Archaeology - The Department of Anthropology at The Field Museum offers professional expertise in the development of complex cultural systems - with active research projects in Asia, Sub-Saharan Africa, Highland and Lowland South America and North America.

Cultural Ecology - The Museum offers unique opportunities to conduct inter-disciplinary research with the extensive faculty of the Museum's Center for Evolutionary and Environmental Biology (CEEB) on the interface between humans and environments, biodiversity, and human-generated environmental problems.

Material Culture Studies - Anthropologists at The Field Museum take a contextualized approach to the study of objects to better understand their relevance to everyday life and to the reproduction of particular cultures. They undertake research on accession archives to understand the changing value and meaning of objects as they are taken out of their original contexts and used in diverse museum settings. In addition the Department is a leader in the development of new techniques for object conservation.

Public Anthropology - The Museum has a commitment to interpreting and translating the knowledge of anthropology to a broad public through the Museum's Center for Cultural Understanding and Change, bringing the insights of anthropology to the critical social issues of our time.

3.2 Repatriation at The Field Museum

The Native American Graves Protection and Repatriation Act (NAGPRA), passed by Congress in 1990, mandates museums in the United States to provide information about their Native American collections to the appropriate tribes or organizations. The law also allows tribes to claim human remains and specific types of objects for repatriation. The Department of Anthropology has been an active participant in this process. Even before the law was enacted, the Department was proactive in building positive working relationships with Native American groups and, since 1989, has hosted many visits by tribal representatives and has also sponsored internships for Native American students. In addition to human remains, The Field Museum has returned several objects of cultural or religious importance on a voluntary basis.

An important consequence of NAGPRA has been to further expand the Museum's connections to the diverse public it serves. In many ways NAGPRA is a practical experiment in living with cultural diversity as staff and representatives of Native American tribes engage in dialogue to resolve important issues relating to the Museum's collections.

3.3 Center for Cultural Understanding and Change (CCUC)

In 1993, two interdisciplinary centers, the Center for Cultural Understanding and Change (CCUC) and the Center for Evolutionary and Environmental Biology (CEEB) were established to provide the unifying curriculum and intellectual rallying points for all Museum programs. These centers cut across departments to articulate and facilitate a museum-wide approach to the environmental and cultural issues that confront local and global communities. In essence, these centers help to connect the academic departments to the Museum's diverse publics.

One of the primary objectives of CCUC is the ongoing effort to articulate and act on the connections between The Field Museum's anthropological collections and research, and contemporary societal concerns. Specifically, CCUC seeks to bring an anthropological perspective to the important issues of cultural interaction and change, cultural understanding and the role of cultural factors in environmental stewardship. This approach encourages anthropologists and other scholars at The Field Museum and elsewhere to articulate the relevance of their work, to share their findings and to undertake collaborative research and educational projects that can make the public more sensitive to the dynamic nature of interactions among cultures, and between cultures and nature.

A second major objective of CCUC is to connect The Field Museum to the diverse local community through which it is supported. It does this through advisory groups comprised of interested individuals from educational institutions, civic organizations and businesses. Members of the advisory groups draw on their background, experience and connections to Chicago to advise on Museum projects, assist in involving their communities, and support efforts to promote Field Museum programs. A natural outcome of these increased relations to the Chicago community has been strong community input into exhibit development and education planning. By organizing student internships, research, and public lectures CCUC works to build partnerships between the Department of Anthropology and other academic institutions in the area. By strengthening connections with the local community in Museum activities, the Center's staff has increased visibility and use of the Museum and its resources within Chicago.

A third major objective of CCUC is to help refine The Field Museum's public education curriculum on anthropological issues. In addition to offering more traditional information on "discrete" cultures this refinement will reflect the Museum's and the Department's renewed commitment to show the connections between cultures past and present and between cultural and environmental issues,. The "Living Together" exhibit, scheduled to open in the Fall of 1997, is an important effort in this area and is a pioneering attempt to apply anthropological insights on cultural diversity to inform multicultural education.

Recently, CCUC hosted the Nuveen Forum at the Field Museum. Funded in part by the National Endowment for the Humanities and the John Nuveen Company, the Forum was a part of the Endowment's national initiative, "Conversations on Pluralism and Identity in America." In the Forum series, entitled "Teaching Culture and Cultural Teachings: Conversations on Culture and Identity in America," CCUC brought together anthropologists, other scholars from the social sciences, humanities and natural sciences with civic activists, religious leaders, museum professionals, community members and educators from the Chicago region to converse on questions of “what is pluralism in America?” “what is culture?” “what is identity?” With high public attendance and participation, these conversations generated lively debate and thoughtful accounts on a variety of contemporary issues. In particular, the Nuveen Forum has stimulated the Museum to creatively use its cultural exhibits to address issues, such as race and racism, ethnic identity and multi-culturalism.

3.4 Other Outreach and Education Activities

The active participation of curators is crucial to strong and intellectually well founded programs in public education at The Field Museum. In addition to their responsibilities for teaching, research and management of the Museum's collections, Field Museum anthropologists are connected to public education in numerous ways. Many teach and mentor students and interns, while others engage teams of students in field work, providing them with invaluable hands on experience. Curators also participate as content specialists for temporary and permanent Museum exhibits, performances and festivals. They also aid the Education Department in producing guides and programs for visitors, and conduct volunteer orientation and training. Often, Museum anthropologists lead group tours through exhibits and collections, lending their knowledge to make material objects “come to life.” To disseminate their anthropological work, many curators speak in diverse public settings including schools, Chicago parks, in-house lectures and seminars. They are also increasingly in the public eye through popular publications, television and other media based programs. All of the Curators in the Department participated as panelists for the Nuveen Forum conversations (see 3.3, above).

In the context of the Field Museum’s overall exhibit plan, Department of Anthropology staff have also been engaged in de-installation of older exhibits, interim renovation of the Halls of the Americas and reorganization of both collection and exhibit space. These are routine but vital responsibilities of all Museum personnel working to offer the most updated/absorbing programs to the public while keeping collections in the best possible condition.

5. CONTENT MESSAGES OF ANTHROPOLOGY RESEARCH AT THE FIELD MUSEUM

Some of the important principles of anthropology that The Field Museum seeks to communicate through its exhibits and other educational programs are:

•Humans, as biological beings, are subject to natural laws. Specialized biological features, such as developed brains and hands with opposable thumbs, language and symbolic communication have provided humans with the capacity to develop culture.

•To understand culture as a process, one starts with the assumption that all human beings have common concerns, such as the need for food and shelter, the need to establish their identity and the need for social organization to accomplish tasks. Different environments permit a range of different life ways. Those who have come before also provide a guide for living. People both perpetuate culture and mold it to the specifics of their lives by drawing on natural environments and cultural histories to meet their needs.

•While humans continually pass down learned knowledge from generation to generation, their unique interactions with their social and natural environments produce cultural change and new knowledge.

•Anthropology has shown that in the last 10,000 years human populations have increased dramatically in size. Concomitant to increased population sizes has been the elaboration of cultures over time, through the rise of complex societies and increased urbanization. However, increasing cultural complexity does not necessarily entail "progress."

•Anthropology has uncovered, and continues to uncover, the long and complex cultural histories of all peoples, both past and present, showing how they have interacted with one another continuously and undergone regular change.

•Anthropology at The Field Museum is committed to show its public that culture exists not only in far away places but also directly in people's lives and histories. Through its new exhibits it aims to provide the public with the conceptual framework needed to see culture as a process by which humans forge social connections.

6. CONTENT MESSAGES OF ANTHROPOLOGY EXHIBITS AT THE FIELD MUSEUM

Museum exhibits and education programs are important vehicles in The Field Museum's strategy for increasing knowledge and understanding of the world's peoples. The following are some of the central messages from The Field Museum's cultural exhibits and those that arise from recent anthropological research in related geographic areas. These messages are germane to the development of the Museum's educational programs.

"Inside Ancient Egypt" - "Inside Ancient Egypt" was the first permanent, thematic exhibit installed under the Museum's Centennial program. The exhibit offers visitors the only opportunity outside Egypt to walk through a mastaba and down a tomb shaft. On the lower level, visitors encounter a series of burial group cases explaining Egyptian funereal rites and displaying dozens of mummies and burial objects. The exhibit also includes a Nile marsh with working water bucket, a rare funerary boat, a lively marketplace with many interactive elements and a shrine.

This exhibit marks a break from previous modes of exhibiting culture in that it does not seek to provide a comprehensive introduction to Ancient Egypt. Instead, it gestures to the life ways of people through detailed interpretation of one aspect of their culture. "Inside Ancient Egypt" introduces visitors to Pharaonic Egypt through funerary rites. Visitors learn about Ancient Egypt's highly sophisticated religion, society, daily life, architecture, craftsmanship, technology and history through the lens of what Egyptians did to secure their afterlife. By tracing the changes in funerary rites, notably the democratization of mummification and the burial process that at the outset allowed only for the afterlife of the King, eventually the nobles, and finally all believers, the exhibit presents a concrete

example of cultural change. In following the movement of mummification practices to Greece and Rome, the exhibit shows visitors the pathways of Egyptian influence on the Greco–Roman world.

Given human preoccupation with death and life after death, Ancient Egypt's elaborate physical, architectural, religious and symbolic treatment of death and afterlife provides many vehicles for visitors to use in investigating the subject for themselves. In the process they are encouraged to explore the relevance of life in ancient Egypt to their own.

"Africa" - The "Africa" exhibit is organized into a Senegal street scene including an introduction to Islam and city/country life, an orientation area, Cameroons (grassland) culture, Benin (royal) culture, savannah ecosystems (with megaherbivores), rift valley ecosystems (with a Research Station), the Sahara Desert with Tuareg culture and Kano market, and finally slavery and the worldwide dispersal of African peoples.

With "Africa," the Museum continued its outreach among Chicagoans to connect with a more diverse public and to encourage their participation in exhibit development. "Africa" was produced with a strong, interpretive underpinning designed to undo commonly held stereotypes, for example, that of Africa as "jungle–covered" and "primitive," and as a continent that has contributed no great civilizations or advanced technologies to world history. The exhibit seeks to communicate the spatial diversity and temporal depth of Africa. Depictions of contemporary life in modern African states (Senegal, Cameroon) speak to the cosmopolitanism of African societies. At the same time, history is introduced at regular intervals to educate about the longstanding traditions of African peoples. Visitors are witnesses to the achievements of very advanced precolonial/postcolonial civilizations marked by large settlements, intricate social/political organization, monumental architecture and elaborate craftsmanship (The Benin Empire). History is also used to demonstrate cultural dynamism and to reflect on the change people have undergone while maintaining continuity with their past, for example through the video on the changing use of the Nkondi figure by the Bakongo people. Historical timelines confirm the age–old associations of African peoples to the world through trade, technology exchange, colonialism and later, the slave trade. Throughout, visitors are encouraged to make connections between their lives and those of people across the world, while appreciating the distinctiveness of each cultural and ecological setting.

The last third of the exhibit presents the African diaspora created by the Transatlantic slave trade. The exhibit ends by displaying Africa's legacy for the Americas through its people and enduring elements of its diverse ways of life. It sends visitors home with the powerful message that Africa has had widespread influence on the historical development of the world.

Messages from Research in African Anthropology

•Africa has provided anthropology with the most extensive fossil evidence on the evolution and early migration of modern humans.

•Africa has also provided archaeology with provocative questions on the origins of metal technology, previously believed to have originated in Asia but which, as some scholars now believe, may have begun at an earlier date in Africa. Archaeologists are also involved in studying the influence of the rise of metallurgy on the development of local societies and global trade across the world.

•Cultural anthropology of Africa began under nineteenth century colonial administration. Although initially concerned to study people and their "tribal" affiliations, subsequent rural migration to cities prompted anthropologists to begin the study of social life in urban settings. This gave rise to urban studies, with its strong bent towards understanding forces of change as contrasted with an exclusive focus on lines of continuity.

Asian exhibits - Although The Field Museum does not have a major exhibit on Asia, three small, country–specific exhibits express some important anthropological messages.

"China" - This exhibit focuses on the ancient art of religious puppetry and stresses the importance of imagery and performance in perpetuating culture. Communities come together in worship during performances and ceremonies. The inclusion of an important early Chinese scroll painting of a Madonna and Christ child helps demonstrate the universality of religious expression.

"Tibet" - This exhibit was renovated in 1993 in preparation for the Dalai Lama's visit to Chicago on the centennial anniversary of the 1883 World Parliament of Religions. The north side of the exhibit presents primarily religious and ceremonial artifacts, while the south side displays objects from everyday life. The exhibit provides insights into cultural continuity in that part of the world through the enduring legacy of Buddhism in ritual and daily life. A video theater in the center of the exhibit updates Tibetan Buddhism practices to the present time.

"Japan" - Currently there is a small exhibit of Japanese inro and netsuke, delicately carved ornamental boxes, from the Leslie Collections and the Karl Kroch Inro Collection. These beautiful lacquer arts demonstrate the continuing role played by folklore images and the central ceremonial role of artifacts in Japanese society. The craft specialization is of exceptional workmanship and serves as an early indicator of future Japanese achievements in production and precision manufacturing.

Issues in Asian Anthropology

•Research on the "caste" system in India, the four–tier social structure, with numerous sub-castes, has long contributed to theories of social stratification. More recent research documents the origins of the caste system in the colonial need for classification and organization of a dense web of polities. However, prolonged contact with colonialists through projects such as census and land reform re–organized Indian society, making people vested in identifying with the caste–structure. In these post–colonial times, caste identity has retained its acquired importance.

•The image of Asian countries with burgeoning populations is common in the media but this is rarely accompanied by any context for understanding why there is such rapid population growth. Anthropological research documents that population growth is not arbitrary, nor the consequence of the ignorant behavior of people, but the outcome of long cultural traditions, social factors and economic needs specific to each region of Asia.

•Despite media portrayal of religious movements in Asia as revivalistic or primordial, religious beliefs and behavior are as much shaped by the experience of modernity as other aspects of social life in Asia. Religious expressions are very often syncretic, drawing from other religions and cultures with which they interact in the public sphere. Also, modern forms of communication and transportation have extended the reach of religion into the everyday lives of people.

•Scholarship in Asia has been overly attentive to documenting its pantheon of religions and spiritual ways, underscoring orientalist perceptions of the region as mystical and otherworldly. However, recent archaeological excavations of ancient ports and mills have re–focused attention on Asia as a prominent early site of technological and industrial innovation.

Native American Exhibits

"Maritime Peoples of the Arctic and Northwest Coast" - This exhibit displays an extensive collection of artifacts from the coastal and Arctic peoples of Washington State, Canada, Alaska and Siberia. It is organized into five galleries: environment, food gathering, shelter, spiritual world and art. The east side of the exhibit presents Northwest Coast cultures, and the west side presents Arctic cultures.

The exhibit provides a holistic introduction to the peoples of the Arctic and Northwest Coast through the theme of contrasting adaptation to environment. This is done by following the evolution of their cultures within particular ecological settings, by depicting a full cycle of seasonal activities and by exhibiting a large collection of material culture within the context of use. The collections on exhibit

date to the time of early contact with colonists but the exhibit updates this information with labels and video installations to communicate the current state of a dynamic cultural revival in these areas.

By comparing the cultures exhibited on both sides of the hall, visitors see cultural ecology in action and the complex interaction between peoples and natural settings that create distinct cultural traditions. While the material culture of the environmentally diverse and resource rich Pacific Northwest is imbued with great variety, detail and color, that of the Arctic is much more austere and instrumental. The exhibit also shows that despite their differences, cultures face common concerns for livelihood and expression through similar social organization, religious beliefs and symbolic representation of the world around them. This comparative perspective emphasizes the fact that cultures are much more similar than would appear at first glance.

"North American Indian Halls" - In the past five years, two of the Museum's North American Indian Halls have been closed in preparation for the opening of a new special exhibit gallery. To make available the most important material from these halls and to maximize the public presentation, the best exhibit cases from these two halls have been retained and combined with existing material to make a cogent exhibit on Plains, Southwest and North American pre-history.

The current exhibit begins with a grouping of cases on the material culture of tribes from the Plains and surrounding intermontane areas, that serves as a physical and cultural transition between the material from the Woodlands and Prairies. The front of the hall is devoted to historic ethnographic materials from southwestern tribes, and begins with exhibits on the Pueblo Indians, then moves to the Navajo, Apache, Yuma and Mohave. The last few ethnographic cases are of Pomo material from California. The second section of the hall focuses on the prehistoric past of North America with the recently remounted Hopewell cases on one side and chronologically more recent materials on the other. From the front to back the exhibit moves back in time and ends with PaleoIndian material from 10,000 years ago. The cases in this area are a mix of culture areas including the southeastern and southwestern United States.

"Indians of the Woodlands and Prairies" - This exhibit houses artifacts from Indians of the Eastern United States and Canada and is organized geographically. It includes the Pawnee Earth Lodge, a full size reproduction of a 19th century earth dwelling,

Messages from Research in North American Anthropology

•At the time the Halls of the Americas were designed, American researchers practiced "salvage" anthropology. Anxious that contact with outsiders and subsequent change was wiping out traditional Native American ways of life, anthropologists set out to record as much as possible about the artifacts, languages and cultures of American Indian groups before it was too late. Their collecting work was helped by a frequently oversimplified geographic approach to cultural regions. Modern research, however, shows that the complexity and dynamics of the cultural situation, which resides in people's relationships to one another and is perpetuated through social interaction, was not fully appreciated by this approach. Today modern representations of cultures must put people at the center of cultural activity and include the dynamic nature of cultural change. The Field Museum has attempted to update its representations of indigenous peoples of the Americas through the Webber Resource Center that houses reference materials (books, journals, videos and audio tapes) on the living cultures of today, their histories and present situations.

•Cultural ecology - the research approach which studies the role of culture as people adapt to their changing physical environments - was first conceived through research among Native American groups. This approach has subsequently become increasingly important as anthropologists have sought to explore how environment influences cultural systems and change, and how humans adapt to environmental change in cultural ways.

•Native Americans today continue to have vibrant and living cultures. These cultures are characterized by tremendous diversity that defies easy categorization. Anthropologists have been

involved in documenting the struggles of contemporary Native Americans in securing their distinct identities and histories through legal, political and economic means.

•It is becoming increasingly clear to anthropologists that the Americas occupy an important role in early human history as the site for rapid migration and diversification of peoples. Inquiry into the conditions under which this occurred holds promise for understanding human diversity.

Central and South American exhibits - The Museum's Central and South American exhibits provide viewers with an introduction to cultures and cultural histories in specific regions of Central and South America through an exposition of their material artifacts, ranging from everyday tools to art objects. Dioramas and photographs of social scenes aid in visualizing the daily lives of peoples.

"Mexico and Central America" -The front portion of the exhibit displays archaeological artifacts divided into five culture regions (Central Highlands - which includes the Aztecs, Northwest, Pacific, Gulf Coast, and Maya). The rear portion contains ethnographic material from modern native groups of Mexico, Guatemala and Panama.

"South America" — This exhibit contains artifacts from South America, mainly from Peru, Chile, Columbia, Brazil and Argentina. These are largely archaeological artifacts from the ancient cultures of the Inca, Chimu and Nazca with some ethnographic objects from contemporary peoples.

Messages from Research in Central and South American Anthropology

•Central and South America, where human settlement extends back thousands of years, are important sites for the anthropological study of human ecology, or the ways in which people have influenced and adapted to the changing environment. Anthropological research extends up to the present when modernization and economic development is disrupting traditional ways of life.

•Contemporary anthropological research has also been involved in documenting the struggle of indigenous peoples in Central and South American for their human rights and cultural identity in the 20th Century.

•The historical representation of the Americas as the "New World" has long been called into question by the archaeological evidence of high civilizations prior to the coming of the Europeans. There is a continuing legacy of these civilizations among living cultures of indigenous peoples today.

•Dependency theory, and its re-formulation in the World Systems theory, grew out of concern for the unequal development of Latin America in contrast to North America. According to World Systems theorists, global economic expansion has drawn all peoples into the capitalist system. World System Theories have been refined by anthropologists who claim that people have not been passive receptors of these ideas and have been engaged in global trade relations long before the onset of capitalism.

•Latin America was the site for much of the early anthropology of gender which first taught scholars to be sensitive to women's place within societies. Through this research it has become clear that women make important contributions to the economies of all cultures and possess considerable political power at many levels. Consequently, households are no longer viewed as undifferentiated entities under the control of men.

"Traveling the Pacific" - "Traveling the Pacific" displays The Field Museum's world renowned collection of Pacific artifacts, assembled by A.B. Lewis and others in the early years of this century. This is a cross–disciplinary exhibit on the natural history and diverse peoples of the Pacific Islands (Melanesia, Micronesia and Polynesia). It begins with an introduction to Pacific geography through a lava theater and themes of island formation. It then explores the question of how natural and human life traveled to the islands. The last two sections of the exhibit are respectively snapshot views of the Huon Gulf in 1910 and a Tahitian village in 1989.

The theme of "Traveling the Pacific" is passage. Through this organizing principle, the exhibit juxtaposes dynamic processes of nature (volcanism and speciation) to culture (exploration, discovery and adaptation). Next, the exhibit introduces visitors to Pacific societies through canoes, vehicles of passage. As we come to understand the importance of canoes to Pacific cultures, we learn about Pacific technology, art, religion and social rituals such as rites of passage in which symbolic representations of canoes abound. We also learn how the ocean was more a passageway for interchange than a barrier to human movement, and was sailed by canoes for exploration, settlement on islands, and interaction with other islands.

"Pacific Spirits" - The "Pacific Spirits" exhibit is divided into sections, each focusing on a single geographic region and a particular theme: Chiefs and Gods (Polynesia); Pigs and Prestige (Vanuatu); Magic for War (Melanesia); Honoring the Dead (New Ireland); Masked Dance (New Britain); Spirit Houses (New Guinea); Pacific Gallery (a space for changing exhibits of our Pacific Collection). The exhibit includes "Rautepupuke II," the Museum's restored Maori meeting house, one of only three outside New Zealand.

"Pacific Spirits," the second component to "Traveling the Pacific" introduces visitors to central organizing themes of Pacific societies. Passage, notably the passage of individuals into successive stages of life, is important and marked by elaborate ceremony. Many arts (sculpture, theater, music and architecture) are used in service of these activities. Ancestors retain an important role in the thoughts of their descendants, and are memorialized in art and oratory. The exhibit also deals with traditional warfare in island societies and modern global wars that have shaped the course of island life in the 20th century. Through these themes, the exhibit is able to communicate some of the diversity of Pacific peoples and the historical changes they have undergone.

Messages from Research in the Anthropology of Pacific Islands

•The Pacific Islands were the basis for the development of anthropology's strongest theories about human relations: exchange theory, the idea that the exchange of goods, services and even people has both economic and cultural implications. Exchange enhances the status of the giver in the eyes of the receiver and the community at large. Exchange helps produce political influence for the giver in societies without chiefs or formal authority structures. Anthropologists have recently introduced a new focus on the role of women as gift givers and receivers in exchange systems to show how women negotiate power within society.

•Research on the Pacific Islands has been foundational in creating the sub-discipline of Economic Anthropology based on the claim that every human society has a distinct and developed economic system. Through its expansion, capitalism has had to accommodate these diverse systems, which have either been undone or integrated within the capitalist mode of production. In other words, the globalization of capitalism has not meant the homogenization of economic practices. Anthropologists study the diverse and changing shape of economic practices within local and global contexts of cultural production.

•There has been considerable cross–disciplinary investigation into the biogeography of the Pacific Islands. Western scholarship has long fostered the view of early human life as a world of closed social aggregates out of contact with other humans. However, instead of seeing the Pacific Islands as remote, undeveloped human colonies scattered across the seas, anthropologists are finding that the Pacific was a notable early sphere of human interactions and accomplishments, on land and sea. The sea served as a passageway for explorers and, later, settlers of these islands, encouraging constant interaction and continual change among Island societies.

The Field Museum, Chicago
Center for Evolutionary and Environmental Biology

PROGRAM THEMES

SYSTEMATICS - THE SCIENCE OF PAST AND PRESENT BIOLOGICAL DIVERSITY

What is Systematics?—Systematics is both the oldest and the most general of all biological subdisciplines. It is fundamentally synthetic, integrating information from all other areas of biology to understand the relationships among living and fossil organisms. In return it provides a comparative framework for biological research — a map of past and present biodiversity — and a standardized reference system of names essential for communication throughout biology. Without systematics all comparative biological or biomedical studies would be scientifically suspect, and communication in biology (and its attendant applied disciplines of agriculture, horticulture and medicine) would be in chaos.

Current Status of Systematics—Systematics is a dynamic science dedicated to exploring the patterns and processes underlying similarities and differences among organisms. Because scientists must always accurately specify the identity of their study organisms, systematics has always been one of the most pervasive of all branches of biology, but in the last decade, the discipline has undergone a striking renaissance initiated by a theoretical and methodological revolution. This revolution substantially improved its rigor, and dealt with several significant philosophical issues formerly blocking progress. In parallel with these advances, there has been the development of increasingly sophisticated computer software for rapid numerical analyses of large or complex data sets, and developments in molecular biology that allow amplification and sequencing of RNA and DNA across a variety of organisms. Taken together, these advances have improved the integration of systematics with modern evolutionary biology and ecology, have attracted a new generation of scholars into the field, and have reoriented the perception of systematics within biology as a whole. Modern systematists view the world's biotic diversity as a single genealogy by which all species, living and extinct, are interconnected. It is the job of the systematist to reconstruct that pattern of relationship—the phylogeny—and this knowledge provides the foundation upon which much of biology is built. The demand for systematic expertise is now greater than at any time in the last 50 years. Not only are systematists in the front-line of crucial environmental concerns, but the schism between molecular and organismal biology is closing rapidly as scientists from both areas come together to more completely explore the basis of biological diversity.

Systematic Research at The Field Museum—Throughout Field Museum's history, the scientific staff has actively engaged in systematic researc, and the institution has maintained the collections making such work possible, both nationally and internationally. The Field Museum is recognized internationally as a leader in the theory of systematic biology, and has world-class systematic biologists working on amphibians, birds, bryozoans, cryptogams, fishes, flowering plants, fungi, insects, mammals, marine snails, mites, octopods and reptiles. The organisms studied by these researchers span the globe geographically and the last billion years temporally. Research efforts in systematics are supported by Field Museum's extensive collections, library, scanning electron microscope facility, computing center, biochemistry laboratories, histology laboratory, functional morphology laboratory and paleomagnetics laboratory. The needs of students at all levels are served through active training programs with area universities and schools. Research in systematics is basic to the work of almost all curatorial faculty, as well as the numerous interdisciplinary programs in which they are engaged.

PROGRAM THEMES

CONSERVATION BIOLOGY

Unquestionably, one of the greatest environmental issues of the 20th Century concerns the rapid disappearance of species worldwide. Current rates of species extinction rival those of the most catastrophic episodes in Earth's four billion-year history. Species loss is particularly great in tropical regions, and while tropical moist forests cover scarcely six percent of the world's land surface, they support about half of all plant and animal species. Many species remain undiscovered and undescribed, and we are ignorant of both their roles in natural communities and their potential uses (e.g., crops or pharmaceutical products). Fewer than 1500 scientists worldwide are trained and equipped to inventory tropical diversity. Currently, less than one percent of the world's fauna and flora is under scientific study.

For nearly a century, Field Museum's departments of Botany and Zoology have inventoried and described global tropical diversity. Encyclopedic collections, extensive libraries, a renowned community of scholars and strong university ties have allowed the Museum to assume a leading role in biodiversity issues. Traditionally, staff activities led to enormous collections and monographic treatises, such as the continuing series Flora of Costa Rica and Flora of Peru or the landmark volumes Living New World Monkeys (Platyrrhini), The Frogs of Sabah and the Flora of Guatemala. Increasingly, however, the activities of curators and other staff focus even more directly on conservation of biological diversity through rapid assessment programs, training courses and the production of rapid field guides.

The impact of Field Museum programs on conservation biology is immediate and extensive. Field Museum botanical and zoological collections document historical range changes and population trends; the collections are also used to locate future parks and reserves. Museum curators, often in multi-disciplinary collaboration, frequently produce the first inventory of species inhabiting tropical parks and are uniquely qualified to formulate species and habitat management recommendations. Museum scientists are also reshaping the conceptual framework of conservation biology by broadening the scope of a discipline rooted in the temperate zone with hard-won data from tropical ecosystems. Ongoing research at Field Museum is extending the theoretical foundations of conservation biology, from a classical focus on how many species are present to include both species composition (which species are present) and evolutionary distinctiveness (how distinctive are species from forms found elsewhere). These studies help to predict how communities of organisms will change under different environmental pressures. At present, the National Science Foundation, National Geographic Society, Conservation International, Agency for International Development and the MacArthur Foundation are all partners in this work.

PROGRAM THEMES

BIODIVERSITY INFORMATION RESOURCES

Computerization now pervades all aspects of modern science and has revolutionized environmental and evolutionary biology. The development of high capacity, inexpensive computers and more sophisticated software allows for unprecedented electronic data capture, storage, analysis and retrieval. Systematists have traditionally collected, analyzed, summarized and communicated information using specimens as single-item samples of biodiversity. However, large collections themselves are also of great value to both scientists and society. In particular, as collection information is computerized, broader questions can be addressed, historical trends can be evaluated, and data can be shared between institutions.

Many of The Field Museum's 20 million specimens are already catalogued in computerized form. Our botanical, geological and zoological databases include such data as hierarchical classification, geographic location, ecology, chemical composition and geologic age. Computer networking is rapidly expanding the availability of these information resources,now becoming available to scientists from thousands of computers world-wide. Information from only one institution is typically inadequate to answer complex questions concerning global distribution patterns or changing species frequencies, thereby making retrieval of ever-growing electronic data from other institutions a necessity. Networking systems allowing access to museum collections and biological libraries throughout the world are now crucial to research and policy decisions in environmental biology. Researchers with network-connected computers routinely communicate through electronic mail and send data around the globe in minutes. Digitized color images of plants, animals, fossils, maps and illustrations residing in remote sites will soon be available over networks and easily coupled with more traditional computer information. The development of geographical information systems will continue to integrate data from many disciplines into dynamic maps necessary to address research priorities, such as the biodiversity crisis and global climate change. Over the last two decades, The Field Museum vigorously moved ahead with collections computerization and continues to take the lead in the application of such databases to biological resource issues.

PROGRAM THEMES

GEOCHRONOLOGY RESEARCH

The accurate subdivision and calibration of geologic time (geochronology) is crucially important in geological exploration and is central to many areas of pure and applied research in modern geology and environmental biology. Traditionally, changes in the composition of fossil assemblages through time have been used to develop a relative chronology of the stratigraphic record (biostratigraphy). The rates of decay of radioactive isotopes in other rocks provide a numerical calibration of "absolute" time (radiometric dating). However, the full potential of these techniques is difficult to realize because the best biostratigraphic time scales are derived in ancient ocean basins while the best radiometric dates come from rocks deposited on ancient land surfaces. In the last twenty years the development of magnetostratigraphy, using the history of reversals in the Earth's magnetic field to "tell time," provided a means of fully integrating biostratigraphic, radiometric and other stratigraphic techniques. This to major advances in establishing increasingly accurate and globally applicable geologic time scales.

For almost a century the world-class fossil collections at The Field Museum have been used extensively in defining and refining biostratigraphic standards. Current programs extend these historic strengths to integrate biostratigraphy, magnetostratigraphy and radioisotopic dating. The recent construction of a new magnetically-shielded laboratory for studies in paleomagnetics has made The Field Museum an internationally recognized center for geochronology. Research currently under way in the paleomagnetics facilities includes: i) providing more secure and accurate age assignments for fossil-bearing strata; ii) developing a refined globally applicable standard geologic time scale; iii) using geochronologic information to understand plate tectonics and the rate and timing of mountain building and basin formation (Rocky Mountain basins; Magdalena Basin, Colombia; Chilean Andes); and, iv) reconstructing paleoenvironments in hydrocarbon-bearing sedimentary basins (western North America, Chile, Colombia). At present, the National Science Foundation, National Geographic Society and NASA are all partners in this work. In 1985 a Field Museum geologist and two co-workers developed a standard geologic time scale for the past 66 million years, currently being used by the Geological Society of America as the time scale for its Decade of North American Geology Project. Recent users of The Field Museum paleomagnetics facilities include students and faculty from the University of Chicago, Northwestern University, Rutgers University, University of North Carolina-Charlotte, Universidad Autonoma of Mexico City, Duke University and the State University of New York at Stony Brook.

Research in meteoritics also emphasizes geochronology using radiometric dating to constrain meteorite formation events in the solar system, and in particular to resolve the chronology of such events in early solar system history.

PROGRAM THEMES

GLOBAL CHANGE RESEARCH

The diverse issues encompassed by the term "global change" (e.g., "greenhouse effect," ozone depletion, deforestation, declining freshwater resources) are among the most pressing societal concerns at the close of the 20th Century. Scientific investigation of these problems requires implementation of large-scale, interdisciplinary research designed with the realization that hydrologic, sedimentological, climatic and geochemical systems are all affected profoundly by spatial and temporal changes in the Earth's biota. A central element of this new holistic research agenda is to look to the geological record as the key to understanding the complex biotic and environmental interactions driving global change. Thus, for the relatively recent past, examination of polar ice cores provides essential data on changing concentration of atmospheric carbon dioxide associated with advancing and retreating ice sheets. On the other hand, knowledge of the more distant past provides insight into the interactions between the Earth's surface and climate systems, including the nature of the biosphere during former "greenhouse" intervals. These historical data also provide an opportunity to test the predictive power of the numerical climate models based only on present-day information.

Paleontological and archaeological collections at The Field Museum are a major international resource for elucidating the history of plants, animals and cultures; provide the baseline data from which the Earth's environmental history may be interpreted and the hypotheses of future global change may be tested. For example, research under way at The Field Museum uses the paleobotanical record to decipher vegetational and climatic changes through a critical phase of Earth history between approximately 140—65 myr B.P. (the Cretaceous Period). This interval witnessed a major modernization of terrestrial ecosystems and was characterized by rapid rates of sea floor spreading, high levels of atmospheric carbon dioxide, massive emplacement of flood basalts, and the evolutionary diversification of several modern groups of plants and animals. Mid-Cretaceous marine rocks also are estimated to be the source of approximately 70% of the world's oil reserves. Field Museum curators are using the extensive published record of pollen grains and spores to reconstruct the marked vegetational changes that occurred through this interval, including the origin and diversification of flowering plants, the rise of modern groups of ferns and conifers, and the extinction of ancient plant groups. With these patterns established, possible causal links to changes in Cretaceous global environments are beginning to be addressed. In the more recent past, Field Museum scientists are studying the vegetational history of the tropics during the last Ice Age and are examining human-environment interactions in Amazonia over the past 12,000 years. The Amazonian project investigates the history of landscapes and biotic communities, the influence of habitat on human development, the human influence on habitat and the implications of this knowledge for conservation and development.

PROGRAM THEMES

DEVELOPMENTAL BIOLOGY, BIOTECHNOLOGY AND BIOPROSPECTING

Comparative studies of plant and animal development have moved to center stage of modern biology, and are fast becoming one of the most active fields of research on the evolution of biological diversity. Classical approaches to evolutionary biology, such as population studies, concentrate on the variability of traits and their genetic background, yet fail to account for the fact that it is not traits nor characters that are inherited, but the potential for their development during the ontogeny of each organism. This means every evolutionary change is reflected by a change in the sequence of developmental events, just as every change of developmental pathways causes an evolutionary change in the population of reproducing organisms. Therefore, the comparative study of developmental pathways, and the inquiry into their underlying causes, holds important keys not only to our understanding of how organisms develop but also to our understanding of the phylogenetic past.

In zoology, developmental studies at The Field Museum include studies of skeleton formation in reptiles, in particular on the sequence and patterns of bone formation. These investigations apply histological techniques of whole mount imaging to embryos of all major reptile groups (turtles, crocodiles and lizards) and provide important insights into "ontogenetic repatterning"—the development of new structural patterns as cartilage is replaced by bone. Understanding of "ontogenetic repatterning" is crucial for the reconstruction of evolutionary relationships, but it also provides the basis for a more detailed investigation of patterns of skeletal reduction in fossil and living reptiles. Preliminary evidence suggests an influence of temperature and moisture during incubation on ossification processes as well as the importance of habitat factors.

In botany, there is great interest in finding additional plants and fungi that contain chemicals that can be harnessed for industrial and medicinal uses, as well as a continuing interest in genetically engineering plants to improve their resistance to disease, to increase their tolerance to drought and to improve their commercial attributes (e.g., larger flower size in horticulture, improved yield in agriculture). In botany, there is great interest in finding additional plants and fungi that contain chemicals that can be harnessed for industrial and medicinal uses as well as a continuing interest in genetically engineering plants to improve their resistance that impart increased resistance to arid or saline conditions. The ultimate objective is to identify the genes controlling the synthesis of these compounds with a view to their transfer to appropriate agriculturally significant species.

PROGRAM THEMES

CHICAGO WILDERNESS—A METROPOLITAN CONSERVATION EFFORT

Chicago Wilderness is a regional nature reserve, comprising an archipelago of 200,000 acres of protected natural lands in the metropolitan region. This globally significant concentration of rare natural communities - the woodlands, forests, grasslands, streams and wetlands - survives in a crescent from southeastern Wisconsin through the six-county Chicago region to Northwest Indiana.

Chicago Wilderness is an unprecedented partnership of 34 public and private organizations joining forces to protect, restore and manage these natural lands and the plants and animals inhabiting them. . The 34 members are organized under an umbrella called the Chicago Region Biodiversity Council comprise of local, state and federal governments, research and education institutions, landowners, and conservation groups. Each is active in local conservation efforts and a signed a memorandum of understanding pledging its commitment to Chicago Wilderness goals. Although Chicago Wilderness seems to be an oxymoron, but this region harbors some of the best remnants of our Midwest "wilderness" - the native plant and animal communities - remaining on earth. It is only through active protection, management and restoration programs that the prairies, woodlands and wetlands comprising Chicago Wilderness will survive.

The Chicago region is one of a handful of metropolitan areas in the world having a high concentration of globally significant natural communities. The region includes some of the best surviving examples of eastern tallgrass prairie and open oak woodlands or savannas, and it supports many rare plants and animals, including 181 species listed as endangered or threatened in Illinois. Less that one-tenth of one percent of Illinois' tallgrass prairie (and even smaller fragments of natural oak savannas) remains, making these grassland and woodland communities more rare than tropical rainforests.

The member organizations and thousands of volunteers are pooling their resources and expertise to most effectively protect, manage and restore the natural heritage of the central Midwestern region. Key goals include:

- Documenting the region's varied natural communities and species in the *Chicago Region Biodiversity Atlas*, expected to be published in April, 1997.
- Helping to restore natural communities on public and private lands.
- Working to prevent the ongoing loss of critical habitat and promoting carefully planned development.
- Offering opportunities for citizens to become involved in Chicago Wilderness activities.
- Communicating with the public and decision-makers about the world-class natural resources in the Chicago region, and the need to protect them.

Chicago Wilderness spans the area from Goose Lake Prairie southwest of Joliet, stretches north to Chiwaukee Prairie in Wisconsin and southeast around the shore of Lake Michigan to the Indiana Dunes. In Illinois, most sites are in six counties: Cook, Lake, McHenry, DuPage, Kane and Will. Chicago Wilderness lies between Lake Michigan on one side and agricultural land on the other.

Financial support for Chicago Wilderness is provided by the member organizations, as well as through additional local, state and federal grants. An important early grant of $700,000 came from the USDA Forest Service. In addition, thousands of volunteers are providing much of the human resources for the projects.

THE COMMITTEE ON EVOLUTIONARY BIOLOGY AT THE UNIVERSITY OF CHICAGO

The Committee on Evolutionary Biology (CEB), is an unique collaboration between a major research and teaching university (University of Chicago) and a major free-standing museum (The Field Museum). The Committee on Evolutionary Biology is one of eight interdisciplinary, doctoral degree granting programs in the Division of Biological Sciences of the University of Chicago. The Committee emphasizes creative, independent thinking in its students and fosters broad scientific interchange among faculty and students. The Committee does not appoint primary faculty of its own, but instead brings together faculty from eight academic departments at the University (spanning all four graduate divisions), The Field Museum, Brookfield Zoo and Argonne National Laboratory. Faculty and student interests in the Committee on Evolutionary Biology span a remarkable array of fields and approaches, ranging from applied ecology to basic mathematical modelling of ecosystems, and incorporating systematics, paleontology, functional anatomy, molecular evolution, ecology, conservation biology and more. CEB is widely acknowledged as a preeminent Ph.D. training program, placing the Chicago area among the best locations to study evolutionary biology.

Field Museum curators are actively involved in the Committee on Evolutionary Biology graduate training program. The largest number of CEB faculty, 20 of the 58 faculty members (34%), are from The Field Museum. Faculty also includes representation from Brookfield Zoo, Argonne National Laboratory and all of the most relevant departments at the University (17 from Ecology and Evolution, eight from Organismal Biology and Anatomy, four from Geophysical Sciences). In recognition of the active participation of Field Museum staff, the University of Chicago formally appointed Field Museum Curator, John Flynn (Geology), as Associate Chair of the Committee to work with CEB Chair Jeanne Altmann. The breadth of institutions contributing faculty, a spirit of cooperation, the outstanding quality of its students, and the explicit directive to build on disciplinary strength while pursuing multidisciplinary science, all combine to make CEB the success it is.

Scholarly Achievement: The University of Chicago had the highest ranking graduate programs in "Ecology, Evolution, and Behavior" (first in "Scholarly Quality" and second in "Teaching Effectiveness" from a comparison of 274 universities; based on the Committee on Evolutionary Biology and departmental programs) in a 1996 rating of the best graduate schools in the U.S.

- CEB and the Department of Ecology and Evolution provide the core of these programs.
- This was the only biological or physical science program at the University of Chicago ranked number one.
- This 740 page report was prepared by the National Research Council of the U.S. National Academy of Sciences. Rankings examine the reputation of the program among academic peers, faculty publication numbers and significance, length of time to student graduation, and other academic information.

Student Quality and Success: CEB students have been exceptionally successful in meriting awards from professional societies, research agencies, and philanthropies. A remarkable one-third of current CEB students have received prestigious, exceptionally competitive National Science Foundation predoctoral fellowships. CEB has graduated more than fifty Ph.D's since it was founded. It has had an excellent track record of placing students in faculty and scientific positions at major universities and museums. Some recent examples include:

- Graduates hold faculty positions at many of the finest universities in the world, including the University of Chicago, Brown University, University of California (UCLA, UC-Davis, UC-Santa Barbara), Northern Arizona State University, Northwestern University, University of Texas, University of Kansas, Oxford University (Great Britain), McMaster University (Canada), and University of Sydney (Australia).
- Melissa Morales Cogan (CEB, Field Museum, Zoology) won a 1994 Ford Foundation fellowship. Melissa is also a former Field Museum Collections Assistant (Zoology, Mammals), and she continues to participate in museum mentoring programs for underrepresented minorities.

• The Field Museum's new Office of Environmental and Conservation Programs is staffed by three Ph.D. scientists trained at the University of Chicago, including its Director (Debra Moskovits, Biology 1985), Douglas Stotz (CEB 1990) and Thomas Schulenberg (CEB 1995).

Training: In 1994 the faculty of CEB began a five-year, one-half million dollar National Science Foundation funded graduate training program in Environmental Biodiversity. This is the first federal training grant received by CEB, marking growing awareness of the scientific and public-policy significance of evolutionary, environmental, and biological diversity studies. The steering committee is chaired by John Flynn, and four of five current trainees center many of their research activities at The Field Museum.
• Field Museum curators serve as thesis advisors, or Ph.D. committee members, for some twenty CEB students (and numerous other University of Chicago graduate students in departmental Ph.D. programs) every year. Of these, typically six to ten are housed at and are pursuing much of their primary research in the collections and laboratories at The Field Museum.
• CEB faculty teach a large majority of the undergraduate courses in Biological Sciences at the University of Chicago, including most of the fundamental "core courses."
• Museum curators teach an introductory course for all CEB students, "Research at The Field Museum," as well as at least eight other courses each year at the University of Chicago.

COMMITTEE ON EVOLUTIONARY BIOLOGY FACULTY - ACADEMIC YEAR 1996

Chair: Jeanne Altmann, University of Chicago
Associate Chair: John Flynn, The Field Museum

The Field Museum
J. William O. Ballard
Rüdiger Bieler
John R. Bolt
Barry Chernoff
Peter R. Crane
Michael Dillon
John Flynn
Lance Grande
Lawrence Heaney
John B. Kethley
Scott Lidgard
Gregory M. Mueller
Matthew Nitecki
Bruce Patterson
Olivier Rieppel
Douglas Stotz
William Turnbull
Janet Voight
Harold K. Voris
Mark Westneat

Argonne National Laboratory
R. Michael Miller

Brookfield Zoo
Robert Lacy
George Rabb

University of Chicago

Anthropology
Russell Tuttle

Ecology and Evolution
Jeanne Altmann
Stevan J. Arnold
Joy Bergelson
Brian Charlesworth
Deborah Charlesworth
Jerry Coyne
Lynne Houck
Martin Kreitman
Matthew Leibold
Thomas Nagylaki
Cathy Pfister
Stephen Pruett-Jones
Ellen Simms
Janice Spofford
Leigh Van Valen
Michael J. Wade
J. Timothy Wooton
Chung-I Wu

Geophysical Sciences
Michael J. Foote
David Jablonski
Susan Kidwell
J. John Sepkoski

History
Robert J. Richards

Obsetetrics and Gynecology
Carole Ober

Organismal Biology/Anatomy
Andrew Biewener
Martin Feder
James Hopson
Michael LaBarbera
Eric Lombard
Mark Martindale
Nipam Patel
Paul Sereno

Philosophy
William Wimsatt

Psychology
Martha McClintock

PROGRAM THEMES

EXPLAINING THE RISE OF COMPLEX SOCIETIES

Human societies began to be complex when groups of early villages were linked by common political systems, integrated economies and shared systems of belief. The first cities and states emerged between 4000 and 3000 BC. By AD 500, similar institutions were present in many parts of the world. Urbanization and centralization have continued to intensify up to the present, although these processes often have been interrupted as various peoples have experimented with balancing complexity with simplicity, centralization with decentralization, and order with freedom. Field Museum anthropologists are seeking to understand the whys and hows of this long-term pattern of development. Did complex societies arise mainly through the influence of neighboring societies or was the process independent? What roles did demography and the environment play? How important has technology been, in politics as well as economics? What has been the long-term effect of warfare? How much complexity is necessary and inevitable? Have successful civilizations ever existed with decentralized political systems but large populations and sophisticated economies?

Relevant current research projects include those of several curators: Chuimei Ho's and Bennet Bronson's surveys of early manufacturing and trading centers in East and Southeast Asia; Chapurukha Kusimba's excavations of early Swahili settlements in East Africa; Charles Stanish's investigation of ancient urban sites on Lake Titicaca in Peru and Bolivia; Jonathan Haas's and Winifred Creamer's studies of early historic period settlements in the Rio Grande Valley of New Mexico; and, Anna Roosevelt's ongoing work on prehistoric complex societies in the Amazon Basin of Brazil. All of these projects involve time spans of many hundreds of years. In addition, Alaka Wali is examining the impact of global economic integration on patterns of urban resource distribution. All this research should illuminate reasons for the rise, decline and change of complex societal patterns.

PROGRAM THEMES

CULTURAL DIVERSITY, SIMILARITY, CHANGE AND STABILITY

Cultures tend to change rapidly in some ways and to be conservative in others. This may be why they are at once very diverse and strikingly similar. Studying cultural change and diversity is central to the interests of many anthropologists, including those who work at The field Museum. This is because anthropology traditionally has been concerned with not only the world's majority cultures but also its minorities - the thousands of groups who in numeric terms form altogether only a few percent of the global population but whose past and present cultures - (languages, arts, faiths, social system) constitute more than ninety-nine percent of those ever to have existed. In this sense, anthropologists are specialists in the variety of human experience, in the vast number of existing solutions, past and present, to such problems as: earning a living; coexisting with the environment; relating to kin; striving for status; organizing society; creating beauty; and, understanding the universe.

Surrounded as they are by material from a great variety of cultures, anthropologists are acutely aware of diversity. Further, because most of our anthropologists use archaeological techniques in their research, they often come face-to-face with the fact that cultures change irregularly over the long term, keeping certain traits and institutions while allowing others to "mutate" or be replaced. Why this happens is a crucial question. Those on our staff most involved in answering this question include Curators Terrell and Welsch, whose ongoing New Guinea Research Project is aimed at investigating a situation where hundreds of languages are spoken within a small area, where economic links among the speakers of those languages have historically been close, and where there is every reason to think cultural differences between groups have persisted for long periods of time. They are collaborating with biologists as well as with social scientists from Papua New Guinea in investigating this issue.

Among those working on related issues are Curators Haas and Creamer, who study changes occurrimg in the Pueblo Indian cultures at time of their first contact with the Spanish, and Curator Wali, whose research on gender roles in New York's Harlem offers new insights into the nature of cultural diversity in our own society. Perhaps the most intensive and practical of our current studies of cultural diversity is that done collaboratively between our staff and representatives of many Native American tribes in the context of repatriation discussions. These discussions are being held under the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) passed by Congress as several years ago. Contacts between Native Americans and the Anthropology Department (as well as other parts of the Museum) are now frequent, intensive and highly rewarding in terms of what we learn about the American Indian collections and about the concerns of members of these very important cultures.

The Field Museum, Chicago
Center for Cultural Understanding and Change

PROGRAM THEMES

THE INTERFACE BETWEEN HUMANS AND THE ENVIRONMENT

A central concern of Anthropology is the analysis of human interaction with the natural environment and the way that interaction shapes both cultural systems and the environment itself. Early theories on human evolution posited a unilineal mode of progression from technologically simple to technologically complex societies. Later, as systematic scientific collection of data on cultural diversity and adaptive techniques increased, unilinear evolutionary theories gave way to more sophisticated hypotheses about the relationship between environment, technological innovation and human cultural change. Cultural ecology is today a vital branch of anthropology, uniting the four sub-disciplines - cultural, physical, archaeology and linguistics. Theoretical frameworks within cultural ecology are used to explore such issues as the relationship between distribution and availability of natural resources and patterns of social organization, the changing relationship between cultural groups and the environments they inhabit, the impact of environmental change on physical variation, the rise and fall of complex societies and the impact of human resource use on global environmental change.

Anthropologists at The Field Museum integrate collections-based research with active field research to explore these issues at a number of sites. In South America, research by Stanish in the Andes and by Roosevelt in Amazonia examines the ancient cultures in these sites to determine the impact of settlement patterns, agriculture and horticulture on these ecosystems. In the Andes, impressive irrigation systems built by archaic states testify to human ability to manage water resources in semi-arid climates. In Amazonia, archaeological research reveals that agricultural chiefdoms with sophisticated pottery traditions existed, indicating a higher density of population that nevertheless managed to use the fragile ecosystem sustainably. Meanwhile, in the urban United States, Wali's cultural ecology approach reveals the way in which the distribution of resources and spatial configuration of settlement patterns affect the unequal access to health care services, and thus affect rates of mortality and morbidity in a human-built environment. Collections-based research by Terrell and Welsch with the A.B. Lewis Collection from the Sepik region of Papua New Guinea is providing clues to the reasons behind cultural diversity and the interplay between diversity and economic exchange of resources. Finally, with the establishment of the joint Ph.D. Program between The Field Museum and the Department of Anthropology/Geography at the University of Illinois at Chicago, opportunity exists for further collaboration on these issues in the fast-growing field of cultural geography.

PROGRAM THEMES

UNDERSTANDING PATTERNS OF HUMAN CONFLICT

Anthropology has long attempted to understand the origins and contemporary configurations of human conflict, both intra-group and inter-group. In studying conflict, anthropologists have examined factionalism, segmentation, lines of communal tension, inter-group hostility or prejudice and warfare. Anthropological research has focused on the social institutions, social relationships and cultural belief systems that regulate or shape patterns of conflict. For example, considerable debate exists about the causes of warfare prior to the emergence of the State. Some theorists contend that a combination of demographic, dietary and technological variables explain persistent patterns of warfare in non-state societies and that here warfare acts as a mechanism to regulate population. Others contest that explanation disputing whether or not warfare actually reached significant levels in pre-state societies. Much anthropological research also documents the mechanisms societies create to minimize conflict and avoid warfare. Studies of state-organized societies explore the emergence of ideological forms, such as racism or sexism, as means to justify stratification and the ensuing conflict that emerges.

Field Museum anthropologists, through their research with collections and in the field, have contributed significantly to the understanding of this issue. Research by Haas and Creamer in the Southwest United States on the Pueblo peoples, before, during and after contact with European colonists is revealing the dynamics of interaction between state-organized and Stateless societies, and the changing nature of conflict patterns. Research in New Guinea by Terrell and Welsch is documenting the long-term existence of patterns of "inherited friendships," outside of competitive exchange relationships which acted to unite far-flung Sepik communities into *interaction spheres*. Research in Asia by Bronson and Ho and in East Africa by Kusimba on long-distance trade relationships is illuminating hitherto unknown connections between complex societies and the impact of these connections on the cultural formations of these places as well as on patterns of conflict. Collections-based research by Bronson and Kusimba on the extensive material culture holdings in The Field Museum from Asia, Africa and Madagascar is contributing significantly to this project.

PROGRAM THEMES

NATIVE AMERICAN PROGRAMS

The Field Museum is actively engaged in building new kinds of positive working relationships with the full range of Native peoples represented in its exhibits and collections. For North America is a specific program is in place to stimulate interaction with tribes across the continent. The program has three parts: Native American internships; visits by Native American tribal representatives; and working with tribes on a wide variety of issues related to the Native American Graves Protection and Repatriation Act (NAGPRA).

Native American interns come to the Museum to engage in different activities within the Anthropology Department, including working with archives, records and collections. Whenever possible the interns work with the material from their own tribe or culture. One of the central goals of the internship program is to develop comprehensive inventories of each tribe represented in the collection. In 1996, interns from the Hopi and Arapaho tribes continued working on repatriation-related grants from the National Park Service. These two projects produced computerized databases of material from the tribes, as well as photographic documentation of almost every object in both of these large and important collections. Additional Native American interns from the Tlingit and Navajo tribes are working on a range of cultural inventories.

Tribal visits are another important aspect of The Field Museums program of outreach with Native Americans. Some of these visits are initiated by the tribes and some by the Museum. In each case, we have a Museum Host Committee responsible for insuring the visitors are welcomed to Chicago and have suitable hotel and transportation arrangements. The visitors are escorted through the Museum and are provided with whatever assistance is necessary to make their visit productive and pleasant. This past year we hosted visits from representatives of many tribes, including Navajo, Hopi, Northern and Southern Arapaho, Southern Cheyenne, Crow, Menominee of Wisconsin, Cheyenne River Sioux, Aleut, Oneida Indian Nation of New York, Pawnee, Fort Peck Sioux and Assiniboine, Gila River Pima and Tohono O'odham.

The Department of Anthropology has been actively engaged in matters directly related to federal NAGPRA legislation. Dr. Jonathan Haas continues to serve on the national NAGPRA Review Committee appointed by the Secretary of the Interior. On the basis of the summaries and inventories the Museum sent out in 1993 and 1995, we are working with several tribes on the possible repatriation of human remains, associated funerary objects and a small number of very important sacred objects and objects of cultural patrimony.

JOINT FIELD MUSEUM-UNIVERSITY OF ILLINOIS AT CHICAGO

PH.D. PROGRAM IN ANTHROPOLOGY

In 1987 discussions were initiated concerning the possibility of The Field Museum's Anthropology Department working more closely with its counterpart at the University of Illinois at Chicago (UIC). The anthropology faculty at both institutions were strong and their location in an urban center presented an opportunity to engage an unusually wide spectrum of ethnic and social groups in anthropological research. UIC lacked qualified teachers in some areas of anthropology, authority to grant Ph.D. degrees, and routine access to museum collections as subjects for learning and research. The Field Museum had the opportunity to benefit from increased interaction with students, access to additional laboratory facilities, and interactions with faculty having expertise in areas not covered by its own specialists.

Discussions between the institutions continued over the next seven years, and resulted in UIC's anthropology department requesting authority from the University and the State of Illinois to set up a full Ph.D. program. Close cooperation with The Field Museum was offered as a primary reason why such a program would be successful and could fill a unique niche in the world of university education. The Field Museum and UIC together would also be ideal partners for programs and research aimed at an ethnically diverse urban community.

In January 1995 the Illinois Board of Higher Education granted full permission for the program to be established. The Field Museum's anthropology curators have adjunct professor status at UIC, and interested anthropologists at the University have adjunct curator status at The Field Museum. Faculty of both institutions serve jointly on admissions committees for students and on search and promotion committees for teaching and curatorial staff. Curators began teaching on a regular basis at UIC two years ago, and the first UIC-initiated student research projects at the Museum were implemented in 1994. Courses in museum studies, begun in 1993, will be expanded over the next few years.

The Field Museum Department of Anthropology will continue to maintain close ties with other Chicago-area universities, and Field Museum anthropologists will continue to be adjunct faculty at several of these institutions. Students from a variety of area universities will continue to work as interns in the Museum. However, the new collaborative effort with UIC means the Museum will play a more central role in the academic programs at UIC, in promoting communications among anthropologists in the Chicago area, and in helping to redefine what anthropology can do to address current social and environmental problems.

PARTICIPATING FACULTY 1996

The Field Museum

Bennet Bronson
Jonathan Haas
Chapurukha Kusimba
Anna Roosevelt
Charles Stanish
John Terrell
Alaka Wali

University of Illinois at Chicago

Brian Bauer
Robert Hall
Paul Hockings
Lawrence Keeley
James Phillips
Jack Prost
Sloan Williams

OFFICE OF ENVIRONMENTAL AND CONSERVATION PROGRAMS

The Office of Environmental and Conservation Programs (ECP), was established in 1995, to expand the Field Museum's research and education efforts in critical conservation biology issues. ECP's central objective is to develop efficient, creative links between the vast knowledge base at the Museum and the immediate needs in conservation action and education at the local, national and international levels.

The Office focuses on five major areas:

1. Rapid Assessment Programs (RAP) and Training, a collaboration with Conservation International (Washington, DC). -- Launched by Conservation International with support from Field Museum in 1989, the Rapid Assessment Program (RAP) assembles teams of expert field biologists and host country scientists to conduct large-scale landscape surveys of remote tropical areas with high potential for conservation. RAP quickly turns over the results of these first-cut biological and conservation assessments to international funding agencies and local decision-makers -- politicians, leaders and conservationists -- who can set priorities and guide conservation action in the country.

In 1995, RAP began to develop its field-training component with a US Agency for International Development grant to Conservation International. This effort focuses on training local scientists to conduct thorough but time-effective biological inventories, and to produce practical, integrated reports that address conservation and management priority issues. The six-week, multi-disciplinary course highlights innovative biological inventory techniques used or developed by RAP scientists. It stresses how to identify key biological communities in the region, and helps the participants translate significant biological findings into accessible recommendations for policy makers. Sixty biologists (including land managers, foresters, park-guards, and museum and university researchers) from throughout Bolivia and Peru have participated in two field courses, one in southeastern Bolivia (1995) and the other in southeastern Peru (1996). The final step of this program is a bi-national RAP trip in 1997, with graduates from both training courses, to a region of Bolivia (in the upper Rio Madidi region) that borders on Peru.

In 1995, the RAP concept was epanded to include the **AquaRAP** initiative, which aims to develop a new approach to freshwater conservation and -- in the tradition of RAP -- to maximize conservation impact and scientific rigor. In 1996 the AquaRAP approach was field-tested in the waters of the Tahuamanu and Manuripi rivers, at the tri-national border of Bolivia, Peru and Brasil. The trip represented a successful multi-national collaboration, with the principal scientists coming from these three countries, as well as the US, Paraguay, and Venezuela. AquaRAP, led by Barry Chernoff (Zoology), focuses urgently-needed conservation attention on the largely neglected aquatic ecosystems -- systems that are critical not only for the survival of their flora and fauna, but also for the well-being of the people who live along and depend on the rivers. The AquaRAP approach includes *entire* river basins, while focusing on the habitats directly relevant to aquatic conservation, such as floodplains. These areas of periodic inundation are among the most critical habitats for effective recruitment of populations of fishes and aquatic invertebrates.

A new RAP component, initiated in 1996, will take place much closer to home. **Illinois RAP** is being undertaken with support from the Illinois Department of Natural Resources (IDNR). It involves the development of rapid assessment methods to assess the condition of -- and monitor the changes in -- the natural communities in Chicago Wilderness. Field Museum zoologists and botanists, in collaboration with Chicago Wilderness and IDNR scientists, are developing and field-testing rapid-inventory methodology for several groups of organisms -- birds, reptiles, amphibians, vascular plants, fungi, bryophytes, land snails, beetles, spiders and others. The field tests are being conducted in examples of the four major natural communities in the region: forest, savanna, prairie and wetland. Preliminary analyses focus on baseline information of the ecological condition of the four sites; baseline information on the organisms present at each site (which are the first such data for the region for some organisms); identification of groups of organisms that lend themselves to rapid assessments and that are good ecological indicators; and comparisons of results between rapid and more traditional methodologies. ECP is coordinating and collaborating with the statewide attempt to develop standard methodologies

and comprehensive databases to monitor the condition of the State's natural areas, and is extending those areas to include Chicago Wilderness.

2. "Instant" Tools for Conservation. -- The Office of ECP works with Field Museum scientists to transform the expertise of our staff, and the storehouse of information in the collections, into practical, ready-to-use tools for conservation. Creative tools that can speed up the labor-intensive and time-consuming process of identifying tropical plants are especially urgently needed. To be of relevance to conservation, biological surveys must involve proper plant identification. And to address the conservation timetable, the surveys must produce almost instant results and recommendations for land use and management. Yet learning the enormous diversity of tropical plants, without access to properly illustrated field guides (which can take a decade or more to create) or easy-to-use plant reference collections, is an overwhelming if not impossible task. What is needed are catalysts to revolutionize the state of knowledge about tropical plant communities.

Such a revolution in speed of identification and training is being made possible by a grant from the A. W. Mellon Foundation, which will allow Robin Foster, along with the Department of Botany, to reorganize part of the Museum's herbarium into a dedicated reference for tropical plants identification. The ***rapid reference herbarium*** is being designed specifically to enhance and accelerate both the identification of tropical plants, and the production of emergency guides to tropical plants (high-resolution photo-reduced copies of appropriate herbarium sheets) that have already proven very successful in the field. The rapid reference herbarium will have representative *examples* of species, rather than the multiple examples in the comprehensive collection. It will offer the best potential for being scanned and entered into computer databases that would make this invaluable reference tool available worldwide.

Another tool for tropical conservation is being developed in collaboration with Conservation International and the Cornell Laboratory of Ornithology. It is a set of compact disks with the calls and songs of the more common birds associated with high-quality habitats of a specific region of conservation concern. Extremely successful in the Peruvian RAP training course in 1996, the first set of CDs was created with the songs of 300 forest birds of southeastern Peru. The CDs allowed local biologists to master calls that had taken the experts a decade or more to identify. Birds -- much more easily heard than seen -- can serve as effective indicators of the type and quality of natural habitats, and they are one of the best group of organisms for rapid assessments.

3. Collection Databases for helping identify priority regions for conservation. -- The Museum's research collections comprise a huge database that has much of the information needed for effective conservation planning. With several of the collections already entered into computer databases, answers can be generated quickly and patterns can be searched for regions of overlap among organisms with restricted geographic ranges (*endemics*) and organisms already facing risk of extinction. A major compilation of the ecology and distribution of all 4000 species of birds that live from Mexico south to Tierra del Fuego -- including data from the Museum's specimens and those of other large collections, and from the field expertise of top ornithologists -- forms the core of "Neotropical Birds: Ecology and Conservation" published in 1996 by The University of Chicago Press. The book by Stotz, Fitzpatrick, Parker and Moskovits analyzes the data to detect the regions in tropical America with the highest concentration of restricted bird species that already face risk of extinction. These are the areas where unique communities of plants and animals will vanish unless appropriate and immediate action is taken. The book provides guidelines to illustrate how governments, conservation organizations, and wildlife managers can use ecological databases to anchor conservation strategies and land management decisions in sound biological reality.

This extensive database on birds also helped Stotz and Schulenberg, along with Norman Myers and Conservation International, identify the 15 tropical regions of "highest conservation priority." Included among these *hotspots* of range-restricted species and threatened habitats are the humid tropical forests of the Andes, the humid forests of Central America, the deciduous and moist forests of Western Ecuador, the Atlantic Forest, the West Indian forests, and the forests of the Philippines, Indonesia, and the East African mountains. Five additional areas qualified as *hotspots* based on their

richness of endemic species, although they currently face relatively low levels of threat. These are: the lowland forests of the upper Amazon river, the Guianan-Tepui region of northeastern South America, the wet Chocó forests of western Colombia, the Zaire basin, and the forests of New Guinea. These regions represent rare remaining opportunities for conserving functional ecosystems in a large wilderness setting.

Computerized databases allow us to predict trends -- to look at biological communities that will *become* endangered if current patterns of habitat destruction continue, so that action can be taken *before* it is too expensive or too late. Databases also allow us to focus much more effectively on entire communities as units for conservation, rather than on individual species. And some databases -- for example, that on migratory birds that have collided with the glass windows of a lakefront building over the past 20 years of spring and fall migrations -- also allow us to detect trends in population sizes over the years, to understand which species are at risk and to analyze the most likely sources of threats. Finally, collection databases are invaluable as historical records of what used to be in an area, to evaluate current conditions.

4. Environmental Education. -- Carol Fialkowski, world-class environmental educator, joined the ECP staff in 1996 to work with the Museum's educators and scientists in developing a Museum master plan for environmental education -- locally and nationally. Fialkowski chairs the Education and Outreach Team for Chicago Wilderness, a regional conservation initiative (see below), and she has served as the major contact with the Illinois Department of Natural Resources (IDNR) to coordinate the statewide "EcoWatch" programs with the Chicago Wilderness region and the Museum's scientists. In the State's on-going attempt to assess and monitor changes in ecological conditions in Illinois -- the Critical Trends Assessment Project, CTAP -- a major finding was that the condition of the natural ecosystems in Illinois is rapidly declining because of fragmentation and continual stress. The report also noted, however, that existing databases do not provide sufficient information on ecological conditions for meaningful statistical analyses on trends. The current phase of CTAP is addressing this information gap by establishing data-collection networks to systematically monitor statewide ecological conditions. These networks, known as *EcoWatches*, rely on trained "citizen scientists" who collect ecological indicator data that can be used to asses conditions of ecological health. The Museum is now collaborating with IDNR to coordinate the EcoWatches -- RiverWatch, ForestWatch, PrairieWatch and WetlandsWatch -- in the region, provide a review of the data collection protocols developed by the Illinois Natural History Survey, and help train citizen scientists. The protocol reviews are being done in conjunction with the Science and Land Management Teams of Chicago Wilderness to insure scientific validity for the region, and to secure the use by thousands of citizen scientists in Chicago Wilderness currently engaged in restoration and monitoring efforts.

As a consultant to the Chicago Park District, Fialkowski also has provided leadership to the development of the Park District's three-year Master Plan for Environmental Education. In 1997 she will oversee the implementation of the first phase of program development.

Overseas, ECP is involved in partnerships to help interpret conservation biology and engage the public in an exploration of the natural riches in their country. Efforts have included developing a master plan for the new ecology and paleontology exhibits of the Museum of Natural History in Quito, Ecuador, and the development of interpretive materials for a new Visitor Center at Kakum National Park, Ghana (in collaboration with Conservation International and the US Agency for International Development).

5. Partnerships for Conservation. Partnerships -- within and outside the Museum -- are critical for the success of all of ECP's conservation efforts. The Office also promotes and facilitates extensive partnerships for conservation. Its two focal initiatives in regional partnerships are *Chicago Wilderness* and the *Conservation Training Consortium*.

Chicago Wilderness is a group of 34 organizations committed to conserving and restoring the world-class natural communities in the Chicago metropolitan area (see also Chicago Wilderness: A Regional Nature Reserve). Chicago Wilderness members include local, state and Federal government agencies, land owners, research institutions and non-government conservation agencies. Chicago Wilderness

encompasses more than 200,000 acres of restorable or high-quality land stretching around Lake Michigan from southern Wisconsin into northern Indiana. The Field Museum, through its Office of Environmental and Conservation Programs, is one of a small group of institutions providing central coordination for this first-of-its-kind regional metropolitan effort. The Museum is also an active or leading partner in several on-the-ground projects in science and public education.

Also in Chicago, five leading research and education institutions -- the Field Museum, the Chicago Zoological Society, the University of Illinois at Chicago, the Shedd Aquarium, and The University of Chicago -- comprise the *Conservation Training Consortium.* This consortium grew out of its successful predecessor -- the Advanced Training Program for Conservation Biology -- and will provide intensive training in conservation biology to young professionals in the tropics who already hold positions on the frontlines of conservation in their countries, and who will be able to immediately put to practice their newly gained experience and expertise.

DEPARTMENT OF ANTHROPOLOGY

Department of Anthropology: History[1]

The anthropological holdings of The Field Museum began with the Columbian Exposition. The first public appeal for extensive anthropological exhibits at the Exposition was made by the celebrated American anthropologist Frederic Ward Putnam, Curator of the Peabody Museum at Harvard, in a letter to the Chicago Tribune in May 31, 1890. Putnam passionately argued that the Exposition and future Museum would be a "perfect exhibition of the past and present peoples of America and thus make an important contribution to science . . . which will be the first bringing together on a grand scale of representatives of the peoples who were living on the continent when it was discovered by Columbus."

Putnam has been described by some as the "father" of American archaeology, and as the great "professionalizer" of the discipline. Putnam was not only Curator at the Peabody and in charge of the anthropology building and exhibit at the Exposition, but he helped found the Departments of Anthropology at Berkeley, the American Museum of Natural History, and ultimately the Anthropology Department at The Field Museum.

Putnam was chief of the Department of Ethnology at the Exposition and appointed Franz Boas, then a German immigrant and professor at Clark University, as his chief assistant and head of the section on physical anthropology. He also appointed one of his students at Harvard, George Dorsey, as head of the archaeology section. The Exposition was the stimulus for a great period of collections building. The most important scientific collections where gathered through the efforts of about 100 scholars in the field under the direction of Dorsey, Putnam and Boas between 1891 and 1892. Important collections were also purchased from around the world. The Columbian Exposition indeed fulfilled Putnam's vision of a grand exposition of objects from the Americas and beyond, illustrating the archaeology, ethnology and physical anthropology of the world's cultures.

On November 28, 1891, Putnam urged the Commercial Club of Chicago to take advantage of the opportunity afforded by the Exposition to build a great natural history museum in the city. Through the private donation of Marshall Field and the efforts of Edward E. Ayer, the museum was born and the Trustess of the Exposition assembled the collections and presented them to the new Museum. Franz Boaz was appointed Curator of Anthropology and began his work on the permanent exhibits for the opening of the Museum in June of 1894.

At the time of the 1894 opening, the anthropology collections consisted of approximately 50,000 specimens. The majority of these collections were from the Americas, consistent with the theme of the Columbian Exposition. Unfortunately, Boas, who was to become the intellectual founder of American anthropology as we know it today, resigned from the Museum under pressure from Harlow Higginbotham, the President of the Exposition and Trustee of the new museum. Boas returned to New York as an assistant Curator at the American Museum of Natural History, and eventually was instrumental in founding the Anthropology Department at Columbia University.

Boas was succeeded by William H. Holmes, an archaeologist from the Smithsonian Institution. In this period Holmes conducted a major expedition with Charles F. Millspaugh, Curator of Botany, to Mexico. Holmes resigned late in 1896 to return to the Smithsonian. His successor at Field Museum was George Dorsey, who had been appointed Assistant Curator the year before. Dorsey held the post until 1915. During his incumbency, the anthropology staff was expanded and a very active field program was carried out in North America and Oceania. The Department developed a carefully articulated methodology for the collection of objects. Between 1908 and World War I, Fay-Cooper Cole, William Jones and Albert Lewis, each Assistant Curators, assembled the Museum's great ethnographic collection from Melanesia and the Philippines with the help of S. C. Simms, Fletcher Gardner and Laura

[1] This historical sketch is a rewrite and update of Donald Collier's article "Men and their Work," originally published in the Field Museum Bulletin in September, 1972.

Benedict. Major Native American holdings continued to be assembled, and a fine Egyptian archaeological collection was purchased in Alexandria over a period of only three months. In 1909, Assistant Curator William Jones, the nation's first Native American Ph.D. in anthropology, was killed during fieldwork in the Philippines.

Dorsey was succeeded by Berthold Laufer, who had been appointed Associate Curator in 1908. Laufer served as Curator until his death in 1934. With a doctorate in oriental languages from the University of Leipzig, Laufer was a sinologist who was fluent in more than a dozen languages, many of which were non Indo-Eurpoean. He was responsible for assembling many of the linguistic texts in the anthropology library, many of which are unique and irreplaceable sources, as well as most of the Museum's important collection of Chinese and Tibetan artifacts. Major archaeological projects continued in the Americas, including the work of A. L. Kroeber in Peru, J. Alden Mason in Columbia and J. Eric Thompson in British Honduras (Belize). These three expeditions provided a huge corpus of archaeological collections that remain the core of anthropology's South and Middle American holdings.

It was also during this period that the Anthropology Department firmly established itself as a major research department outside of the New World, with a series of research and collecting expeditions to many areas of the world outside of the Americas including the work of Henry Field in Iraq, Laufer's work in China and Ralph Linton's work in Madagascar. Laufer and Linton's work in particular stand as major scientific achievements and their work continues to be cited today.

After Laufer's death, Paul S. Martin was appointed Acting Curator and was given the new title of Chief Curator in 1936. Of course, Martin assumed his position in the middle of the Great Depression, and fieldwork was severely curtailed. From 1935 to 1941, there were only four anthropology expeditions, and none were conducted during World War II.

Under Martin's tenure, the Museum purchased from Captain A. W. F. Fuller his great collection of 6,500 ethnographic specimens from Oceania, with the enthusiastic support of Stanley Field. After Captain Fuller's death in 1961, Mrs. Fuller gave the Museum her very important collection of Benin objects from Nigeria. This gift, combined with previous holdings, made The Field Museum's collection of Benin materials comparable to those found in the British Museum and the Museum für Völkerkunde in Berlin.

The end of the war also saw two fundamental changes that affected museum anthropology. First, there was a clear shift from Museum and donor-sponsored expeditions to foundation and government-funded research. Second, foreign nations increasingly forbade the export of valuable archaeological and historical objects. Fortunately, Paul Martin was one of the great archaeologists of the time able to adapt to this changing climate. His research interest was squarely scientific in nature focusing on the interaction of humans within their environment.

Martin was part of a great intellectual movement in archaeology that shifted the focus of research away from historical reconstructions and towards the testing of scientific models of human behavior. As a result, there was a concomitant shift in what archaeologists collected. Instead of focusing on the elaborate objects of the art, archaeologists began collecting scientifically valuable objects, such as potsherds, ancient pollen and bone, soil and the like. Martin received major funding from the young National Science Foundation and led many research projects to the American Southwest raising the profile of The Field Museum in the anthropological community. He set new standards for archaeological research, initiated interdisciplinary research designs testing models of human and ecological interactions, defined settlement patterns, documented environmental change and studied the origins of agriculture and the first settled villages.

Given these shifts in the discipline, it is fortunate that The Field Museum is one of the great museums of the United States that began at the turn of the century when collections could be accumulated from around the world. As a result, The Field Museum has enormous exhibit and research collections that today are not importable from most countries or even some states in the United States. Also, the status of The Field Museum encourages major donations of objects collected and imported when it was legal. Therefore, as Field Museum and other anthropologists continue to collect scientifically valuable objects

and strategically add to the collections, these build on enormous existing collections so as to meet the Museum's research, exhibit and general educational missions. The scientific framework and the collections strategies of the present Anthropology Department were in essence born in the Martin era. Paul Martin moved to emeritus status in 1964, but continued to be extraordinarily active in the field until his death.

Martin was succeeded as Chair of the Department by Donald Collier, Curator of Middle and South American anthropology. Collier, an archaeologist, had brought major scientific collections to The Field Museum in the 1950's from his excavations in Ecuador and his archaeological reconnaissances in Peru and Ecuador. These included the type collection for an early agricultural site on the coast of Ecuador, and collections of pottery and field notes of many archaeological sites now destroyed in Peru. His work greatly expanded the scope of our Andean collections and added to those previously collected by Kroeber, Dorsey and others.

During this period, James W. VanStone joined the Department. One of the eminent Alaskan anthropologists of his time, VanStone conducted extensive archaeological and ethnological research in the Arctic, and he continues to extensively publish his materials. Phillip H. Lewis also joined the museum during this period, and began his work on New Ireland culture and art and greatly added to the expertise of the Department in Oceanic anthropology. Glen Cole also joined the Department as Curator of Prehistory and excavated paleolithic sites in Malawi, Tanzania and Zambia.

James W. VanStone became the first Chairman of Anthropology in the newly devised system of rotating Chairships that continues to the present day. In the 1970's the Department added several new curators: Bennet Bronson, John Terrell and Michael Moseley. Michael Moseley initiated a major research program in southern Peru, in cooperation with the Southern Peru Copper Corporation. Known as Programa Continsuyu, this large archaeological and museum program provided the umbrella for a number of research projects beginning in 1981 and continuing to the present day.

After James W. VanStone completed his chairship, it rotated to Glen Cole, Phil Lewis, John Terrell, and Bennet Bronson. Throughout this time, the present curatorial staff took its shape, with the addition of Charles Stanish in 1987, Jonathan Haas in 1991, Anna Roosevelt in 1992, Alaka Wali in 1994, and Chapurukha Kusimba in 1994. In 1995, Charles Stanish began his term as Department Chair, replacing Bennet Bronson who had served for two terms.

The Department now officially holds more than 600,000 objects. In reality, this figure is an extremely low estimate, given that one catalog number is generally assigned to a box of specimens that may number into the hundreds. The total collection in anthropology, if assessed as other museums do by individual objects, would number well over 1,500,000 and possibly over 2,000,000 objects. The collection continues to grow, particularly in ethnographic and scientific archaeological objects, and continues to focus its strengths on the American Southwest, the American Midwest, Alaska, Mexico, Central America, the Andes, East Asia, Southeast Asia, the Middle East, Oceania and sub-Saharan Africa.

Department of Anthropology: Research

The relationship between humans and their environment is the core of the anthropology department's research. Over the past several years, the Museum has consciously sought to develop this research focus as a strategic decision to build an intellectually strong and coherent department. The current Department of Anthropology is composed of seven curators, all of whom concentrate on the relationship between culture, humans and environment. Six curators are archaeologists who work on the evolution of complex, preindustrial society and one is an ethnologist who works with development projects in Central America and applied anthropology. The anthropology department has maintained a strong connection between curatorial appointments and collections strengths. Presently, curators have research projects in East Africa, Southwest United States, China, Paupa New Guinea, the Andes, urban United States and Amazonia. Research Associates extend this research scope even further.

Bennet Bronson, Curator of Asian Archaeology and Ethnology, works on evolution of technology and trade in Asia. He notes that "the ancient world had surprising similarities to our own in terms of the importance of commercial competition, the effects of technological progress and the causes of economic development and decline." In line with these interests he has been involved for a number of years in a program of archaeological and ethnographic work in Asia combined with research on the Asian collections. He has collaborated with several specialists outside the museum on studies of early metallurgy in southeast Asia and China. Along with Chuimei Ho, Adjunct Assistant Curator in anthropology, he has completed most of the analysis of excavations conducted by The Field Museum and the Thai Fine Arts Department at ancient seaports in southern Thailand. Ho and Bronson have also started a three-year project in Southeast China, focusing on the early ceramic and metal industries. This research effort includes work on collections, including studies of Chinese and Japanese bronze objects dating to AD 1400-1900, East and Southeast Asian textiles, and early glass and glaze chemistry. This work promises to throw new light on patterns of early international trade.

Jonathan Haas, Curator of North American Archaeology and Ethnology and his colleague, Winifred Creamer, Adjunct Associate Curator in the Department, have been working on the evolution of cultural systems in the American southwest. They are looking at the effects of European contact and colonialism on the Pueblo peoples of northern New Mexico in the 16th and 17th centuries AD. The initial focus of the project is on changes in the size and distribution of the population of the region during the time just before and after the arrival of the Spaniards in 1540. As part of this research effort, Haas has begun a long term project to inventory, catalog and analyze the Paul Martin collections here at the Museum (see History section, above). By examining the archaeological and ethnohistorical records of the area we are gaining new insights into the effects of Old World disease and regional warfare on the Pueblo peoples.

Chapurukha Makokha Kusimba, Assistant Curator of African Archaeology and Ethnology, studies the technology, trade and urbanism on the precolonial Kenyan Coast. Kusimba's work tests models of the development of complex Swahili polities of the East African coast from roughly AD 700-1500. In particular, he has focused on the role of local craft production, especially iron production, in the development of the political and economic relationships between the East African Coast and its Indian Ocean trading partners, the early Indian Ocean trade as a stimulus for technical innovation, economic profit, and as a conduit for the transfer of technologies among East Africa, the Middle East and South Asia, and the role of coastal and interior peoples in the organization, production, use, and trade of local crafts. In conjunction with this field work, Kusimba began intensive studies of our collections, particularly the Ralph Linton Madagascar collection composed of 3,700 objects that help us understand the rise of complex society in the East African Coast.

Anna Roosevelt, Curator of Archaeology, has focused her research on the human ecology and cultural evolution in Amazonia. Her research focuses on the changing relationship of humans and environments. Since 1983, she has conducted extensive, multi-disciplinary research in the Brazilian Amazon uncovering a long sequence of human occupation. The first humans arrived around 11,000 years ago with cave-painting paleoindians who subsisted on forest fruits, such as Brazil nut, fish, shellfish and game. Subsequently, people in fishing villages began to make pottery, the earlierst in the Americas circa 8000 BC. Later, people began farming and by AD 1000 had settled in towns and built large earthworks. They traded their fine crafts long distances and fought each other for political control. Roosevelt's work has revised our understanding of Amazonian prehistory, and provides insights not only for archaeology, but for conservation and development planning in the region.

Charles Stanish, Associate Curator of Middle and South American Archaeology and Ethnology, focuses on the evolution of complex society in the Andean highlands, specifically the Lake Titicaca Basin of southern Peru and Bolivia. Stanish currently has two separate projects, one on the Peruvian side of the lake and one on the Island of the Sun, on the Bolivian side of Lake Titicaca. His research team has discovered more than 1,000 archaeological sites in the past six years and has excavated almost one dozen sites. The Titicaca Basin research has defined the evolution of complex agricultural systems, the rise and collapse of ancient empires, the development of imperial ritual centers, and the interaction of humans and environment in the region. Stanish is conducting research on several

collections of Inca and earlier materials in the collections as part of this overall reseach program. In particular, he is working on a collection of Inca objects that relates to the Island of Sun research.

John Terrell, Curator of Oceanic Archaeology and Ethnology, studies the origins of complex society and the biogeography of modern peoples in the Pacific Islands. Along with Robert L. Welsch, Adjunct Associate Curator of Anthropology, he has recruited an impressive number of research colleagues expanding Field Museum's New Guinea Research Program to include scientists from Northwestern University, Oxford University, Columbia College and other research departments from around the world. This program studies the biological diversity, population structure and prehistory on the Sepik coast of New Guinea, first identified as a major research problem through the analysis of our extensive Oceania collections. The research focused on the nature and processes of regional integration along one of the world's most linguistically diverse areas. In conjunction with this research, Terrell and Welsch collected approximately 1,000 ethnographic objects for the Museum in the past two years, to be incorporated into our extensive Oceania collections.

Alaka Wali, Associate Curator and Director of the Center for Cultural Understanding and Change, joined the Museum in 1994. Her research focuses on understanding the impact of global economic restructuring on the ways in which people organize themselves and constitute their social identities. As an applied anthropologist, Wali uses the results of her research to formulate more humane solutions to social problems. This research has concentrated on two different sites: Central and South American "hinterlands" and urban areas in the United States. In Central and South America, she has studied the ways in which indigenous people have confronted massive disruption to their use of land and resources as a result of national development projects. In the United States, she has researched the obstacles to resource acquisition for economically disadvantaged groups and the ways in which local social organization forms and cultural strategies can be incorporated into grass-roots empowerment programs.

Department of Anthropology: Collections

Africa[1]: Collections

The Africa collection includes 15,400 ethnographic, 3,490 historical (mainly from Egypt), and more than 140,000 prehistoric archaeological objects. The strongest collections are:

Madagascar Ethnographic Collection—This collection of 3,770 objects was made by Ralph Linton in 1925. It is well documented in his notes, and is the most systematic of the Museum's African holdings. All Malagasy tribes are represented, with special attention paid to the Imerina, Tanala and Betsileo. While the 500 traditional textiles in the collection have received the most attention from scholars, the collection is also strong in wood carvings, weapons and ironwork. This collection is the largest and best–provenanced Madagascan collection in the United States.

Angola Ethnographic Collection—The Field Museum's Angola Collection was made in 1929 by Wilfred Hambly while he was the Museum's Curator of African Ethnology. The 850 objects are primarily from the Ovimbundu tribe.

Cameroon Ethnographic Collection—The Cameroon Grasslands collection, numbering 2,500 objects, was made prior to World War I while Cameroon was under German colonial rule. The Museum purchased the collection in 1925 from New York dealer, Jan Kleykamp. The Field Museum previously loaned one third of this collection for inclusion in the Smithsonian exhibition, "The Art of Cameroon," which travelled widely within the United States.

Benin Ethnographic Collection—The Benin collection of 400 objects includes wood sculptures, hide fans, and cast brass, ivory, and beaten brass objects. It is one of the Museum's most significant African

[1] "ethnographic " refers to collections material from contemporary cultures;
"historical/historical archaeological " refers to collections material from cultures in the recent past;
"archaeological/prehistoric " refers to collections material from prehistoric times of which there is little written record.

collections both in terms of artistic worth and monetary value. Half of the collection was donated to the Museum by Captain and Mrs. A.W.F. Fuller, and the remainder was purchased earlier this century by the Museum. Except for a few recent ethnographic objects, the entire collection dates to the Benin Punitive Expedition of 1897. While some of the objects may be dated stylistically to the 17th century, no definitive assessment has been conducted.

Miscellaneous African Ethnographic Collections—In addition to the above, the Museum's African collections include 1,000 objects from North Africa, 1,200 objects from the Sudan, 300 objects from the East Horn area, 700 objects from the Congo region, 3,780 objects from East and South Africa and 3,100 objects from West Africa. While this material is not as systematic as the collections described above, it extends the ethnographic scope of the Museum's Africa collection. It also includes many objects of high artistic value, especially within the West Africa collection.

Egypt Archaeological Collection—This collection contains approximately 3,490 objects. Edward E. Ayer began to assemble the Museum's Egyptian collections in Cairo and Alexandria in 1894. His purchases included funerary objects, such as mummies, coffins, ushabtis, Books of the Dead and canopic jars; wood, stone and bronze images; and fragments of stone reliefs from the period of the Middle Kingdom through the Roman era. In 1907–8 Ayer added two intact chapel rooms from the tombs of Unis–ankh and Netcher–user to the Museum's collections. Pre–dynastic collections of pottery and stone vessels, flints, and offering objects from the early to late periods were donated to the Museum by Sir William M. Flinders Petrie, H.W. Seton–Karr, and Gertrude Caton Thompson. In 1944, the Egypt collection was further enhanced through the gift of the Gurley collection, which consisted of jewelry, scarabs, canopic jars, ushabtis, and statuettes. Notable within the collection is the funerary boat of Sen–Wosret, one of only six known to be outside of Egypt. This comprehensive Egypt collection also includes Coptic textiles, stone, bronze, and pottery pieces.

Tanzania Prehistory Collection—In 1957 and 1958 a field party from the University of Chicago collected 7,500 stone artifacts from the Isimila Prehistoric Site in the Central Highlands of Tanzania. A majority of these specimens, recovered from the Acheulian levels of the site, was dated by the Uranium–series method as more than a quarter of a million years old, but is now suspected to be considerably older. A smaller collection of Middle Stone Age and later artifacts were obtained from higher, more recent deposits at the site and from neighboring localities.

South African Prehistory Collection—This collections is from University of Chicago excavations at the Nelson Bay Cave Site along the southern African coast. The material was excavated from the Middle Stone Age levels at the site which are regarded to be more than 60,000 years old, and perhaps as much as 120,000 years old. Of particular interest are artifacts that are similar to those believed by historians and archaeologists to be the work of the earliest anatomically modern humans.

Miscellaneous Prehistory Collections—In addition to the two prehistory collections described above, another 3,100 specimens, mainly stone artifacts, are derived from other locations evenly dispersed between northern and sub–Saharan Africa. The northern African material, mostly Neolithic and late Paleolithic, was collected from sites scattered from Morocco to Egypt. The remaining material, mostly from the Later and Middle Stone Ages, was collected from sites in eastern, central and southern Africa.

Asia: Collections

China Collection—This collection contains 23,500 archaeological, historical and ethnographic objects made between BC 10,000 and AD 1980. The collection is strong in textiles (3,000 plus), rubbings of stone inscriptions (5,000 plus), and utilitarian and decorative objects of the 18th to 20th centuries (ca. 10,000). Three quarters of the collection was acquired in China between 1908 and 1923 by Field Museum anthropologist Berthold Laufer. Well-known and often studied subcollections include some 400 stone and glass snuff bottles, 230 toggles, 130 rhinoceros horn cups, 500 puppets, 1,000 coins, 1,000 jade carvings, 1,500 folk embroideries, 30 early cast iron objects, 500 items of Daoist and Buddhist sculpture, 400 Han Dynasty ceramics, 230 pewter objects, and 300 pieces of equipment for pets, mostly pigeons and crickets.

Japan Collection—The 4,700 historical and ethnographic objects in the Museum's Japan collection were acquired as gifts to the Museum. Approximately 200 items were exhibited at the 1893 World's Columbian Exhibition. In the early 1950s, Commander and Mrs. Gilbert Boone of Monmouth, Illinois acquired extensive collections in Japan and later donated them to the Museum. Their gift comprises one half of the current collection and includes 500 illustrated, woodblock–print books and 300 traditional paintings from the 18th to the 20th century. Gifts from other Chicago–area collectors include more than 1,000 Japanese sword furnishings (i.e., tsuba, fuchi–kashira, etc.) in the Gunsaulus collection, 200 lacquerware items (with many inro) in the Kroch and Leslie collections, and 300 Ainu objects.

Tibet Collection—This collection includes approximately 4,400 secular and religious objects that were acquired in China and eastern Tibet by Field Museum anthropologist Berthold Laufer in 1908–09. Nearly all date from the 17th through the 19th century. The highlights of this collection include more than 1,000 traditional Tibetan books, both printed and hand written woodblocks, 850 costumes and personal accessories, 800 ritual containers and images and 350 tangka paintings. These objects comprise one of the largest and best–provenanced Tibetan collections in the United States.

Indonesia–Malaysia Collection—The 6,400 objects in this collection include approximately 600 objects gathered from Malay hunter–gatherer (Orang Asli) groups, 700 textiles and textile–related items, 400 iron and steel weapons, 300 wayang drama items, and one of the finest sets of gamelan musical instruments outside of Java. Much of the Java subcollection was assembled in the 1880s. The objects from Sumatra, Borneo and the Malay Peninsula were collected in the 1920s, while the Sulawesi Toraja subcollection came to the Museum more recently. Objects were collected by Field Museum anthropologists Faye Cooper Cole, George Dorsey and Robert Welsch; the English civil servants Ivor H. N. Evans and Alleyne Ireland; and the Dutch administrator E. E. W. G. Schroder. While the Field Museum collection may be smaller than similar collections in the Netherlands or Germany, it is one of the finest in the United States.

Philippines Collection—The Field Museum's Philippine collection includes more than 8,000 ethnographic–historical and more than 1,000 archaeological objects. Its collection of Luzon and Mindanao tribal material is considered to be the largest and finest in the world. Collected by Field Museum anthropologists Faye Cooper Cole, William Jones and S. C. Simms between 1907 and 1910, this well documented collection covers all facets of traditional Philippine culture. Many of the textiles in the 700–800 piece collection are unique and of considerable scholarly interest.

Andaman and Nicobar Islands Collection—The 400 specimens in this small collection were purchased in the field by the noted British anthropologist, A. R. Radcliffe–Brown and were illustrated in his book, The Andaman Islanders. This collection consists of wood, bamboo and rattan utilitarian and ritual objects reflecting the material culture of the Andamanese. This collection is the only one of its kind in the United States.

Iraq Collection—The Iraq collection of more than 30,000 archaeological objects was excavated between 1929 and 1931 by a jointly sponsored expedition of Oxford University and The Field Museum at the former capital of Kish, led by S. Langdon, Ernest MacKay and Henry Field. Although most of the collection dates to the Early Dynastic period (middle 3rd millennium BC) it also includes a significant number of objects from the Sassanian period (ca. AD 200–600) and the Jamdat Nasr period (ca. BC 3000). It is especially strong in everyday artifacts such as ceramic and bronze items and flaked stone tools. This is one of the largest, most comprehensive and most systematic collections of objects from Early Dynastic Mesopotamia in the United States.

Asia & Africa, Textiles: Collections

The textile holdings of The Field Museum include approximately 7,000 Asian and African items. There are 670 archaeological pieces, nearly all from Egypt. The 6,000 ethnographic textiles and textile–related items include more than 400 from Sub–Saharan Africa, 500 from Madagascar, 400 from India, 3,000 from China, 800 from the Philippines, 700 from Indonesia, 100 from Korea, 100 from Central Asia and 200 from Japan. Many are well documented and in good condition. The collection is believed to be the most extensive in the Midwest and one of the top five in the United States.

Australia

Aboriginal Collection—This ethnographic collection numbers approximately 2,130 objects. While a few pieces were included in the 1893 Columbian Exposition, the remainder, including the Fuller Collection and bark paintings from the Louis Allen collection, originated in a program of exchanges and purchases with Australian museums and collectors. These pieces date from the early twentieth century to the present.

Europe

Italy Collection—With only 1,360 Roman and Etruscan objects (of which 200 are replicas) in its collection, the Museum might appear to not be a significant archaeological repository of Classical material. In fact, the Museum's 280 Etruscan objects represent several complete tomb groups and are, therefore, of great scientific and educational significance. Many of the genuine Roman objects come from the site of Boscoreale near Pompeii and include important fresco paintings, fine bronzes and jewelry, and a good selection of well–preserved objects illustrating everyday life during the Roman period. All were purchased in Italy in the 1890s.

Western Europe Prehistory Collection—The second major component of the Museum's European holdings is the Old World Prehistory collection from Western Europe comprised of 45,700 objects. These were acquired by Henry Field in the late 1920s for the Museum's Old World Prehistory Hall. The French prehistoric materials, including stone and bone tools, and artifacts of materials decorated by engraving or painting, constitute a particularly valuable part of the collection and are of considerable scholarly interest.

Middle and South America

Mexican Pottery Collection—The Department of Anthropology holds an exceptional collection of ancient Aztec pottery collected in the 19th century by Frederick Starr. This collection consists of several hundred pieces of exhibition–quality decorated pieces, a number of which have been exhibited in The Field Museum's Mesoamerican Hall. Portions of the collection were previously loaned to the Mexican Fine Arts Center and the Art Institute of Chicago. As part of a major scientific study in the early 1990s, microscopic quantities of clay from several pieces were analyzed using a technique known as neutron activation. This technique enabled two Field Museum Research Associates to determine the geographic origin of the pottery, which allowed staff in the Department of Anthropology to define the nature of Aztec economic exchange during the Late Post–Classic Period (ca. AD 1450–1521).

Montez Collection of Peruvian Artifacts—The Department of Anthropology also holds an exceptional collection of ancient Peruvian objects purchased in the 19th century from a private Peruvian collector. This collection consists of approximately 1,200 objects, of which the vast majority are ceramic vessels from the Inca Period. Several important pieces have previously been loaned to the Fowler Museum, University of California, Los Angeles.

Andes Collection—The Museum's collection of rare Andean textiles, dating to the 18th and 19th centuries, was purchased in the 19th century by Field Museum collectors. These ethnographic textiles originate from the high Andean areas of Peru and Bolivia and represent an indigenous weaving tradition that is now virtually extinct due to the influence of industrial dyes and the effects of tourism on the local society.

Maya Pottery Collection—The Museum's important scientific and exhibit–quality collection of Maya archaeological specimens was collected at the turn of the century from the Yucatan of Mexico and sites in Belize. These archaeological objects were scientifically collected (according to the standards of the time) and are valuable because there is reasonable provenance and documentation available for the entire collection.

Cerro Narrio Collection—In the late 1940s, Curator Emeritus Donald Collier excavated Cerro Narrio, an early agricultural site and one of the most important archaeological settlements in the northern Andes in Ecuador. The Field Museum holds the type collection from this site as well as thousands of

objects from the systematic excavations. The collection has been repeatedly studied over the years and serves as the basis for several critical theories on the early prehistory of Ecuador.

Coastal Peru Collection—In the 1920s and 1930s, anthropologist Alfred Kroeber excavated a number of important archaeological sites on the Peruvian coast. The Field Museum possesses the systematically collected and well documented objects from the three main sites. The collection includes ceramic pieces and textiles from at least BC 1000 to AD 1300, some of which are on display in the Museum's South American Hall, and are extensively studied by scholars. The Nazca collection of ceramic objects, in particular, ranks as one of the finest in North America.

Guatemala Collection—The Department of Anthropology holds a fine collection of contemporary Guatemalan textiles purchased throughout the 20th century. Guatemala is known for the rich diversity of its indigenous and mestizo ethnic groups and communities who express their social affiliation through dress. This ethnographic textile collection is displayed extensively in the Museum's Mesoamerican Hall.

Brazil Collection—This collection is comprised of select, well preserved archaeological and ethnographic objects from the Amazon and Central Brazil. It includes fifty important vessels of polychrome archaeological pottery from Marajo Island, excavated around 1918 by anthropologist William Farabee of the University Museum, University of Pennsylvania. The pottery, excavated from well-known artificial earth mounds at the mouth of the Amazon, dates to AD 400-1100. The Brazilian collection, specifically its ethnographic material, also includes more than 200 items of ceremonial paraphernalia and musical instruments from Tukanoan and Arawakan speaking Indians of the Northwest Amazon region; more than 200 articles of dress, artwork, containers, and tools for daily living from native tribes and rural peoples of the Middle and Lower Amazon and Northeast Brazil, including the well-known Caraja and Tapirape Indians and lesser known groups such as the Karapana. Theodor Koch–Gruneberg collected many of the objects from the Northwest Amazon, while the Museum acquired its Caraja collection from the collections of Erland Nordenskiold, an important synthesizer of South American anthropology, which were previously held at the Goteborg Ethnographic Museum.

North America: Collections
The North American collection at Field Museum consists of approximately 225,020 objects. The strongest collections are listed as follows:

Naskapi Collection—Approximately 500 ethnographic objects were collected by William Duncan Strong among the Davis Inlet and Barren Ground Naskapi of northern Labrador in 1927–1928. The collection covers nearly every area of material culture and is particularly strong in clothing and objects relating to subsistence. The collection is supplemented by a superb series of photographs made by Strong as well as his correspondence with Museum staff. This collection is supplemented by 170 objects from the related Montagnais of north central Quebec, collected by Frank G. Speck in 1927.

Plains Cree Collection—This collection includes approximately 200 ethnographic objects, a portion of which was collected by Hudson's Bay Company factor Isaac Cowie for the 1893 World's Columbian Exposition. The remainder was collected by Museum curator Stephen Simms in 1903. Both portions are strong in clothing, tools, and household equipment. The Simms collection is strengthened by extensive correspondence between Simms and George Dorsey, Chief Curator of the Museum's Department of Anthropology.

Blackfoot (Blood) Collection—This collection of approximately 135 objects from the Blackfoot (Blood) reserve in southern Alberta was obtained in the field by Methodist missionary John M. Maclean for the World's Columbian Exposition in 1893 and by George Dorsey in 1897. Although this collection is not large, it covers most categories of material culture and is among the earliest in any museum.

Eskimo Collection—In 1896 and 1897 the Museum purchased two collections of contemporary ethnographic material from Miner W. Bruce, a United States government employee and trader who lived in Alaska for a number of years beginning in 1892. The collections were made among the Inupiat

Eskimos of Port Clarence and Kotzebue Sound in western Alaska. They include approximately 1,460 objects and are representative of most categories of material culture. Important for comparative purposes are the many examples of a single artifact type. The collections are supplemented by extensive correspondence between Bruce and the Museum's Department of Anthropology.

Pawnee Collection—This collection of approximately 400 ethnographic objects was collected in 1901 and 1902 in Oklahoma by George Dorsey with the assistance of James Murie, a mixed–blood Pawnee. It is perhaps the best documented North American collection within the Museum. The collection is especially valuable because it is supplemented by two large collections of mythology and oral traditions, an extensive assemblage of linguistic texts, and two large unpublished manuscripts ("Ceremonies of the Pawnee" and "Skiri Pawnee Religion and Society").

Tlingit Collection—This large and varied collection of more than 1,900 objects was purchased from Lieutenant George Emmons, a naval officer and ethnographic collector, in southeast Alaska in 1902. Although varied, this collection includes a concentration of ceremonial equipment. It is supplemented by notes and correspondence from Lieutenant Emmons.

Apache Collection—This is largely a representative collection of approximately 900 objects, most of which were obtained in Arizona in 1901 and 1903 by Charles Owen, a Museum curator. This material is supplemented by a large collection purchased from Fred Harvey in 1905.

Pacific: Collections

Melanesia Collection—The Museum's ethnographic materials from Melanesia comprise one of the world's finest collections of Pacific materials. The collection of approximately 36,000 objects, includes tools, weapons, works of art, and clothing - most originating from the first two decades of this century. Most of lowland and coastal New Guinea is represented, as are the islands of the Bismarck Archipelago, New Britain, New Ireland, the Admiralty Islands, the Solomon Islands, the New Hebrides (now called Vanuatu) and New Caledonia. The Field Museum's Melanesian curator, Albert Buell Lewis amassed one half of the total Melanesian holdings of the Museum, comprising some 15,000 artifacts, between 1901–1913. The remainder is derived from other sources of the time, including ship captains, German dealers and German anthropologists.

Micronesia Collection—The ethnological and archaeological collections in The Field Museum number 11,270 objects. Alexander Spoehr, Curator of Oceanic Archaeology and Ethnology, carried out anthropological work immediately after World War II and collected both ethnological and archaeological materials for the Museum's collections. Fred Reinman, a Pacific archaeologist and the Museum's Oceanic Curator, also conducted field work and collected in these regions. While some of the Micronesian holdings come from the A.B. Lewis and the A.W.F. Fuller collections, the remainder come from curators Spoehr and Reinman. While the collection is varied, it is comparatively good, and the archaeological collections from Spoehr and Reinman are noteworthy.

Polynesia Collection—The collection of Polynesian ethnological and archaeological objects number approximately 5,190, and covers most of the island groups comprising Polynesia, i.e., New Zealand, Hawaii, Easter Island, Samoa, Tonga, Marquesas, Cooks, etc. A significant portion of this collection originated in the A.W.F. Fuller collection. The Polynesia collection includes some outstanding individual objects, such as the Hawaiian "mate" to the Bloxam figure, on loan to the Bishop Museum, and the Hawaiian feathered war god, "Kukailimokur." The Hawaiian tapa is particularly noteworthy. The Maori collection is outstanding, and includes the council house, Ruatepupuke II, one of only three council houses outside of New Zealand. Many of the Maori weapons and implements are also of fine quality and of scholarly importance.

DEPARTMENT OF ANTHROPOLOGY - COLLECTION SIZE AND GROWTH

	1995 Number of Specimens	1996 Number of Specimens	1995-1996 % growth
Africa			
Sub-Saharan, History-Ethnograph			
Cameroon, Nigeria and West Africa	5,406	5,452	0.85
Benin Bronzes	104	104	0
Angola and Zaire	850	850	0
East and South	3,877	3,877	0
Madagascar, History-Ethnography	3,770	3,770	0
Egypt, Archaeology	2,820	2,824	0.14
Coptic Textiles	670	670	0
General, Prehistoric Archaeology	141,940	141,940	0
General and Other, History-Ethnography	1,603	1,603	0
Subtotal Africa	**161,040**	**161,090**	**0.03**
Europe			
Italy, Archaeology			
Etruscan	280	280	0
Roman and Graeco-Roman	1,080	1,080	0
Pompeii	200	200	0
Other, Archaeology and History-Ethnography	120	120	0
General, Prehistoric Archaeology	45,700	45,700	0
Subtotal Europe	**47,380**	**47,380**	**0**
Asia			
East Asia, Archaeology and History-Ethnography			
China,	15,661	15,676	0.09
Rubbings	5,000	5,000	0
Textiles	3,000	3,000	0
Tibet	4,401	4,401	0
Japan	3,935	4,000	1.65
Sword furniture	1,060	1,060	0
Other (Korea, Siberia, etc.)	702	702	0
Southeast, History-Ethnography			
Philippines	9,151	9,151	0
Indonesia-Malaysia	6,462	6,462	0
Mainland			
Burma	246	247	0.41
Thailand	139	139	0
South, Archaeology and History-Ethnography			
India, Nepal, Bangladesh	2,420	2,420	0
Sri Lanka	430	430	0
Pakistan and Afghanistan	823	823	0
Middle East			
Iran and Jordan, Archaeology	300	300	0
Iraq, Archaeology	31,500	31,500	0
General Ethnography	105	105	0
Other (Central, West)	100	100	0
Subtotal Asia	**85,435**	**85,516**	**0.09**

DEPARTMENT OF ANTHROPOLOGY - COLLECTION SIZE AND GROWTH (cont.)

	1995 Number of Specimens	1996 Number of Specimens	1995-1996 % growth
South America			
Andean Area, Archaeology	16,900	16,902	0.01
Andean Area, History-Ethnography	707	707	0
Amazonia and Marginal, History Ethnography	5,421	5,421	0
General, History—Ethnography	50	51	0
Subtotal South America	**23,078**	**23,081**	**0.01**
Central And Middle America			
Mainland, Archaeology	10,600	10,601	0.01
Mainland, History-Ethnography	2,768	2,773	0.18
Caribbean, History-Ethnography	956	956	0
Subtotal Central and Middle America	**14,324**	**14,330**	**0.04**
North America			
Artic, History-Ethnography	4,922	4,971	0.99
Northwest Coast, History-Ethnography	6,954	6,956	0.02
California, History-Ethnography	4,355	4,355	0
Plains and Basin, History-Ethnography	15,175	15,177	0.01
Southwest, History-Ethnography	5,613	5,624	0.19
East and Central, History-Ethnography	3,207	3,234	0.84
General, History-Ethnography	150	150	0
Southwest and Central, Archaeology	185,000	185,000	0
Subtotal North America	**225,376**	**225,467**	**0.04**
Pacific			
Australia, History-Ethnography	1,561	1,561	0
New Guinea, History-Ethnography	16,271	16,283	0.07
Melanesia, History-Ethnography	14,902	14,902	0
Polynesia, History-Ethnography	5,257	5,257	0
Micronesia, Archaeology, History-Ethnography	11,270	11,270	0
General, History-Ethnography	100	100	0
Subtotal Pacific	**49,361**	**49,373**	**0.02**
Osteological Collection			
	4,696	**4,696**	**0**
Total	**610,690**	**610,933**	**0.04**

DEPARTMENT OF BOTANY

Department of Botany: History

Field Museum acquired its first botanical collections from the World's Columbian Exposition of 1893 when Charles F. Millspaugh, a physician by training but an avid botanist and naturalist, began soliciting donations of exhibited collections for the Museum. These were largely materials of economic use: collections of gums, resins, fibers, oils, waxes, tannins, dyes, starches, cereals, sugars, spices, medicinal plants, timbers and cabinet woods offered by more than twenty countries. In this manner the Department of Botany began with a fine collection of cabinet woods, forest products and useful plant products. These original specimens today comprise the Economic Botany collection at The Field Museum.

Millspaugh, who in 1887 published a major work on American medicinal plants, became the first appointee to the scientific staff as the Curator of Botany. The herbarium was established in 1894, and numbered 50,000 specimens by 1898. Millspaugh made important collections in the Yucatan Peninsula in the period 1894 -1896, and in the West Indies during 1899-1907. From this time on, the Museum concentrated its efforts on the American tropics, sponsoring or co-sponsoring more than sixty botanical expeditions to the region, and establishing one of the world's major collections of Central and South American plants. Some major contributors to the development of the collections are noted below.

Jesse H. Greenman collected extensively in Mexico and Central America from 1904-1912. J. Francis Macbride, who joined the staff in 1922, worked in Peru and initiated one of the department's major floristic works, the Flora of Peru, (8,508 pages of which have been published to date). Paul C. Standley joined the staff in 1927 and began extensive fieldwork in Central America. Since Standley frequently did not make duplicates, many of his collections at Field Museum are unique, at least within United States herbaria. Among his many publications are The Flora of the Lancetilla Valley (Honduras), The Flora of Costa Rica, The Rubiaceae of Colombia, also of Ecuador, of Bolivia and of Venezuela. In 1938 he began The Flora of Guatemala, which also attracted many new collections to the Museum. Standley's many achievements, together with a phenomenal memory that allowed him to identify on sight an estimated 20,000 species from Mexico and Central America, earned him an enduring place in the history of American botany. Standley was later joined in the Flora of Guatemala project by Julian Steyermark, who joined the staff in 1937 and made numerous valuable collections in Guatemala and contributed to the published flora. Steyermark also completed the Flora of Missouri while at Field Museum, and deposited his study specimens here. In the 1940's, Steyermark initiated collecting programs in Venezuela and Ecuador, and The Field Museum's holdings of these early collections are not duplicated elsewhere in North America. Louis O. Williams joined the staff in 1960 and supervised the completion of the Flora of Guatemala (thirteen parts, 6,528 pages). Williams also collected widely in Central America and developed an active research program that supported the work of other collectors, such as Antonio Molina of Honduras. Williams served as departmental chair from 1964-1973, and in 1965 he appointed William Burger to begin working on the Flora of Costa Rica project.

While neotropical floristics of flowering plants has been a major focus in the history of the department, several staff have distinguished themselves in other areas: Llewelyn Williams in economic botany; Francis Drouet in algae; B. E. Dahlgren in palms; and Theodor Just in evolutionary biology and paleobotany.

Department of Botany: Research

Current staff in the Department continue the strong tradition of botanical research in the Neotropics with a variety of projects in Peru (Michael Dillon), Costa Rica (William Burger) and Central and South America (Thomas Lammers). Among cryptogams, a major emphasis is on liverworts, particularly leafy liverworts from the Southern Hemisphere (John Engel) of which the Museum has major collections. In mycology (Gregory Mueller), Museum programs include studies in North America, South America and China. In addition to Department of Botany curators, resident Research Associates Robin Foster and Doel Soejarto have active programs in the department.

Department of Botany: Collections

The Department of Botany manages the fifth largest herbarium in the Western Hemisphere, estimated to include 2.54 million specimens of angiosperms, gymnosperms, pteridophytes, bryophytes, fungi (including lichenized ascomycetes), and algae. The department includes the research collections, libraries, a general purpose laboratory, plant preparation area, mounting, sorting and shipping areas, and office and research areas for curators, resident research associates and visiting scientists. The Botany staff has managed and maintained its vast collections and has made them accessible to researchers worldwide, at levels of activity comparable to those of larger institutions focused exclusively on botanical research and education.

The Herbarium was established in 1894 based on acquisitions from the World's Columbian Exposition of 1893. Numerous botanical expeditions, sponsored or co-sponsored by The Field Museum, have established the herbarium as one of the world's preeminent depositories of Central and South American plants and approximately sixty percent of the phanerogam collections are from these areas. Important early collectors included C. Millspaugh, J. H. Greenman (Mexico and Central America) and B. E. Dahlgren (Cuba, Brazil and British Guiana). The Flora of Peru, initiated in 1922 by J. F. Macbride is continued today by M. O. Dillon. Specimens generated from this project have provided The Field Museum with one of the world's best collections of Peruvian plants. Macbride also spent nearly ten years in Europe photographing type specimens of South American plants at major European botanical institutions and arranging for exchange of numerous Latin American specimens (many of them unmarked types from the herbaria in Vienna, Paris, Madrid, Geneva, Munich, and Berlin) of collectors that are not well represented in other United States herbaria (e.g., Ruiz and Pavon, Blanchet, Glaziou, Pohl and Schott).

Mycology: Collections

The Mycology Collection at The Field Museum is a major resource for mycological systematic and biodiversity studies. It consists of approximately 157,000 specimens with world-wide coverage and broad taxonomic representation. It is rich in type collections, especially of Neotropical taxa. The greatest strengths of the collection are the Agaricales *sensulato* (e.g., mushrooms, boletes, false-truffles, puffballs, chantrelles, tooth fungi, and coral fungi) and the lichenized Ascomycetes of the Western Hemisphere. The collection is especially significant in that it is one of only two active, large centers for Neotropical Agaricales in North America, and one of only a handful of herbaria active in such studies in the Western Hemisphere. Specific components of the collection are discussed below.

Agaricales—The collection attained worldwide prominence largely through the efforts of the late Rolf Singer, resident Research Associate for twenty-five years and author of *The Agaricales in Modern Taxonomy*, now in its fourth edition (Singer, 1986) (see Mueller, 1994; 1995). Singer was the most active student of Tropical American Agaricales (e.g., Singer and Morello, 1960; Singer 1976, 1987, 1988, 1989, Singer et al., 1983, 1992; Singer and Gómez, 1984; Singer and Araujo, 1986). He also collected and published widely on extralimital American taxa (e.g., Singer, 1989; Singer and Hausknecht 1990). Many of his collections, including types, and all of his field books and collection notes which include unpublished descriptions, illustrations and keys, are deposited at The Field Museum. A computerized index to the more than 2,500 new taxa (not counting new names and new combinations) published by Singer during his 70-year career has been completed (Mueller et al., 1992; Mueller et al., in preparation). It documents 595 holotypes at The Field Museum with the remaining types distributed in forty-one other herbaria. In addition to having the largest number of Singer types, The Field Museum houses authentic material of many of his other taxa. Singer's collections and notes are indispensable for systematic, ecological and biodiversity studies of higher fungi and are a major strength of the Museum's holdings.

Other important holdings of Agaricales include the 10,000 specimens of E. T. Harper, which represents one of the preeminent collections of fungi from the central Great Lakes region. These specimens were used as the basis of several books on the fungi of the region (e.g., Moffat, 1909; Graham, 1933, 1970). These midwestern collections have been supplemented by numerous more recent collections by Mueller, Singer, Wu, Huhndorf, members of the Illinois Mycological Association, and by the recent acquisition of

the fungal herbarium from the Ford Forestry Center, L'Anse, Michigan (1,500 specimens from the Upper Peninsula of Michigan). The Field Museum also houses one of the largest and most complete collections of Agaricales from the Gulf Coast States. This collection includes over 3,500 specimens of east Texas fungi donated by D. P. Lewis (Vidor, Texas). Recently, W. Cibula (Picayune, MS) has committed to donate his large collection of Louisiana and Mississippi fungi to Field Museum. These Gulf Coast collections complement the major collecting program on neotropical oak and pine forest fungi being undertaken by Mueller and colleagues. Besides Singer's and Mueller's specimens, outstanding collections from Mexico and Central America include those of J. García (eastern Mexico) and L. D. Gómez and associates (Costa Rica). The collections of Singer, Mueller and Gómez constitute the largest and most important holdings of Central American Agaricales in the world.

Ascomycetes—This important component of our herbarium has nearly 90,000 specimens. The lichenized ascomycete collection has broad taxonomic and geographic representation with its major strengths in North and Central American material. Among its important holdings are North American collections compiled by A. W. Herre, E. Hall, and A. B. Seymour; Central American material collected by P. C. Standley (Guatemala, Honduras, Nicaragua) and J. A. Steyermark (Guatemala); and European collections of C. Sbarbaro. There is also a large Illinois and Chicago area component to the collection. The nonlichenized ascomycete collection also has broad taxonomic and geographic representation. The Great Lakes region is well represented by the collections of E. T. Harper, while P. C. Standley and J. Steyermark deposited Central and South American material. The collection includes a large number of European specimens that were distributed by P. Sydow, O. Jaap, P. Vogel, and the Fuckel Herbarium. Recently, the collection has seen a sharp increase in the number of tropical loculoascomycetes and pyrenomycetous ascomycetes due to the activities of Resident Research Associate Sabine Huhndorf.

While the Mycology Collection at Field Museum has long been recognized as an important source of information by the systematics community, it has seen a marked increase in activity since Mueller joined the curatorial staff (1985) and focused on improving curation procedures and increasing the use of the collection by the mycological community. Several recent workers have used The Field Museum as the repository of their collections (e.g., J. García, K. M. Leelavathy, D. P. Lewis, J. D. Lodge, and C. Ovrebo). This has resulted in the acquisition of well over 6,000 collections including type specimens from a number of Central and South American countries. In addition to these gifts, growth of the collection has occurred through the active field program of Mueller and colleagues (e.g., Singer, 1989; Singer et al., 1992; Mueller and Singer, 1988; Mueller and Rajchenberg, 1991; Mueller, 1991, 1992; Mueller and Strack, 1992; Petersen and Mueller, 1992). Current field work is focused on a survey and inventory program of the Agaricales of Costa Rican oak forests. Together these activities have resulted in a twenty percent increase in holdings since 1986 and have stretched the current collection space beyond its limits.

Lichens: Collections
The lichen collection consists of 52,000 specimens, including 1,405 types, and ranks sixth nationally. Important collections include those of A. W. Herre and E. Hall (North America), P.C. Standley (Guatemala, Honduras, Nicaragua), J. A. Steyermark (Guatemala), C. Sbarbaro (Europe) and A. B. Seymour (Eastern North America).

Algae: Collections
This collection consists of 78,000 specimens, including 1,131 types and ranks among the top five in the United States. The collection is strong in marine taxa from North America, including material from both the Atlantic and Pacific coasts. Important collections include those of M. Doty, D. C. Eaton, H. Habeeb, F. Wolle, and M. Nitecki. The collection includes representative *exsiccatae* from Europe and North America. This herbarium also contains the cyanobacteria collection of F. D. Drouet, and consists of one of the world's largest collections of that group (30,000 specimens).

Bryophytes: Collections
North American bryophytes comprise about one-third of the collection (60-70,000 specimens), and include material from a large number of collectors. Many of these were acquired by the Museum through gift of Elmer J. Richards, including the large moss collection of A. B. Seymour, mostly from the

northeast United States. Regionally, the herbaria of Elihu Hall and H. N. Patterson are especially noteworthy, containing early Illinois collections of bryophytes dating from the early- to mid-1800's. Here also, there are differences in representation between the two major bryophyte groups. About one-third (ca. 20,000 specimens) of the North American mosses are Midwestern, and of these ca. 10,000 specimens are from the Chicago Region, comprising the states of Illinois, Indiana, Michigan and Wisconsin. Regional representation of hepatics is much lower (ca. 1,000 specimens), reflecting the much smaller number of hepatic species in the region as compared to mosses.

The bryophyte collection at The Field Museum is a major resource for bryophyte systematics, particularly for Central and South American, temperate Australasian, North American and European taxa. The collection consists of more than 180,000 specimens, including 127,614 moss and 51,508 hepatic specimens with a total of 2,284 types. Representation from south temperate regions is particularly strong and includes the collections of J. Engel (hepatics), R. M. Schuster (hepatics), H. Roivainen (hepatics and mosses, southern South America), R. E. Hatcher (hepatics, Chile and New Zealand), J. Child (ca. 3,000 mosses and 2,000 hepatics, New Zealand), G. O. K. Sainsbury (mosses, New Zealand) and R. Ochyra (hepatics and mosses, Antarctica). The collection also includes a complete set of the Guatemalan mosses collected by Standley and Steyermark which served as the basis for Bartram's Mosses of Guatemala (Bartram, 1949), as well as the hepatics, which have never been determined or published. Other important holdings include the personal herbarium of R. S. Williams, which includes significant early collections from Bolivia, the Yukan and Montana, including many types.

Major areas of geographic strength in the collection include North America, Europe, Central and South America, and Australasia. The hepatic collection is notable for its strong representation in south temperate regions; the moss collection for its North American, Central American and Andean South American coverage. Notable differences between the moss and hepatic holdings sampled are seen in the representation of specimens from south temperate regions (temperate South America and Australasia) and from tropical America. South temperate material accounts for nearly half (ca. 23,000 specimens) of the hepatics, as compared with an estimated 6,500 mosses. By contrast, tropical American specimens represent about one-fourth (ca. 33,000 specimens) of the mosses, versus only approximately 3,000 hepatics. The preponderance of south temperate hepatics reflects not only the focus of research activity over the past twenty years, but also the fact that the center of origin and diversity of hepatics is in the temperate regions of the Southern Hemisphere. Mosses, on the other hand, are numerous and well-represented in both temperate and tropical regions of the world.

Significant growth of the collection has occurred through the active research programs of Field Museum staff. John Engel's continuing floristic and monographic research on austral Hepaticae has made Field Museum one of the centers for studies of this group (Engel, 1980; Schuster and Engel, 1985). Resident Research Associate Gary Merrill's research on Polytrichaceae continues to elicit requests for identifications of specimens of this family, which become part of the permanent collection (Merrill, 1992, 1993). In addition, a large set of North American bryophytes (ca. 1,000 specimens), collected by Merrill over the past five years, chiefly from the Great Plains region, is being incorporated into the permanent collection.

The Schuster Collection—The most significant component of the bryophyte collection at The Field Museum is the recently purchased hepatic herbarium of R. M. Schuster, which is equal in world-wide geographical coverage, systematic breadth, and nomenclatural importance to the major 19th century hepatic collections of Stephani (G) and Schiffner (FH). The herbarium (ca. 58,000 specimens) is being transferred to The Field Museum in stages. 17,000 specimens have been received to date including material relevant to Volumes 1-4 of Schuster's Hepaticae and Anthocerotae of North America (Schuster, 1966, 1969, 1974, 1980), and miscellaneous Australasian research material. The remainder of the Schuster herbarium (ca. 41,000 specimens) will be transferred to The Field Museum within the next decade. When the transfer is complete the Schuster collection will almost double the number of hepatics at Field Museum and establish the museum collections as a unique international resource for research on the systematics of Hepaticae and Anthocerotae.

The Lewis Collection—A major field program by Field Museum associate Marko Lewis in Alaska, Hawaii, Ecuador and Bolivia, beginning in 1973, has led to acquisition of an estimated 22,000 specimens of bryophytes. Especially important is a large collection of Bolivian bryophytes, which was essentially inaccessible in its original condition. Specimens were collected for the most part in remote areas rarely visited by collectors, and are provided with extensive habitat data. In view of the rapid disappearance of tropical ecosystems, this collection represents a significant and irreplaceable resource. When the Lewis Bolivian collections (ca. 16,000 specimens) are studied by specialists they will inevitably yield many new taxa, as well as material documenting variation, distribution and ecology of rare and poorly understood species.

The Mary Taylor Herbarium—The importance of the southern Appalachians as a reservoir of rare and relictual taxa has long been recognized. In 1985, Field Museum acquired the Mary Taylor collection of ca. 8,000 specimens of Hepaticae, which consists primarily of collections from the southern Appalachians, but also from various remote areas of Florida. Included are irreplaceable collections made in the late 1920's and 1930's in these now threatened and declining ecosystems, and many are from habitats that have long since been destroyed. The herbarium is in excellent condition despite its age, and includes a presently unknown number of types, as well as extensive field notes and correspondence. Mrs. Taylor took special care to secure sporophyte material whenever available, and the collection is particularly rich in these especially valuable specimens. The collection was received in a condition requiring considerable curation, but all specimens have now been organized and locality data for the entire collection have been entered into the cryptogamic database.

The Richards Central American and North American Mosses—Along with his personal bryophyte herbarium, the late Donald Richards bequeathed to Field Museum an estimated 1,200 specimens of unidentified mosses from Mexico, Guatemala, Honduras and Nicaragua gathered by Richards, Louis O. Williams and others (Engel, 1981). Also included are an estimated 1,500 unidentified United States specimens, chiefly mosses.

Pteridophytes: Collections

The pteridophyte collection ranks fourth in the nation in size and includes more than 106,000 specimens of ferns and fern allies, including 373 types. The collection is worldwide in scope but has a strong concentration in tropical America. The Ferns and Fern Allies of Guatemala (Stolze, 1976, 1981, 1983) and Pteridophyta of Peru (Tryon and Stolze, 1989a,b, 1991, 1992, 1993, in press) were based primarily on our holdings. Central American and Mexican collections include the outstanding material of Standley, Steyermark, Molina and L. O. Williams (Guatemala), Matuda, Ringle and Purpus (Mexico), Molina, Williams, Shimek (Nicaragua), and Brenes and Austin Smith (Costa Rica). South American material includes specimens from J. F. Macbride, Mexia, Killip and Smith, and both Carlos and José Schunke (Peru), Cuatrecasas (Colombia), Steyermark and Llewelyn Williams (Venezuela), Acosta Solis (Ecuador), Buchtien and Steinbach (Bolivia), and Brade (Brazil). Although Old World specimens are not especially numerous, they include valuable collections of Blanchard (Africa), Boivin and Humblot (Réunion, Madagascar) and Zenker (Cameroon).

Gymnosperms: Collections

The gymnosperm collection consists of approximately 12,000 collections, including thirty-seven types. There is good representation of Gnetaceae, Ephedraceae, Cycadaceae and Pinaceae with the bulk of the Pinaceae from the United States and Mexico. In addition to herbarium sheets, the collection contains a large number of cones which are housed separately.

Flowering Plants: Collections

Of the 2.4 million specimens housed in the Department of Botany, more than 2 million are flowering plants which ranks as the fifth largest collection of flowering plants in the nation. This number includes 32,500 type specimens, estimated in 1995. Strong representation of neotropical taxa is credited to the many floristic projects and collection-oriented research programs, an integral part of the department since its inception. Especially rich are holdings in the neotropical families Rubiaceae, Asteraceae, Palmae, Piperaceae and Solanaceae, primarily due to the work of present or former staff botanists. The Central American material is overall one of the world's finest single collections with

special strengths in Guatemala, Honduras and Costa Rica. The South American collections are important with special strengths in Venezuela, Colombia, Ecuador and Peru. A good representation in North American taxa is found, especially for Missouri and Illinois, and unmarked types are commonly discovered in these holdings. Some major contributors to the development of the collections are noted below.

Jesse H. Greenman collected extensively in Mexico and Central America from 1904-1912. B. E. Dahlgren concentrated on collecting palms in Cuba, Brazil and British Guiana, his most active field work being conducted between 1909 and 1938. J. Francis Macbride initiated the Flora of Peru in 1922, and added significantly to the Peruvian holdings through his own expeditions and through attracting collections of others.

In recent years the Botany Department has collaborated on the Flora of Veracruz, Mexico project from 1973-1985 resulting in the herbarium housing the nation's best collection of plants from that area. During the 1980's South American representations increased due to the collecting efforts of Timothy Plowman whose expeditions included trips to Brazil, Colombia, Ecuador, Peru and Venezuela.

More recently, floristic projects and collection-oriented research programs have continued to build on our Neotropical strengths, particularly in Central America with Williams Burger's Flora Costaricensis and Michael Dillon's coordination of the Asteraceae for the Flora of Nicaragua project. The collections of Michael Dillon have greatly improved our holdings from Peru and Chile, as he continues floristic and monographic efforts in the Peruvian flora. His work on the Asteraceae over the past ten years has added numerous specimens to that family's holdings. Thomas Lammers is providing monographic efforts for the Campanulaceae in Peru and Chile. Resident research associates maintain active programs that contribute to collection strength, including Robin Foster's inventory projects in Peru, Panama and Bolivia, and Doel Soejarto's drug plant exploration, especially in the Paleotropics.

The herbarium also expanded through purchase of major private collections and through acquisition of the herbaria of the University of Chicago, Northwestern University and the Department of Pharmacy, University of Illinois at Chicago, among others. The Field Museum is likely to continue to play an important role in the future, serving as a repository for such "orphan" collections.

The Field Museum curates an extensive collection of dried fruits, large seeds, bark and other plant parts generally not accommodated on herbarium specimens. A seed collection consisting of some 6,400 glass vials also is maintained by the Department. A reference collection of 3,600 pollen slides is maintained and increased through exchange. In addition, 1,030 anatomical slides are preserved.

Timothy C. Plowman Economic Botany Collection
The Economic Botany collection had its origin in the World Columbian Exposition of 1893, and was especially enriched by gifts from the national exhibits of British Guiana, the Philippines, Japan, Brazil, Burma and India. Specimens also were acquired from the Paris Exposition (1901), the Louisiana Purchase Exposition (1904), and the Panama-Pacific Exposition (1915), as well as numerous Field Museum sponsored expeditions. The collection was recently enhanced by the acquisition of more than 2,000 pharmaceutical specimens from the College of Pharmacy, University of Illinois, Chicago. The Economic Botany collection, of more than 12,000 specimens, uniquely represents plant products and artifacts that complement the Museum's more traditional herbarium collections. Comprehensive collections of economic plant materials are rare and the collection at Field Museum is rivaled by few institutions in the world.

Type Photograph Collection
The Botany Department's unique type photograph collection originated in 1929 when J. Francis Macbride, funded by the Rockefeller Foundation, traveled to Europe to photograph herbarium specimens of nomenclatural types. The intent was to make the photographs available to American botanists unable to finance travels to European herbaria; the widespread adoption of the loan process was not as fully developed as it is today, necessitating travel for consultation. Over a ten year period, Macbride photographed type specimens of tropical American plants at the following major herbaria:

B, C, G, HAN, HBG, MA, M, P, and W, using Berlin-Dahlem and Geneva as bases of operation. His sojourn in Europe resulted in more than 40,000 photographic negatives, and duplicate collections, types, and type fragments of authentic material which were selected and sent to The Field Museum as exchange. The results were of immediate importance to American systematic botany, but acquired added meaning following the destruction of parts of some European herbaria during World War II. In some instances, the only visual record of a species is one of these photographic prints. The Type Photograph Collection now consists of more than 65,000 negatives. Continuous additions to this collection are made primarily by systematically photographing types in The Field Museum's vascular plant herbarium as well as types and authentic specimens received on loan from other institutions. The collection data for all of these are in database form.

DEPARTMENT OF BOTANY - COLLECTION SIZE AND GROWTH

	1995 Number of Specimens	1996 Number of Specimens	1995-1996 % growth
Algae	78,132	78,133	0
Fungi	147,872	150,561	1.82
Bryophytes	184,157	184,157	0
Pteridophytes	114,805	115,105	0.26
Gymnosperms	10,500	10,550	0.48
Angiosperms	2,035,749	2,048,869	0.64
Total	**2,571,215**	**2,587,375**	**0.62**

DEPARTMENT OF GEOLOGY

Department of Geology: History

The first chair of the department, Oliver C. Farrington, came to the Museum at the time of its founding in 1893. Farrington built the collections into worldwide importance during his tenure. Elmer S. Riggs, appointed shortly after The Field Museum's opening, became the first paleontology curator, and assembled the nucleus of the vertebrate paleontology collections. Riggs collected many dinosaurs from the Rocky Mountain states and Canada, and led several expeditions to South America where he amassed an outstanding Cenozoic mammal collection.

Henry W. Nichols, the second chair, specialized in mineralogy. He was followed by Sharat K. Roy, who studied in his native India, London, and Illinois, and led a number of museum expeditions, including those to Baffin Land and Labrador in 1927-1928. Bryan Patterson, on staff from 1926 to 1955, published extensively on Riggs' collection of South American fossil mammals, and made several major collections in the United States, including those from the Piceance Basin, one of the first significant Paleocene fossil vertebrate faunas. His collection and studies on the Trinity Cretaceous mammals of "metatherian-eutherian grade" from north Texas was a major contribution to mammalian paleontology.

Rainer Zangerl became head of the department in 1962 after serving seventeen years as curator of fossil reptiles. Zangerl extended his interest to Pennsylvanian paleoecology, and co-authored (with Eugene Richardson) a now classic memoir on paleoecology of Pennsylvanian black shales. Zangerl was succeeded in 1974 by Edward J. Olsen, who came to the museum in 1960 after teaching at Case Institute of Technology and Western Reserve. David M. Raup joined the geology staff as department chair in 1978, following faculty positions at the California Institute of Technology, Johns Hopkins, the University of Rochester, and the University of Chicago. John R. Bolt became department chair in 1981, following a period in which Bertram G. Woodland was acting chair. Bolt received his doctorate from the University of Chicago, and joined the Museum in 1972 after several years of teaching at the University of Illinois at Chicago. Peter R. Crane joined the Department in 1982 and served as Chair from 1990-1992 before taking a more senior administrative position. The current chair, John J. Flynn, joined Field Museum's geology staff in January, 1988, following several years as a professor in the Department of Geological Sciences at Rutgers University.

Department of Geology: Research

The Department of Geology maintains a primary focus on paleontological research, with curators covering fossil mammals, fossil fish, fossil plants, fossil reptiles and amphibians, and fossil invertebrates. The study of meteoritics has been and continues to be the department's other major research area. The scientists in the Department of Geology, together with colleagues at area universities, form an integral part of one of the nation’s largest concentrations of paleontologists, and one of the key meteoritics research groups in the world.

Fossil Mammals: Research

J. Flynn's research emphasizes mammalian paleontology and systematics, and paleomagnetism and geochronology. Current research uses DNA sequencing and anatomy of fossil and living taxa to analyze the higher-level evolutionary relationships of the Carnivora and rates of molecular, taxic and morphological evolution. Recent field work has yielded new fossil mammal faunas, providing new insights into the biogeography, temporal history and evolution of the highly endemic South American mammal fauna, and the age and patterns of change between early Cenozoic and North American mammal faunas. W. Turnbull's current studies of mammalian systematics and evolution focus on late Tertiary and Pleistocene mammalian faunas of Australia, and the 50 million-year-old mammalian fauna of the Washakie Formation in Southwestern Wyoming, with current emphasis on uintatheres and marsupials. Other projects examine the functional anatomy of the masticatory musculature of the Eocene taeniodont *Stylinodon*, the multituberculates of the Early Cretaceous (Trinity Group) of North Texas, and problems in paleopathology and taphonomy. S. McCarroll's research concentrates on the

faunas and the biostratigraphy of the Washakie Formation, with current studies involving description of the perissodactyls and artiodactyls, and reviews of the faunas of the very upper and lower-most rock units of the formation. G. Buckley's studies include the systematic treatment of 64-million-year-old mammals from the Crazy Mountains Basin of Montana and a reanalysis of the temporal zones used for North American mammals of the period.

Fossil Fishes: Research
L. Grande studies the comparative osteology and ontogeny in fossil and living fishes, with a particular emphasis on the ray-finned fishes (Actinopterygii). Some of the groups he has studied include the Siluriformes (catfishes), Clupemorpha (herring and herring-like fishes), Osteoglossomorpha (bony-tongues) and other more primitive actinopterygian groups such as sturgeons, paddlefishes, amiiforms, gars and polypterids. Recent research also addresses different types of intraspecific morphological variation (e.g., ontogenetic vs. non-ontogenetic) and its effects on phylogenetic reconstruction, problems regarding inclusion of fossils in phylogenetic studies and historical biogeography.

Fossil Reptiles: Research
J. Bolt focuses on the early diversification of tetrapods, particularly amphibians, from the Mississippian, Pennsylvanian and Early Permian age (ca. 360 to 270 myr B.P.). The relationships and morphology of primitive amphibians from a new Mississippian locality in Southeastern Iowa constitutes one area of current research. Other studies examine the fossil evidence for the origin and evolution of the tetrapod auditory system and its implications for otic evolution and tetrapod relationships, and the origin and early evolution of the living amphibians (lissamphibians). O. Rieppel's primary research focus is the analysis of phylogenetic relationships of marine Mesozoic reptiles, specifically the Triassic stem-group, the Sauropterygia, from the northwestern United States, Europe, Israel and China. Related research addresses problems of skeleton formation in all three major clades of extant reptiles (lizards, crocodiles and turtles), focusing on patterns and sequences of ossification. He also conducts studies in the philosophy and methodology of systematics and its relation to evolutionary theory. G. Buckley's research focuses on the systematic relationships and biogeography of the Late Cretaceous crocodilian fauna of Madagascar. Fieldwork conducted in 1993 and 1995 has produced a number of specimens that will help shed light on the nature and origin of the Malagasy fauna during the Age of Dinosaurs.

Fossil Invertebrates: Research
S. Lidgard continues his work on the evolution and ecology of cheilostome bryozoans, with a particular emphasis on species recognition and the relationships of colonial growth and form, for example, how different modes of growth relate to large-scale patterns of evolution, environmental distribution and ecology. Related research attempts to re-evaluate the role of competition in large-scale evolutionary replacements (e.g., dinosaurs vs. mammals, brachiopods vs. clams). M. Nitecki's work emphasizes the study of cyclocrinitids and receptaculitids, problematic fossils that do not fit into any living phylum, and thus represent early evolutionary experiments that prompt reconsideration of the history of life. He also writes on the history and sociology of science (e.g., the underlying structure of scientific attitudes and beliefs), and theories of evolutionary biology. P. Wagner's research focuses on the origins and maintenance of morphological and taxic diversity, contrasting the evolutionary dynamics of "failures" (e.g., rostroconchs, paragastropods, bellerophontid gastropods) with those of very successful mollusks (e.g., gastropods). Other research examines the distribution of soft anatomy characters and morphogenetic trajectories across gastropod phylogeny. This research integrates paleontological and neontological data to examine the effects of developmental constraints on two basic aspects of biodiversity: numbers of morphologic types and numbers of species encompassed by those types.

Fossil Plants: Research
P. R. Crane devotes primary study to the evolution of angiosperms and associated patterns of Cretaceous vegetational change. Other current projects involved the initial diversification of land plants, origin of seed plant biology and evolution of water-conducting tissues. Field work in North America and central Portugal recovered well-preserved microscopic flowers of early angiosperms and related plants from the mid-Cretaceous (about 100 myr B.P.). Investigations of this material will improve understanding of large-scale biotic and environmental changes that occurred during this period. P. Herendeen's work on

the evolutionary history of plants is directed at the paleobotany and systematics of the legume family, and the Cretaceous fossil record of flowering plants (angiosperms). Current legume research involves a paleobotanical and neobotanical study of the subfamily Caesalpinioideae; other projects include a study of Cretaceous fossil floras of the southeastern Atlantic Coastal Plain, and an examination of the structural evolution in the wood of early angiosperms.

Meteoritics: Research
M. Wadhwa studies primitive meteorite groups (including enstatite chondrites, eucrites, and mesosiderites) as well as some of the youngest known meteorites (e.g., the SNC or "martian" meteorites). Her current research on these widely diverse objects seeks to decipher the processes involved in their formation using trace element distributions in their minerals, and to determine the time scales of their formation using long-lived (Samarium-Neodymium and Rubidium-Strontium) and short-lived (Manganese-Chromium) chronometers, in order to better understand meteorite formation events and their chronology in the solar system.

Department of Geology: Collections

Paleontology Collections
The Field Museum paleontological collections include those of the former Walker Museum of the University of Chicago and are very highly ranked, both nationally and internationally. The paleontological collections now number almost 600,000 specimens (several millions if individual items within specimen lots are counted separately) and include historically important material collected by J. Hall, S. and J. M. Weller, S. A. Miller, A. Noe, E. S. Riggs, B. Patterson and R. Braidwood among others. In numbers of specimens, the Geology Department at The Field Museum ranks third or fourth among all paleontological collections in the United States and among the top ten of such collections worldwide. The Vertebrate Paleontology collections at Field Museum rank fourth in size nationally with more than 125,000 specimens. The invertebrate paleontology collections rank third nationally with over 319,000 specimens, and are also rated third among the most significant and useful collections of their kind in North America (Glenister et al., 1977). The paleobotany collections at Field Museum rank fourth or fifth in size nationally with about 77,800 curated specimens that range in geologic age from Precambrian to Pleistocene.

Fossil Mammals: Collections
The Fossil Mammal Collection at The Field Museum is an important national and international systematic and paleontological resource, totaling more than 60,000 catalogued specimens. Since 1981 these collections have grown by 20,000 specimens (50%), almost all of which were added through the activities of Field Museum staff and associates, with contributions from other professionals and the public. Among the Vertebrate Paleontology subareas, The Field Museum Fossil Mammal Collection is among the largest, most active, and most significant in the United States (this collection is the largest of the Museum's Vertebrate Paleontology collections, together ranked fourth in size in the United States, with several collections of international importance). There are more than 300 references (more than fifty in the past ten years) in our partial tabulation of papers referring to specimens in the collection. This collection contains more than 60,000 catalogued specimen numbers (each catalogue number represents 1-10 or more individual specimens, as early collections often included more than one specimen under a single number), and more than 10,000 uncatalogued specimens (primarily in the Middle East and Australian Pleistocene collections). Since 1981 it has grown by over 50%, or about 3% per year.

Systematic Coverage—Most major groups of Mammaliamorpha and Mammalia (especially Theria) are well represented. Particular strengths include Mesozoic mammals, marsupials, edentates, carnivorans, rodents, early primates, insectivores and most ungulate groups.

Geographic Strengths—Central and South America, North America (especially Colorado, Illinois, Montana, Nebraska, South Dakota, Texas andWyoming), Australia and the Middle East.

Type Specimens—There are more than 75 holotypes and 50 paratypes in the Fossil Mammal Collection.

Tertiary of North America—These collections are mainly from the Rocky Mountain states, where late Paleocene and early-late Eocene faunas from Colorado, Texas and Wyoming are noteworthy and are actively growing through J. Flynn's collecting efforts in the Bridger and Washakie Basins of southwest Wyoming. The collections of late Eocene-Miocene faunas of Nebraska, South Dakota and Wyoming are classic, and are being augmented by new collecting of Research Associate Michael Parrish and his students at Northern Illinois University and University of Chicago graduate students.

Cretaceous of Texas—The Trinity Cretaceous collection built by B. Patterson remains The Field Museum's most important Mesozoic mammal assemblage, and has been augmented through later collecting by W. Turnbull, J. Flynn, Research Associate Cathy Forster, and Ray Rogers (Cornell College). University of Chicago graduate students R. Blob and M. Carrano are making significant microvertebrate collections from the late Cretaceous of Montana.

Late Tertiary-Pleistocene of North America—This varied, but extensive, collection is quite good, with broad geographic and temporal coverage. It includes important Miocene and Pliocene collections from throughout the United States, an important late Miocene fauna from Honduras, a collection of La Brea Pleistocene mammals, and both regional and national Pleistocene collections.

Tertiary and Pleistocene of South America—This is one of the most significant elements of The Field Museum Fossil Mammal Collection, and it is one of the finest and broadest collections of South American Fossil Mammals housed anywhere in the world. The great majority of the collection was made by Elmer Riggs during three field seasons in Argentina and Bolivia in the 1920's. It has been augmented subsequently by new material and cast exchanges, by Patterson, Turnbull, Larry Marshall, Kubet Luchterhand (Research Associate, working in Colombia) and Flynn. Flynn has received support from The National Science Foundation and other organizations for collection, preparation and research on exciting new faunas from South America.

Latest Tertiary and Pleistocene of Australia—This extensive and important collection of material from Madura Cave (Western Australia), the Limeburner's Point and Hamilton faunas (Victoria), and the Pilbara and Danning Basins, was made during the 1950's-1970's by William Turnbull and Research Associate Ernest Lundelius. Turnbull and co-authors published a series of monographs (seven parts) on the Madura Cave fauna, and twelve papers on the other faunas.

Quaternary of the Middle East—Several collections of material associated with archaeological sites in the Middle East (sites such as Palegawra Cave, Jarmo, and Warwasi; primarily in Iraq and Iran, but also Jordan and Turkey), form the core of a large and important element of the Fossil Mammal Collection. Most were collected by Robert J. Braidwood, Oriental Institute, University of Chicago. The earliest evidence of domestication of many mammals are documented in these collections. Additional Middle East material now housed in Anthropology and Zoology will be integrated into the Fossil Mammal collections facility in the future.

Endocast Collection—Former Research Associate Len Radinsky's exceptional collection of recent and fossil brain endocasts was donated to The Field Museum after his death. More than 500 fossil endocasts are currently curated and inventoried on the computerized database.

Madagascar Mesozoic-Pleistocene Collections—Flynn and other Field Museum staff have established a collaborative "Accord" with the University of Antananarivo, Madagascar. This international research and Malagasy student training program will yield significant material for The Field Museum Fossil Mammal Collection, as the "Accord" includes a specimen sharing agreement. S. Goodman currently is in Madagascar making and curating collections of Pleistocene-subrecent fossil mammals for Field Museum. David Krause (SUNY-Stony Brook) and colleagues have initiated a major collecting and research program in Madagascar, which has yielded the island's first Mesozoic mammal (with more mammal specimens found in 1995), as well as abundant reptile, amphibian and invertebrate fossils. This material will be housed at Field Museum. The combination of material from these two programs will

make The Field Museum collection of Madagascar fossil mammals one of the most important in the world.

Fossil Fishes: Collections
The fossil fish collection is the first or second largest in North America, and one of the world's top four. It contains about thirty thousand specimen numbers, but because fossil fishes are frequently preserved in mass mortalities, the number of individuals in the collection is much higher. Specimen PF9668, for example, is a slab of limestone with over 200 nearly complete articulated skeletons. The Field Museum fossil fish collection contains representatives of over 250 families and well over 1,000 nominal species. The collection is worldwide in geographic scope and contains material from the Early Ordovician (500 million years before present) through the Pleistocene (1-2 thousand years old). The collection includes not only fish fossils from most of the major, well-known fossil fish deposits of the world (Solnhofen, Monte Bolca, Mount Lebanon, Green River Formation, Niobrara Formation, etc.), but also many unusual elements. Of the thirty thousand specimens, about 65% are cataloged. Major strengths are: Mesozoic and Cenozoic ray-finned fishes, Silurian and Devonian jawless fishes, lungfishes, coelacanths, and placoderms (mostly from western North America), and Pennsylvanian chondrichthyans (sharks and kin) and paleoniscoids from the black shales of Indiana and Illinois.

Type specimens—The collection contains about 200 holotypes and hundreds, perhaps thousands, of paratype and figured specimens.

Systematic Coverage—Most major groups are well-represented, with particular strengths in Actinopterygii, Sarcopterygii, Iniopterygii, as well as various extinct Paleozoic shark groups and placoderms.

Geographic Strengths—The collections are particularly strong in material from western North America, including Canada and Mexico, as well as Brazil, the Middle East and Europe, with some coverage of Asia, Antarctica, Australia and Africa.

Pennsylvanian Age Fishes—The Pennsylvanian Collection (approximately 4,000 specimens) is recognized by many paleoichthyologists as one of the world's most important Paleozoic fish collections. Mostly chondrichthyans and paleoniscoids, it includes the country's largest collection (over 1,200 specimens) of nearly complete, articulated chondrichthyan skeletons from the Paleozoic, and contains several undescribed taxa and unique examples of fine preservation. Most of these specimens were obtained from Indiana and Illinois (localities listed in Zangerl and Case, 1973) by Zangerl during the last thirty years, and some of his localities, as well as other Pennsylvanian sites represented in the collection, can no longer be collected.

Eocene Freshwater Fishes from North America—We have, by far, the world's largest collection of this material. This is a collection of several thousand specimens, and includes the most comprehensive data on the early development of the modern-day North American fish fauna.

Cretaceous Fishes—This is one of the largest collections of Cretaceous fishes including premier collections from Brazil, Israel, Lebanon, Mexico and the United States, and also smaller collections from Antarctica, Europe, South Yemen and Australia. Many of these pieces are "acid-transfer"-prepared, with preservation rivaling osteological preparations of living species.

Devonian Fishes—Amassed primarily by Curator R. Denison, the collection of Devonian fishes contains well over 1,000 specimens. Most of these are from North America (e.g., Wyoming and Ontario), but we also have strengths in Devonian fishes from Scotland.

Fossil Reptiles and Amphibians: Collections
The Field Museum's collection of fossil amphibians and reptiles comprises 5,825 catalogued specimens. The collection is concentrated in the North American Paleozoic, especially the Early Permian. Particularly important holdings are enumerated below.

Type Specimens—The collection includes 146 holotypes and 471 paratypes.

Systematic Coverage—Most major groups of Paleozoic amphibians and reptiles are represented in the collections, notably those from the Early Permian and Late Mississippian. Other groups with significant representation include turtles from the Tertiary, Triassic marine reptiles, Cretaceous dinosaurs and Tertiary birds.

Geographic Strengths—The collections' primary strength is North American material, especially Early Permian of Texas and Oklahoma, Late Mississippian of Iowa and Middle Triassic of Nevada.

Early Permian—The core of our Early Permian holdings is represented by the Walker Museum collection, which was transferred here from the University of Chicago. It and our other Early Permian collections come mostly from Texas and Oklahoma, with some important specimens from New Mexico. This part of the collection represents the research efforts over nearly 100 years of some of the best known workers in early tetrapod systematics, including A. S. Romer, Everett Olson, and their numerous students. It is relatively well studied and rich in type and figured specimens. Major additions to our Early Permian holdings within the last 20 years are primarily from Oklahoma, and due to the work of both Everett Olson (then at the University of Chicago) and some of his students, and J. Bolt (as a student at the University of Chicago, and later as a curator at Field Museum). Bolt's activities in particular have resulted in addition of many exquisitely preserved specimens of small tetrapods from a fissure-fill system in southwest Oklahoma.

Fossil Turtles—Fossil turtles, most collected from the Tertiary of Wyoming are a significant area of the collection, and largely due to the work of Rainer Zangerl.

Dinosaurs—The dinosaur collection includes mostly Cretaceous specimens (tyrannosaurids, hadrosaurs, ceratopsians) from both the United States west and Canada (the well-known mounts of *Albertasaurus* and *Lambeosaurus*). The most important Jurassic dinosaur material is a (composite) mounted specimen of *Apatosaurus*, currently on display in "DNA to Dinosaurs," and the holotype of *Brachiosaurus* on display in Stanley Field Hall. Recent additions of therapod material includes *Cryolophosaurus*, a Jurassic dinosaur recently discovered in Antarctica by Research Associate Bill Hammer. Ongoing work in Madagascar by Research Associates Dave Krause and Cathy Forster, Field Museum's G. Buckley, Malagasy and other colleagues is yielding new material of dinosaurs, birds, crocodiles and other reptiles.

Marine Middle Triassic Reptiles—O. Rieppel's ongoing field program in the Middle Triassic marine deposits of northwestern Nevada have resulted in significant discoveries of marine Middle Triassic reptiles. Specimens collected represent the only Triassic stem-group Sauropterygia known from the New World (other than the enigmatic genus *Corosaurus* from Wyoming).

Mississippian Amphibians—A remarkable assemblage of Mississipian amphibian material was collected within the last 10 years by crews directed by J. Bolt, all from a single locality in southwestern Iowa. This site, a sinkhole some 16 meters in diameter, was probably a pond during the Later Mississippian. It has produced hundreds of tetrapod specimens; many are very well preserved and some are nearly complete. This locality was the first reported occurrence in midcontinental North America of Mississippian tetrapods (the continent's oldest), and is one of no more than two dozen such localities in the world.

Fossil Invertebrates: Collections

The Fossil Invertebrate collection constitutes a national resource that is ranked third in the size of its holdings and third among the most significant and useful collections of its kind in North America. The collection includes classic material from the former Walker Museum of the University of Chicago , including historically significant collections by Weller, Hall and others. Collection size is estimated at 320,000 specimen lots made up of as many as two million individual specimens. The collection spans the geologic column from Precambrian to Holocene with representatives from all the continents. The collection is rich in population and community samples by which variability, growth and

environmental associations of the past may be assessed. During the past 25 years, there has been a constant effort to upgrade the quality and representation of the collection through new acquisitions.

Type Specimens—Approximately 3,500 specimens are primary types and an additional 15,000 are secondary types.

Systematic Coverage—The collection includes examples of all the classes and nearly all the orders of invertebrate life found in the fossil record.

Geographic Strengths—The collection's primary strength lies in materials from North America, notably the Paleozoic of the Mississippi Valley. Areas of key significance are listed more fully below.

Paleozoic of the Mississippi Valley—The collection of fossil invertebrates includes the most extensive representation of the Paleozoic of the Mississippi Valley; there are no other comparable collections. Particularly important are Ordovician through Pennsylvanian fossils from the margins of the Illinois Basin. Among the most significant materials are: Ordovician limestone faunas, Mississippi Valley; Silurian reef and interreef faunas of Illinois and Wisconsin; sponges of Tennessee; Devonian falls of the Ohio, especially corals, brachiopods, bryozoans; Mississippian faunas of the Mississippi Valley; crinoids and trilobites from Crawfordsville, Indiana; Pennsylvanian Mazon Creek (see below) and Mecca Faunas (currently the most active collection); and receptaculitids from the Ordovician and Silurian (the most important collection worldwide).

Mazon Creek—The Mazon Creek assemblage of fossil animals and plants is unique in its remarkable preservation of a 300 million year old marine and terrestrial biota, and it is one of only a handful of similar occurrences known from the geological record. The Field Museum collections are the definitive resource for the study of the Mazon Creek Biota.

New Acquisitions—Several important collections of excellent Paleozoic and Cretaceous fossil invertebrate material are slated for accession. Among them is a collection documenting the early diversification of echinoderms in the Ordovician, currently being studied by Research Associate T. Guensberg (Rock Valley College) and J. Sprinkle (University of Texas), Mississippian Bryozoa collected and studied by Research Associate F. McKinney (Appalachian State University), and rare Mazon Creek taxa including an undescribed arachnid and several Pennsylvanian insects collected by R. Masek (Field Museum) and studied in part by J. Kukalova-Peck (Carleton University). The largest lot of material to be accessioned is a collection of Campanian, Maastrichtian and Danian invertebrates from Madagascar, collected by Buckley, Joe Hartman and others in 1993 and 1995. Additional material from Madagascar is expected to be collected in 1996, and commitments to study this material have already been made by a number of specialists.

Fossil Plants: Collections

The paleobotany collections at Field Museum rank fourth or fifth in size nationally with about 77,800 curated specimens that range in geologic age from Precambrian to Pleistocene. The paleobotanical collections at The Field Museum are an important national and international resource for systematic and evolutionary plant biology. In the past five years these collections have grown by over 10% (ca. 7,800 specimens). Of the recent acquisitions, ca. 41% were added through the activities of Field Museum staff and associates, and ca. 59% were added through the acquisition of scientifically important donated collections. Active field work by Field Museum staff, associates and students during this period has resulted in steady growth of the paleobotanical collection.

Type Specimens—Approximately 1,200 specimens of fossil plants have been designated as types, or figured in publications by scientists from The Field Museum and other institutions. Type and figured paleobotanical specimens are housed separately from the general collection and are organized by publication.

Systematic Coverage—Most groups of plants are well-represented in the paleobotanical collections. Particular strengths include a wide array of Carboniferous taxa, and Cretaceous and Paleogene angiosperms.

Geographic Strengths—The paleobotanical collections possess nearly worldwide coverage, but are strongest for North American localities. Within North America the collections are especially strong in Paleozoic material from Illinois, Indiana, Iowa, Michigan, Ohio and West Virginia, Mesozoic material from Alaska, Utah, Virginia, Maryland, Georgia and Tennessee, and Cenozoic material from Mississippi, Tennessee, North Dakota, Wyoming, Montana and Colorado. Especially significant localities are described below.

Mazon Creek Flora—One of the greatest strengths of the paleobotanical collection is the Pennsylvanian Mazon Creek flora, a collection of 23,907 fossil plant specimens. The Mazon Creek assemblage was the subject of an NSF facilities grant that supported curatorial improvements to this unique collection. One important result of these activities is that 455 type and figured fossil plant specimens from Mazon Creek have been identified and removed to the type and figured collection.

Paleocene of the Rocky Mountain and Great Plains—The paleobotany holdings at Field Museum are also particularly strong in the Paleocene of the Rocky Mountain and Great Plains area. The bulk of this collection derives from field activities by Crane, Herendeen and others in North Dakota, Montana, and Wyoming, where in the past ten years approximately 5,350 fossil plant specimens have been collected, primarily from two localities, Almont and Melville. The most significant of these localities is that near Almont, North Dakota, where a laterally restricted outcrop of shale belonging to the upper Paleocene Sentinel Butte Formation has yielded approximately 3,500 specimens, from which 65 types of fossil leaves, fruits, seeds and stems belonging to 30-45 species have been identified (Crane et al., 1990). This Paleocene flora is particularly significant both because it is diverse (as compared to other assemblages of similar age) and because many specimens are silicified and anatomically well-preserved (e.g., Crane et al., 1990, 1991).

Mid- and Late Cretaceous of Eastern North America—Recent field work by Crane and Herendeen and colleagues in the mid-Cretaceous Potomac Group and Late Cretaceous of the southern Atlantic Coastal Plain of eastern North America has generated a large collection of fossil angiosperm, gymnosperm and pteridophyte material. Fossil plant materials from the Atlantic Coastal Plain are isolated from unconsolidated sediments by sieving and are exceptionally well preserved. Specimens are mummified and fusainized and are providing a wealth of information about the morphology and anatomy of Cretaceous plants (e.g., Crane and Upchurch, 1987; Crane et al., 1989, 1993, 1994; Srinivasan and Friis, 1989; Drinnan et al., 1990, 1991; Herendeen, 1991a,b; Pedersen et al., 1991, 1994; Herendeen et al., 1993, 1994, 1995; Srinivasan, 1992). Although the fossil angiosperms remain the focus of active ongoing research and are being actively curated in concert with the research effort, the abundant gymnosperm, pteridophyte and bryophyte material is equally significant (e.g., Srinivasan and Friis, 1989; Srinivasan, 1992).

Recent Acquisitions—Two large paleobotanical collections have recently been added to The Field Museum holdings. The larger of these collections, which numbers approximately 4,600 specimens, was given by Prof. A. T. Cross (Michigan State University). The Cross collection, which is extensively documented by field notes with precise locality and stratigraphic data, includes material from numerous North American and foreign localities from the Silurian through the Paleogene (Neogene collections were retained at Michigan State University). Of these localities several are particularly significant. A Middle Pennsylvanian locality from near Grand Ledge, Michigan, is a deltaic siltstone deposit in which fossil plants are abundant. The Grand Ledge collection comprises approximately 850 specimens of taxa such as *Megalopteris, Ginkgophyllum*, cordaite stems, leaves and seeds of several types, and other reproductive structures (Cross et al., 1981). Another extensive collection made by A. T. Cross and colleagues is that from the Early Permian (Dunkard) of the Appalachian Plateau (Cross, 1984). The Dunkard flora, which comprises over 1,000 specimens of compression fossils in siltstones and shales, was extensively collected from numerous localities in West Virginia, southeastern Ohio and western Pennsylvania. The Dunkard florules are generally dominated by Late Pennsylvanian species

with Early Permian plants represented in lesser numbers. Other significant floras in the Cross collection include the Paleocene and Eocene of Alaska (ca. 360 specimens) and the Cretaceous of Wyoming and Utah (ca. 1,500 specimens). While the Cross collection is extensively documented by field notes, considerable curatorial work is required to improve the availability of these materials and to maximize their utility to the scientific community.

Physical Geology: Collections
There are approximately 63,000 specimens in the six physical geology collections (mineralogy, gems, petrology, sedimentary rock, economic geology and meteorites).

Meteorites—The meteorite collection housed at The Field Museum is one of the largest and most representative in the world, and is an important resource for the international cosmochemical and planetary science community. There are roughly 2,611 known well-documented meteorites in the world; The Field Museum collection contains nearly 48% of these known meteorites and ranks as one of the seven largest meteorite collections in the world. The collection contains approximately 2,388 meteorite samples with 3,499 meteorite specimens, including a valuable reference collection of polished and thin sections. The Field Museum collection contains useful specimens of 62.5% of all non-Antarctic meteorites, including representatives of all meteorite classes and sub-classes. Including the Antarctic meteorites, the collection has approximately 1,249 distinct meteorites: 405 iron meteorites, 44 stony-iron meteorites and 800 stone meteorites. The meteorite collection is one of the most active collections in the Geology Department in loan activity, with most loans for the purpose of research investigations and destructive analysis. A survey made by Research Associate L. Grossman (University of Chicago) showed that during the period 1978 - 1987, Field Museum meteorite specimens were used in 27% of specimen-based scientific papers published in the preeminent geochemical journal *Geochimica et Cosmochimica Acta*, with additional papers using Field Museum meteorite specimens published in *Meteoritics, Earth and Planetary Science Letters, Nature* and *Science*.

The collection is particularly strong in iron meteorites, and contains very large amounts of Murchison (a Type 2 carbonaceous chondrite and the first meteorite in which amino acids were discovered, in The Field Museum collection), Allende (a Type 3 carbonaceous chondrite), and Indarch (an enstatite chondrite). Two recently acquired meteorites (Peekskill and Axtell) were obtained by exchanges, and were studied and classified, resulting in two announcements in the *Meteoritical Bulletin* and *Meteoritics* journal, two abstracts and a paper. The purchase in 1996 of a new and previously unknown mesosiderite from Kansas marks a significant addition to the collection.

Mineralogy—The mineralogy collection of approximately 30,000 specimens contains a wide variety of mineral species and geographic occurrences, and is an important public education collection.

Gem Collection—Most of the Museum's small but significant collection of representative precious and semi-precious stones is on exhibit. The most significant specimen is a 62,000 carat single crystal of topaz, very light yellow and transparent, which has been described as "textbook quality." Recent donations of jewelry including diamond, ruby, sapphire, emerald, opal, jade and pearls have increased the variety and educational value of the collection.

Petrology—The petrology collection contains diverse rocks from all over the world. It is particularly strong in material from Vermont and the Black Hills of South Dakota, and there is a large collection of slates and weakly metamorphosed rocks from Pennsylvania, Michigan, Arkansas, Oklahoma and Wales. Central American volcanic rocks, largely collected by S. K. Roy, are well represented.

Sedimentary Rock—The sedimentary rock collection includes a significant assemblage of Lower Tertiary terrestrial rocks from the eastern front of the Rocky Mountains and Utah, useful in studies of paleoenvironments.

Economic Geology—The economic geology collection contains examples of most metallic and non-metallic ores from all over the world. The collection began with the vast number of specimens assembled for the World's Columbian Exposition in Chicago in 1893, later enhanced by materials from

the Louisiana Purchase Exposition, 1904, the Panama-Pacific International Exposition, 1915, and the Alaska-Yukon-Pacific Exposition, 1909. Significant additions of South American specimens were made during the 1920s by O. C. Farrington and H. Nichols, and in 1962 with the acquisition of the E. S. Bastin collection of metallic ores from Canada, Mexico and the western United States.

Petrographic Thin Sections—An important adjunct to the physical geology collections is the 2,700 petrographic thin sections of rocks, minerals and meteorites, which reflect the research interests of the staff and the external scientific community - particularly igneous and metamorphic rocks and concretions, and meteorites.

DEPARTMENT OF GEOLOGY - COLLECTION SIZE AND GROWTH

	1995	1996	1995-1996
	Number of Specimens	Number of Specimens	% growth
Physical Geology	63,057	63,059	0.003
Invertebrate Paleontology	320,255	320,923	0.21
Plant Paleontology	63,111	63,300	0.30
Vertebrate Paleontology	81,506**	81,992*	0.006
Total	**524,268**	**527,929**	**0.69**

*catalogued specimens. Does not include approximately 25,000 uncatalogued specimens, reported as part of total specimens in prior years.

DEPARTMENT OF ZOOLOGY

Department of Zoology: History

The Department of Zoology traces its origin to the foundation of The Field Museum in 1893. At the inception of the department, its title "Department of Zoology, except Ornithology," reflected the existence of Ornithology as a separate department. Curator C. B. Cory had donated his collection of 19,000 bird specimens to the museum in exchange for departmental status for Ornithology, and his appointment as lifetime curator without residence obligations. The Department of Ornithology, with Curator Cory and Assistant Curators, G. K. Cherrie and N. Dearborn, remained separate for six years.

In this early period, Curator D. G. Elliot, an eminent ornithologist and mammalogist, led Zoology (except Ornithology) with Assistant Curators O. P. Hay and later S. E. Meek. Despite their specialty in ichthyology, both assistant curators worked in all non-ornithological fields of zoology. Meek's collections of Mexican and Central American Fishes made ichthyology a world-renown resource. The first Assistant Curator hired with responsibility for a specific animal group was W. J. Gerhard, appointed in Entomology in 1900.

Taxidermist C. Akeley was hired into the Department of Zoology in 1895. During Akeley's fourteen years with the Museum, he perfected his sculptural methods in taxidermy and created vivid depictions of animals in their natural habitats - an idea so beautifully executed at The Field Museum that it became the standard to which all museums aspired. However, Akeley was not the only pioneering taxidermist in Field Museum history; L. L. Walters, at the Museum for forty-three years beginning in 1911, perfected new techniques to prepare animals, such as amphibians and rhinoceroses, that could not be prepared with standard methods of the time.

In 1906, the loss of Cory's personal fortune left him unable to support his appointment in Ornithology, and when Elliot resigned to return to New York, Cory was named Curator of the newly-unified Department of Zoology - an appointment that lasted until his death in 1921. During this interval, Zoology flourished, assistant curators were appointed for the divisions of Osteology (E. N. Gueret in 1906), Mammalogy and Ornithology (W. H. Osgood in 1909), Ichthyology and Herpetology (C. L. Hubbs in 1916, replaced by A. C. Weed in 1920). The Division of Oology was created in 1917 around the bird egg collection donated by Judge R. M. Barnes. Barnes retained his appointment of absentee curator of the Division of Oology until his death in 1945, when the egg collection was incorporated into the Division of Birds.

The year 1921 brought several changes, among them Cory's death and the appointment of W. H. Osgood as Curator of Zoology. The names of the zoology divisions, Conchology (the only division without its own curator), Entomology, Herpetology, Ichthyology, and Mammalogy and Ornithology were anglicized in 1921 although Osteology remained unchanged. Mammalogy and Ornithology were also established as separate divisions. E. Heller became Assistant Curator of Mammals through 1927 and J. T. Zimmer took that role through 1930 in Birds. A. C. Weed focused on Fishes, and K. P. Schmidt became Assistant Curator of Reptiles and Amphibians the following year.

In 1922, C. E. Hellmayr was named the first Associate-level Curator in Zoology. Hellmayr's specialty in Neotropical birds was a major impetus to the development of what has now become a major international resource in that area at The Field Museum. C. B. Cory had begun what was to become the eleven-part, fifteen volume "The Catalogue of Birds of the Americas" in 1918; Hellmayr's task was to complete it, which he did in 1949, with the assistance of C. B. Conover. With Osgood's guidance, Conover had developed from a wealthy young sportsman to a scientific ornithologist, who not only contributed to the completion of the Catalogue, but earned the status "Benefactor" through his long relationship with The Field Museum. The donation of his personal bird collection increased the Museum's holdings dramatically and, through his efforts, "The Catalogue of Birds of the Americas" remains a basic taxonomic text.

In the 1920's, Field Museum collections grew as museum expeditions to Africa, South America and the Pacific led by staff from Birds, Mammals and Amphibians and Reptiles, as well as individuals such as Captain Marshall Field, members of the Roosevelt family and Conover, returned with scientific specimens. The expeditions increasingly focused on building research collections rather than collections solely for public exhibits.

Expeditions continued at a reduced pace during the 1930's. Schmidt traveled to Guatemala and Peru to collect specimens. The curator of Birds, W. R. Boulton from 1931-1946 collected in West Africa, Angola and the Kalahari Desert. In 1935, E. Blake, hired as Assistant Curator of Birds, furthered the collections of Neotropical birds through trips to South America.

In 1936, changes in curatorial titles reflected increasing scientific professionalism among museum staff. The Curator of Zoology became the "Chief Curator," Assistant Curators became Curators, and Assistants, including E. R. Blake in Birds and D. D. Davis in Osteology (renamed Vertebrate Skeletons), became Assistant Curators. During the depths of the Great Depression, the Workers' Progress Administration (WPA) funded additional positions at the Museum, which resulted in dramatic increases in curatorial activity.

In 1938, F. Haas, a researcher renowned for his study of fresh-water mollusks, had fled Nazi Germany, and was appointed as Curator of Lower Invertebrates. Haas' efforts extended beyond his scientific research to opening the crates of invertebrate specimens that had been closed after the 1893 World Columbian Exposition. These specimens, representing a frequently over-looked aspect of animal diversity, were re-identified, rehoused and catalogued to form the foundation of what has become a world-class collection of invertebrates, with a strong emphasis on mollusks. The second Assistant Curator of Insects at The Field Museum was J. E. Lijebland, appointed to join W. J. Gerhard in 1936. Lijebland was replaced by R. Wenzel in 1940. Wenzel, who retired in 1981, continues to serve The Field Museum as an active Curator Emeritus. In 1941, H. S. Dybas joined the staff as an assistant, and moved to Assistant Curator status in 1946. Dybas retired and became Curator Emeritus in 1980.

With W. H. Osgood's retirement from duties of Chief Curator of Zoology in 1940, K. P. Schmidt served in that position for the next fifteen years. Schmidt's promotion opened a position in Reptiles that was filled by C. H. Pope. In Fishes, L. P. Woods was hired as Assistant Curator in 1941. His career at The Field Museum, despite interruptions during the 1940's, would last through 1978, and produced significant growth of both the freshwater and marine fish collections. During World War II, many museum careers were suspended as staff participated in the war efforts. The volunteers in the Bird division and Ellen Thorne Smith, founder of the Women's Board, and Marion Grey in the Fish Division, were practically the only staff in their divisions during these years.

In 1946, R. F. Inger began working as a part-time assistant in the Division of Amphibians and Reptiles while he conducted his doctoral research. He was appointed Assistant Curator of Fishes in 1949, and continued in that position until 1953. P. Hershkovitz was appointed as Assistant Curator of Mammals in 1947; he became Curator in 1956 and Research Curator in 1962. H. Hoogstraal was Assistant Curator of Insects from 1947-48. Hoogstraal continued a strong association with the Museum through his field collections for many divisions. In 1955, Schmidt was the first member of the Museum staff elected to the National Academy of Sciences.

A. L. Rand served as Curator of birds from 1947 until 1955, when on Schmidt's retirement, he became Chief Curator of Zoology. H. Marx was appointed as assistant in the Division of Amphibians and Reptiles in 1949, became Assistant Curator in 1960, and moved through the curatorial ranks to become Curator in 1973.

After fifty years in the Insect Division, Curator Gerhard retired to become Curator Emeritus in 1950. Rand became Chief Curator of Zoology in 1955, holding that post until 1970. Inger succeeded Pope as Curator of Amphibians and Reptiles in 1954. In 1956, M. Traylor became Assistant Curator of Birds, appointed in recognition of his contributions to the division since 1937 as an expedition collector and unpaid associate. Despite his retirement in 1980, Traylor continues his work as Curator Emeritus.

A. Solem was appointed in 1956 as Assistant Curator of Invertebrates, sharing duties of the Invertebrate Division with Haas until Haas retired in 1958. Solem, an exceptionally productive researcher, built large collections of land snails, especially from Australia. J. Moore served as Curator of Mammals from 1961-1971.

K. P. Schmidt's retirement ended prematurely on September 26, 1957 when he was bitten by a poisonous snake that had been brought to The Field Museum for identification. Schmidt disregarded the seriousness of the bite of the juvenile boomslang (*Dispholidus typus*) and did not try to counteract the effects of the venom. The notes he made on the progression of his symptoms were published in a posthumous scientific paper.

The Department of Zoology achieved its current form - in which all specimens of a group are maintained within a single division - in 1972. After D. Davis' 1964 retirement, K. F. Liem had taken charge of the Division of Vertebrate Skeletons, the final incarnation of Osteology, previously Anatomy and Osteology (and Vertebrate Anatomy). Liem's acceptance of a position at the Museum of Comparative Zoology at Harvard resulted in the division being dissolved and its collections dispersed to their taxonomically appropriate divisions. Around this time, the administrative head of the Zoology Department changed from that of Chief Curator to a Chairman who is elected from among the curatorial staff.

Additions to the curatorial staff in the 1970's included R. K. Johnson, who rose to the rank of Curator and was Department Chair from 1980-1986. J. Kethley appointed as Assistant Curator in 1970, is currently Curator of Insects. Inger left the Division of Amphibians and Reptiles to become Chairman of Scientific Programs for the Museum and later Assistant Director of Science and Education, returning in 1978 to his curatorial position. H. K. Voris joined Zoology in 1973 as Assistant Curator of Amphibians and Reptiles. He later served the Museum as Assistant to the Director of The Field Museum (1983-84), and Vice President of Collections and Research (1985-89), returning to a curatorial role in 1989. D. J. Stewart was Assistant Curator of Fishes from 1978-1985. J. W. Fitzpatrick curated Birds from 1978 to 1989, and was later Department Chair.

Several of the current curatorial staff joined the Zoology department in the 1980's: including Curator of Mammals, B. Patterson in 1981; Associate Curator of Insects, A. Newton in 1985; Associate Curator of Fishes, B. Chernoff in 1987 (currently Department Chairman); and Associate Curator of Mammals, L. Heaney in 1988. Also appointed in the Division of Insects were L. Watrous (1980-1984) and S. Ashe (1982-1988). S. M. Lanyon was appointed as Assistant Curator of Birds in 1985, and served as Chair from 1990-1993. Lanyon was instrumental in establishing the shared interdepartmental Biochemistry Laboratories at The Field Museum.

Changes in Zoology at The Field Museum in the 1990s have kept pace with rapid advances in zoological science. The sudden death of A. Solem in 1990 prompted the department to strengthen its commitment to invertebrate zoology by appointing R. Bieler and J. Voight as the first marine malacologists in Field Museum history. M. Westneat's appointment as Assistant Curator of Fishes in 1991 added a component of functional morphology to specialties represented among the staff. The appointment in 1995 of Assistant Curators J. W. O. Ballard (Insects), S. Hackett and J. Bates (Birds) and A. Graybeal (Amphibians and Reptiles) bring new research strengths and increased breadth to the Department.

Department of Zoology: Research

The Department of Zoology is the largest of the Museum's four curatorial departments and is currently organized into six divisions: Amphibians and Reptiles, Birds, Fishes, Insects, Invertebrates, and Mammals.

Amphibians and Reptiles: Research
Extensive field work since 1950 in Southeast Asia by R. F. Inger has led to systematic works on the herpetofauna of tropical Asia, with emphasis on the Bornean fauna. These studies, involving both Inger and H. K. Voris, include analysis of relative abundances over a twenty-two-year period at a single Bornean site, and regional diversity of the herpetofauna of Borneo. Two new projects were recently initiated: i) variation in sequence of changes at metamorphosis in Bornean tadpoles; and, ii) relative size and spatial relations of viscera in Bornean tadpoles. H. K. Voris continues his research on the ecology of marine snakes. In collaboration with faculty and students at the University of Malaysia, Sabah campus, he has initiated mark and recapture and thermoregulatory studies on sea snake populations off the coast of Borneo (Sabah, Malaysia). He also continues studies with research associates W. B. Jeffries and C. M. Yang on the coevolutionary relationships between barnacles and sea snakes and decapod crustaceans found in the sea adjacent to Singapore. A. Graybeal's interests focus on the evolution of diversity, both macroevolutionary (patterns of character evolution, biogeography) and microevolutionary (population differentiation and speciation). She addresses these topics using the large frog family Bufonidae (True Toads) because these organisms display interesting patterns of similarity and differentiation, hybridization and geographical distribution. Her principle source of data is molecular (primarily DNA sequences), though she also works with morphological characters. While the main goal is to use genetic sequences to determine phylogenetic relationships among the toad species and subsequently interpret patterns of character evolution and biogeographical radiation, she maintains a strong interest and curiosity regarding the various aspects of this analytical process, including how to achieve and evaluate support for particular relationships, how to evaluate the phylogenetic utility of genetic sequences, etc., and pursues side projects on these topics. Her microevolutionary research is beginning with a study of speciation of North American toads. She is obtaining DNA sequences from various genes and is using coalescent methods to explore different microevolutionary processes that may affect or be symptomatic of speciation. These data will also be used to provide empirical insight into current debates over species concepts.

Birds: Research
S. Hackett and J. Bates both work on the systematics and biogeography of Neotropical birds. Bates works mainly at lower taxonomic levels studying the genetic structure of bird species distributed in South America. He is also continuing research investigating the genetic consequences of habitat fragmentation. S. Hackett conducts systematic research at higher taxonomic levels: species, generic, familial. Currently, she is continuing a systematic project on the avian family Pipridae, where she is studying genetic, syringeal, behavioral, and plumage evolution, and biogeography. D. E. Willard conducts research on distribution of East African montane birds and on the demography and morphometrics of Illinois migrants. M. A. Traylor, Jr., continues working on the systematics of South American birds. E. R. Blake works toward completion of the second volume of his Manual of Neotropic Birds.

Fishes: Research
B. Chernoff's research has emphasized the systematics and phylogenetic relationships of silverside fishes of the world, and choriciform fishes from the freshwaters of South America. He has long-term collaboration with Dr. Antonio Machado-Allison, Universidad Central de Venezuela, to study the systematics and biogeography of Venezuelan freshwater fishes. His other research includes studies of morphological evaluation and the theory and methods associated with systematic biology. M. Westneat's research combines functional morphology with phylogenetic systematics. The biomechanics of feeding and locomotion in fishes are of particular interest. Techniques include high-speed video analysis of the behavior of living animals, descriptive morphology and physiological measurements of muscle activity. Functional hypotheses are tested with a combination of laboratory experimentation and field work in the coral reef habitat of the fishes. His evolutionary research involves studying the anatomy of the labrid fishes, one of the most diverse fish families on coral reefs throughout the world. Studying these fishes involves collecting expeditions to tropical coral reefs in Australia, the Coral Sea and Thailand.

Insects: Research
J. Kethley's research involves phylogenetic analysis of comparative developmental data for soil mites living in nutrient-poor ecosystems such as very sandy soils. The goal is to contribute to an understanding of the evolution of chelicerate terrestrialization and soil mite community structure. W. Ballard's research strives to unite evolutionary pattern and process by using phylogenetics to infer change. Ballard's current research focuses on cospeciation: of bats and their fly parasites, and of a rickettsial parasite with its arthropod hosts. A. Newton's research focuses on the systematics and evolution of the beetle superfamily Staphylinoidea. Recent contributions include a review of the classification of all beetle families and subfamilies (with J. Lawrence of CSIRO, Australia) and the discovery of a "missing link" that resulted in the merging of two staphylinoid beetle families to form one of the largest insect families with over 42,000 known species (with M. Thayer). Newton and Thayer also collaborate on a long-term study of the systematics and biogeography of the poorly-known fauna of these beetles in the southern hemisphere; their recent field work in Australia has produced over 400,000 adults and larvae, half of which represent unnamed species. The southern temperate work is part of M. Thayer's interest in systematics, evolution and biogeography of world rove beetles, especially the more basal lineages. Her ongoing studies of the worldwide tribe Omaliini will provide a phylogenetic background for evolutionary studies of their biogeography and feeding habits; the latter are unusually diverse among rove beetles. She has recently begun studying the rove beetle fauna of the Chicago region as part of the Museum's efforts to increase knowledge of this rich area's biodiversity and provide data for use in land management decisions. Under contract to the National Biological Service, Thayer is also coordinating assembly of a database of all names that have been used for the roughly 25,000 beetle species of the United States and Canada. P. Sierwald's research focuses on the systematics and biogeography of the large world-wide spider family Pisauridae. Currently, the investigations concentrate on African and Malagasy members of the family. A second project is underway, focusing on mating behavior, sexual selection and evolution of mating systems in widow spiders. A third long-term project is an investigation into the ontogenetic development and evolution of complex female genitalia in spiders. Long-term studies on the systematics and biogeography of other insect groups continue by H. Nelson on dryopoid water beetles (with recent field work in eastern Asia), R. Wenzel on histerid beetles and batflies, and P. Parrillo on scaritine ground beetles.

Invertebrates: Research
Historically, the research emphasis of the staff has been systematic malacology, spanning land, freshwater and marine molluscan taxa with successive curatorial appointments. Founding curator Haas built and used a large collection of freshwater taxa. He published 319 titles and described nearly 400 new genera and species over a sixty-year career at Senckenberg Museum and The Field Museum. Solem's research focused on the Pacific Basin, Neotropical, and Australian land snail fauna and how they are related to faunas of other area, the overall phylogeny of land mollusks, shifts in feeding patterns and structure, and overall reproductive strategies of snails living in semi-arid zones. He published 140 scientific papers plus many popular articles while at Field Museum. R. Bieler's research concentrates on gastropod phylogeny, employing a variety of techniques ranging from marine field work to gene sequencing and fine-histological techniques in the newly established histology laboratory. He also continues projects dealing with the phylogeny of sessile marine snails and of marine gastropod groups with long-distance dispersal abilities. J. R. Voight studies the evolution and ecology of cephalopod mollusks, with an emphasis on octopuses. To learn more about the animals and their habitats, Voight analyzes their anatomy and morphology to discover characters that reveal the animals' phylogenetic relationships. Many forms of little-known octopuses live in the water-column, as do squids, although most familiar are bottom-dwelling octopuses. Understanding how these benthic octopuses came to occur throughout the world's oceans, from the intertidal zone to hydrothermal vents at great depths, is one goal of her research.

Mammals: Research
L. R. Heaney is continuing his investigation of the evolution and ecology of mammals in island ecosystems on a wide range of issues, including systematics, biogeography, population ecology and genetics; this research is carried out in North America and especially in Southeast Asia. He is also increasingly active in issues involving conservation of biological diversity. B. D. Patterson's main focus is on the ecology, evolution and distribution of the mammals of Central and South America. His work on

rodent evolution and conservation in the face of environmental change have recently added tropical Africa and Madagascar to his long-term interests in the Andes Mountains and Amazon Basin. P. Hershkovitz is continuing his landmark studies of Neotropical mammals, with studies of the small mammals of eastern Brazil that he and colleagues obtained in the 1980s and early 1990s. Despite the depauperization and massive habitat destruction in the Atlantic coastal forest of Brazil, he has continued to discover new mammalian species and genera. W. T. Stanley is studying the biogeography and ecology of small mammals in montane areas of East Africa, with particular emphasis on the fauna of the Eastern Arc Mountains of Tanzania. S. M. Goodman is studying the living and fossil mammals and birds of Madagascar, making remarkable new discoveries of species, documenting patterns of biological diversity, and providing advanced training to Malagasy graduate students in systematics, ecology and conservation biology. J. C. Kerbis is investigating the biogeography and systematics of African small mammals, particularly those on mountaintops astride the Albertine Rift in Central Africa. J. Fooden conducts revisionary studies of macaques and other tropical Asian monkeys, while R. H. Pine continues his research on the systematics of Neotropical mammals.

Department of Zoology: Collections

Division of Amphibians and Reptiles: Collections

A separate Division of Amphibians and Reptiles was established at The Field Museum in 1921. Prior to that time, the ichthyology and herpetology collections had been administered by the same curators. The arrival of Karl Patterson Schmidt in 1922, as the first curator of the Division, signaled the beginning of significant expansion of the collection in terms of size, geographic scope and taxonomic diversity. When Schmidt's tenure began, the herpetology collection consisted of less than 8,000 specimens, representing approximately 3,245 catalog entries. By 1941 when he became Chief Curator of Zoology, the collection had increased to about 50,000 specimens representing 36,612 catalog entries. The collection currently contains over 265,000 specimens and 251,715 catalog entries, an increase of 264% over the past forty-five years. Amphibians represent 138,976 catalog entries (55% of all entries) and reptiles represent 112,739 catalog entries (45% of all entries). The bulk of the collection is preserved in fluid (98%) and stored in more than 23,500 jars and 160 stainless steel tanks.

The collection serves as a major research resource for the national and international scientific community, and it contains unique material of special historical and ecological significance. It has been recognized as one of the five largest and most representative collections of amphibians and reptiles in the United States (Wake et al. 1975). Collection use has been growing steadily. Loan requests, visits by researchers, and information requests are at or near record levels.

A substantial portion of the growth of the collection was the result of the field programs of past and current curators. Karl P. Schmidt conducted fieldwork in Brazil, Argentina, Uruguay, Peru, Chile, Galapagos Islands, Guatemala, Panama, Belize, Honduras, Mexico, West Indies, Arizona, Texas, Illinois and the islands of the Pacific. Clifford H. Pope's field efforts, while at The Field Museum, were directed towards plethodontid salamanders in Mexico, California, and the eastern United States. By contrast, Robert F. Inger and Harold K. Voris have conducted their field programs in the Old World, specifically Asia and the Indo-Australian region. However, strategic purchases, long-standing open exchange programs, sponsorship of field collectors, and networking, particularly by Curator Emeritus Hymen Marx, which resulted in the donation of substantial collections, have added to the depth and breadth of divisional holdings. Significant accessions, measured in terms of quantity and quality, include Inger's Bornean material, Voris' hydrophiid material, the Harry Hoogstraal collections from East Africa through Turkey, the Sherman C. Bishop collection (including the University of Rochester collection), and the massive Edward H. Taylor collection. The Edward H. Taylor collection was the single, largest collection received from an external source. This 35,000-specimen collection, which included material from Mexico, Costa Rica, the Philippines, Thailand, Liberia and Kansas, added to the taxonomic, geographic and typic diversity of the Division's collection. Of particular note is that Taylor, Hobart M. Smith and others published extensively on large parts of this collection.

The entire herpetological collection was moved from the third floor to the present ground floor location in 1952 and 1953. Serious overcrowding due to tremendous increases in the size of the collection necessitated the initial move from the third floor and three separate ground floor expansions beginning in the late 1970's. With the last expansion in 1994, sufficient space for satisfactory housing of the existing collections and a comfortable measure of expansion potential have been provided.

Geographic Coverage—The collection is global in origin and almost equally divided between the New World and Old World (49.3% and 50.4% respectively). The breakdown of collection holdings by major geographic area is: North America (32.9% of catalog entries), Indo-Australia (20.9%), Asia (15.4%), South America (10.4%), Africa (9.0%), Central America (4.7%), Australia (2.7%), Caribbean (1.2%), Pacific (0.9%), Europe (0.6%), Madagascar (0.5%), Atlantic Ocean (0.3%), and Indian Ocean (0.1%). Some of the strongest foreign holdings (major collectors/donors in parentheses) are from Australia (David Liem, William Hosmer); Malaysia (Robert F. Inger, Harold K. Voris, Edward O. Moll); Philippine Islands (Dioscoro S. Rabor, Harold Hoogstraal); Thailand (Edward H. Taylor, W. Ronald Heyer, Robert F. Inger); Taiwan (Robert F. Kuntz); China (Cheng-chao Liu, Clifford H. Pope, Robert F. Inger); Egypt (Harold Hoogstraal); Colombia (Federico M. Medem, Kjell von Sneidern); Chile (Tomás Cekalovic K., Luis E. Peña); Peru (John E. Cadle, Karl P. Schmidt, Luis E. Peña, Felix Woytkowski); Mexico (Edward H. Taylor, Hobart M. Smith, Clifford H. Pope, Ernest G. Marsh, Howard B. Shaffer, James Hanken); and Central America (Karl P. Schmidt, Harold Trapido, Edward H. Taylor, Emmett R. Dunn). The Division's Malaysian collections undoubtedly constitute the largest accumulation of preserved Malaysian herpetofauna in the world. Additional areas of strength include Brazil, Sri Lanka, India, South Africa, Tanzania, Zaire, and southwestern Asia. The total number of catalog entries from the United States is approximately 49,500. States representing from five to ten percent of this total include (ranked highest to lowest): Illinois, New York, Texas, North Carolina, Mississippi and Indiana. Significant collections of United States material were made by or received from the following individuals (states given in parentheses): Sherman C. Bishop (New York); Denzel Ferguson (Mississippi); Edmund Heller and Sherman C. Bishop (California); and Walter Stille (Illinois and Indiana).

Systematic Coverage—The collection contains 6,229 species, 1,136 genera, 88 families and 9 orders and suborders. These constitute 86% of the genera, 99% of the families, and 100% of the orders and suborders recorded by Myers (1988). The taxonomic breadth of the collection is revealed by comparing the number of species in the collection to the total number of extant species as recognized by Halliday and Adler (1986) for amphisbaenians, lizards, and snakes; Iverson (1992) for turtles; King and Burke (1989) and Ross (1990) for crocodilians; Daugherty et al. (1990) for rhynchocephalians; and Duellman (1993) for amphibians. The Field Museum's herpetological collections contain approximately 56% of the 11,084 extant species of reptiles and amphibians. The breakdown of collection holdings by order or suborder is: frogs (42.6% of catalog entries), salamanders (12.4%), caecilians (0.25%), turtles (1.97%), rhynchocephalians (0.006%), lizards (26.4%), snakes (16.0%), amphisbaenians (0.16%) and crocodilians (0.26%).

Frogs—The frog collection contains representatives of all families, 80% of all genera, and approximately 51% of all species. Much of the diversity and quantity of the frog collection is due to the field work of Robert Inger in Malaysia, Thailand, China, India and Zaire. Particularly significant also are the collections made in western China by Cheng-chao Liu and studied by him while resident in the Division during 1946 and 1947 and the New Guinean and Australian specimens received from David Liem.

Salamanders—The salamander collection contains representatives of all families, 84% of all genera, and approximately 77% of all species. The salamander collection contains specimens assembled by some of the most important collectors and researchers including Sherman C. Bishop, Clifford H. Pope, Karl P. Schmidt, Richard J. Newcomer, Robert E. Gordon, H. Bradley Shaffer, Cheng-chao Liu and Edward H. Taylor.

Caecilians—The caecilian collection contains representatives of all families, 73% of all genera, and approximately 41% of all species. The caecilians (including type specimens) that formed the basis for Edward H. Taylor's classic 1968 monograph were acquired through the purchase of his collection.

Turtles—The turtle collection contains representatives of all families, 83% of all genera, and approximately 80% of all species. The Edward O. Moll collection from Malaysia is a relatively new addition that contains species that were previously not or only poorly represented in our collection. The turtle holdings from areas of geographic strength such as Malaysia, Thailand and Mexico are well represented, taxonomically and numerically.

Rhynchocephalians—Two species comprise the recent sphenodontidans. The collection contains only one of these species. The holdings number fifteen specimens. Several of these are skeletonized or cleared and stained.

Lizards—The lizard collection contains representatives of all families, 87% of all genera, and approximately 54% of all species. The lizard collection contains eight specimens of the extremely rare, earless monitor (*Lanthanotus borneensis*), the sole species in the subfamily Lanthanotinae. The specimens of *Lanthanotus* are constantly in demand by researchers worldwide and are usually on loan. Particularly valuable, for example, to researchers are the large series of Bornean lizards. Our holdings of the agamid genus *Draco* (flying dragons) dwarf the combined holdings of other museums. Such large series support studies that would be impossible otherwise. Additionally, such large series also allow several researchers to work on subsets of the material simultaneously, thereby alleviating the need to shift the same material from one researcher to another. Significant also are holdings of the family Xenosauridae which contains only two rare genera, *Shinisaurus* and *Xenosaurus,* and two adult, whole body, fluid preserved Komodo dragons (*Varanus komodoensis*).

Snakes—The snake collection contains representatives of all families except the Bolyeriidae, 87% of all genera, and approximately 65% of all species. One of the single, most important subsets of the collection are the sea snakes (Hydrophiidae) collected by Harold Voris. Significant also are several specimens of the virtually unobtainable viperid, *Azemiops*. The snake skull collection is extremely varied taxonomically and contains large series of single species of aquatic snakes.

Amphisbaenians—The amphisbaenian collection contains representatives of all families, 81% of all genera and approximately 33% of all species.

Crocodilians—The crocodilian collection contains representatives of all families, 100% of all genera, and approximately 96% of all species. Several species are present in large series. The crocodilian holdings (particularly skulls) were enhanced by the purchase of Federico Medem's collection (1955-1966).

Type Collection—The type collection contains 1,284 named forms (species and subspecies) of which 485 are represented by holotypes. The lists of type specimens have been published (Marx 1958, 1976). Frogs, lizards, snakes and salamanders comprise 36%, 29%, 21%, and 10% of the named types, respectively.

Skeletal Collection—The skeletal collection contains over 5,000 dry skeletons and over 300 cleared and stained specimens. The snake skull collection is particularly taxonomically representative due in large part to the research efforts of Curator Emeritus Hymen Marx. The sea snake (Hydrophiidae) skull collection is particularly valuable not only because of its taxonomic representation but also because of the large series of each sex of selected species. The hydrophiid skulls were prepared through the efforts of a dedicated, long term volunteer, Sophie Anne Brunner. Cleared and stained turtle, lizard, and crocodilian embryos, prepared and published on by Geology Curator, Olivier Rieppel, form a valuable subset of the collection.

Auxiliary Collections—The Division maintains the following auxiliary collections: histological slides (6,640); stomach contents (>3000); frozen tissues (729); tape recordings (33); color slides (>1,900); black

and white photographs (>1,230); X-ray negatives (175); field notes (619 sets), maps (>200) and original illustrations (>150).

Karl P. Schmidt Memorial Herpetological Library—This branch of the main Field Museum Library contains approximately 1,792 books and 36,000 reprints on herpetology. Donations of extensive herpetological libraries (Karl P. Schmidt, D. Dwight Davis, Emmett R. Dunn, Robert F. Inger, and Walter L. Necker) as well as an active reprint exchange program have enhanced the breadth of the library.

Archives—The archives, housed in the main library, include the Karl P. Schmidt and Emmett R. Dunn correspondence.

Division of Birds: Collections

The bird collection of The Field Museum houses one of the largest and most comprehensive scientific collections of birds in the world. The collection began as a byproduct of the Field Columbian Exposition in 1893, when Ornithology was one of six scientific departments of the new museum. The first large core collection came with the hiring of C. B. Cory in 1906. The next fifty years were a period of major acquisition of large collections from around the world. In 1920, the collection contained about 50,000 specimens, by 1940 it had grown to 137,000, and in 1960 it held 262,000 specimens. Following accession and cataloging of a major acquisition in 1980, the collection numbered about 310,000 specimens. As a result of a vigorous collecting program, the collections have grown substantially over the past fifteen years. Today there are more than 400,000 specimens in the Bird Division's skin and anatomical collections.

Today, the Division of Birds houses the third largest scientific bird collection in the United States. The main collection contains over 410,000 specimens, including 600 holotypes, 30,000 skeletons, and 6,000 fluid specimens. In addition, the division houses 16,500 egg sets and 200 nests. The scope of the collection is world-wide; all bird families but one are represented, as are 85% of the world's species. Included among its many historically and scientifically valuable individual collections are the H. B. Conover Game Bird Collection, Good's and Van Someren's African collections, C. B. Cory's West Indian collection, the Bishop Collection of North American birds, a large portion of W. Koelz's material from India and the Middle East, and many separate collections from South America, Africa and the Philippines.

As priorities and staffing of educational institutions shift, teaching and research collections can often become orphaned. The Division of Birds has demonstrated a willingness to work with these institutions to ensure that their collections receive proper care. However, when administrators are unwilling or unable to maintain collections at their institutions, it is important that museums offer to house and curate them. In recognition of this responsibility, The Field Museum has accepted three such collections in recent years (from Northern Illinois University, Princeton University and the University of Miami).

Geographic Strengths—The collection is strongest in North American (including all species and virtually all subspecies), Neotropical and African material (about 95% of species in both areas), the Philippines and India. Significant additional holdings exist from all regions of the world except Micronesia. Even in areas of relative weakness, however, large-scale exchange programs with other museums have resulted in at least synoptic representation.

Skin Collection—The Bird Division's skin collection ranks third in absolute size among the North American collections, and is fourth largest in the world. In systematic and geographic breadth, the ranking is roughly the same. In addition, certain of its holdings are as extensive and complete as any in the world (e.g., Conover game Bird Collection, Van Someren and Good central African collections).

Eggs—The egg collection, which includes a portion of the massive and renowned R. M. Barnes collection, ranks sixth in size in North America (with 16,500 sets).

Skeletal and Fluid Preserved Material—The Field Museum holdings in skeletal and fluid-preserved specimens rank seventh and tenth in size in the world, respectively. Because of their growing importance in avian systematic studies, the anatomical collections have been the focus of special efforts by the Bird Division staff over the last five years. In the three years between the first two editions of the "Avian Skeletal Specimen Inventory," The Field Museum has jumped from thirteenth to seventh in overall size and from twelfth to seventh in overall breadth. This effort to expand the anatomical holdings is expected to continue in the next several decades.

Frozen Tissues—In recognition of the increasing importance of biochemical approaches in evolutionary biology, a collection of frozen tissues has been established within the Bird Division.

Salvage Program—In addition, the Bird Division operates a salvage program that adds between 1,000 and 2,000 specimens per year to its collection, chiefly anatomical specimens of local and migratory North American Birds.

Division of Fishes: Collections

Established in 1894, The Field Museum's fish collection now contains nearly 1.7 million specimens in 125,000 lots. The scope of the collection is worldwide. Some 300 nominal families and more than 7,000 nominal species are represented, including three well-preserved specimens of the Coelacanth.

The Division of Fishes serves the research needs of scientists and students on all continents, both through their visits to the division and through outgoing loans. Continued scientific interest in the holdings of the fish collection stems not only from its historically important specimens and types, but also from the active incorporation of new material into the collection. Much of the growth of the collection was derived from the active field and collection programs of the curatorial staff. S. E. Meek (1897-1914) pioneered the study of the freshwater fishes of Mexico and Central America. L. P. Woods (1941-1978) amassed large and important collections of freshwater and marine fishes from North America, and the Atlantic, Indian, and Pacific Oceans. R. K. Johnson (1972-1986) obtained significant collections of open-ocean mesopelagic fishes, and shorefishes from Belize and Honduras amounting to 100,000 specimens. D. J. Stewart (1978-1985) made outstanding collections of freshwater fishes from Ecuador, Peru and Venezuela.

The ichthyological collection at The Field Museum is an internationally recognized systematic resource, and is ranked among the largest, most diverse, and most important fish collections in the world. Its importance has been recognized by the Advisory Committee for the Development of a National Plan for Ichthyology of the American Society of Ichthyologists (Collette and Lachner, 1976). This committee and recent surveys (ASC Survey, 1988; MITRE report 1993) have ranked The Field Museum within the top ten most important international ichthyological resource centers in North America. The ranking is based not only upon the size of the holdings but also the geographic coverage of the collection and the extensive type collection.

The specimens comprise approximately 125,000 lots of which 104,000 catalog numbers are assigned. (The number of database entries has been reduced to 83,231 by consolidating single lots that were given multiple catalog numbers). The large backlog of uncatalogued fishes is largely a function of the extensive collecting efforts of previous curators (e.g., R. K. Johnson in Central America, D. J. Stewart in South America, L. Woods in the Indian Ocean), acquisition of the Northern Illinois University Collection, and the Chicago Sanitary District fish survey. Much of the backlog is identified to family, sorted to genus, and requires further identifications.

Systematic Coverage—More than 9,000 species in 320 families are estimated to be represented in the collection (including the backlog of uncatalogued fishes). Using the estimates provided by Nelson (1984), the ichthyology collection of The Field Museum has representatives of 41% of the estimated living species of fishes and 72% of the families. This systematic breadth engenders ecological and environmental diversities within the collection from the full range of freshwater habitats, to estuarine, to shallow-marine nearshore, to offshore and to deep sea environments.

Geographic Coverage—The collection contains specimens from all continents, many countries (ca. 48%), all oceans, most major seas, and many islands or island groups. The collections are divided almost equally between freshwater and marine holdings. Collections of premier importance include those from: the freshwater of Mexico, Central and South America; the western tropical Atlantic, especially from the Gulf of Mexico and western Caribbean; and fresh and nearshore marine waters of North America. There are also important, diverse holdings of fishes from East Asia, Southeast Asia, and the Indian and Pacific Ocean basins. Field Museum ichthyological resources from other regions (e.g., Iraq, Poland, Lebanon, China) are generally not well represented in other United States institutions.

Type Specimens—The collection is especially rich in type specimens. Holdings of type materials (850 primary types, 750 secondary types) place The Field Museum among the five most important type depositories in North America. There are at least 1,410 nominal species represented by primary types. At present, estimates are not available for the total number of primary and secondary types, because the type catalogs of Gray (1947) and Ibarra and Stewart (1987) do not provide counts of the secondary types. The type holdings comprise taxa from five continents and the Atlantic, Pacific and Indian Oceans. The type collection derives from the following sources: exploratory fieldwork and systematic research of curators and associates, purchase of the Carnegie Museum fish collection in 1952; and receipt of gifts or exchanges from colleagues throughout the world. Acquisition of the Carnegie Museum collection, with about 500 taxa represented from primary types (Henn, 1928) more than doubled the type collection of fishes in The Field Museum (Ibarra and Stewart, 1987). Most of the taxa represented by Field Museum types were described after 1900, with the largest percentage described between 1905 and 1930 (see Ibarra and Stewart, 1987, Fig. 1). The majority from that time were described by S. E. Meek (Field Museum), S. F. Hildebrand (United States National Museum), C. H. Eigenmann (Indiana University), D. S. Jordan (Stanford University), C. L. Hubbs (Field Museum, University of Michigan), C. H. Gilbert (Stanford University), J. D. Haseman (Carnegie Museum) and their associates.

Historically Significant Materials—In addition to the type collection, The Field Museum maintains much other material of historic value. These collections include pre-1930 materials from areas that have or are now undergoing significant environmental changes (e.g., United States, Mexico, North Borneo, Mexico, Central and South America, etc.). Much of this material is documented in the now classic works of Meek, Meek and Hildebrand, and Eigenmann and his students, among others. Other material of historic importance includes the turn of the century collections from the United States and Mexico by A. J. Woolman, and collections from Japan, Taiwan, Korea and China by Jordan and colleagues, as well as the numerous purchases by A. Owston.

Skeletal Material—The skeletal collection comprises more than 3,600 skeletons from more than 210 families of fishes. Of these, approximately 1,200 are dry, articulated or disarticulated preparations from 147 families, and the remainder are cleared and stained specimens. Dry skeleton preparations are facilitated by the dermestid colonies maintained by the Museum.

Special Collections—There are a number of special collections (e.g. freshwater fishes from Borneo, Iran, Lebanon) that are unique or unusual among United States holdings. The collections also contain extensive holdings of large fishes. The collection has 135 specimen tanks that hold 1,163 large specimens from 114 families. However, two collection areas, neotropical freshwater and marine fishes, warrant special mention because our holdings are especially important and have been growing in size and value.

Marine Fishes of the Western Caribbean and Indo-Pacific—Two major marine collections are those of A. Owston in the Japanese Archipelago during the early 1900s and L. P. Woods in the Pacific and Indian Oceans in the 1960s. The Owston collection contains over 1,100 lots, and the Woods collections represent over 1,200 catalogued lots and an additional estimated 800 lots of backlog material. More recently, R. K. Johnson and D. W. Greenfield have been collaborating on an intensive faunistic, systematic, ecologic, and zoogeographic study of western Caribbean shorefishes. They have specialized in Belize and

Honduras, bringing to The Field Museum more than 100,000 specimens comprising ca. 10,000 lots during the decade 1970-1980. In the last four years M. Westneat has added approximately 200 lots (>2,000 specimens) of fishes from the Eastern coast of the United States, approximately 800 lots (>10,000 specimens) of fishes from the Northern Great Barrier Reef of Australia, and approximately 200 skeletal specimens, 200 lots from Thailand, 200 lots from Philippines.

Neotropical Freshwater Fishes—Beginning with the work of S. E. Meek in Mexico and Central America, the ichthyological collection has maintained important and still growing collections of neotropical freshwater fishes. In the last fifteen years, D. W. Greenfield, J. Thomerson and their collaborators have placed in The Field Museum more than 50,000 specimens comprising ca. 2,000 lots and 107 species from 150 different localities within Belize. The Carnegie Museum collection, accessioned in 1951, included the substantial collections made by C. H. Eigenmann and his associates in South America earlier this century. D. J. Stewart (Assistant Curator of Fishes, 1978-1985) brought in abundant material from collecting trips to Venezuela (1979), Peru (1980) and Ecuador (1981, 1983). His collections in the Rio Napo basin of Ecuador have brought to The Field Museum approximately 83,200 specimens (not including the 41,600 specimens returned to Ecuador) in approximately 4,250 lots representing more than 430 species. The Napo collection containing samples from more than 200 different localities between 200m and 2500m elevations is among the finest collections ever made for a neotropical river basin of its size. B. Chernoff has continued to increase the neotropical freshwater collection. In the past five years, Chernoff's collections from Peru and Venezuela contain approximately 50,000 specimens in over 1,900 lots, with more than 100 species new to the collection.

Division of Insects: Collections

Arthropods—The Field Museum's Division of Insects houses worldwide collections of Arthropoda (excluding Crustacea) that rank fifth in overall size among North American collections. At present, the collection includes approximately 3.9 million pinned insects and 6.4 million specimens or lots of insects and other arthropods in alcohol or on slides. More than 200,000 named species and subspecies are represented, over 10,000 of them by types including at least 9,200 primary types. To a greater degree than most other large collections, however, the growth of these collections has been strongly focused taxonomically, ecologically and geographically. As a result, some elements of the collection (e.g., world Staphylinidae, soil arthropods and some groups of mites) are of unique importance and see heavy international use, while others are of lesser or only local significance.

Beetles—Coleoptera is by far the best represented and most heavily used major insect order in The Field Museum collections, with unusually comprehensive material at the family and generic level. The collection of Palearctic (Eurasian and North African) beetles is the most extensive in this hemisphere, as are collections from Australia, the Philippines and Micronesia for at least many beetle families. The countries of Central and South America are also exceptionally well represented, including perhaps the largest collection of Chilean beetles (including the L. Peña collection) in existence. North American collections are significant, especially for the northeastern United States, where the recent addition of the N. M. Downie collection provides nearly complete species representation for this area, including voucher specimens for a new guide to beetle species of northeastern North America (Downie and Arnett 1994, two more volumes in progress).

Staphylinid Beetles—Outstanding among Coleoptera is the collection of Staphylinidae (the second-largest beetle family with over 42,000 named species), certainly the largest collection in the world and probably the most comprehensive and rich in species represented by types (rivaled only by the British Museum). This family alone accounts for nearly a third of all loan use of the insect collection, and includes nearly half of the species in the entire collection represented by types. Several other beetle families (e.g., Histeridae, Ptiliidae, Leiodidae, Cleridae, Mordellidae, Lucanidae) are unmatched among New World collections in world representation of genera and species (probably surpassed only by the British and Paris Museums), and others have tremendous strengths in particular regions (e.g., Elateridae, Buprestidae, and Cerambycidae for North America, Tenebrionidae for South America as well as world genera) or subtaxa (Scarabaeidae: Cetoniinae).

Butterflies and Moths—The Lepidoptera collection stands out as by far the strongest of the other large orders, with good worldwide holdings of macrolepidoptera, both butterflies and moths. The single largest element is the Strecker Collection, a world-wide collection of nearly 50,000 specimens built up in the late 19th century and including over 450 types of species or subspecies described by Strecker or others. At the time of his death in 1901, Strecker's collection was the largest and most important private collection of butterflies and moths in the New World. Recent curatorial work in the Strecker Collection turned up previously unrecognized type material. Other strengths are North American Lepidoptera (about 75% of named species of Macrolepidoptera) and European moths.

Vertebrate Ectoparasites—Another major element of The Field Museum collection is ectoparasites of vertebrates. Most significant among those are the ectoparasitic bat fly families Streblidae and Nycteribiidae; our holdings are unparalleled in the world and include over 75% of the known world species, including types of 40% of known species. We also have 50% of described tick species of the world; about 30% each of described flea and sucking louse species (and types of over 250 species of fleas); and major holdings of parasitic mites from Australian and Neotropical hosts. Most of these specimens were collected by mammalogists and have excellent host data, making them a superb resource for host-relationship and coevolutionary as well as purely systematic or taxonomic studies.

Bulk Arthropod Samples—The Field Museum is one of the world's largest repositories of bulk arthropod samples of various kinds, collected by museum staff and associates and by collaborators from numerous other institutions. The majority of these are samples of soil and litter faunas (mostly from forests) around the world, extracted by use of Berlese funnels or other means including deep-soil washing, and stored in 70% alcohol. Most samples have full ecological data. At over 14,000 samples, this is undoubtedly the largest such collection in existence. Most samples have had some taxa removed (e.g., beetles or mites), but still contain vast numbers of other arthropods. In addition to the soil and litter samples, there are also samples from some 4,000 trap collections (flight intercept, pitfall, dung- and carrion-baited pitfall, and blacklight) and small-scale pyrethrin-fogging. The spiders extracted from some of these samples provide an excellent example of the significance of this resource; they include representatives of some 70% of all spider families, including many that are generally rare in other collections. Similarly, the representation of Coleoptera from the bulk samples is extremely comprehensive at the family level - about 80% of described families and nearly two million specimens in alcohol.

Arachnids—In addition to the vertebrate parasites mentioned, the collection contains major holdings in several additional mite groups, especially: Hydrachnidia (water mites; types of 90% of described North American species and numerous types from other areas), Neotropical Opilioacariformes, Australian and Neotropical Holothyrida, World Trigynaspida, New World Endeostigmata, World Trombiculidae (chiggers; including over 1,500 type slides), and arthropod-associated mites (especially World Eviphidoidea). The spider collection of nearly 100,000 lots is also of growing importance, with recent additions from Madagascar.

Division of Invertebrates: Collections

Established in 1938, the Division of Invertebrates, which began with a collection of 16,000 lots, now manages over 317,000 lots, with approximately 5 million specimens. Most of these belong to the phylum Mollusca, and our molluscan collection now ranks among the top three or four in North America. The various components of our collection, described below, are valuable in establishing historical records of species distributions important to conservation, studies of biogeography, biodiversity and ecology as well as providing information necessary in studies of evolution, functional morphology and systematics.

Systematic Coverage—A 1993 survey found specimens of 62% of the currently recognized mollucan families present in the collection with 80% of the shelled molluscan families represented in that percentage. Approximately 68% of our holdings are terrestrial taxa, 18% marine and 14% freshwater.

Geographic Coverage—Within the terrestrial and freshwater molluscan collections there is strong representation from the Neotropical, Nearctic, Pacific Island, Australian and European regions. The marine mollusk collection has a world-wide coverage with strengths in Florida and the Caribbean.

Terrestrial Mollusks—Holdings of recent pulmonate gastropods (land snails) contain approximately 3.5 million specimens in about 210,000 lots and represent roughly 35,000 species. This collection is one of the most comprehensive in the world and an internationally recognized resource, with geographic concentrations in North America, Australia and the Pacific Islands, Central and South America, and Europe. It contains a great variety of alcohol-preserved specimens and one of the most diverse holdings of modern field collections of land snails. Acquisition of the Leslie Hubricht Collection in 1990 made this the premier collection of North American terrestrial mollusks. Through NSF support the Hubricht Collection has been completely rehoused and relabeled in archival quality storage materials. In addition, the Beetle-Pillmore Collection of U.S. land snails (ca. 4,800 lots) has also been rehoused into archival quality storage materials. The large holdings of eastern U.S. species comprise a unique resource for ecological, environmental, systematic and other studies. Dr. Alan Solem (curator 1957-1990) was largely responsible for amassing this important collection.

Freshwater Mollusks—The freshwater mollusks are estimated to number 30,000 lots of gastropods (snails) and 14,000 lots of bivalves (clams). The freshwater snails of eastern North America are well represented in the collection, providing an excellent resource for systematic and ecological studies. Other geographic areas covered by these collections are Southeast Asia and the Philippines, South America and Europe. The bulk of the freshwater bivalves are composed of an outstanding unionid collection assembled by Dr. Fritz Haas (curator 1938-1958) and recurated in 1993 by visiting scholar, Dr. Arthur Bogan. He found some 72% of the genera in the superfamily Unionoidea represented in our collection. The majority of endangered species in the U.S. are unionids and species of this group are often sensitive environmental indicators. The area of geographic strength in our freshwater bivalves is North America.

Marine Mollusks—Most marine material, approximately 55,500 lots, was received as part of formed collections or as voucher material. There is a good synoptic representation of the extant marine mollusks and a growing, taxonomically diverse collection of small-shelled “micro” mollusks. Geographic coverage is world-wide with strengths in Florida and the Caribbean. The collection contains considerable historically important marine material acquired in several major private collections, for example those of Charles D. Nelson, Fred Button and Walter Biese. Recent growth in the marine collections has resulted from the work of the present curatorial staff. The research-related field work of Dr. Rüdiger Bieler focuses on three areas: i) building a truly synoptic collection of gastropods to assist in group-wide phylogenetic analyses based on anatomical and molecular data, ii) building a collection of “worm-snails” to study their biology and phylogeny and iii) further strengthening our focus on tropical/subtropical Western Atlantic holdings for zoogeographic studies. The cephalopods, prior to the arrival of Dr. Janet Voight, were comparatively under-represented in the collection. Since 1990, specimen acquisition through orphan collections, cooperation with fisheries surveys and collaborative research by Voight has increased the cephalopod collection to include most of the recognized families and many octopus genera. Strengths of this collection are to be found in squids from the North Pacific and Gulf of Mexico to the North Atlantic and octopuses from hydrothermal vents on the floor of the Pacific Ocean.

Type Specimens—The molluscan type collection contains representatives of several thousand nominal taxa. Type designations by just three Field Museum-associated authors, Haas, Hubricht and Solem, account for over 500 species. Additional type material of species described as early as 1860 entered the collection through the accessions of various formed collections. These collections added to the breadth of our holdings and contained voucher material from published research, although comprehensive counts are unavailable. These historic collections are especially important because they document changes in geographic ranges and often contain species now extinct.

Non-Mollusk Invertebrates—The Division of Invertebrates currently holds approximately 8,000 lots of non-mollusk invertebrates, 3600 of which are identified and catalogued. Crustaceans comprise over

half of this material. Although the core of these holdings are collections acquired by The Field Museum from the 1893 Columbian Exposition, type specimens (mostly paratypes) constitute 88 lots, representing 49 nominal species in five phyla. Additions to these collections have come via collecting efforts with primary focus on other groups and the deposit of voucher material.

Auxiliary Collections--The Division of Invertebrates houses several auxiliary collections: radulae on Scanning Electron Microscope (SEM) stubs; a reprint collection of invertebrate scientific literature; and over 6,500 SEM photos and negatives of molluscan feeding apparatus and shell microstructures which are a unique resource for systematic studies. Recently, frozen specimens and other material especially preserved for DNA and fine-anatomical research were added to our auxiliary collections.

Fluid-Preserved Specimens—Numerous field programs have resulted in one of the most diverse holdings of alcohol-preserved land snails, a resource that has been important in several recent family and higher level taxonomic revisions. Fluid-preserved marine specimens, including “micro” mollusks, form a rapidly growing segment of the collection.

Division of Mammals: Collections
Established in 1894, the collection of the Division of Mammals is worldwide in scope, and with 155,671 specimens, is one of the largest, most representative and most heavily used collections of mammals in the world. In terms of absolute numbers of specimens, it ranks third or fourth in the nation, and in terms of geographic and taxonomic representation, it probably ranks third in the nation and fourth in the world. More than 410 primary type specimens are included in the collection.

Over the last twenty years, major transformations have brought the mammal collection to high standards of curation. Beginning in 1975, nearly the entire collection was moved into newly-constructed quarters; nearly all of the dry collection was accommodated in new specimen cases, and sufficient space has been allocated for several decades of growth. Staff eliminated a large backlog of skeletal specimens; input, edited and verified nearly all collection data in computerized files; constructed a new, well-equipped tanned skin facility; and adopted a large "orphaned" collection of large African mammals originally collected in the 1920s. Field Museum staff have also cataloged and installed large backlogs; updated geographic information on specimens; completed verification of the dry collection; and re-identified large parts of the dry collections (with assistance from Visiting Curators).

Recent collection growth has included specimens from recent field work in East Africa (especially Madagascar, Burundi, Tanzania and Uganda), South America (especially Brazil and Chile), and Southeast Asia (especially Malaysia and the Philippines), and from a wide range of other parts of the world. Growth of the fluid-preserved collection has been especially rapid. Nearly all of these specimens have come from recent field work, with the majority coming from Southeast Asia and East Africa. Many of these represent the only fluid-preserved individuals of their species, and at least 20 newly-discovered species are included.

The mammal collection of The Field Museum currently consists of 155,671 cataloged, plus 1,500 specimens or less that await cataloging (about half of which are newly acquired through research programs). Some 15,000 specimens have been returned to our foreign collaborators after preparation and cataloging at the Museum.

Geographic Coverage—The Field Museum mammal collection is global in scope, and includes specimens from 190 countries or equivalent geographic units. The collection is especially strong in material from South America, Southeast Asia, East Africa, Southwest Asia, China, Central America, Mexico and Australia, with smaller but very important collections from Madagascar, the Sudan, the Himalayan Front, and northern and southern Africa. In comparison with most other large collections, holdings from the United States and Canada are small (ca. 25,000). More than 40% of the specimens are Neotropical, followed by 16% Nearctic, 14% Palearctic, 13% Oriental, and 13% Ethiopian. Although the Neotropical collections represent all areas and taxonomic groups, the collections from northern Colombia and Chile are the best of their kind; Peru, Mexico,

Bolivia, Brazil, Guatemala, Belize and Ecuador are also particularly well represented. From the Palearctic Region, important collections include those from Afghanistan, Iran, Egypt and China, while strengths from the Oriental Region include the Philippines, Borneo, Malaysia and India-Ceylon-Nepal-Sikkim-Burma. Most of these are unique collections. Important collections from the Ethiopian Region include those from the Sudan, Tanzania, Uganda, Burundi, Kenya, Madagascar, Ethiopia and Angola.

Systematic Coverage—The collection is equally broad in its systematic coverage. All but one family of mammals is represented (though several by only a few specimens). The Muridae (under the current broad definition) is most abundantly represented with 59,318 specimens, followed by the Phyllostomidae with 11,977, Vespertilionidae with 10,189, and Sciuridae with 9,115 specimens.

Some families that are represented by unusually large numbers in The Field Museum collection include the hedge-hogs and relatives (Erinaceidae, 803), several families of bats (Pteropodidae, 4,563; Emballonuridae, 2,030; Rhinolophidae, 4,609), flying lemurs (Cynocephalidae, 90), several families of primates (Lemuridae, 1,364; Callitrichidae, 660; Cebidae, 1,861; Cercopithecidae, 1,409; Pongidae, 152), several unusual families of rodents (Ctenomyidae, 268; Echimyidae, 1,383), large carnivores (Canidae, 2,256; Felidae, 1,365; Hyaenidae, 114), and large herbivorous mammals (Bovidae, 2,554; Cervidae, 940). These figures again indicate the global scope of the collection. Of the 136 extant families of mammals, 135 are represented, with the exception being one family of bats; approximately 83% of 1,100 extant genera are represented. Holdings of rodents and bats are especially large and complete. The Neotropical primate collection is unique owing to the endeavors of P. Hershkovitz. Most of the specimens are study skins with skulls, but some 35,000 are fluid-preserved. In addition, there are 12,000 partial or complete skeletons, including the collection of anatomist D.D. Davis, and segregated collections of genitalia, auditory ossicles, gastro-intestinal tracts and endocranial casts.

Fluid-Preserved Specimens—Although all parts of the collection are heavily used, there has been especially rapid growth and increasing use of the fluid-preserved portion during the last five years. This portion of the collection now contains over 35,000 cataloged specimens and approximately 1,480 uncataloged specimens. The fluid-preserved collection grew by 5,613 cataloged specimens (16%) in 1989-1993 (twice the rate of growth in the dry collection), the majority of which were newly acquired through current research programs. This collection includes many species that are rare in museum collections, and contains an unusually large number of large mammals.

Auxiliary Collections—The auxiliary collections in the Division of Mammals includes a fluid-preserved brain collection representing most mammalian order, 3500 preserved genitalia, several hundred auditory ossicles, and over 500 endocranial casts representing the majority of mammalian orders. There has been growth in the collection of gastro-intestinal tracts, mainly due to recent field projects of the staff. We also have several hundred owl pellets containing mammal bones, which provide important information on predation, distribution of small mammals, etc. The reprint collection in the Division continues to grow, especially with significant donations by P. Hershkovitz.

Frozen Tissues—The Division's frozen tissue collection contains over 10,000 samples, including whole tissue, DNA extracts, and cell suspensions; the collection is growing rapidly due to active field program and high level of demand for this material. The collection has recently been inventoried and is soon to be entered into a computerized database as an aid to management.

DEPARTMENT OF ZOOLOGY - COLLECTION SIZE AND GROWTH

	1995	1996	1995-1996
	Number of Specimens	Number of Specimens	% growth
Amphibians and Reptiles	265,969	266,670	0.26
Birds	419,530	425,104	1.32
Fishes	1,793,270	1,798,285	0.28
Insects	10,227,619	10,275,928	0.47
Invertebrates	3,923,000	3,961,100	0.96
Mammals	155,671	157,991	1.50
Total	**16,785,059**	**16,885,078**	**0.59**

COLLECTIONS OF THE FIELD MUSEUM LIBRARY

The formation of the Library's collections, their rapid growth in the Museum's first decades, and their continuing development are the result of the cooperative endeavors of many organizations and institutions, private donors and collectors, and the Museum's administrators, scientific staff and librarians.

Initial Collections, Special Funds, and Ongoing Acquisitions

The World's Columbian Exposition
The creation of the Library's collections commenced in 1894 with initial transfers of books from the libraries of various departments of the World's Columbian Exposition. Chief among these transfers was the collection formed for the Exposition's Department of Ethnology. This collection had been assembled by soliciting donations of books from researchers worldwide who were at that time contributing to the formation of the disciplines that were to become modern anthropological research. The 1,400 titles in this collection are well documented in the surviving manuscript list of its holdings compiled by Charles Staniland Wake (1835-1910), who served as librarian for the Department of Ethnology. Most of the titles on Wake's list are still held by the Library and form the historic core of the Anthropology Department library.

Among the geological materials assembled for the Exposition was one of several book collections formed during his career by George Frederick Kunz (1856-1932), mineralogist and gemmologist with Tiffany and Company. Judged by its titles alone, this collection might seem somewhat eclectic. In fact its 6,300 titles demonstrate the depth of scholarship Kunz brought to the task. Every work in the collection either bears directly on some aspect of mineralogy, gemmology, or metallurgy, or contains sections, chapters or even simple passages illuminating some facet of these subjects. Including one of the Library's two incunables - a 1490 edition of Avicenna - the collection is rich in titles from the sixteenth through the nineteenth centuries. Harlow N. Higinbotham (1838-1919), president of the World's Columbian Exposition of 1893 and president of Field Museum from 1897 to 1909, purchased the Kunz collection and presented it to the Library in 1894.

International Publication Exchange
The Museum's first publication, *An Historical and Descriptive Account of the Field Columbian Museum*, was sent to museums and scientific organizations worldwide, accompanied by solicitation for mutual exchange of publications. Several hundred exchange agreements were quickly established. As the Museum's scientific publications began to appear and were distributed to exchange partners (at that time through the Smithsonian Institution's Bureau of International Exchanges) hundreds of scientific journals began to arrive in the Library. In time the number of exchange partners exceeded 1,000 and has been maintained at that level to the present. Each of these partners receives one or more of the Museum's four series of *Fieldiana* covering the areas of anthropology, botany, geology and zoology. Each exchange involves an approximate parity in the value or number of titles supplied. At its beginning the exchange program brought the Library several hundred journals; by the time it reached its full development, it provided nearly 2,000 scientific serials. The result of the exchange program is the Library's rich and extensive holdings of core journals in the Museum's research disciplines, a collection of rarely held materials that could not now be duplicated.

Edward E. Ayer
Edward Ayer (1841-1927) has been the principal benefactor of Field Museum Library. Instrumental in the founding of the Museum, and serving as its first President, Ayer gave great attention to the Library from the moment it was organized. In 1894 he presented to the Library his private ornithology collection of over 400 carefully chosen volumes, and he purchased the 600 volume collection of ornithologist Charles Barney Cory (1857-1921). In the same year he donated the ichthyology and angling collection of over 1,000 volumes formed by Robert Clarke and presented the Library as well with his own collection on ichthyology. All these collections are distinguished by their rich retrospective coverage of these fields, which is an essential resource for ongoing biological systematics. These collections are also marked by the beauty of their scientific illustrations, the majority of which

are hand-colored engravings and, from the mid-nineteenth century on, hand-colored or color-printed lithographs. Ayer continued to develop these collections through his own acquisitions and through an endowed fund for book acquisitions by the Library in these areas. The continuous development of the Ayer Ornithology Library during Ayer's lifetime was driven by his desire that it should be among the foremost collections of its kind. His success in achieving this goal became evident in the year before his death when the Museum published John Todd Zimmer's *Catalogue of the Edward E. Ayer Ornithological Library* (Chicago, 1926). This classic of ornithological bibliography clearly confirmed the Ayer Collection as one of the finest in the world. After Ayer's death, his endowments for the library were combined into a single fund, referred to simply as the Library Fund, whose earnings have provided the core support for book acquisitions for the ensuing seven decades.

Other Endowed Acquisition Funds
In the 1970's, under the auspices of Field Museum president E. Leland Webber, several new endowments were established to provide book acquisition funds for the Library. Along with the Library Fund, derived from the early donations of Edward Ayer, these three additional funds provide critical support for ongoing book acquisitions to the Library collections. The many thousands of titles acquired through these funds support all aspects of the Museum's mission by providing an essential research resource. The funds established during this time were: The Cherry Library Fund in Memory of Samuel M. Cherry, The Louis A. and Frances B. Wagner Library Fund, and The Jane B. Tripp Library Fund.

Mary W. Runnels Rare Book Room
In the late 1970's a major fund was established to create the Mary W. Runnells Rare Book Room and to support acquisitions to the collections it was to hold. Construction of the room was completed in 1981 and this splendid facility housing the Library's rich special collections was officially opened on December 2 of that year. The room is named as a memorial for Mrs. Runnells, donor in 1969 of the Library's exceptional copy of the double elephant folio first edition of John James Audubon's *The Birds of America* (London, 1827-1838). The Runnells Rare Book Fund has made many significant additions to the collections. Several lacunae in the Ayer Ornithology Collection have been filled with purchase of rare works by Thomas Brown, Polydore Roux and Du Bus du Gisignies. Other acquisitions have included: the eighteenth-century travel narratives by Bartram and Colnett; original illustrations by British ornithologist John Prideaux Selby; the mycological library of Rolf Singer; the joint acquisition with the Friends of Field Museum Library of a set of the works of the sixteenth-century naturalist Ulisse Aldrovandi; and the purchase in 1985 of one of the Library's principal desiderata at that time, a first edition, first issue of Charles Darwin's *On the Origin of Species*, published in 1859.

The Friends of Field Museum Library
Formed in 1989, the Friends of the Library joined the Runnells Fund in supporting the ongoing development of the collections held in the Mary W. Runnells Rare Book Room. In the few years since its formation the Friends group has made impressive contributions to the Library's collections. Acquisitions have included: Roderick I. Murchison's *The Silurian System*, (London, 1839), a classic work on stratigraphy and paleontology; the official narrative of the Beagle voyages, published in 1839, which includes Charles Darwin's *Journal of Observations on Geology and Natural History*, his first published book; the joint acquisition with the Runnells Fund of a set of the works of Ulisse Aldrovandi (1527-1605); Robert Kaye Greville's *Scottish Cryptogamic Flora* (1823-1828); Richard Bradley's *Philosophical Account of the Works of Nature* (1723); the modern facsimile (1986) of *Birds of the Pacific Slope*, the previously unpublished ornithological accounts and illustrations by Andrew Jackson Grayson (1818-1869), self-styled successor to John James Audubon; and Jean Bauhin's *Historia Plantarum Universalis* (1650-1651), an important work in pre-Linnean botanical systematics.

Collectors and Collections, Private and Curatorial

Development of the Library collections has benefited from the presence and generosity of sophisticated bibliographers and dedicated collectors among the Museum's research and other staff. Curatorial staff have regularly donated important works to the Library and have often directed their personal collections to the Library by bequest. The Museum's librarians have also seized every opportunity to acquire significant private collections by donation or purchase.

Berthold Laufer (1874-1934), curator of Asian Anthropology from 1908 to 1934, was a pioneer in the study of Asian cultures. Polymath and polyglot, his interests seemed unbounded and his linguistic skills unequaled. His extensive book collections came to the Library by bequest and enriched many areas of the Library's holdings. His collection of over 7,000 volumes in Chinese includes imprints from the fifteenth to the twentieth centuries, and includes such rarities as a copy of the official Ming Dynasty gazetteer published in 1461. Laufer's extensive working collections in Western languages include thousands of scarce imprints and ephemeral publications, and are especially rich in east European materials.

George Amos Dorsey (1868-1931), curator of anthropology from 1898 to 1915, was a formative influence in the study of the native cultures of the American Southwest. The Library received considerable materials through his active collecting in that field.

Charles Frederick Millspaugh (1854-1923) was the first Curator and Chairman of the Museum's Botany Department, a position he held up to the time of his death. Millspaugh was a great builder of the Museum's herbarium and of the Library's collections in botany. His book collection came to the Library by bequest, strengthening many subject areas, especially in economic and medical botany. Included in his library were many presentation and other association copies of important works. Also included were important materials relating to publication of Millspaugh's classic *American Medicinal Plants* (New York and Philadelphia, 1884-1887). Among these materials are: a volume containing Millspaugh's original watercolor illustrations for the book, each accompanied by a proof print; Millspaugh's own copy of the work as originally issued; and over a hundred proof sheets of various portions of the text with extensive corrections in Millspaugh's hand.

Several notable zoologists enriched the Library's holdings in their special disciplines by contributions during their lives and by bequest of their collections. Karl Patterson Schmidt (1890-1957), Curator of Herpetology from 1922 and Curator of Zoology from 1941, was a thorough bibliographer and collector. At the time of his death, his book and reprint collections were virtually exhaustive. Schmidt's manuscripts and papers, held among the Library's Special Collections, contain considerable material documenting his pursuit of book collecting. Wilfred Hudson Osgood (1875-1947), Curator of Zoology from 1909 to 1941, made similar contributions to the Library's holdings in mammalogy and ornithology. His personal collection contained many presentation copies of important works and included numerous editions of the works of Linnaeus and other eighteenth-century authors. The bequest of the library of Henry Boardman Conover (1892-1950) built further on the strengths of the Edward Ayer Ornithology Collection. Conover, who became a Trustee of the Museum in 1941, had been a Research Associate in ornithology since 1924. His collection was especially strong in modern imprints, but also filled several gaps in the earlier literature of ornithology.

In the 1930's Museum President Stanley Field presented the Library with his choice collection of books documenting the history of the British presence in North America. This collection contains first editions of the published narratives of British voyages of discovery, from Anson to Cook, Vancouver, Franklin and Hearne. Exploration of the interior of the continent is represented by Jonathan Carver and Lewis and Clark, and by the important ethnographic works of Schoolcraft, M'Kenney and Hall, and Edward S. Curtis. This is a distinctive personal collection, notable also for its many fine bindings, both in original states and in careful restorations.

LIBRARY ACQUISITIONS AND COLLECTION USE, SUMMARY TABLE, 1996

Library	Holdings 12/31/95	BOOK ACQUISITIONS Purchase	Holdings	Gift	Serials Received (volumes)	Holdings 12/31/96
General	105,978	166	33	169	450	106,796
Anthrolopogy	38,497	242	17	126	120	39,002
Botany	32,331	73	18	48	130	32,600
Geology	36,783	58	12	31	170	37,054
Zoology	37,753	139	12	115	120	38,139
Birds	11,755	26	0	15	20	11,816
Mammals	4,260	20	4	18	15	4,317
Insects	14,668	32	3	21	60	14,784
Invert.	4,105	24	4	40	12	4,185
Fishes	1,123	20	1	12	8	1,164
Reptiles	1,864	17	0	9	5	1,895
Total	251,342	678	92	489	990	253,591

PHOTOGRAPHIC COLLECTIONS

The Photographic Collection serves as an important supplement to The Field Museum's exhibits and research, and it increases the educational value of the artifacts and specimens. Associated collector's field notes and diaries also strengthen the importance of the Photographic Collection. Millions of people who have not visited Field Museum see our photographs in displays, textbooks, journals, magazines and electronic media. Photographs are requested and republished, often with different uses for the same photograph. This cumulative effect increases the value of the Photographic Collection for many different disciplines.

Research and Other Scholarly Uses of the Collection

The Photography Department processes all outside photograph and usage requests from a variety of sources: publishers, teachers, students, commercial and public television as well as museums, universities, galleries and the general public. The photographs are used in textbooks, advertisements, educational programs, calendars and posters. The Photographic Collection is also an important research resource for Museum scientists and curators. The Museum's monthly "In the Field," distributed to over 25,000 members, has also used the Photographic Collection repeatedly during its past 54 years.

The Photographic Collection is widely used in the Museum's exhibits and especially in the Webber Resource Center, where the peoples and cultures of North, Central and South America are featured. Photographs show the people, environment, technology, architecture, religion, costumes, and food gathering and preparation activities. Records show that the use of photograph albums is extremely popular. Copies of prints are available for purchase through the Photography Department.

Contents and Historical Significance of the Collection

Native American Material
Between 1895 and 1910, the Museum collected most of its Native American ethnological and archaeological material to augment the collections obtained from the World's Columbian Exposition. Between 1897 and 1898, free-lance photographer Edward Allen and Museum curator George Dorsey documented the daily activities, ceremonies and peoples of the Pacific Northwest Coast, and the plains, plateau and desert regions of the western United States.

In 1899, Charles H. Carpenter was hired as the Museum's first full-time, professional photographer. He remained in that position until his retirement in 1947. Carpenter went with curators on several early expeditions including the 1900 Stanley McCormick-sponsored expedition which produced over 1,200 negatives of the Hopi Indian tribes. Carpenter and H.R. Voth, a missionary to the Hopi from 1893 to 1902, and ethnologist for the Field Columbian Museum, photographed daily activities and life of the villagers. Voth lived with the Hopi for several years. Photographer Sumner Matteson, under the direction of Dorsey, added other photographs of the Hopi to the Collection. Soon after these photography excursions, the United States Government severely restricted the use of cameras on Hopi reservations, and eventually banned them entirely.

John W. Hudson spent his life as a collector-scholar, and he amassed a significant number of California Indian baskets held by The Field Museum. The Smithsonian Institution, Brooklyn Museum and Hudson Museum in Ukiah, California also have material collected by Hudson. Photographs in The Field Museum's possession document the native Pomo, Yurok, Miwok and Hupa from 1900 to 1905 when Hudson was collecting artifacts under Dorsey's auspices. Hudson visited more than twenty tribes and photographed traditional activities such as basket-making, acorn-grinding and other aspects of daily life. In many cases, these photographs are the only visual record of such activities. The Hudson collection contains over 450 negatives. J. W. Hudson's field notes and papers were deposited at the Sun House (also called the Hudson Museum). In an exchange of photographs, field notes and ongoing research, between the two institutions, Field Museum received detailed documentation of the Hudson photographs. A computerized catalogue of the photographs and artifacts was compiled by Field Museum Research Associate Eloise Richards Barter. Other strengths in the Collection of Native

American culture include Dorsey and Carpenter's photographs of Cheyenne life, Matteson's prints of the Blackfoot tribe, and S. C. Simms' Crow and Cheyenne photographs.

Carpenter and the Louisiana Purchase Exposition
In 1904, the city of St. Louis was host to an exposition held to celebrate the centennial of the Louisiana Purchase. There were over forty-seven acres of exhibits of Philippine and Native American tribes including Pawnee, Pueblo, Pima, Pomo, Kwakiutl, Eskimo, Oglala and Rosebud Sioux who recreated ceremonies and lived in native habitats on the Fairgrounds. The Fair was Carpenter's last field assignment for the Museum, and he made over 3,000 negatives, including portraits of Geronimo and Pacific Northwest Coast Natives Americans Bob Harris and Charles Nowell. Prints from Charles Carpenter's series of Native American portraits taken at the Louisiana Purchase Exposition were requested by the Oglala Lakota College archives. Field Museum sent more than 100 photographs, but lacked detailed caption information for all but a few. In return, the College provided the Museum with the names and family histories of sixty of the photographs' subjects.

A. B. Lewis and Melanesia
From 1909 to 1913, Museum curator A. B. Lewis became the first American to conduct systematic ethnological field research in Melanesia. During the course of his travels, Lewis collected more than 12,000 examples of Melanesian ethnological material. This is the largest American collection of such material, and it is one of the world's largest collections from that area of the Pacific. Lewis created an extensive photographic record of the areas he visited. His photographs, numbering more than 2,000, represent over one hundred different societies in Melanesia and have been used to catalogue and interpret his collections of artifacts. Many of Lewis' photographs have been displayed in Field Museum exhibits.

West African grassfields - Cameroon
Field Museum contains one of the finest collections of Cameroon artifacts from the West African grassfields. In the 1920's, Jan Kleykamp, representing the J .F. G. Umlauff Company in Hamburg, sold a collection of artifacts to The Field Museum. The purchase included 332 ethnological photographs taken in 1912 and have been attributed to a man named Schroeder (Geary 1988: 141). Like the A. B. Lewis photographs, Schroeder's images consist of village scenes and portraits that illustrate the use and social context of the artifacts. There is a growing interest by ethnographers for source materials on African history. The often complete destruction of photographic material held by German museums during two world wars makes Field Museum's Schroeder photographs of particular value to scholars of African art and culture.

Worcester Collection
During the 1920's, Museum curator Fay-Cooper Cole visited the Philippine Islands and Indonesia. Through a prominent Philippine official, Dean C. Worcester, Cole obtained over 200 prints of the area taken by Worcester's personal photographer. The Worcester Collection is an extremely important and untapped resource for the study of Philippine anthropology (in particular, the Nias region), and late colonial Philippine history. Cole also took more than 400 photographs while visiting other areas of Indonesia and the Philippines.

Laufer Collection
Berthold Laufer, Curator of Asian Ethnology, spent three years in China and Tibet in the 1920's while laying the foundation for the Museum's highly regarded collection of Asian material. The collection of negatives that Laufer made while in the Far East include photographs of important ceremonies, daily life and portraits.

The Father of Modern Taxidermy - Carl Akeley
In the late 1800's, Carl E. Akeley collected and mounted animals for Field Museum, and revolutionized the art of taxidermy. None are more famous than the "Fighting African Elephants" on display in the Museum's Stanley Field Hall. Akeley made two separate trips to Africa in 1895 and 1906. Akeley was also a photographer, and made thousands of negatives of the trips including villages and native peoples. Some of these photographs were used by Akeley in mounting the mammals he collected.

Akeley's negatives show the capture of the Elephants, which were first displayed at Field Columbian Museum in 1908.

Rawson-Macmillan Subarctic Expedition
From 1926 to 1928, the Museum sponsored the interdisciplinary Rawson-Macmillan Subarctic Expedition. Assistant Curator of North American Ethnology and Archaeology, William Duncan Strong, led the anthropological expedition. Strong excavated archaeological sites during the summer months and studied the Naskapi Indians during the winter months. Joseph Field, son of then Museum president Stanley Field, was a member of the expedition and took several hundred photographs of the Naskapi and Labrador. Over 1,700 negatives were produced during the three year expedition.

Henry Field
Physical anthropologist Henry Field spent the period between 1928 and 1934 excavating and collecting material from the Sumerian-Akkadian capital of Kish and nearly 5,000 photographs of the excavations, and ethnological portraits of villagers were produced by Field or his associates. Field also took photographs of prehistoric caves in France and Spain, and gathered data from which sculptor Frederick Blaschke created a series of nine life-sized "Prehistoric Man" dioramas for display at Field Museum.

Other Museum Expeditions
During the early 1900's, the Department of Anthropology collected artifacts mainly on the North American continent, while the departments of Zoology, Geology, and Botany concentrated on collecting in Central and South America. Natural science materials were collected, but like Akeley's African photographs, there are also many of village scenes and portraits. Geological expeditions during this period focused on the western states of Colorado, Arizona and New Mexico.

Malvina Hoffman-Sculptor
In 1930, Stanley Field, the nephew of Museum Founder Marshall Field I, commissioned artist Malvina Hoffman to sculpt and cast bronze figures depicting the peoples of the world. "The Races of Mankind" is the largest singly-commissioned body of her work and consists of 104 busts, heads, and life-sized figures. In preparation for the exhibit, Hoffman and her husband, S. B. Grimson, traveled throughout the world to find authentic models for the sculptures. The resulting photographs from the trip appear in her two autobiographies, as well as in several publications about Hoffman. The original negatives (over 2,000) represent one of the most complete photographic records of her travels.

Historical Photographs at The Field Museum

The Photographic Collections document the construction of the present Museum building, and when this was completed in 1921, both the collections and equipment were transferred both by truck and train using five miles of railroad track between the old building in Jackson Park and the new Grant Park location. The entire moving operation was finished in 34 days and was fully documented by Charles H. Carpenter. During the 1930's, Carpenter also photographed the preparation and installation of exhibits and the activities of Works Progress Administration employees. Field Museum's roots lie in the Columbian Exposition and with the prominent Chicago families who helped to establish the Museum. The Collection contains important documentation concerning the growth of the City of Chicago and its history. Visitors to the Museum, staff related activities and portraits continue to be an important part of the Collection's historical documentation. The Field family, who have played an active role in the Museum since 1893, is especially well represented through historical photographs in the Collection.

Photographs in the Botany, Geology and Zoology Departments

Negatives and slides of field work (expeditions) produced by and for the Botany, Geology and Zoology departments, between 1893 and about 1950, are housed in the Photography Department's Collection storage area. In the 1950s, curators and staff began to keep their own slides and negatives of field photography, and the Photography Department does not house these images. There have been two

recent donations of curators' field work photography to the Department, and both included a database catalogue of the photographs. These databases are an essential part of the collections of photographs.

Botany Collection
Botany curator, J. Francis Macbride, made extensive photographic records of his expeditions to Peru and other parts of South America. The Botany Department holds Macbride's field notes and the photographs made on the expeditions correspond with the field notes.

In addition to the Botany Department's specimen type collections that are in the Herbarium, Field Museum houses an extensive botanical type photographic collection. J. Francis Macbride began the project in 1929 and during the ensuing years he visited several major European herbaria, and obtained photographs of more than 40,000 types and historically important sheets. This collection is especially important because it includes records of type specimens that no longer exist or were heavily damaged during World War II.

More than 62,000 type photo-negatives are stored in the Photography Department's "Negative Room" and represent about 20% of the space used in the room. The Botany staff receives requests from other herbaria and scientists, they pull the negatives, and the Photography Department staff makes prints of the negatives and returns both the prints and negatives to the Botany Department for distribution and refilling. New negatives are shot, processed and catalogued by Botany Department volunteers.

Frequently requested Botany images are dioramas such as *Welwitschia*, Illinois Woodland and Maine Coastal Reef and plant models from the former Hall 29. Photograph requests for contemporary field work are usually referred to the staff members who have extensive slide libraries of their work.

Geology Collection
E. S. Riggs, Geology Curator, also made an extensive photographic record of his trips to collect fossil vertebrate material from 1899-1930. It is estimated that the Photographic Collection contains approximately 4,000 plus negatives from Riggs' various trips. For scientific use, the Riggs' photographs have been used recently in the design, move and reconstruction of the "dinosaur" skeletons in Life Over Time and Teeth, Tusks and Tar Pits. Riggs' expedition photographs are among the images requested most frequently for curatorial and staff use in publications, lectures and preparation of mounted specimen and for the "outside" scientists, authors, publishers and television and movie productions.

Frequently requested images from Geology include the Charles Knight murals - twenty-eight murals representing the first signs of geological life through the extinct prehistoric mammals, and the E. S. Riggs' collection. Other frequently requested images are: fossil vertebrate skeletons from the exhibits, the Carboniferous Forest diorama, Mazon Creek specimens, Gems and meteorites.

Zoology Collection
The staff of the Museum, both scientific and exhibit departments use the Zoology collection of historical expeditions the most. However, both the Carl Akeley photographs and the Rawson-Macmillan Sub-Arctic expedition photographs have been used by Anthropologists, both in and outside the Museum. Included in the collection are several thousand negatives from approximately 100 expeditions conducted by the Museum from 1893-1940.

Frequently requested images from Zoology include dioramas, mounted specimens and Carl Akeley field photographs from the 1898 and 1905 African Expeditions, and photographs made on the Abyssian 1920s expedition with acclaimed wildlife artist Louis Agassiz Fuertes.

COLLECTIONS COMPUTERIZATION

Principal systems that are part of the Field Museum network are as follows:

1. DEC Prioris HX 5133DP Server running SCO UnixWare 2.1.1 -- This system is principally used for research and collection management activities. C/base, a commercial 4GL relational database software product, is used to manage collection related information for Anthropology, Botany, Geology and Zoology (specifically, Divisions of Birds, Mammals, Amphibians and Reptiles, Invertebrates and Insects). It also functions as a intra- inter- and gopher server.

2. DECsystem 5100 running the RISC Ultrix 4.3 operating system -- This system functions as the Museum's communication server. It routes mail to other museum systems and provides the full compliment of Internet services, including e-mail, telnet and ftp; we are also using this system as a gopher server. It supports TCP/IP, DECnet and PATHworks network protocols.

3. Sun SPARCclassic runs Solaris (Unix) 2.x operating system -- This system is used principally as a gopher client/server in the Division of Fishes. It is connected to the Museum network for access to Internet.

4. Sun SPARCstation 5 runs Solaris (Unix) 2.x operating system -- This system is used primarily for database needs of Michael Dillon in the Department of Botany; it is configured as a Gopher and Netscape client/server for Internet and as a Popmail server for E-mail.

5. DEC Microvax 3100/20 runs the VMS 6.1 operating system -- It is a multi-user system and the platform for the Museum's Timeline financial operations. It is connected to the systems above by DECnet networking protocol.

6. DEC Microvax 3100/10 runs the VMS 6.1 operating system -- It is used as a LAN server for PCs using PATHworks and the Raiser's Edge software from Blackbaud.

7. Pentium server runs Windows NT 4.0 -- It is used by Public Relations; Microsoft Office is the principal application software running on this system.

8. Pentium server runs Windows NT 3.51 -- The Advanced Training program uses this system to run WordPerfect office.

9. Pentium server runs Windows NT 3.51 operating system -- Raiser’s Edge application software from Blackbaud for the Women’s board is used to help them manage their various activities.

10. Pentium server runs Windos NT 4.0 operating systems -- It is used in Computer services for departmental needs and software testing.

11. DEC Prioris HX 6200DP Server running Windows NT 4.0 Server -- This newly acquired system runs MS Backoffice and office professional and is being configured to support needs of the Divisions of Invertebrates and Insects while also functioning as the Museum’s World Wild Web server.

12. Novell 4.1 LAN -- It supports MUSE application software for collections management used by the Division of Fishes.

13. Novell 4.1 LAN -- It is used by Special Events to run customized software for scheduling events and WordPerfect office.

14. An AppleTalk peer-to-peer network used for MacIntosh systems -- Used by Design and Production.

All fourteen of these systems are connected through Ethernet cables. The DECsystem 5100 by virtue of its facility to run three network protocols is the link that allows users connected to any of these systems to interconnect and use services on any of the other systems including our T1 link to Internet, provided they have proper permissions.

Separate from the systems described previously, but not connected to the larger Museum network are the following:

1. Museum attendance system uses custom application software over Novell 3.12 LAN.

2. Design and Production network running Lantastic for AutoCad software to design new exhibits.

3. Novell 3.12 LAN for Security Department runs specialize security software.

4. The library has two OCLC terminals supported by a dedicated line and multiplexer.

5. Multiple peer-to-peer LANs using LANtastic and Workgroup for Windows and Windows 95.

6. AT&T GIS 3416 system running Unix System V release 4.2 version 1.1 operating system and C/base 3.8 to support the Personnel Department.

Of the six networks or systems listed above, numbers 1 through 4 have been developed, installed and maintained by outside contractors. Although the Computer Services staff does not provide principal support for these systems, they have consulted with staff and contractors as necessary.

There are approximately 40 dumb ASCII terminals connected principally to the Prioris server and Microvax 3100/20 systems. In addition, Field Museum has approximately 250 IBM (or compatible) PCs running a variety of software products including Paradox, Access, Approach, FoxPro, WordPerfect Office, Lotus Smartsuite, JAVA, SYSTAT, SAS, Procomm Plus, Netscape, Eudora, and many others. We also have about fifty Apple Macintosh (or compatible) systems which run WordPefect, Quark Xpress, Eudora, Netscape, PAUP and a variety of programs.

Computerization: Department of Anthropology

All of the Anthropology collections are in a computerized database. All incoming specimens are entered into the database as they are accessioned and cataloged. Portions of the database are currently being verified and updated.

Computerization: Department of Botany

Mycology—Databasing of collections information is well advanced in several areas of the mycological holdings, including all new accessions since 1986, all types (including lichens) and fungi from selected mid-western states (Illinois, Indian, Michigan, Wisconsin). In addition all material from Costa Rica, associated with projects by Mueller and others are summarized in database form.

Bryophytes—Over the last decade the data for the John Child collection of New Zealand bryophytes, the Marko Lewis Hawaiian and South American collections, and the Mary Taylor herbarium have been entered in the Museum's cryptogamic collections database.

Economic Botany—All of the basic data for the Economic Botany collection are available in a computerized database.

Andean Botanical Information System—ABIS (Andean Botanical Information System) represents Field Museum's efforts coordinated by M. O. Dillon to provide collector information from the floristic and systematic investigations of the phanerograms of Andean South America. ABIS is developing a networked databased of specimen-label data for selected groups of Andean plants, including the flora

of coastal Peru and Chile, floristic inventories montane forests of northern Peru, and monographic treatments providing searchable text and online images. The database derived from this endeavor will allow for the nearly instantaneous, automatic sorting of these data by a variety of criteria. Activities related to ABIS are coordinated with the Museum Informatics Project at the University of California at Berkeley and utilized a design developed for a similar project, SMASCH (Specimen Management System for California Herbaria).

Phanerogram Types—The Field Museum, the center for Flora of Peru, Flora of Guatemala, Flora of Veracruz, and Flora Costaricensis, houses over 2 million flowering plants collections. Over 32,000 are currently identified phanerogam types and one third have been entered into a computerized database. This project is ongoing and the database contains over 62,000 records of computerized label data, corresponding negatives and publication information (see Taxon 35: 934. 1986). The Asteraceae records are being consulted and updated with additional label information, annotation history, barcodes and image capture. The Asteraceae types should be available in 1996.

Berlin Negatives—The Field Museum houses an extensive collection of South American phanerogam type photographs. For decade beginning in 1929, the Field Museum's J. Francis Macbride visited all the major herbaria of the European continent (B, C, G, HAN, HGB, MA, P, and W) and his efforts resulted in quality photographs of over 40,000 types and historically important sheets, most of which were South American in origin. The importance of this collection is notable since it includes records from herbaria damaged or destroyed during World War II. These black and white images are being scanned and associated with the updated database records, including additional label information and annotation history. Some of the Berlin type photos are already available for viewing on the World WideWeb.

Lomaflor & Detbase—Access to collection label data of South American Andean plants within an integrated database management system will provide improved access to the collections on which much taxonomic work of Andean flora is based. The specimen-label information from over 7,400 collections from coastal Chile and Peru have been electronically captured (LOMAFLOR) and are initially available in a hierarchical browser. A comparable database project, DETBASE, contains over 10,000 collections from northern Peru (Departments Amazonas, Ancash, Cajamarca, Piura, Lambayeque, La Libertad, San Martin) and will initially be made available in an hierarchical browser and ultimately a manual flora. Both databases are being incorporated into information systems for detailed studies of correlation's between geographic distribution and habitat factors and easier identification of rare and endangered species. Regional and local checklists will be available through improved geographic access to the collections, and ABIS will be connected to specimen-label databases developed in other regions to examine the distributions of taxa whose total range is not confined to the Andes (e.g., Flora Mesoamericana, Peru Checklist).

Monographs and New Species Online—Monographic treatments and new species of Andean taxa are to be placed on the ABIS server, with the Nolanaceae serving as the prototype with 50 color images of flowers and habitats within coastal Chile and Peru. These sample images now reside in a sampler of ABIS photographs. It is planned that macromorphological data, keys to taxa, and pertinent bibliographic information will be on-line and in hypertext format to allow connections with protologues and images of type specimens, flowers, and habitats. It is expected that new and previously published Andean taxa will also be brought on-line.

Computerization: Department of Geology

Paleontology—All paleontology specimens currently being catalogued are entered into a computerized collections database (using custom software) on a distributed server-network with high-speed Internet interface. Approximately 80& of all catalogued specimens (all of the fossil mammal collection) are in the computerized database. A complete database also exists for the collections of the Mazon Creek biota.

Physical Geology—Approximately 50% of the Physical Geology collections - Mineralogy, Meteoritics, Gems and Building Stones (a mini-collection of Economic Geology) are in the computerized database. Data entry for the petrology and economic collections has been postponed pending evaluation and reconfiguration of these collections.

Computerization: Department of Zoology

Amphibians and Reptiles—The original collection computerization project, begun in 1978 entailed the entry of 121,000 records from thirty-one handwritten catalogs. By mid-1980, all records - but not all fields of all records - had been entered. All original collection catalog data fields for the first 250,131 records have now been entered into the computer database. The result has been a significant increase in the Division's ability to provide the scientific community with information regarding the collections. In 1995 alone, nearly 4,600 pages of data output was generated to satisfy information requests. Since 1993. Up to this point verification of computerized collection data has only been initiated in response to incoming requests.

Birds—The bird collections recently were computerized. The Field Museum's collection is the largest collection of birds to be computerized to date. All records are now in the computer database, and the Division is at the mid-point of a five year project aimed at verification of the database information through a specimen-by-specimen comparison.

Fishes—The specimen records of the ichthyology collection are completely computerized and the database is in the process of being verified. The local area computer network is run from a Pentium-based server that connects the MUSE database to sites throughout the Fish Division. Using MUSE for the database management system, records were entered from the collection catalogues and locality information was supplemented by detailed field notes where available. All loan documents are processed and specimen labels are generated using MUSE. MUSE is able to query the database, sort records by numerous user-defined criteria, and provide reports. In addition, the database is available for investigators through the Internet, using either Gopher or the World Wide Web. Current efforts are focusing on the verification of the accuracy of the database in order to provide better service to the ichthyological community. To reach that goal, every record in the database is being checked against the corresponding lot of fishes in the collection and discrepancies are being resolved whenever possible.

Insects—A species-level database of the pinned insect collection is complete for the two large beetle families Staphylinidae and Histeridae, which together account for about a third of all research use of the collection. This database of over 41,000 names includes records for more than 21,000 species and 630,000 specimens represented in The Field Museum collection. The forty-two fields for each record include data on the current scientific name, number of specimens, presence of types and overall geographic distribution of each species. The 14,000 bulk Arthropod samples in fluid are cataloged in a separate database which can be used to generate labels for specimens removed from the samples. Loan transactions are also computerized. A general specimen-level database for the collection, as used in other divisions in Zoology, has not been implemented, but a special-purpose database on batflies and their hosts is largely complete. Specimen databases for spiders and local staphylinids in the collection have been designed but not yet implemented. Plans are also underway to make the species-level and bulk sample databases available via the Internet.

Invertebrates—Between March 1992 and August 1993, the data from more than 40,000 lots of the Leslie Hubricht Collection were computerized in a relational database on the museum's VAX computer. These

data are available on the Internet via gopher and the World Wide Web. Ongoing database efforts are focusing on the Australian field collections of Alan Solem and recent accessions.

Mammals—Standardized data representing the entire collection has been entered into a computer database. The dry collection and most of the wet collection has been verified through a specimen-by-specimen comparison with the database. Discussion is now under way on the best strategy for placing aspects of the database on-line.

A summary of geographic data from the vertebrate zoology databases follows.

Vertebrate Zoology Collections Size - Countries and Comparable Areas

	Fishes	**Herpetology**	**Birds**	**Mammals**	**Total**
USA	203960	49574	111151	23592	388277
East Indies	30097	52705	NA	NA	82802
Mexico	31231	30445	12272	5376	79324
Malaysia	22230	50517	1031	4748	78526
Belize	61957	689	77	1525	64248
Ecuador	56185	1142	3315	1636	62278
Colombia	30196	4566	13619	7042	55423
Peru	11006	6256	18168	11076	46506
Brazil	19675	2031	13602	3957	39265
Philippines	3899	7159	20093	6989	38140
Atlantic Ocean	36867	715	172	NA	37754
Venezuela	22374	824	6817	833	30848
Pacific Ocean	28432	2332	20	NA	30784
Panama	21690	4657	3181	962	30490
West Indies	11355	2991	14516	237	29099
Indian Ocean	26953	1314	35	NA	28302
India	4820	2097	15092	2595	24604
Bolivia	2823	561	10403	5937	19724
Kenya	8	635	14597	3446	18686
Chile	1152	6653	3025	7634	18464
Egypt	1731	4289	3315	9055	18390
China	2427	3994	5505	5995	17921
Costa Rica	8526	3363	4571	633	17093
Thailand	1315	10654	1735	521	14255
Canada	4950	476	7541	1230	14197
Australia	2370	6560	3204	1708	13842
Uganda	32	566	8689	2169	11456
Iran	69	1180	5441	3509	10199
Cameroon	53	762	8466	451	9732
Nepal	21	987	7270	1442	9720
Tanzania	68	1132	3167	2985	7352
Sudan	38	1250	2053	2952	6293
Taiwan	1393	4096	243	23	5755

Vertebrate Zoology Collections Size - States and Comparable Areas

	Fishes	Herpetology	Birds	Mammals	Total
Illinois	87809	5614	31070	1845	126338
California	13042	2048	14860	4377	34327
Wisconsin	23897	1142	3758	3381	32178
Florida	10512	2413	10289	475	23689
Texas	13213	4599	4506	698	23016
Missouri	12976	674	59	148	13857
New York	1624	5610	1653	116	9003
Connecticut	22	72	7773	18	7885
Mississippi	1272	2866	571	46	7675
Arizona	58	891	4915	1036	6900
North Carolina	950	3921	1393	60	6315
Kentucky	2034	420	162	33	5115
Arkansas	2733	1756	319	180	4988
Louisiana	2816	1360	500	230	4906
Alaska	188	11	3381	1162	4742
Michigan	3341	429	602	308	4681
Indiana	9664	2514	831	276	4617
Iowa	3631	232	191	66	4120
North Dakota	255	11	3539	220	4025
Tennessee	3684	1	124	183	3992
Washington	2380	482	467	552	3881
Hawaii	3261	374	30	4	3669
Virginia	791	1531	1087	27	3436
Colorado	83	315	1888	803	3089
Oregon	43	869	1691	438	3039
Georgia	557	1231	1048	147	2983
New Jersey	48	71	2733	129	2981
Minnesota	836	173	1487	424	2920
South Carolina	1118	807	612	62	2599
Kansas	5	1561	749	151	2499
New Mexico	0	446	1356	697	2499
Massachusetts	239	38	1850	14	2141
Oklahoma	158	1412	164	270	2004
Idaho	28	153	1256	229	1666
Maine	758	14	738	89	1599
Utah	44	288	587	381	1300
Nebraska	803	103	134	225	1265
Ohio	816	186	127	47	1176
Montana	93	15	799	171	1078
Alabama	382	418	260	1	1061
Wyoming	367	46	318	192	923
Pennsylvania	53	268	495	16	832
Maryland	310	328	0	0	638
Nevada	15	49	124	419	607
South Dakota	73	95	123	167	458
West Virginia	5	137	109	162	413
Vermont	24	70	16	11	121
District of Columbia	11	4	83	0	98
New Hampshire	0	12	73	9	94
Delaware	7	74	12	0	93

Vertebrate Zoology Collections Size - States and Comparable Areas (cont.)

	Fishes	Herpetology	Birds	Mammals	Total
Rhode Island	1	0	49	1	51
Bering Sea	0	0	0	1	1
Northwest	0	0	0	0	0
Upper Mississippi Valley	0	0	0	0	0

Vertebrate Zoology Collections Size - Illinois Counties

	Fishes	Herpetology	Birds	Mammals	Total
Cook Co.	9590	2031	23431	633	35685
Will Co.	15326	172	461	30	15989
McHenry Co.	10140	174	64	1	10379
Lake Co.	5175	1376	1533	351	8435
Jo Davies Co.	6491	11	12	22	6536
DuPage Co.	2259	288	980	143	3670
DeKalb Co.	2514	1	1087	0	3602
Champaign Co.	3175	8	3	15	3201
Grundy Co.	2662	65	9	0	2736
Vermilion Co.	2695	1	5	5	2706
Edgar Co.	2687	3	3	0	2693
Kane Co.	1833	96	278	15	2222
Boone Co.	2189	0	10	0	2199
Stephenson Co.	1905	3	4	0	1912
Ogle Co.	1475	27	113	3	1618
LaSalle Co.	1548	15	27	26	1616
Kankakee Co.	1244	51	139	39	1473
Winnebago Co.	1365	4	59	1	1429
Macoupin Co.	930	44	55	3	1032
Carroll Co.	878	27	27	4	936
Monroe Co.	819	35	5	1	860
Ford Co.	770	1	2	0	773
Morgan Co.	656	56	12	1	725
Alexander Co.	19	196	155	169	539
Effingham Co.	514	0	1	0	515
Mason Co.	302	201	7	5	515
Massac Co.	487	3	7	0	497
Saline Co.	453	24	0	0	477
Iroquois Co.	473	2	1	0	476
Christian Co.	427	2	22	2	453
Cass Co.	422	4	3	0	429
Macon Co.	416	0	0	0	416
Coles Co.	405	9	0	0	414
McLean Co.	406	1	5	0	412
Pulaski Co.	0	2	393	0	395
Lee Co.	331	11	39	1	382
Hardin Co.	204	9	0	115	328
Union Co.	74	218	6	28	326
Randolph Co.	253	4	0	0	257
Clark Co.	251	1	0	0	252
Whiteside Co.	233	5	13	0	251
Shelby Co.	236	0	0	0	236
Kendall Co.	206	12	10	4	232
Fulton Co	28	18	175	2	223
Jasper Co.	213	2	6	2	223
Marshall Co.	1	7	194	2	204
Pope Co.	101	60	3	38	202
Jackson Co.	22	90	73	8	193
Douglas Co.	186	0	0	0	186
Sangamon Co.	141	2	4	6	153

Vertebrate Zoology Collections Size - Illinois Counties (cont.)

	Fishes	Herpetology	Birds	Mammals	Total
Wabash Co.	144	0	1	0	145
Tazewell Co.	132	0	0	1	133
Henry Co.	0	1	127	2	130
Peoria Co.	96	2	1	12	111
Madison Co.	84	12	7	0	103
Johnson Co.	0	4	0	80	84
Menard Co.	69	0	3	1	73
Hancock Co.	0	8	42	17	67
Crawford Co.	64	0	0	0	64
Cumberland Co.	4	51	0	0	55
Woodford Co.	53	2	0	0	55
Clay Co.	53	0	0	0	53
Gallatin Co.	46	1	0	0	47
Rock Island Co.	41	2	2	0	45
Porter Co.	0	0	0	38	38
Williamson Co.	34	2	1	0	37
DeWitt Co.	31	1	0	0	32
Richland Co.	0	23	3	5	31
Adams Co.	1	22	3	4	30
Putnam Co.	0	7	16	1	24
Fayette Co.	14	1	6	0	21
Bureau Co.	0	12	6	1	19
Warren Co.	0	18	0	0	18
Jersey Co.	4	10	0	0	14
Moultrie Co.	14	0	0	0	14
Piatt Co.	11	1	0	0	12
Pike Co.	0	5	7	0	12
St. Clair Co.	0	7	3	0	10
Calhoun Co.	0	2	6	0	8
Logan Co.	0	2	5	0	7
Marion Co.	2	0	3	2	7
Knox Co.	0	3	1	1	5
Jefferson Co.	1	1	0	2	4
Livingston Co.	0	1	3	0	4
Clinton Co.	0	0	3	0	3
Mercer Co.	0	3	0	0	3
Schuyler Co.	0	1	2	0	3
Washington Co.	0	0	3	0	3
Bond Co.	0	0	2	0	2
Brown Co.	0	0	2	0	2
Franklin Co.	0	1	0	1	2
Greene Co.	0	2	0	0	2
Lawrence Co.	0	1	1	0	2
Makapan Co.	0	0	0	2	2
McDonough Co.	0	0	2	0	2
Columbia Co.	0	0	0	1	1
Henderson Co.	0	0	1	0	1
Lacon Co.	0	0	1	0	1
Montgomery Co.	0	1	0	0	1
Stark Co.	0	0	1	0	1

PROGRAMS IN THE CHICAGO REGION

ILLINOIS—Survey of Northern Illinois Fungi—Gregory M. Mueller, John (Jack) Murphy, and John Paul Schmit, Botany—Recent surveys of the "higher" fungi of northern Europe have documented the value and feasibility of intensive mapping and inventory programs. Three of the most significant findings of these European studies are: i) a change in frequency of fruiting for a number of species of "higher" fungi has occurred during the past thirty years, with several once common species now apparently extinct in certain countries, ii) certain fungal species are sensitive to air pollution and can be used as early and accurate indicators of a decline in forest health due to air pollution; and, iii) many species show restricted ranges and/or habitat requirements. These three findings have important forest management and conservation implications. Comparable data, however, are not available for North America. The Survey of Northern Illinois Fungi project is a multiyear project initiated in 1994 to provide some of the necessary data for central North America. The aims of our study of Illinois fungi are to: i) determine what macrofungi occur in the region; ii) determine their distribution patterns and habitat requirements; and, iii) determine if there has been a discernible change in frequency of occurrence of fungi during the past fifty years. To determine if there has been a change in species composition and frequency over time we need to determine what fungi were in the area prior to the recent increase in air pollution and to carry out a thorough survey of the fungi that currently occur in the area. As a first step in this project, we have entered all of the Midwestern collections of mushrooms and their relatives housed in the Field Museum herbarium into a database. The field work component was initiated with the aid of a number of volunteer collectors from The Nature Conservancy, Illinois Mycological Association, and high school and university student interns. Data will be collected over several years since fungi fruit sporadically and their appearance is highly weather dependent.

INDIANA—Impact of Air Pollution on the Fungi of Indiana Dunes National Lakeshore—Gregory M. Mueller and John (Jack) Murphy, Botany and John Paul Schmit, Graduate Student, University of Chicago—The Indiana Dunes National Lakeshore is one of the richest areas for plant life in North America. It also has the highest air pollution level of any park in the National Park system. By focusing on areas under different pollution stresses (e.g., upwind and downwind from steel mill plants), we hope to document the effects of air pollution on fungi, and to determine if particular fungi can be used as sensitive indicators of pollution stress on the prairies, oak savannas and forests of the Great Lakes region.

CHICAGO REGION—Studies of Bryophyte Diversity in the Chicago Region—Gary Merrill, Botany—The Chicago region includes a reported 180 species of mosses, eighteen sphagna, and fifty liverworts, compared with 420 mosses and 120 liverworts for all of Illinois. Of the mosses, twenty-one species occur in Illinois only in the Chicago region; nine are reported in Illinois only from Lake County, and two are known only from Cook County. Baseline data are available for the Chicago region, dating from the early 1900s, but there exists no up-to-date inventory of bryophytes of the region. Although traditionally neglected in surveys of biotic diversity, bryophytes are potentially important as indicators of air and water pollution, soil chemistry, and other site conditions, both past and present. Using historic collections in herbaria, studies will document bryophytes present in the region a century ago, compared with present members of the flora.

CHICAGO REGION—Survey of Reptiles and Amphibians in Northwest Indiana—Alan Resetar, Zoology—Surveys to monitor the populations of reptiles and amphibians in the area are conducted with the Indiana Department of Natural Resources Nongame Program and the National Park Service. Special emphasis is placed on state–listed species and on selected federal and state properties. Resulting documents include a technical report on the amphibians and reptiles of the Indiana Dunes National Lakeshore. Related efforts involve co–coordinating the historical trends section of the Declining Amphibian Population Task Force (Central Division), and being an active member of the Indiana Nongame Program Amphibian and Reptile Technical Advisory Committee.

CHICAGO REGION—Spider Species Richness in Midwestern Prairies—Petra Sierwald, Zoology —A five-year sampling program investigates the changes in soil spider fauna during prairie restoration through collections and surveys at two prairie sites south of Chicago. Bi-weekly soil samples and flight intercept samples are sorted and specimens identified by group specialists.

CHICAGO REGION—Computerization of the Chicago Region Molluscan Records—Margaret Baker, Rüdiger Bieler, and John Slapcinsky, Zoology—The Field Museum houses one of the largest mollusk collections in the world and the most comprehensive land snail collection in North America. The collections include several thousand historic and recent records from the Chicago region. Plans include entering these specimens into a computerized database, to be made accessible via the Internet. The resulting database will serve as a baseline for mollusk distribution in the region, and for assessments of gaps in our knowledge.

CHICAGO REGION—Population Trends in Migratory Birds—Douglas F. Stotz and David E. Willard, Zoology—The apparent decline of migratory bird populations has become a serious concern to conservationists in the United States. Are these birds' populations declining with the destruction of habitat in Central and South America? Or are the threats facing these birds closer to home, with the fragmentation and loss of breeding habitat in North America? The Field Museum has a large, computerized database of the migratory birds that have died by hitting the windows of some city buildings over the past sixteen years. Specimens continue to be collected every day of spring and fall migration. These data allow us to examine the trends in the populations of the birds, and preliminary analyses of those species with sufficient information indicate that the populations of about one–third of the species are indeed declining. Most of these species face serious threats in the United States, with fragmentation of deciduous, temperate forests and with conversion of grasslands into farmland or housing developments. Further analyses will focus on trends in age structure, which will give us a measure of breeding success; trends in sex ratios, which may indicate additional stresses placed on males or females because of breeding requirements; patterns of migration related to sex and how this relates to dominance in wintering grounds; and a few evolutionary questions (e.g., how much are the dynamics in wintering grounds driving selection of migratory species? Do birds moving north in the spring differ morphologically from southbound birds in the fall? Strong evidence of selection would suggest high mortality in winter). Preliminary analyses of the database have also unearthed some surprises about the natural history of some species, with immediate consequences for conservation. For example, patterns in the sex ratio of woodcocks show that many more females than males pass through Chicago. Further investigation indicates that females mate while in transit and that nesting sites may be hundreds of miles north of mating (lek) sites.

CHICAGO REGION—Distribution, Habitat Associations, and Ecological Roles of Rove Beetles—Margaret K. Thayer, Zoology— The highly diverse family Staphylinidae is a major component of the soil and litter fauna. Based on published taxonomic studies, there probably are (or originally were) at least 400 species of rove beetles in the Chicago region. The Field Museum, with unrivaled collection and library resources for Staphylinidae, is an excellent base for a regional survey of rove beetles. No species list exists for the area, so the first step has been compilation of a list of recorded and expected species. Existing reference material is being supplemented with recently collected (and better documented) specimens. As part of the Swallow Cliff Restoration Effects project based at The Field Museum, initial collecting efforts have focused on a forest preserve area where restoration work is planned and on another nearby area (as a control) to assess the effects of restoration work and habitat change on the rove beetle fauna. Longer range plans include sampling of other habitats in the Chicago area and computerization of specimen records for the area. Recently collected material is being computerized at the lot level as part of the sorting and preparation process; computerization of older local material will begin with The Field Museum's extensive collection.

PROGRAMS IN NORTH AMERICA AND THE ATLANTIC

IOWA and ILLINOIS—Mississippian Fossil Tetrapods and Early-Tetrapod Phylogeny—John R. Bolt, Geology, and R. Eric Lombard, University of Chicago—The earliest tetrapods (land vertebrates) are from the Upper Devonian, about 370 million years before present, but up to the end of the Carboniferous (c. 290 million years before present), tetrapod fossil remains are rare and often poorly preserved. Recent collecting in the Mississippian of Iowa (by Field Museum parties) and Illinois (by University of Kansas parties) has yielded major collections of fossil tetrapods from a very poorly represented time period (c. 340 million years before present) that includes several groups of early and very primitive land vertebrates. Both the Iowa and Illinois specimens are currently under study at The Field Museum, and through recent publications they are beginning to make an important contribution to understanding the early evolution of tetrapods. These collections include the earliest known representatives of some major tetrapod groups, as well as examples of some taxa that have long been known from other localities. Even in the latter case, though, the superb preservation of some specimens has revealed unexpected and significant new features.

MONTANA—Geographic and Temporal Distributions of Fossil Mammal Species in the Crazy Mountains Basin—Gregory A. Buckley, Geology—The Crazy Mountains Basin in south central Montana has produced fossil mammals for more than a century. These fossils are significant for several reasons, the most important of which is their age (after dinosaurs became extinct, at the beginning of what is called The Age of Mammals). During this time (the Paleocene), mammals were becoming increasingly diverse. In order to obtain a better understanding of the relationships between geographic and temporal distributions of species, it is important to know precisely when these animals lived. Fieldwork was conducted to collect rock samples that are currently undergoing paleomagnetic analysis, which will provide an independent assessment of the age of the fossils.

WYOMING—Eocene Faunas of Southwest Wyoming—John J. Flynn, Lance Grande, Steve McCarroll and William Turnbull, Geology—The Field Museum has more than a forty year history of collection and research of the fossil vertebrate faunas of southwest Wyoming. The terrestrial rocks of the Washakie Basin and the lacustrine deposits of the Green River Formation preserve the most complete early to middle Eocene (56-44 million years) sequence of vertebrate evolution in the world. Included in the Washakie Basin sequence are several important transitions between North American Land Mammal Ages. In addition, radioisotopic dating and magnetic polarity-stratigraphy analyses are possible, giving independent tests of the timing and correlations of vertebrate evolution in North America. The Green River Formation contains the largest known sequence of lake deposits, and the most detailed insight into the emergence of the modern North American fish fauna over the last fifty million years. Recent research has focused on what the Green River Formation fish fauna tells about the evolution of the North American fish fauna. Results indicate a strong relationship between the Green River fishes and fishes in Asia and the Indo-Pacific region.

WYOMING—Revision of the Terminal Members of the Extinct Mammalian Order Dinocerta (Lintatheres)—William D. Turnbull, Geology—Over the past several years research has been concentrated on these early giants (about the size of the largest living rhinoceroses). The work has documented the Museum's holdings of this group, and has also included important specimens of other institutions. The paleobiology of the Order is evaluated drawing on the biological aspects of living mammals that are partial analogues. Interpreting the paleobiology for this long extinct group (they died out in the Late Eocene) which has no close living relative, forces the search for partial functional, ecological and biological analogues as the means of understanding how these creatures lived and flourished.

SOUTHWEST NORTH AMERICA— The Evolution of Cultural Systems in the Southwestern United States— Winifred Creamer and Jonathan Haas, Anthropology— It has long been held that infectious diseases borne by the conquistadors and colonialists who reached the upper Rio Grande Valley in the mid-16th Century decimated the Puebloans and forced them to abandon settlements sometimes as large as 3,000 rooms. This ten-year project of excavation and analysis seeks to understand the nature of change in pueblo society between 1450, nearly a century before contact, and the Pueblo Revolt of 1680. Successive phases of the work address changes in demography, economics and political/religious organization. Examination of the ruins of 13 pueblos in the Rio Grande Valley between Taos and Albuquerque show half of them were apparently abandoned prior to contact while others were still occupied after contact. More extensive excavation at one of the largest precontact sites, Pueblo Blanco south of Santa Fe, which contains some 1,500 ground floor rooms, is helping to determine how many rooms were simultaneously occupied. The conclusions may alter long-accepted views of pueblo demographics as well as the nature of interactions between colonist and Pueblo groups.

EASTERN NORTH AMERICA and EUROPE—Fossil Flowers and Angiosperm Evolution—Peter R. Crane and Patrick Herendeen, Geology—With more than a quarter of a million species, flowering plants (angiosperms) are the most diverse group of plants on the planet. Their relatively sudden appearance in the fossil record about 120 million years before present, and their rapid expansion to dominate terrestrial vegetation, has long been one of the central enigmas of plant science. Current research at The Field Museum, in collaboration with scientists from the Swedish Natural History Museum and the University of Aarhus, Denmark, is using very early fossil flowers from Europe and North America to clarify the pattern of early angiosperm evolution. These studies are being integrated with data from fossil pollen to understand how this evolutionary pattern relates to major events of global environmental change that occurred at approximately the same time c. 100 million years ago.

NORTH AMERICA—Evolution of Mating Systems in Widow Spiders—Petra Sierwald, Zoology— Widow species vary in their mating systems and exhibit sexual dimorphism in the form of very small males in some species. Studies of the copulatory behavior in five of the six North American species revealed autapomorphic species-specific characters as well as synapomorphic characters. These behavioral features combined with morphological characters, has facilitated a preliminary phylogenetic analysis. In addition to pursuing the systematic work on the group, research in the next year will focus on the behavior and mating systems of three *Latrodectus* species occurring in Florida: the Floridian red widow, the eastern black widow and the brown widow. Through observations in the field, data will be collected on a number of mates for males and females, male-male interaction and possible competition for access to females, female-male interaction, and female-female interaction and competition for males.

NORTH AMERICA—Biosystematic studies in oak ferns (Gymnocarpium)—Kathleen Pryer, Botany— The genus Gymnocarpium comprises a small group of morphologically cryptic ferns that are native to temperate regions of the northern hemisphere. They exhibit a reticulate pattern of polyploid evolution that has been revealed through chromosome studies, enzyme electrophoresis, and scanning electron microscopy. Studies in Gymnocarpium are providing insights into the evolutionary significance of polyploidy and hybridization in these and other polyploid complexes of ferns. To further elucidate the systematics and evolution of hybrid oak ferns, research that incorporates field studies, morphology, isozymes, chromosomal evidence, and DNA sequence data is ongoing. Conservation studies documenting the rare and endangered occurrences of oak ferns are being updated for both Canada and the United States, with a particular focus on the Appalachian endemics (see Flora of North America, Volume 2).

NORTH AMERICA—Studies of the Bryoflora of the Great Plains Region—Gary Merrill, Botany— The Great Plains region is bryologically the poorest known part of the North American continent. Distribution patterns of bryophytes in the region appear to reflect the same complex vegetational history inferred from the distributions of phanerogams. Research has been directed toward an inventory of the bryophytes of the Great Plains, which is basic to understanding their role in past and present-day grassland communities. A small group of species appear to be true prairie mosses, flourishing in "healthy" tallgrass prairies which are both grazed and burned. An important recent discovery, the new genus and species *Ozobryum ogalalense* Merrill, is restricted to northwest Kansas and adjacent Nebraska. Since bryophytes are capable of persisting as distributional relicts which reflect past climatic conditions and floras, endemics such as *Ozobryum* may be clues to earlier regional floras of which they are the sole survivors.

NORTH AMERICA—Systematics of the Moss Family Polytrichaceae—Gary Merrill, Botany— Research over the past twenty-five years has been focused on the Polytrichaceae, or "Hair-cap Mosses," a family of world-wide distribution, comprising twenty-four genera and ca. 300 species. The family is an isolated and phylogenetically primitive group, with no close living relatives, and a fossil record extending back to the Late Cretaceous (ca. 80 million years ago). The group is notable for the structural complexity of both gametophyte and sporophyte generations, and features not found in any other group of bryophytes. For example, gametophytes of the Polytrichaceae have specialized internal conducting tissues, comparable to those of simple vascular plant sporophytes. Current projects include treatments of Polytrichaceae for Volume 13 of Flora North America (ten genera, forty-eight species; scheduled for completion in 1997), and a systematic study of the family, together with an outline of a revised and updated classification.

NORTH AMERICA—Anna Graybeal, Zoology—The process of lineage splitting (speciation) is fundamental to the generation of organismal diversity, yet it remains poorly understood. This project applies genealogical, or tree-based, population genetic methods and theories to a comprehensive study of the pattern and process of speciation in a two-species genus of hylid frogs from the eastern United States (genus *Acris*) and two species groups (each of which consists of three species) of toads from the southwestern US and northern Mexico. I am currently in the process of collecting samples that represent several hierarchical levels of divergence: intra- and interpopulation, and intra- and interspecies. I am also beginning to collect sequence data from various unlinked regions of the genome that will be used to reconstruct gene trees. These data will reveal which microevolutionary processes have influenced divergence and speciation in these groups, by providing estimates of parameters such as levels of gene flow, population size over time, and intensity of selection on different loci. Furthermore, the gene trees will provide information regarding species limits in these groups, and will allow empirical analysis of the utility of several new theoretical species concepts.

NORTH AMERICA and EURASIA—Systematic Comparisons of Fossil and Living Amiid Fishes—Lance Grande, Geology—This is a large-scale systematic project on the comparative anatomy and evolutionary history of fossil and living amiid fishes. Amiid fishes are widely acknowledged as a key group for developing a better understanding of the evolution of ray-finned fish—the most diverse group of vertebrates. Research involves detailed study of early embryology in modern *Amia* as well as fossil bowfin material from numerous localities around the world. Localities of special interest include the Eocene deposits of Messel and Geiseltal, Germany; the Jurassic deposits of Solenhofen, Germany; and Cretaceous localities in England, Israel, Spain and Brazil. This project involves Field Museum collections as well as visiting museums and localities in England, Germany, Israel, Russia and Spain.

NORTH AMERICA and WORLD-WIDE—Systematics and Morphospace Occupancy of Paleozoic Gastropods—Peter J. Wagner, Geology—With an excellent fossil record and modern representatives facilitating biological interpretations of morphology, Paleozoic gastropods offer opportunities to test many macroevolutionary hypotheses. An on-going project involves phylogenetic and morphometric analyses of gastropods known from the Late Cambrian through Devonian (approximately 500 to 360 million years ago). Results from these analyses are being used to test hypotheses about long-term evolutionary patterns among different clades and ecologic groups, as well as to examine how evolutionary trends changed with the appearance of more "modern" taxa (e.g., jawed fishes). The project draws not only on specimens housed at the Field Museum, but those housed at other North American museums (e.g., the Smithsonian Institution) and also housed in several English and European museums.

NORTH AMERICA and WORLD-WIDE—Systematics and Ecology of Deep-Soil Mites—John Kethley, Zoology— The biodiversity of deep-soil arthropods is virtually unstudied despite their potentially great significance for understanding nutrient cycling, community structure and as indicators of pollution. Research has involved the development of methodologies to properly document this fauna. Field work has emphasized soils of coastal, alluvial, fluvial and glacial out-wash origins. Recently collected specimens have proven to be new to science and are being described to develop a comparative data base for ecological, phylogenetic and zoogeographic studies.

NORTH AMERICA and WORLD-WIDE—Systematics and Biogeography of the Rove Beetle Tribe Omaliini—Margaret K. Thayer, Zoology—Rove beetles, the family Staphylinidae, are the second largest family of beetles worldwide, with more than 43,000 named species. One of the most widespread and trophically diverse groups of rove beetles is the relatively primitive tribe Omaliini, occurring mainly in temperate areas of the Northern and Southern Hemispheres, and to a lesser extent in the intervening tropics. An ongoing long-term project is revision of all the North American species of this tribe, consisting of fifty named and numerous newly discovered species belonging to about fifteen genera. The project draws on fieldwork in many parts of North America and on thousands of specimens from the holdings of The Field Museum and more than thirty other collections. Most of the genera also occur in Europe and/or Asia, so parts of the study rely heavily on related work in progress that is reclassifying the more than forty genera of the group worldwide. Studies of this group, placed on a sound phylogenetic basis, may help to elucidate pathways of trophic evolution in beetles and the historical biogeography of forest-dwelling insects and other animals.

NORTH AMERICA and WORLD-WIDE—Phylogenetic Character Evolution and Biogeography Among Bufonids—Anna Graybeal, Zoology—The frog family Bufonidae (true toads) is a large group of approximately 350 species distributed throughout all major land masses of the world except the polar regions. Because of apparently large differences in rates of morphological and behavioral evolution, speciation, and geographical range, the family raises intriguing macroevolutionary questions, and provides a rich resource for studying pattern and process in evolution. For example, these frog species exhibit extraordinary variation in reproductive behavior: many lay externally fertilized eggs that hatch into tadpoles, others lay eggs that by-pass the tadpole stage to develop directly into froglets, and still others give birth to live froglets. Although these last more unusual amphibian reproductive modes occur relatively rarely within Bufonidae, they occur in several geographically disjunct subgroups, prompting the question of whether phylogenetic relationships within the family are more congruent with present-day geography or with character-state distribution. My goals are to use DNA sequences and morphological characters to reconstruct phylogenetic relationships among bufonids, and use the resulting trees to better understand patterns of character evolution and biogeography.

NORTH AMERICA and WORLD-WIDE—Analysis of Frog Relationships—Anna Graybeal, Zoology— Frogs are by far the largest of the three amphibians groups (containing approximately 4,000 species), and occupy nearly every corner of the world. Yet our understanding of frog phylogeny, especially within one subclade (Neobatrachia) containing over 95% of the recognized species, is very poor. I am currently collaborating with Dr. David Cannatella at the University of Texas and Dr. Karl Kjer at Brigham Young University on an using separate and combined analysis of two data sets: i) nuclear and mitochondrial ribosomal DNA sequences available from GenBank that we have re-aligned according to strict concordance with secondary structure models, and ii) morphological characters. Our results indicate that the re-aligned DNA sequences produce trees significantly more congruent with morphological hypotheses than the previously published analyses of these same DNA sequence data (not aligned according to secondary structure), and provide the most comprehensive hypotheses of frog relationships to date.

ATLANTIC OCEAN—Biodiversity and Phylogenetic Svstematics of "Wormsnails"—Rüdiger Bieler, Zoology—Worm-snails have enigmatic relationships within the gastropods and despite their major importance in snail evolution they are virtually unstudied. They are also of great importance as natural reef builders in the world's oceans. The animals cement their tube-shaped shells to hard surfaces and do not move during their adult lives. Because of their unusual biology, worm-snails could play a role in coastal protection schemes and as indicators for water pollution, but the absence of basic taxonomic information precludes such applications. Most of the recently collected specimens belong to previously undescribed species, now being monographed to form a basis for future zoogeographic and phylogenetic studies. Extensive field work in the Bahamas, Belize, Bermuda, Florida, Panama and Venezuela has been aided by numerous institutions such as the Bermuda Biological Station, the Smithsonian Marine Station at Link Port and the Smithsonian Tropical Research Institution. Comparative data have also been collected in Portugal and the mid-Atlantic Azores.

ARCTIC-ALPINE REGIONS—Systematic revision of the lichen *Ionaspis-Hymenelia* complex—François M. Lutzoni, Botany—The lichen-forming ascomycetes classified within the genera *Ionaspis* and *Hymenelia* are among the most poorly studied lichens in the world. This group includes rock-dwelling crustose species, many of which are aquatic. They are restricted to Arctic-Alpine regions of the Northern Hemisphere, and many species exhibit tremendous morphological variation along an hydric-xeric gradient. In addition to logistic difficulties in accessing these habitats, the small thallus size and lack of obvious morphological characters have contributed greatly to their very unstable classification. Field work has been done in the Low and High Arctic of Canada, and eastern alpine and boreal regions of North America. A generic revision of this complex was done based on detailed morphological-anatomical and isozyme studies. This project is being pursued worldwide at the species level with the integration of PCR-based techniques on the nuclear ribosomal DNA repeat unit.

ARCTIC-ALPINE REGIONS—Cospeciation studies of the *Omphalina/Coccomyxa* model system—François M. Lutzoni, Botany—Lichens are among the most successful symbiotic associations, with almost 13,500 species worldwide representing almost 1/5 of all known fungi. Despite this tremendous ecological success, no studies have yet investigated the mode of speciation of the fungal and algal partners of these mutualistic associations. This is due in major part to the difficulty in delimiting species of unicellular algae that have very few reliable diagnostic anatomical features. It is believed that the diversity of algal species found in lichens is far less than the diversity of the fungal symbiont. With the advent of PCR, genomic DNA can be studied directly, providing a profusion of informative characters. Within the mushroom genus *Omphalina,* five species are obligate mutualists, associated with the unicellular green alga *Coccomyxa*. Populations of these five species were sampled from Eastern Canadian Arctic, Greenland, Iceland, Norway, Sweden and the French Alps. For each specimen, the DNA was isolated from the basidiocarp of the mushroom and axenic cultures of the algal partner. The ITS portion of the nuclear ribosomal DNA repeat unit was sequenced for both co-living symbionts. The phylogenetic study of these two data sets is underway. Supplementary field work is planned for the near future.

PROGRAMS IN EUROPE AND THE MIDDLE EAST

UNITED KINGDOM—Character Database for Paleozoic Tetrapods—John R. Bolt, Geology, and R. Eric Lombard, University of Chicago—Paleozoic tetrapods are known from the Upper Devonian about 370 million years before present (B.P.) through the end of the Permian (about 260 million years B.P.). The tetrapod fossil record gradually improves over this time span, and there are many more species from the Permian than from earlier periods. New specimens, especially from the earliest phases of tetrapod evolution, are becoming available, and computer-assisted techniques for studying evolutionary relationships are now in widespread use. To make the best use of new research tools and recently-acquired specimens, we need to assemble larger and more sophisticated databases than are now available, and this should be done on a worldwide basis. We are collaborating in this project with Dr. Jennifer Clack of the University of Cambridge, who is an active researcher on early tetrapods and will contribute her expertise on the European material. The three of us presently constitute a kind of editorial board for this emerging database. For the next phase of the project, we have recently enlisted contributors to the database from several U. S. and Canadian institutions. Each of them is an expert on some group(s) of Paleozoic/Mesozoic tetrapods, and with their help we expect to broaden the taxonomic focus of the database.

UNITED KINGDOM—Large-Scale Evolutionary Trends in Bryozoans—Scott Lidgard, Geology—In collaboration with Paul Taylor of The Natural History Museum, London, the project is designed to quantify the global marine evolutionary radiations and extinctions of major groups of bryozoans through geologic time, as a model for understanding the evolutionary histories of other major animal phyla. The research relies heavily on classic museum collections, as well as new field collections from North America and Europe. Work to date has shown the supposed competitive replacement of cyclostome bryozoans by cheilostome bryozoans to be far more complex than had been assumed previously. Cheilostome species do indeed increase in number but there is little significant change in the number of cyclostome species.

NORWAY—Lower Paleozoic Algal Floras From Norway—Matthew H. Nitecki, Geology—About 500 million years ago Europe was the bottom of an equatorial sea covered with abundant, luxuriant life. The extensive mountain-building processes that followed transformed the warm-water sediments into metamorphic rocks and almost entirely obliterated the fossil record. A small portion of the marine basin was preserved in the Oslo region, providing an unusual window to early life, and particularly on an extinct group of marine algae. Nitecki, a North American specialist on this group of fossils, began studying them with Professor Nils Spjeldnæs of the University of Oslo. Nine titles have resulted from these investigations. Nitecki will continue his field work in Norway in 1997 and expects to publish a book on these fossils next year.

SWEDEN and THE BALTIC SHORE—The Enigma of the Baltic Problematic Fossil Taxa—Matthew H. Nitecki, Geology—During the last glaciation in northern Europe, extensive ice sheets excavated deeply buried rocks, with their enclosed fossils, and transported them along the shores of the Baltic. These fossils can now be collected from glacial boulders, which contain an unusual assortment of fossils. Among them are 300-million-year-old problematic organisms, the receptaculitids. Adequate interpretation of the history of life on Earth must deal with its totality, therefore problematic fossils are indispensable for understanding of the evolution of life. These receptaculitids are now being studied by Nitecki and Professor Harry Mutvei of the University of Stockholm. Their goal is to reconstruct the history of life in the time interval represented by the relatively short life-span of these problematic fossils.

ISRAEL—Reptiles from the Triassic of Nahal Ramon, Negev—Olivier C. Rieppel, Geology—A relative sea level rise during the Middle Triassic (early Anisian, about 240 million years before present) resulted in a marine transgression covering large parts of what today constitutes central and northeastern Europe. During this interval, a diverse fauna of marine reptiles immigrated from the Paleotethys through the East Carpathian Gate, and/or through the Silesian-Moravian Gate, and established itself in this tropical and partly shallow "Muschelkalk sea." This scenario was not contradicted by the study of a small sauropterygian fauna from the Anisian of Transsylvania (Romania), just east of the Silesian-Moravian Gate. According to this scenario, sauropterygians from localities further east of the Muschelkalk basin were expected to be more primitive in nature than their supposed descendants who invaded the Germanic Triassic. Recent work on a diverse sauropterygian fauna from the Nahal Ramon in the Negev desert falsified these expectations, in that the fauna is very closely related to derived taxa which inhabited the Muschelkalk sea shortly before its disappearance in late Ladinian times. Research now concentrates on the reconstruction of the phylogeny and paleobiogeography of sauropterygians and its correlation with the development of the Neotethys, the ancient Mediterranean sea which started to open up between the African-Arabian Plate and Laurussia during the late Permian.

PROGRAMS IN CENTRAL AND SOUTH AMERICA

AMAZONIA—Human Ecology and Cultural Evolution in the Amazon Basin—Anna C. Roosevelt, Anthropology—While most of the interior of Amazonia consists of nutrient-poor soils subject to erosion in the absence of trees, the extensive lowland flood plains of the Amazon supported relatively advanced cultures for thousands of years. These culminated in agricultural chiefdoms with sophisticated pottery, handicrafts and trade that were destroyed by the European conquest in the 17th century. It now appears that aspects of the "traditional" culture of some Indians of the rain forest are actually a recent phenomenon - in some cases, a lifestyle antedating the chiefdoms. Prehistoric Amazonian pottery cultures that are also at least 1,000 years older than any found elsewhere in the Americas, are challenging the conventional understanding of the diffusion of culture in the New World. These results show that not only were some Amazonian Indians productive agriculturalists, but they introduced to their local ecosystems some exotic plants that have helped to make the rain forest what it is today. Results from this project emphasize that neither present-day Indian culture nor the rain forest itself is a completely "natural" phenomenon.

CARIBBEAN BASIN—Systematic Studies in the Woody Caribbean Lobelioideae—Thomas G. Lammers, Botany—The West Indies are home to more than fifty species of Lobelioideae, all woody to some degree; seven related species occur in southern Mexico and Central America. The objectives of this research program are to determine the patterns of evolutionary diversification in this group; to examine the geographic component of this diversification, as a test of existing theories of Caribbean biogeography; to prepare a useful and biologically sound taxonomic monograph of the group; and to contribute to our understanding of how woody plants have evolved from herbaceous ancestors, how fleshy fruits have evolved from dry capsules, and how polyploids have evolved from diploids.

CHILE and ARGENTINA—Ecology and Evolution of Mammals in South Temperate Rainforests—Bruce D. Patterson, Zoology—Like the spruce and redwood forests of our Pacific Northwest, the giant southern beech (*Nothofagus)* forests of Chile and adjacent Argentina constitute true temperate rainforests. Also like our own rainforests, those in Chile support a rich endemic fauna that is threatened by urbanization and logging. Over the last decade, the unique mammal faunas of these forests have been examined, including their genetics, ecology, evolution and relationships to faunas elsewhere. Studies of community change along an elevational transect illuminate habitat and food-use of species. Reliance of both plants and animals on underground fungi—mammals for food and trees for water and nutrients—bind all of these groups into highly integrated and coevolved communities. The 1992 discovery of a new genus and species of long-clawed mouse emphasizes that much remains to be learned about this biota, which is highly differentiated from others in South America. In fact, the endemism of rodents and marsupials in *Nothofagus* forests exceeds that for the same groups in ancient, isolated New Guinea. Moreover, studies of endemic marsupials there—both the shrew opossum and monito del monte,—tell about the dawn of the Age of Mammals in South America, including the ancestry of Australia's marsupials.

CHILE—Systematics and Evolution of the Chilean Campanulaceae—Thomas G. Lammers, Botany— Lammers is contributing the taxonomic treatment of Campanulaceae to the new Flora de Chile, being prepared at the Universidad de Concepción, and has made extensive collecting trips throughout the country. Of particular interest is the evolution of two clades endemic to Chile. The first of these, the *Lobelia tupa* complex, represent the only known hexaploids among the woody members of the family. The other, the *Wahlenbergia fernandeziana* complex, is restricted to the Archipièlago de Juan Fernández and possesses a unique basic chromosome number (x=11 in a genus that otherwise has x=9). This research will shed light on the relationship between changes in chromosome number and the acquistion of the woody habit by otherwise herbaceous groups of plants.

CHILE—Fossil Mammal Faunas and Geology of the Andean Main Range—John J. Flynn, Geology— During most of the last 80 million years South America drifted as an island continent. The highly peculiar land mammals that arose in response to this isolation have captured the interest of biologists and paleontologists for more than two centuries. Research has yielded at least three new and highly unexpected fossil mammal assemblages in volcanic sediments of the Abanico Formation of the Andes mountain chain in central Chile. These assemblages help to fill in what was previously a lengthy gap in the South American fossil record between approximately 30 and 50 million years before present. This gap coincides with an interval of fundamental faunal and climatic changes in South America, as well as with the first arrival on the continent of two exotic lineages - primates and rodents. In addition to several other important first and last occurrences, the 32 million year old assemblage is notable in containing the earliest known rodents from South America, and serves to "bridge" a critical time interval between faunas dominated by archaic forms and those of more "modern" aspect. In January 1994 Flynn and colleagues discovered a new 20 million year old assemblage containing a skull of an early New World monkey. Occurrence of these fossils in volcanic-derived rocks also permits application of various "absolute" geologic dating techniques to provide precise age calibration for the assemblages. The University of Chile, University of California, Santa Barbara, American Museum of Natural History, Institute of Human Origins and the National Museum of Chile are all partners in this work. This on-going collaborative project will help clarify biotic, environmental and geologic events during crucial intervals of South American land mammal history.

COSTA RICA—Flora Costaricensis—William Burger, Botany—For the past twenty-five years, this project has focused on collecting and studying Costa Rican flowering plants. This work, together with the contributions of colleagues, has provided treatments for the encyclopedia-like Flora Costaricensis series. This flora provides basic taxonomic nomenclature, detailed morphological descriptions, and ecological information available through the use of keys and illustrations and is a basic resource for all those working with the vegetation and ecology of Costa Rica and adjacent areas. Close collaboration between The Field Museum and the Museo Nacional de Costa Rica, first initiated in the mid-1930s, is the basis for these ongoing programs.

COSTA RICA—Mushrooms and Related Fungi of Costa Rican Oak Forests—Gregory M. Mueller, Botany—This project is part of Mueller's ongoing program on the fleshy fungi of Central and South America. Fungi play vital roles in all forest systems, and knowledge on their occurrence, distribution and ecology have important conservation and forest management implications. Even so, little is known regarding fungi in the Neotropics. New species and genera are being found during each trip and data from this study are among the first available to critically examine distribution patterns, seasonality and biodiversity of higher fungi. This project also involves helping develop the scientific infrastructure in Costa Rica. This has included training graduate students and finding the funds needed to upgrade facilities at the University of Costa Rica.

COSTA RICA—Screening Costa Rican Macrofungi for Bioactve Compounds: Fungi from the Guanacaste Conservation Area—Gregory M. Mueller, Botany—This is a collaborative project between Costa Rica's National Biodiversity Institute (INBio), the U.S. National Cancer Institute and the Field Museum. Its primary goal is to screen fungi for potential anti-AIDS and anti-cancer compounds. Secondarily, the project is designed to further develop facilities and knowledge to enhance Costa Rica's ability to undertake bioprospecting projects. The three major ecological zones in the Guanacaste Conservation Area in northwest Costa Rica (dry forest, cloud forest, and rain forest) cover approximately thirty-six different habitats and are estimated to be home to sixty percent of Costa Rica's biodiversity. Based on current work in Costa Rica, many new species of fungi await discovery. Thus, the possibility of including novel fungi in the screening program is very high.

DOMINICAN REPUBLIC —Plant Collecting Program—Djaja Doel Soejarto, (Research Associate, Botany) and University of Illinois at Chicago—A plant collecting program is being undertaken in the Dominican Republic with the cooperation of the National Botanical Garden and "Dr. M. S. Moscoso" of Santo Domingo. Although the primary goal of the project is the collection of plant samples for evaluation for their biological activity and potential medical utility, all samples are fully documented by voucher herbarium specimens. A set of duplicates of the collection is deposited at the John G. Searle Herbarium, The Field Museum, as well as in the host herbarium institution. From the botanical point of view, the importance of the project is to contribute new data and to enrich the database of herbarium collections of the flora of the Dominican Republic. In addition, it will be useful in further increasing our knowledge of the flora and vegetation, as well as in assessing the endemic status of many plant species, of this island nation.

FRENCH GUIANA—Ascomycetes of a Neotropical Lowland Rainforest, Saül Area—Sabine M. Huhndorf, Botany—French Guiana was chosen as a site for studying the diversity, distribution patterns and ecology of pyrenomycete and loculoascomycete fungi. Information from ongoing fieldwork and collaboration with co-workers is being gathered into a checklist. This list documents the extant mycobiota and provides a baseline against which to monitor future changes in the mycobiota, whether natural or as responses to development, pollution, etc., and it provides a standard for comparison to other tropical and temperate areas. The checklist will lead to an eventual illustrated manual for the taxa of the region.

GREATER ANTILLES—Ascomycetes of the Greater Antilles—Sabine M. Huhndorf, Botany—This project involves coordinating floristic work on ascomycete fungi and writing the treatments for a number of pyrenomycete and loculoascomycete families. One objective is databasing the existing Antillean ascomycetes. Most of these groups are underrepresented in herbaria and will need additional collecting to understand the diversity in this region. Another objective is to gather information about host specificity relationships among wood-inhabiting pyrenomycetes and loculoascomycetes in the tropics to better understand the ecology of these fungi. The floristic treatments will provide distributional documentation of species and habitats, and will serve as a foundation for studies of ecosystem processes and management, fungal diversity and forest health.

GUATEMALA—Plant Collecting Program—Djaja Doel Soejarto, (Research Associate, Botany) and University of Illinois at Chicago—A plant collecting program is being undertaken in Guatemala with the cooperation of the Herbarium of the Faculty of Agronomy, University of San Carlos, Guatemala. Although the primary goal of the project is the collection of plant samples for evaluation for their biological activity and potential pharmacological utility, all samples are fully documented by voucher herbarium specimens. General collecting throughout Guatemala is also being undertaken as part of this fieldwork operation. A set of duplicates of all collections is deposited at the John G. Searle Herbarium, The Field Museum, as well as in the host herbarium institution. From the botanical point of view, the importance of the project is to contribute new data and to enrich the database of herbarium collections of the flora of Guatemala, and it will be useful in further increasing our knowledge of its flora and vegetation.

NEOTROPICS—Systematics of Eriocaulaceae—Nancy Hensold, Botany—The Eriocaulaceae are a little known monocot family of about 1,200 species that is most diverse in the "campos rupestres" of Central Brazil. These unique habitats, characterized by thin, extremely nutrient poor soils, support paradoxically high levels of diversity and endemism of flowering plant species, of which the Eriocaulaceae represent an extreme example. For example, *Paepalanthus* subg. *Xeractis*, recently monographed, comprises twenty-seven species endemic to a small mountain range only 370 km long and 10-40 km wide. Approximately 250 additional species of the same genus are thought to occur in the same area, most of them endemic. It is hoped that by studying the taxonomy and diversification patterns in this genus, much can be learned about the reasons for high species diversity in the "campos rupestres." In addition, a family treatment has been provided for the Flora Venezuelan Guayana, The Manual Flora of Costa Rica , and the Checklist of the Flora of Mato Grosso (Brazil), and a partial revision of South American *Syngonanthus* is in preparation.

NEOTROPICS—The Rapid Reference Collection and Production of Emergency Field Guides for Conservation Research—Robin B. Foster, Environmental and Conservation Programs—Tropical forests are facing a crisis—they are disappearing at great speed before we know much about what is in them. Traditional organization of herbarium collections and traditional production of reference works for identification of plants are still as valid and important today as they have been for centuries. But they are not optimally suited to respond to a crisis. Large herbaria, with the most complete collections, are painfully slow to work through to identify an assortment of individual plants. Furthermore, few tropical forest plants are in flower during an inventory, and yet most identification references require flowers. Few tropical areas have any useful identification reference, and fewer still have well-illustrated leaves or trunks. Foster, with the support of The Field Museum, has initiated a rapid reference collection to speed up the identification of general collections and reduce damage to the main collections. Starting with the areas of immediate interest and building from there, the rapid reference also serves as a basis for producing "emergency" illustrated field-guides using high-resolution images of herbarium specimens and a desk-top binding system. The focus of this program will be on areas of particular importance for education, conservation or research throughout all the neotropical countries.

NEOTROPICS—Molecular Systematics and Biogeography of Neotropical Birds—Shannon J. Hackett, Zoology—Manakins (Pipridae) are among the most studied Neotropical birds because of their elaborate display mechanisms. Male manakins dance for females at leks in forests. Species vary in the complexity of their displays and in their display repertoires. In addition, male manakins exhibit considerable plumage differentiation. Hackett is comparing phylogenetic estimates from behaviors and plumages to those for syringeal morphology and DNA sequences. A complete phylogeny of manakins from the population level up to the family level can offer insight into the evolution of this group and also the historical biogeography of Central and South America. Future studies will require additional fieldwork to sample more species and populations and gather more complete behavioral data.

NEOTROPICS—Genetic Structure in Amazonian Birds—John M. Bates, Zoology—The Neotropics harbor the highest avian species diversity of any region in the world. Understanding how this diversity evolved is a daunting prospect, yet the combination of traditional morphologic data with molecular data (DNA sequences) and the development of new phylogenetic approaches to analyze these data are enhancing our understanding of this diversity. Goals of this research are to understand how genetic structure in these birds has been influenced by aspects of bird behavior and the important historical events that have affected the basin. For instance, we are learning that not only is species diversity higher in the Neotropics, but also genetic structure among populations is greater in these Neotropical birds. Another novel finding of the molecular data is that avian species in Amazonia evolved earlier than the Pleistocene. These data suggest that although species are the currency used to assess biodiversity and conservation value, genetic diversity in this region is also higher than what is found in temperate zone birds.

NEOTROPICS and NORTH AMERICA—Systematics of New World *Platydracus* and Allied Genera—Alfred F. Newton Jr., Zoology— This group of seven genera includes some of the largest and most frequently encountered rove beetles, most of them inhabitants of tropical or warm temperate forests where they prey on other insects. The 215 species recognized as a result of this long-term study include 101 new species that will be named in a monographic treatment of the largest genus, *Platydracus*, which is in preparation. Many species including most of the new ones are narrowly endemic to small areas of montane cloud forest or rainforest from Mexico to Brazil. Detailed analysis of their distribution patterns (best known in Mexico as a result of nine months of field work) in the context of a phylogenetic analysis of the species may aid understanding the origin of current distribution patterns of forest-dwelling insects in the Neotropics.

PANAMA—Forest Resources of Panama—Robin B. Foster, Environmental and Conservation Programs—In collaboration with the Smithsonian Tropical Research Institute and the University of Panama, Foster is using rapid assessment techniques to inventory the forest communities of Panama. More than half of the country's forests have already been destroyed, but large areas of the Atlantic slope and the Darien are still mostly intact, although poorly explored. It is not known what are the most abundant trees in the remaining forest, nor what is the status of the many species important to the native human communities. By diffuse sampling, one can estimate the population sizes of the plants that make up the bulk of the forest, and can identify areas of concentration for each species. The work makes use of an interchange of information between rapid reference collections built up over the last couple of years in Panama and The Field Museum Herbarium. Guidebooks are being prepared to permit faster identification in the field.

PANAMA, PERU and VENEZUELA—Host-Parasite Study System—William Ballard, Zoology, in collaboration with Bruce D. Patterson and Rupert Wenzel, Zoology—A series of studies are being initiated on an exceptional host-parasite study systems, the New World bats (Chiroptera: Nictilionoides) and their batfly ectoparasites (Diptera: Streblidae). This system is remarkable for the taxonomic and ecological diversity of both hosts and parasites. This offers variation in numerous life-history traits that should influence coevolution, such as mating systems, roosting ecology, metabolic rates of bats, and the vagility and visual acuity of batflies. However, because a phylogenetic hypothesis for the Streblidae is currently lacking, none of these coevolutionary questions can be cast in modern comparative terms. This project is currently in the process of generating a rigorous phylogenetic hypothesis for the Streblidae and evaluating the nature and scope of their coevolution with New World bats.

PERU—Origin and Evolution of Prehispanic Civilizations of Southern Peru—Charles Stanish, Anthropology—The Titicaca Basin of southern Peru is one of the heartlands of ancient Andean society and has a long and complex history of cultural evolution. The first settled villages in the Titicaca Basin began around 2000 BC and by 200 BC, archaic states controlled vast areas of agricultural land and built impressive irrigation systems. This project has studied these societies paying special attention to the rise and fall of ancient agricultural systems. In the last five years, almost 500 sites have been discovered. Supplementary to this work are two major research projects on Field Museum collections. One is a study of ceremonial Inca (circa AD 1350-1550) pottery from Cuzco, and a second is a study of prehispanic (circa AD 1100-1350) shamanistic artifacts from the northern Chilean coast.

PERU—Floral Inventory of Manu and Yanachaga National Parks—Robin B. Foster, Environmental and Conservation Programs—The Manu Park of southeastern Peru, and Yanachaga-Chemillen Park of the Selva Central of Peru, are two of the most important reserves of plant and animal species in tropical America. Each ranges from more than 4000 meters elevation in the treeless Andes down to 300 meters elevation in the flatlands of the Upper Amazon drainage. They each contain an estimated 5-7,000 species of vascular plants. From more than twenty years research in Manu, Foster has made the Field Museum the principal specimen repository outside of the Museo de Historia Natural in Lima, and the base of operations for the study of the Manu flora and vegetation. The Field Museum also has the principal reference collection for the flora of the Selva Central built up over the last fifteen years by Foster in collaboration with the Missouri Botanical Garden. These collections have served as the basis for checklists reference works and in-house identification that have supported the numerous ecological research projects and conservation efforts in these parks.

PERU—Systematics of Peruvian Asteraceae—Michael O. Dillon, Botany—This project has been based on an extensive program of fieldwork in Peru since 1978, when a floristic treatment of the Asteraceae for the Flora of Peru was initiated. The Asteraceae is the second largest family of plants in Peru, with more than 1,400 species, and is found in all habitat types. It was one of the few families left untreated by J. Francis Macbride in his Flora of Peru. Three tribal treatments have now been completed, an additional three have been edited, and work on other tribes is in progress. In collaboration with Nancy Hensold, the Asteraceae treatment for the Catalogue of the Flowering Plants and Gymnosperms of Peru (an updated species checklist) has been completed. This preliminary work suggests that the Asteraceae has the highest percent species endemism of any of the larger families in the country. More than half of these species of Asteraceae occur only in Peru.

PERU—Inventory of Montane Forests of Northern Peru—Michael O. Dillon and Nancy Hensold, Botany and Abundio Sagástegui Alva (Research Associate, Botany) and Isidoro Sanchez Vega (Research Associate, Botany)—The montane forests of northern Peru represent the southernmost extension of a once-continuous humid forest formation extending to Colombia, and later fragmented by climate change, uplift, and more recently, deforestation by humans. The remaining fragments are small and highly threatened refuges containing many taxa which are endemic, or find their southern limit in Peru. Since 1985 this project has collaborated closely with Peruvian scientists from three area universities to collect and inventory these areas. A preliminary inventory of Bosque Monteseco was published in 1991, and of Bosque Cachil in 1995. Work is now underway on the flora of Bosque Cutervo, one of the largest remaining forests, and a National Park since 1961. These studies aid not only in the identification and assessment of natural resources, and their loss over time, but they also shed light on the biogeographic history of the forests and suggest conservation priorities.

PERU—Distribution and Abundance of Mammals in Andean Peru—Bruce D. Patterson, Zoology—No terrestrial environment in the world harbors more species than the western Amazon Basin where it meets the foothills of the Andes Mountains. Peru's Manu Biosphere Reserve, which includes South America's largest national park, has been the site of mammal surveys undertaken by The Field Museum in collaboration with researchers from Universidad de San Marcos, Lima; the University of California, Berkeley; and the National Museum, Washington. From top to bottom, one valley in this reserve (the Río Cosñipata) is known to harbor twice the number of mammal species found in the eastern third of North America. Field samples and studies of museum collections establish the elevational ranges of species in these communities, including the presence of several species new to science. Patterns in species replacement help to indicate the nature of individual adaptations and the long-term integrity of communities occurring at different elevational levels. Ongoing studies at The Field Museum now focus on bat communities that comprise a third of all mammal species in the reserve. The project has become a highly effective vehicle for training Peruvian biologists in the theory and practice of field sampling and museum-based studies of biodiversity.

PERU—Floristics of Cajamarca—Nancy Hensold, Botany—While North Americans take for granted the existence of manuals and experts to authoritatively identify the local flora, no such reliable resources exist for tropical countries, where species diversity is ironically much higher. For inventory work in northern Peru (principally the state of Cajamarca), specialists are available to identify only about twenty-five percent of the material, and even then, an identification may take years. Therefore, it has been necessary to do a "rapid-assessment" revision of the classification of several groups, such as Begonia, Cordia subg. Varronia, and the mint, amaranth, and verbena families, for which no taxonomic specialist is currently available. Publications of new species and taxonomic changes are now in preparation. At the same time, a database is being maintained of all The Field Museum's Cajamarca specimens. Using the Missouri Botanical Garden's database of Peruvian species (1993) as a baseline, a revised and annotated checklist is being prepared for Cajamarca, including a checklist of rare and endemic species.

PERU and BOLIVIA—Rapid Assessment of Biological Diversity—Robin B. Foster, Debra K. Moskovits, Thomas S. Schulenberg and Douglas F. Stotz, Environmental and Conservation Programs— The Office of Environmental and Conservation Programs (ECP), in collaboration with Conservation International (CI), coordinates the Rapid Assessment Programs (RAP) in the American tropics. Launched by CI in 1990, RAP relies on the extensive tropical expertise of field biologists, who team up with host country scientists to conduct rapid surveys of selected areas of conservation concern. These surveys can be performed more quickly than traditional field sampling efforts, and reports are distributed to in–country policy makers and conservationists. The program focuses on initiating or promoting conservation efforts in areas of priority for conservation, and in helping define boundaries for viable reserves. In the coming years, the geographic focus for RAP will be in Peru and Bolivia. Follow–up programs will include field training for young biologists and professionals in the two countries.

PERU and CHILE—Flora of the Lomas Formations—Michael O. Dillon, Botany—Coastal Peru and Chile, between about 5˚ and 29˚S, is home to a unique plant community termed the lomas formation. These scattered "green belts" are islands in hyper-arid desert, occurring only on fog-bathed slopes close to the seashore. Species endemism in the lomas exceeds forty percent and suggests a long period of evolutionary isolation. Between 1983 and 1989, in fertile years of El Niño phenomenon rainfall, extensive collections were made in these areas, and a preliminary species checklist and database of specimens from several herbaria was produced. In a collaborative project, the database is now being used to study floristic changes in the lomas over the last century, which may be linked to global warming. Work also proceeds to resolve basic taxonomic problems and publish a manual of lomas plants.

PERU and CHILE—Systematics of the Nolanaceae—Michael O. Dillon, Botany—In connection with studies on the flora of the lomas, a monographic study of the endemic lomas genus *Nolana* has been undertaken. Between eighteen and eighty species of these succulent showy-flowered herbs are estimated to occur, depending on the specialist consulted. Morphological, chloroplast DNA, and seed propagation studies are being conducted with collaborators. Because of the extensive radiation of this genus within the lomas formations, it is proving especially informative as to the biogeography and history of these unique plant communities.

PUERTO RICO, CENTRAL AMERICA and ECUADOR—Systematics and Biogeography of the Lasiosphaeriaceae and other Ascomycetes—Sabine M. Huhndorf, Botany—This project is focused on collecting, identifying and culturing ascomycetes, specifically in the Lasiosphaeriaceae, from lowland rainforests and other areas in Central and South America. These fungi are important agents of decomposition in the forests and data from this project will provide a better understanding of their ecology. Goals of the project include publishing monographs of key genera in the family and studies documenting the distribution and biogeography of these fungi, especially in tropical areas.

SOUTH AMERICA—AquaRAP: Rapid Assessment Program for Conservation of Aquatic Ecosystems—Barry Chernoff, Zoology and Debra K. Moskovits, Environmental and Conservation Programs— AquaRAP is a rapid environmental assessment program designed to determine the conservation and biological value of aquatic ecosystems in South America recognizing basins or watershed as the natural units of conservation. The goal is to provide governmental agencies and environmental planners with a series of recommendations concerning particular habitats and regions. AquaRAP is governed by a steering committee with scientists from six nations as well as from Conservation International. The first AquaRAP was carried out in the Tahuamanu and Manuripi drainages of Bolivia in order to test the protocols on a multinational basis. Sixteen AquaRAP projects have been identified across South America. The protocols and the results from AquaRAP will be published; information about the fishes will be available on the NEODAT project Biodiversity Gopher.

VENEZUELA—<u>Systematics, Biogeography and Conservation of Fishes of the Orinoco Drainage</u>—Barry Chernoff , Zoology and Antonio Machado-Allison (Research Associate, Zoology)—The Orinoco River is second only to the Amazon in terms of the diversity of fishes it supports. There are more than 1,000 named fish species living in the Orinoco of Venezuela. This project is a collaboration with the professors and students at the Institute of Tropical Zoology, Universidad Central de Venezuela in Caracas. Studies are designed to contribute to both science and conservation. The project is interested in the gradients of fish diversity among the numerous habitats and physical environments, for example, from the Andes to Llanos to Amazonian flooded forests. In each region, the program discovers which fishes are present and uncovers many new species. Phylogenetic relationships are also studied, and these are critical for our understanding the historical connections and geographic pathways that have influenced evolutionary diversification. For example, many species have been discovered from the Guyana Shield, whose closest relatives live in the Andes of Ecuador and Peru, and not in the Amazonian lowlands. The project is especially interested in the fishes of fragile habitats, such as the spring-like morichals, with high degrees of endemism. These scientific studies are used along with fisheries information to help establish conservation guidelines and reserves in Venezuela. All of the information is computerized in both home institutions and made available internationally on computer networks via the NEODAT project on Biodiversity Gopher.

PROGRAMS IN AFRICA AND MADAGASCAR

AFRICA—Technology, Trade, and Urbanism on the Precolonial Kenya Coast — Chapurukha M. Kusimba, Anthropology—Field Museum anthropological research in Africa is currently being primarily undertaken in East Africa. Archaeological and anthropological fieldwork led by Kusimba is being conducted on a twenty-two acre precolonial Swahili town of Mtwapa on the Kenya coast, with the aim of understanding the development of technology, trade and urbanism in East Africa and the Horn between 800 AD and 1600 AD. The evidence at hand suggests very strong technical, cultural and biological communication existed between East Africa, the Middle East, East Asia, South Asia and Southeast Asia during the Middle Ages. Bennet Bronson and Chuimei Ho have recently joined the African project to bring into East African studies the much needed view from Asianists. Kusimba and Bronson have also begun a collaborative project on traditional Malagasy art and other artifacts at The Field Museum. The collection includes nearly 3,700 items from the main ethnic divisions of Madagascar and is easily one of the two or three finest in the world.

AFRICA— Systematics and Biogeography of African and Asian Pisauridae—Petra Sierwald, Zoology—The large family of nursery web spiders (Pisauridae) is distributed in Africa south of the Sahara, with some members occurring in Southeast Asia. Previous systematic research lead to the definition of several monophyletic groups within the large family. Ten South American genera were removed and have been placed into their own family (Trechaleidae). Current research focuses on another monophyletic group Sierwald defined, the subfamily Pisaurinae, consisting of eighteen mainly African genera, with some representatives in Asia. The program includes: species level revision of genera, cladistic analysis of generic relationships, and analysis of the peculiar Africa-Asian distribution pattern of the group.

AFRICA—Phylogeny of the aquatic fern family Marsileaceae—Kathleen Pryer, Botany—The aquatic fern family Marsileaceae comprises three extant genera: the water-clovers or pepperworts (Marsilea), the pillworts (Pilularia), and the monotypic Regnellidium, each with unique modifications of the vegetative and reproductive system. In the sporeling development of Marsilea there is a striking leaf transformation series from juvenile to adult morphology. Parallels are seen between certain juvenile leaves of Marsilea and the mature leaf morphology of its closely related genera. One focus of this study has been to develop a phylogenetic hypothesis for marsileaceous ferns using morphological and DNA sequence data, and to use this phylogeny to address the hypothesis that heterochrony may have played a role in their morphological evolution. A parallel focus of this project is on the phylogeny of Marsilea, a worldwide genus of about sixty species. The center of diversity for the genus is in Africa, where more than half of the sixty species occur, many of them endemic and rare to the continent. This interesting genus of ferns has been neglected for almost a century, most likely due to its enormous range in phenotypic plasticity of the leaves, a phenomenon common to most aquatic plants. Many African species adapt to seasonal changes by producing leaves in the wet season that are entirely different from those produced in the dry season, which has resulted in tremendous taxonomic confusion. In addition to DNA sequence data, morphological and ontogenetic features of the reproductive structures, or sporocarps, are proving to be useful in Marsilea systematics. Future field work to regions of South Africa is planned to study these unusual ferns in their native habitats and to supplement current greenhouse collections of Marsilea for developmental studies.

BURUNDI, ZAIRE and UGANDA—Small Mammals in the Mountains of the Albertine Rift—Julian C. Kerbis Peterhans, Zoology—For the past six years, this project has coordinated small mammal surveys in the mountains adjacent to the Albertine Rift in Central Africa. Collaborators have included l'Institut Nacional pour l'Environment et la Conservacion de la Nature and the Peace Corps/USAID Biodiversity Project, Burundi; Institut Nacional pour la Conservacion de la Nature and New York Zoological Society, Zaire; Makerere University and the Uganda Wildlife Authority, Uganda. The goals of these surveys are to develop comprehensive surveys of small mammals from these isolated mountain tops, to assess the biogeographic history of the different mountain tops by comparing faunal communities within and among African montane zones, and to develop within-country programs, reference collections and expertise to continue surveying and monitoring small mammals. These studies are especially timely for conservation management decisions as four of the studied areas have been established as National Parks in the past five years. In 1995 two grants were received to further develop these programs. The first award, from Chicago Zoological Society, will fund two Ugandan post-graduate students in small mammal studies at Bwindi Impenetrable National Park (Uganda), including: i) small mammal niche partitioning; and, ii) an elevational transect of rodents and shrews through the diverse biotopes of the park. The second award from the MacArthur Foundation is entitled: "Conservation of Biological Diversity in Uganda: A Collaborative Program in Training and Education between Makerere University, Uganda, and The Field Museum Chicago." The five year award: i) rehabilitates the Museum of Zoology and outfits the new National Herbarium, both on the Makerere campus; ii) trains east African conservation biologists from five countries in intensive ten-week data gathering techniques; and, iii) provides Ugandan National Parks with the baseline data necessary for conservation management decisions.

NIGERIA—Plant Collecting Program—Djaja Doel Soejarto, (Research Associate, Botany) and University of Illinois at Chicago—A plant collecting program is being undertaken in Nigeria with the cooperation of the Forest Research Institute of Nigeria. Although the primary goal of the project is the collection of plant samples for evaluation for their biological activity and potential pharmacological utility, all samples are fully documented by voucher herbarium specimens. General collecting throughout Nigeria is also being undertaken as part of this fieldwork operation. A set of duplicates of all collections is deposited at the John G. Searle Herbarium, The Field Museum, as well as in the host herbarium institution. From the botanical point of view, the importance of the project is to contribute new data and to enrich the database of herbarium collections of the flora of Nigeria, and it will be useful in increasing further our knowledge of its flora and vegetation.

TANZANIA—Forest Fragmentation and Conservation of Small Mammals in the Eastern Arc Mountains—Steven M. Goodman and William T. Stanley, Zoology—The Eastern Arc Mountains parallel the Indian Ocean coast in eastern Tanzania and contain some of the most biologically diverse montane ecosystems in all of Africa. Recent field work and systematic studies indicate a large number of forest endemic species of both plants and animals occur in these mountains, but much of this forest has been destroyed or is threatened by human encroachment. In conjunction with the University of Dar es Salaam, this project studies the small mammals (insectivores, bats, and rodents) of these mountains to determine their distribution and natural history and to develop effective strategies to conserve their habitat. The project is also investigating the biogeographical relationships of the various Eastern Arc Mountains to each other, as well as to other mountains in eastern Africa. Primary goals include working with Tanzanian biologists and local government officials in developing conservation strategies, and also supporting the Department of Zoology Vertebrate Museum, University of Dar es Salaam, which plays an important role in housing important research material and the education of Tanzanian zoology students.

UGANDA—Birds of the Rwenzori Mountains—David E. Willard and Thomas P. Gnoske, Zoology— While the avifauna of the Rwenzori Mountains was fairly well-documented as long ago as the turn of the century, little information was gathered regarding ecology or elevational ranges. These mountains have also experienced dramatic changes in habitat over the last century. This study seeks to document the current birds of the Rwenzori Mountains and to compare them to the now much better known faunas of other mountains on the west side of the Albertine Rift. An elevational transect in the Mubuku Valley at the southern edge of the range has been accomplished. A similar survey in the Semliki Valley at the north end of the range will complete the project.

MADAGASCAR—Late Cretaceous Crocodiles and Other Fossils from Madagascar—Gregory A. Buckley, Department of Geology—The unique biota of Madagascar, off the east coast of Africa, is well known and of great interest to zoologists. Unfortunately, the origin of the Malagasy fauna and its evolutionary history is poorly understood, due primarily to a scanty fossil record on the island. A multi-institutional expedition to Madagascar in 1993, 1995 and 1996 collected an extremely diverse Late Cretaceous vertebrate fauna (including the first Late Cretaceous mammals and birds ever to be found in Africa, several remarkably preserved dinosaur species, the earliest known frogs from Madagascar, and several varieties of fish, turtles, lizards and snakes), as well as a diverse Late Cretaceous and early Tertiary invertebrate fauna. Many of these species are providing a wealth of information regarding Cretaceous Malagasy biodiversity and biogeography. Many of the fossils collected during the three field seasons are being prepared in the Geology Fossil Lab in Stanley Field Hall, with a portion of these collections to be housed at The Field Museum.

MADAGASCAR—Malagasy Textiles from the Linton Collection—Chapurukha M. Kusimba and Bennet Bronson, Anthropology—We plan to publish a substantial part of the Museum's collection of textiles from Madagascar, purchased in the 1920s by the noted anthropologist Ralph Linton. This is the largest such collection in existence, from a part of the world that formerly produced exceptionally beautiful cloth. The projected publication will feature short essays by the best-known specialists on the subject, plus large-format color plates and additional text by the editors: Bronson, Kusimba and Judy Odlund. Malagasy culture in general, and textiles in particular, represent a fusion of Southeast Asian and African cultural elements. It is hoped that the textile project will help to lay the groundwork for a more intensive historical, archaeological and environmental study of early contacts between Madagascar, Africa and Asia.

MADAGASCAR—Evolutionary History of the Avifauna of Madagascar—Thomas S. Schulenberg, Zoology—Although Madagascar is separated from the African mainland by only a few hundred miles, the avifauna of the island seems highly different; most bird species on Madagascar are not found anywhere else. It has been thought that some of the birds of Madagascar may represent interesting examples of adaptive radiation, a type of explosive evolution in which the descendant species of an original colonizing form have diversified widely. Schulenberg's studies of the vangas of Madagascar, using DNA sequencing, have called this notion into question, at least with respect to these species, but leave open many questions about the closest mainland relatives of Malagasy birds. Further studies on the systematics of the birds of Madagascar, and on species from their potential source areas on Africa and Asia, are necessary to properly understand the history of bird colonization of this island.

MADAGASCAR—Biodiversity Through Space and Time—Steven M. Goodman, Zoology—The fauna of Madagascar, the world's fourth largest island, is notable because of its extraordinarily high degree of endemicity (most species found on Madagascar are found nowhere else in the world) and because of the very high percentage of this fauna currently threatened with extinction, primarily as a result of human-mediated habitat destruction and disturbance. Several research programs are underway to provide biological underpinnings to conservation efforts in Madagascar, with particular emphasis on birds and mammals. One aspect of this research is to carry out faunal surveys that document the current fauna at these sites. This information can then be used to manage refuges so as to maintain current levels of biodiversity, allow rankings of the relative importance of different reserves, and provide basic natural history information on threatened species. It is well-documented that a wave of extinction affecting large-bodied animals, including elephant birds, took place on Madagascar at about the time humans colonized the island, but knowledge of the islands' fauna in the recent past is still incomplete. To assess the influence of human activity on the fauna in the recent past, another research program is an investigation of sub-fossil vertebrate deposits. A key component to all research on Madagascar involves training of Malagasy students.

MADAGASCAR—Investigating Mechanisms of *Wolbachia pipientis*—William Ballard, Zoology— This research program is investigating mechanisms by which naturally occurring *Wolbachia pipientis*, and alpha proteobacteria, influence genetic divergence and speciation in *Drosophila simulans* fruit flies collected in Madagascar. At least six strains of *Wolbachia* infect *D. simulans* with each strain apparently associated with only one of the three *D. simulans* mtDNA haplotypes. *Wolbachia* is the causative agent of reproductive cytoplasmic incompatibility in *D. simulans*, typically causing a reduction in gene flow between uninfected females and infected males and among individuals infected with different strains of *Wolbachia*. Ballard is: i) investigating assortative mating within and among the three *Drosophila* host haplotypes as a potential outcome of a *Wolbachia* induced reduction in gene flow; ii) quantifying intra- and inter-haplotypic mitochondrial and autosomal variation in *D. Simulans*; iii) generating a robust *Wolbachia* phylogeny; and iv) monitoring *Wolbachia* strains in similar and different host genetic backgrounds to test a central prediction of coevolutionary theory, that the interaction of host and endosymbiont should evolve from disease toward symbiosis.

MADAGASCAR—Reptilian and Mammalian Evolution Madagascar—John J. Flynn, Geology—The biota of Madagascar is unique and peculiar, but poorly understood, in part because fossils from the island are extremely rare. A collaborative collecting and training project was begun in 1996 with the University of Antananarivo, co-led by Flynn and Research Associate Mike Parrish (Geology). Also participating in the summer 1996 expedition to Mesozoic deposits of western Madagascar, supported by the National Geographic Society, were Bill Simpson (Geology), André Wyss (Research Associate, Geology), and three Malagasy students from the university. This exploratory trip resulted in skulls and skeletons of the first Triassic cynodonts (early mammal relatives) and teeth and skeleton parts of Jurassic carnivorous and herbivorous dinosaurs. The results of this project should be very important for clarifying the early history of reptilian and mammalian evolution in Madagascar (and southern hemisphere "Gondwanan" continents in general), constraining the interplay between plate tectonic movements (including the separation of Madagascar from northeast Africa beginning in the Jurassic) and biotic change, and determining the effects of environmental changes on both past and current biotic distributions in this important biogeographic area.

PROGRAMS IN ASIA, THE INDO-PACIFIC AND AUSTRALASIA

AUSTRALASIA—Morphological Species Concepts in Bryozoans: A Test Case in *Adeonellopsis* —Scott Lidgard, Geology—This project seeks to quantify how much variation exists in characters that are used to determine species in colonial bryozoans. Even within a colony, individual zooids may differ as much as those from colonies in geographically separate populations or even different species. Colonies of the genus *Adeonellopsis* from dozens of localities covering Australian and New Zealand were analyzed by video-digitizing techniques. This research has determined an alarming number of cryptic species exist within currently accepted yet poorly defined species boundaries. If these results hold for other genera, the global diversity of bryozoans (currently estimated to be about the same as mammals) may be underestimated by a factor of two, three or more.

AUSTRALASIA—Systematic Studies in Lepidoziaceae (Hepaticae)—John J. Engel, Botany—The south temperate areas of the globe are notable for the large concentration of relatively ancient representatives of numerous families and genera of Hepaticae. Many, if not all, of the major suborders appear to have their most primitive extant members in Australia, New Zealand and southern South America. Previous field seasons have resulted in the accumulation of a major research collection of New Zealand and Tasmanian hepatics, which is currently being studied. Monographs of selected genera are being prepared as part of the Hepatic Flora of New Zealand program, in collaboration with Rudolf Schuster. Work is nearing completion on a monograph of the large Australasian genus *Telaranea*, in collaboration with Field Museum Adjunct Curator Gary Merrill.

AUSTRALIA—Stream Blockage at the Smeaton, Victoria, Fossil Vertebrate Locality—William D. Turnbull, Geology—As a student of the Australia fauna for the past forty years, Turnbull has collected and reported extensively on Pliocene and Pleistocene fossil mammals of that continent. His 1993 publication with E. L. Lundelius and T. Ford concerns the small faunule from Smeaton, and his current interest is in interpreting the nature of the deposition of the entombing sediments. The area has several volcanoes which have lava flows that have blocked the local drainage, contributing to deposition of the sediments. With E. Wilkensen of the Victorian Mines Department, Turnbull is attempting to learn more of the history of these deposits, known to preserve three or four superposed fossiliferous beds. Other ongoing studies of the placentals of the Pleistocene, Madura Cave fauna continues, as do those on certain marsupials of the Pliocene, Hamilton fauna of Victoria with Lundelius and T. Rich.

AUSTRALIA—Staphyliniform Beetles of Australia—Alfred F. Newton and Margaret K. Thayer, Zoology—This poorly known group of beetles includes about 2,000 named species in Australia, but at least three times this many species occur there based on the long-term faunal survey that is the heart of this program. The known and newly discovered species include many odd "living fossil" species unlike anything known from the rest of the world, as well as many species closely related to species in other now-distant southern temperate areas, especially of New Zealand and Chile (each the subject of similar surveys). Research focuses on the discovery and detailed study of these species of special phylogenetic and biogeographic interest, with the aim of answering questions about the origin and early diversification of the group as a whole and the relative importance of continental drift versus dispersal in explaining "southern connections" found in many groups of plants and animals and especially common in these beetles. The program, begun in 1980 and continued most recently with two months of field work in Tasmania and southeastern Australia in early 1993, has been funded by the National Geographic Society, Australian Biological Resources Study, American Philosophical Society and the Field Museum, with extensive cooperation and logistic support from CSIRO's Division of Entomology, home of the Australian National Insect Collection in Canberra.

AUSTRALIA AND PACIFIC OCEAN— Biodiversity and Biomechanics of the Wrasses in the Coral Sea—Mark W. Westneat, Zoology—Field work in the Coral Sea of Australia is aimed at sampling the biodiversity of this pristine coral reef environment as well as to obtain critical specimens of wrasses, family Labridae, for phylogenetic and biomechanical studies. Labrid fishes are primarily circumtropical inhabitants of coral reefs. There are species of labrid not well represented in museum collections which are crucial for this phylogenetic studies of this group. Films of labrids swimming were made which will be analyzed at the Field Museum in order to learn about the biomechanics and evolution of pectoral fin locomotion. Additionally, tunas and mackerels were collected and dissected for other biomechanical studies of swimming and evolution of fish design. Long-term projects in Australia and Thailand aim to document diversity of reef fishes and study evolutionary relationships of Indo-Pacific labrid fishes.

NEW ZEALAND—Flora of New Zealand—John J. Engel, Botany—Both the uniqueness of the New Zealand hepatic flora and its richness are characteristics that give it broad interest. No other region of the globe as limited in size as New Zealand possesses a comparably diverse and rich hepatic flora. No other area with corresponding dimensions shows higher levels of endemics at both genus and species level, and the endemics include some of the most isolated and unusual genera extant in the world's flora. A significant factor in the uniqueness of the New Zealand flora is due to isolation—it separated from its proximity to Gondwanaland some eighty million years ago yet preserves rich elements of the Gondwanaland flora. Treatment of species of the flora includes a description of the plant, discussion of its differentiation from related species, a statement of variability, a detailed statement of the ecology of the species in New Zealand, its word-wide distribution, as well as the range of the species in New Zealand.

ASIA—Metallurgy and Other Technologies in Ancient Asia—Bennet Bronson, Anthropology—This project is focused on the general theme of early commercial competition, the effects of technological progress, and the causes of economic development and decline, particularly as it relates to the subject of ancient metal production and manufacturing in Asia. In this region metallurgy and ceramic technology developed early and reached levels of technical excellence not matched elsewhere in the world until the late 19th century. Since 1985, working with several collaborators and making extensive use of museum collections, several studies have been published on early and traditional metalworking in Indonesia, India, Thailand, China and Japan. Current research efforts are focused on early Chinese bronze and iron, Indonesian weapons and South Asian steel, and general Asian ceramics and glass.

CHINA—The Early Ceramic Economy of Southern Fujian—Chuimei Ho and Bennet Bronson, Anthropology—This project, due to run from late 1994 through 1997, is funded by the Chiang Ching-kuo Foundation. It is aimed at examining the role of this part of China in Asian history through studying the manufacture and export of ceramics and ironwares during the 11th-16th centuries. Fujianese ceramics are found at archaeological sites as far away as Egypt. The project will throw light on such issues as: the functioning of a regional economy over a period of several centuries; the causes of industrial and commercial success (and failure) in the premodern period; and the nature of long-term economic and cultural interactions between a notably outward-looking part of China on the one hand and the countries of Southeast and East Asia on the other. Most of the work is being done through jointly conducted archaeological surveys. The Field Museum's main collaborators include the co-director, anthropologist Ye Wencheng of Xiamen University, and curators from nine county-level museums in southern Fujian.

CHINA and EASTERN NORTH AMERICA—Relationships between the Macrofungi of Eastern North America and Temperate Eastern Asia—Qiuxin Wu and Gregory M. Mueller, Botany—Eastern North America and temperate eastern Asia reportedly share a relatively high number of taxa of macrofungi (mushrooms and relatives), including a number of taxa that have putatively eastern North America/temperate eastern Asia disjunct distributions. These reports have been used to imply an affinity between the mycotas (fungal equivalent of flora and fauna) of the two regions. To date, however, this affinity has not been examined in detail. A comparison of north temperate macrofungal mycotas is being undertaken to examine the similarity between these regions. This is a collaborative field and laboratory program between The Field Museum and the Systematic Mycology and Lichenology Laboratory, Chinese Academy of Science, Beijing. Field work is being undertaken in northeastern and southwestern China and in the Huron Mountains in northern Michigan and Highlands, North Carolina to obtain comparative data. The goals of this study are to document macrofungal diversity in China and to determine the taxonomic similarity of eastern North America and temperate eastern Asia using detailed morphological analyses and analyses of DNA sequence data of selected taxa.

CHINA—Fossil Reefs of China—Matthew H. Nitecki, Geology—Nitecki, earlier in his career, worked on the Ordovician reefs in Utah, Texas and Oklahoma. He began his studies of the fossil reefs in China along the Yangtze River Gorge, and along the beautiful, deep, narrow and impossibly steep slopes of its tributaries in Hubei and Sichuan provinces. This cooperative work of the Field Museum and the Jianghan Petroleum Institute in Hubei, China, demonstrated the striking morphological and developmental similarities of the North American and Chinese reefs. Nitecki and his Chinese colleagues presented a paper on the biology of the Ordovician reefs at the International Symposium on the Ordovician System. The expectation from this joint Sino-American research is an elucidation of the global distribution and the morphological complexities, community paleoecology and evolutionary successions of the Ordovician reefs.

MALAYSIA—Training and Research on Mammalian Diversity in Malaysian Borneo—Lawrence R. Heaney, Zoology—Malaysian Borneo (Sarawak and Sabah) supports one of the largest tracts of tropical forest in the world. However, that forest is being removed rapidly for timber and agricultural production. The impact on the rich mammalian fauna is largely unknown, and few Malaysian biologists are conducting basic research on the potential conservation problems. This project is oriented toward developing both the essential information and research capabilities at the appropriate regional universities. Studies of island biogeography and elevational diversity gradients are being conducted in collaboration with a Malaysian colleague who recently completed his Ph.D. studies at The University of Illinois at Chicago and The Field Museum.

MALAYSIA: SARAWAK—Variability and Harvest Sustainability of Anti-HIV Compounds in a Natural Population of *Calophyllum*—Marian R. Kadushin and Djaja Doel Soejarto (Research Associate, Botany) and University of Illinois at Chicago—With the discovery of anti-HIV compounds calanolide A and costatolide from two different species of *Calophyllum* from the tropical rain forests of Sarawak, East Malaysia, a study was initiated early in 1993 to investigate the variability of the occurrence of these compounds in natural populations, as well as their seasonal variability. In partnership with the National Cancer Institute and Sarawak Forest Department, the goal is to determine the optimal harvesting time and harvest sustainability. Samples of stembark exudate from various numbered trees are collected periodically in the field for biological testing and chromatographic evaluation in the laboratory. Preliminary data indicate costatolide is very stable and samples harvested six months after the first still contain the compound, without any decrease in its anti-HIV potency, *in vitro*. Other related studies being undertaken are estimating population density and species abundance of the anti-HIV-containing *Calophyllum* species.

MALAYSIA: SABAH—Structure and Organization of Communities of Amphibians in Rain Forests of Borneo—Robert F. Inger and Harold K. Voris, Zoology—This program seeks to analyze the composition, structure and variation of amphibian communities, with attention given to local and regional diversity as well as to patterns of variation over time and from place to place. Both larvae and adults are being studied. This is a long term program which has provided a unique opportunity to examine changes in these communities. Two major conclusions have resulted so far: i) at any given locality, differences in characteristics between communities along different streams are equivalent to differences within those communities over the time span (up to twenty-two years) of our observations; and ii) regional differences in community characteristics are largely attributable to topography, which controls stream quality. One of the offshoots of this program is an analysis of the effects of logging on amphibian populations. Two of the field sites have areas that have been logged. Comparison of amphibians in logged and pristine sections provided an opportunity to estimate the effects of logging in adjacent areas.

MALAYSIA: SABAH—Systematics, Evolution and Ecology of Frogs in Borneo—Robert F. Inger, Zoology—Sampling of amphibians in Southeast Asia generally has been sporadic and unorganized. This program, by concentrating on Borneo, has provided a baseline for an amphibian fauna in that part of the world. Collecting of specimens and data has been systematized allowing comparisons of regions (and communities, see above) within Borneo. This sampling program has provided the basis for estimates of local as well as regional diversity, for discovery of new species, for associations of larvae with adults, for analyzing partitioning of resources and for phylogenetic studies. Now underway is a study of patterns of development and life strategies and the association of those patterns with phylogenetic relations. Populations of adults and tadpoles have also been monitored for two years in two national parks in Sabah, Malaysia (northern Borneo). Implantation of passive transponders in adult frogs has made possible long term, certain identification of individuals for the first time. Monitoring the tadpoles will provide fundamental data needed to evaluate the chances for survival of populations following logging (see above), for there is an interval between logging and the stabilization of soil by plants that may determine survival.

MALAYSIA: SABAH—Ecology of Marine Snakes—Harold K. Voris, Zoology and Rob Stuebing, (Research Associate, Zoology)—In the Pulau Tiga marine park off the north coast of Borneo, Voris and Stuebing are exploring the ecology of the banded sea krait, an amphibious sea snake. Their objective is to learn how these snakes budget their activities between the land and the sea on this island which is very near the equator, and then to investigate the plasticity in these activities and important life history traits over the species' huge geographic range that extends from New Caledonia to the Bay of Bengal. At the core of this work is a seven–year mark–and–recapture program that has provided detailed information on the numbers and structure of the population as well as the growth rates of individual snakes.

PHILIPPINES—Inventory of a Palawan Forest—Djaja Doel Soejarto (Research Associate, Botany) and University of Illinois at Chicago—In an attempt to quantify data on the potential medical value of a tropical rain forest tract, a one-hectare plot was set down in a lowland mixed forest on the eastern slope of Mount Beaufort of Central Palawan. Plant samples were collected from this plot for testing against cancer cell lines and HIV. Based on the species-area curve of tree species with a diameter of ten cm and above found in the ne-hectare plot, an estimate will be made through extrapolation on the number of species of potential importance to yield anticancer and anti-HIV drugs, in the entire 5,000-6,000 hectares forest tract in Central Palawan. Such information should strengthen the justification for further conserving these forests, as well as for utilizing them in a sustainable manner. This project is on going with the cooperation of the Philippine National Herbarium (PNH), Manila, and the Palawan Integrated Area Development Project Office (PIADPO) in Palawan, and in partnership with the National Cancer Institute's plant collection project at the University of Illinois at Chicago.

PHILIPPINES—Field Studies and Database on the Flora of Palawan—Djaja Doel Soejarto (Research Associate, Botany) and University of Illinois at Chicago—Palawan Island, the fifth largest island in the Philippines with an area of approximately 10,000 square kilometers, is the only large island of this archipelagic nation still more than half covered by good tropical rain forests. There is an interest on the part of the Philippine Government to develop these forests in a sustainable manner for the well-being of the people of Palawan and the Philippines. One important step toward the sustainable utilization and development of forest resources is to know the plants that grow in these forests. Towards this goal, a plant collecting program has been undertaken annually on this island since 1988. New collections are incorporated into a database of the Palawan flora in deposit at the herbaria of the Philippine National Herbarium and The Field Museum. This database contains more than 6,000 records, comprising at least 1,000 species of angiosperms. This database provides information on endemic taxa, taxa extensively collected, taxa rarely collected or perhaps of rare occurrence, etc., which should be useful in any planning for the conservation for sustainable utilization and development of Palawan forests. It should also provide a foundation for the writing of a checklist and, eventually, a flora of Palawan. This project is on-going in partnership with the Philippine National Herbarium (PNH), Manila, and the National Cancer Institute's plant collection project at the University of Illinois at Chicago.

PHILIPPINES—Birds of Sibuyan Island, Philippines—Steven M. Goodman and David E. Willard, Zoology—Sibuyan Island, a very small island in the Sibuyan Sea south of Luzon, has never been thoroughly explored ornithologically. Early surveys were restricted to its periphery with none covering the steep slopes of Mount Guitinguitin which dominates the island's center. Because Sibuyan is an oceanic island with no history of connections to other islands or any mainland area, baseline information on its avifauna is important for understanding the biogeographic patterns and declining bird diversity of the Philippines as a whole.

PHILIPPINES—Assessment and Conservation of Mammalian Biodiversity—Lawrence R. Heaney, Zoology—With 110 species of mammals unique to the Philippines, this island nation is home to one of the richest endemic mammalian faunas in the world. However, it is also one of the least known faunas; twenty species have been discovered in the last ten years, a rate of discovery of new species that equals that of any continent. Working with colleagues from five Philippine institutions over the last fifteen years, this project has provided the first modern assessment of patterns of mammalian distribution, including the definition of major biotic regions, the impact of diversity gradients along elevational gradients on biodiversity patterns, and study of the genetics, phylogeny and ecology of many rare and poorly-known species. The results of this research are now being used by the Philippine government in their effort to rejuvenate their national park system, which had been decimated during the Marcos years. The ongoing Integrated Protected Areas Project, now supported by a $20 million grant from the Global Environmental Fund of the World Bank, uses recommendations from this project as one of their primary guidelines. As a result, the prospects for the survival of this unique array of species has gone from exceedingly dim to guardedly positive, and they continue to improve.

PHILIPPINES—Training and Program Development in the Conservation of Biodiversity—Lawrence R. Heaney, Zoology—Although the Philippine islands once were covered in rich tropical rainforest, about eighty percent of that forest has been cleared, imperiling the rich native fauna and flora. Moreover, loss of the forest, with its natural ability to absorb the water produced by the many typhoons each year, also represents loss of watersheds that control flooding, erosion, hydro-electric dam siltation and coral reef siltation. This project, which has received support from the MacArthur Foundation and the National Science Foundation, has sought to respond to this problem by improving the capacity of Philippine institutions to conduct basic biodiversity research, to improve facilities for research and teaching and to increase training opportunities for conservation biologists. The program has provided: field research training opportunities for several dozen young faculty and other biologists in the Philippines; more advanced and intensive training at The Field Museum for more than a dozen biologists; advice on program development and assistance in obtaining funding for their programs; assistance in developing a new Philippine Wildlife Conservation Society that holds annual meetings that promote communication and encourage research; and, specialized information to Philippine government offices on the status of endangered species and habitats.

SOUTHEAST ASIA—Plant Collecting Program—Djaja Doel Soejarto (Research Associate, Botany) and University of Illinois at Chicago and Charlotte Gyllenhaal, University of Illinois at Chicago—A plant collecting program was initiated in Southeast Asia in 1986 under the auspices of the United States National Cancer Institute (NCI) partnership with the University of Illinois at Chicago, using the University of Illinois at Chicago and the Botany Department of The Field Museum as a base of operation. The Arnold Arboretum of Harvard University, the Department of Botany of Bishop Museum and the Rijksherbarium (Leiden, the Netherlands) are also cooperating in this project. In addition, the project receives the cooperation of all major botanical (host) institutions in Southeast Asia (Bangladesh east to Papua New Guinea, through the Gulf of Thailand States and Malesia), where collecting work is being undertaken. Although the primary goal of the project is the collection of plant samples for anticancer and anti-HIV evaluations, all samples are fully documented by voucher herbarium specimens. General collecting throughout Southeast Asia is also undertaken as part of the field work operations. Thousands of plant species, in particular angiosperms, have been collected as part of this project. Duplicates of all collections are deposited at the John G. Searle Herbarium, The Field Museum, as well as in each host herbarium institution and in other collaborating botanical institutions. From the botanical point of view, the importance of the project is to contribute new data and to enrich the database of herbarium collections from Southeast Asia, and it will be useful in increasing our knowledge on the flora and forests of Southeast Asia.

SOUTHEAST ASIA—Symbiotic Interactions Between Barnacles and Their Sea Snake and Crustacean Hosts—Harold K. Voris, Zoology, and William B. Jeffries (Research Associate, Zoology)—In the Straits of Johore between Malaysia and Singapore and along the coast of southern Thailand, Voris and Jeffries are studying ecological and life history interactions between small goose barnacles and their hosts, marine crabs and sea snakes. Their work has focused on details of the life history of the barnacle larvae, cyprids and adults, and mechanisms of colonization of their hosts. These investigations have contributed to an understanding of the effect of colonization patterns on the survivorship of the commercially important mangrove crab in crab fisheries. Most recently Voris and Jeffries have published a study exploring the relationships among the degree of plate armament on different species of barnacles, the types of host they select and their preferred locations on the hosts that they colonize.

SOUTHEAST ASIA—Evolution Across Major Life Zones—Harold K. Voris, Zoology—In freshwater swamps and marine estuaries in Borneo and Thailand, Voris, along with his colleagues and students, are exploring how aquatic snakes budget their activities between the two major life zones, land and water. In the aquatic and semi-aquatic tropical habitats of Southeast Asia several independent lineages of snakes have evolved aquatic habits. Through comparisons between lineages, and among species within lineages, Voris and his colleagues are gaining insights into the reasons why these fundamentally terrestrial vertebrates have re-invaded aquatic habitats so often evolutionarily. Thirty-two species of aquatic homalopsine snakes form an ecological bridge between freshwater and fully marine snakes. Work on these species includes a study of their morphological and biochemical relationships, as well as an in-depth investigation of the ecology of species that live in representative habitats such as rice fields or intertidal mud flats. Field work has included marking snakes by implanting passive transponders with the goal of estimating the numbers, movements and age of snakes. This program is being conducted with Daryl Karns, Research Associate, Zoology, from Hanover College, and John Murphy, Zoology Field Associate, and Chicago-area teacher. It has also benefited from the assistance of high school student interns who have worked in the Division of Amphibians and Reptiles during the last several summers.

SOUTHERN AND EASTERN ASIA—Systematic Review of Macaques—Jack Fooden, Zoology—The macaques (Macaca), comprising approximately nineteen species, are the most widely distributed genus of Old World monkeys. Based on field research, examination of museum specimens and literature study, this project seeks to investigate the classification, distribution and evolutionary history of these monkeys.

TROPICAL ASIA—Distribution of Amphibians of Southern Asia—Robert F. Inger, Zoology—The amphibian fauna of southern Asia, from India to the Philippines and the Lesser Sundas, has long been known as one of the major tropical faunas. However, it has been studied only in terms of its component political subdivisions. This is the first attempt at an analysis considering the fauna as a whole. There are clearly two major geographic components, defined essentially by pre-Tertiary geologic history: i) India/Sri Lanka, and ii) all the rest. Overlap between these two major components is accounted for mainly by species that are commensals of man or, "weed" species that tolerate extreme environmental disturbance. The India/Sri Lanka portion, which excludes the mountainous northeastern part of India, has all the attributes of a Gondwana fauna with endemic genera and subgeneric lineages with clear African relationships. Southeastern Asia, from Burma to Borneo and the Philippines, has a single distinct fauna with a few subregional endemic lineages but with subregions defined by physiographic boundaries and many endemic species.

TROPICAL ASIA—Measuring and Monitoring Amphibian Populations in Tropical Asia—Robert F. Inger, Zoology—To date the only attempt to measure and monitor amphibian populations in all of tropical Asia has been carried out in Malaysian Borneo. For large parts of tropical Asia, there are no inventories of species present. In an attempt to encourage and stimulate work in this area, a workshop on measuring and monitoring amphibian populations was held in Sabah, Malaysia. The workshop conducted by Inger, Tan Fui Lian and R. B. Stuebing (both Associates, Zoology), was attended by biologists from Sabah and Sarawak (Malaysian states in Borneo), Indonesia, peninsular Malaysia, the Philippines, Vietnam, Thailand, India, Australia and the United States. Participants produced seven proposals for research in their home countries.

MELANESIA—The New Guinea Research Program (NGRP)—John Terrell, Anthropology—The Sepik region of Papua New Guinea has long had a special place in Pacific anthropology because of its marked cultural diversity. The A.B. Lewis Collection at The Field Museum, one of the largest and best documented collections ever made in the southwest Pacific by a single field researcher, was assembled by Curator A. B. Lewis (1867-1940) during the 1909-1913 Joseph N. Field South Pacific Expedition. This collection provides an historical baseline for the Sepik coast at the turn of the century. Since 1987 the New Guinea Research Program has been exploring cultural diversity and historic change among communities on the Sepik coast combining collections-based museum research with extensive field studies. Field work in 1993-94 by Terrell and R. L. Welsch Anthropology, in the Aitape district of West Sepik (Sandaun) Province, supported by National Science Foundation and the National Endowment for the Humanities, has discovered that people there still actively maintain an extensive network of relationships based on inherited "friendships" passed down from one generation to the next that has little to do with competitive exchange or direct barter. These traditional friendship ties unite Sepik communities for hundreds of kilometers into a stable, resilient interaction sphere or community of culture. NGRP's archaeological field work at Aitape in 1996, also supported by the National Science Foundation, discovered that cultural practices of the first people to colonize Polynesia more than 3,000 years ago may have evolved on the Sepik coast of northern Papua New Guinea, and not in southeast Asia as most experts have thought.

PACIFIC and INDIAN OCEANS—Biodiversity and Systematics of 'Lower Heterobranch' Snails—Rüdiger Bieler, Zoology—This project focuses on the evolution of gastropods, specifically the 'lower heterobranchs,' a group of marine snail families. These are of interest due to their unusual anatomical features and still uncertain relationships to other snail groups. Their long-range larval distribution and excellent fossil record also allow us to address general biological questions such as, how does a high-dispersal marine invertebrate animal speciate? Extensive field collecting by SCUBA diving and deep-water dredging was done in South Africa, the Hawaiian Islands and Australia. With recent National Science Foundation support, the project has been expanded into a combined anatomical/molecular study by adding a DNA sequence component.

NORTHEAST PACIFIC—Biological Communities at Hydrothermal Vents—Janet R. Voight— Biological communities at hydrothermal vents represent one of the major startling scientific discoveries of the century. Janet Voight's research at hydrothermal vents of the Northeast Pacific Ocean along Juan de Fuca Ridge investigates whether predators, such as octopuses, distribute vent-produced resources across the resource-limited abyssal ocean floor. Her research, conducted in cooperation with Canadian and United States scientists, has received financial support from the West Coast office of the National Undersea Research program.

HAWAIIAN ISLANDS—Systematics and Evolution of the Endemic Hawaiian Lobelioideae—Thomas G. Lammers, Botany—The Hawaiian Islands harbor almost 1,000 species of flowering plants, ninety percent of which occur nowhere else in the world. These 900 endemic species ultimately trace to just 200 original colonizations of the islands by plants from continental areas; the "extra" species are the result of evolutionary diversification from these original colonists. The group with the greatest degree of diversification is the Lobelioideae, with nearly one hundred species derived from a single ancestral stock. They are thus the Darwin's finches of the plant world, and study of their relationships and evolutionary history will shed important light on the processes by which continental species invade and diversify in oceanic island systems.

J. WILLIAM O. BALLARD

Assistant Curator, Insects, Department of Zoology, Field Museum; Committee on Evolutionary Biology, University of Chicago; Visiting Scientist, Commonwealth Scientific and Industrial Research Organization, Australia.

B.Sc. (Hons.), Zoology, Australian National University, Canberra, Australia, 1982.
M.Sc./DIC., Entomology, Imperial College, London, England, 1986.
Ph.D., Entomology, University of Queensland, Brisbane, Australia, 1991.

Commonwealth Scientific and Industrial Research Organization (CSIRO) Postdoctoral Fellow, Entomology, 1991-1993.
National Health and Medical Research Council C. J. Martin Postdoctoral Fellow. University of Chicago and CSIRO, 1993-1995.

Host-parasite co-evolution and speciation.

The pattern and process of evolution can be studied as distinct fields of research, yet the two disciplines are intimately related and progress in one facilitates studies in the other. On one hand, phylogenetic knowledge is essential for determining the order of changes in a study investigating the neutral hypothesis of evolution. On the other, knowledge of the pattern and rate of change of a given molecule is crucial in attempts to reconstruct evolutionary history. My research unites pattern and process by using phylogenetics as a tool to infer evolutionary change.

I would be pleased to supervise students interested in applying biochemical, cytological, morphological or behavioral data to interesting questions in coevolution or in pursuing projects on computational evolution.

Selected Publications

1991. (with D. G. Bedo) Population cytogenetics of *Austrosimulium bancrofti* (Taylor) (Diptera: Simuliidae) in eastern Australia. Genome 34: 338-353.

1992. (with G. J. Olsen, D. P. Faith, W. A. Odgers, D. M. Rowell and P. W. Atkinson) Evidence from 12S ribosomal RNA that onychophorans are modified arthropods. Science 258: 1345-1348.

1994. (with M. Kreitman) Unraveling selection in the mitochondrial genome of *Drosophila*. Genetics 138: 757-772.

1994. (with D. P. Faith) Length differences and topology-dependent tests: A response to Kallersjo et al. Cladistics 10: 57-64.

1995. (with M. Kreitman) Is mitochondrial DNA a strictly neutral marker? TREE 10: 485-488.

(In press) (with J. Hatzidakis, T. L. Karr and M. Kreitman) Reduced variation in *Drosophila simulans* mitochondrial DNA. Genetics.

FRED R. BARRIE

Visiting Assistant Curator, Vascular Plants, Department of Botany, Field Museum; Assistant Curator, Missouri Botanical Garden, St. Louis.

B.G.S., University of Michigan, 1976.
B.S., Biology, Metropolitan State College, Denver, 1979.
M.S., Botany, Washington State University, 1981.
Ph.D., Botany, University of Texas at Austin, 1990.

Research Fellow, Department of Botany, The Natural History Museum, London.
Secretary, Special Committee on Lectotypification of the XVth International Botanical Congress.
Editorial Committee, The International Code of Botanical Nomenclature.
Botanical Curator and member of the Curatorial Collections Committee, The Linnean Society of London, 1990-1993.

Systematics of *Valeriana*, particularly New World/Mesoamerican floristics/botanical nomenclature/typification of linnaean and other 18th Century plant names.

Research includes studies of the systematics of the genus *Valeriana* and other Valerianaceae, particularly in the New World, and the Flora Mesoamericana Project. A collaborative venture of the Missouri Botanical Garden, the Universidad Autónoma de México and the Natural History Museum, London, the Project is producing a modern, comprehensive flora for Panama, Central America and México east of Oaxaca and Veracruz. Volume six (monocots) was published in 1994, volume one (pteridophytes) in 1995. The remaining five volumes will be published by 2000. The Searle Herbarium is a vital resource for any floristic account of mesoamerica, as it contains one of the largest and most comprehensive mesoamerican plant collections.

Prior to arriving at The Field Museum, I spent five years at the Natural History Museum, London, collaborating with Charles Jarvis on the Linnaean Plant Name Typification Project. The Linnaean Project's goal is to identify, evaluate and catalogue the potential type material for the 10,000 plant names published by Carl Linnaeus. The results will appear in an annotated catalogue and in a computerized database which will be available on-line. In 1993, we published a list of the 1,300 Linnaean generic names and their types, including the first effective typifications for 451 names.

Selected Publications

1989. The neotypification of *Valeriana scandens* L. (Valerianacae). Taxon 38: 296-298.

1989. Two new species of *Valeriana* (Valerianaceae) from Cerro de Teotepec, Guerrero, Mexico. Sida 13: 265-272.

1991. (with J. L. Reveal and C. E. Jarvis) Proposals to permit the designation of an authenticating element to allow the precise interpretation of an ambiguous type. Taxon 40: 667-668.

1993. (with L. J. Dorr) Typification of Linnaean names in *Pyrola* (Ericaceae, Pyroloideae). Brittonia 45: 177-180.

1993. (with C. E. Jarvis, D. M. Allan and J. L. Reveal) A list of Linnaean generic names and their types. Regnum Vegetabile 127: 1-100.

1994. (with W. Greuter, H. M. Burdet, W. G. Chaloner, V. Demoulin, D. L. Hawksworth, P. M. Jørgensen, J. McNeill, D. H. Nicolson, P. C. Silva and P. Trehane) (eds.) The International Code of Botanical Nomenclature, Adopted by the Fifteenth International Botanical Congress, Yokohama, August—September 1993. Regnum Vegetabile 131: 1-395.

JOHN M. BATES

Assistant Curator, Department of Zoology, Field Museum.

B.S., University of Arizona, 1983.
M.S., University of Arizona, 1987.
Ph.D., Louisiana State University, 1993.

Systematics, genetic structure, and geographic variation in birds.

My research focuses on genetic structure of Neotropical birds, primarily at the level of populations and species. At a continental scale, I use data from DNA sequences to uncover patterns of history among lineages of Amazonian and Andean birds. Multi-taxon studies, in which samples of different taxa are obtained at each geographic site provide insightful comparative data sets. Coupled with an understanding of distribution and ecology, I can search for correlations between molecular differentiation and other aspects of the biology of these birds such as morphological differentiation, ecology (e.g., habitat selection, foraging guild membership, breeding system, degree of seasonal movement) and phylogenetic relationships (phylogenetic constraints). In addition, to addressing evolutionary questions, these distinct patterns of genetic structure can have relevance to conservation biology.

At the local geographic scale, I have studied genetic structure in populations of five forest understory species from continuous forest and from forest fragments in northeastern Bolivia. The sites in continuous forest and the forest fragments are all within 200 km of one another, yet genetic differentiation appears to have developed in the forest fragments for three of the species studied. This work also has implications for the design of nature reserves and for conservation planning, because my data indicate that genetic structure in these forest species can be affected by forest fragmentation.

I also study geographic variation using traditional museum specimens and computerized databases. I recently completed a study of geographic variation in some South American finches which uncovered misconceptions about traditional species limits and diagnosable populations. Such studies demonstrate the vital importance of museum collections and, along with results of molecular studies, emphasize that additional inventory work on birds is sorely needed.

Selected Publications

1988. (with G. S. Mills, and J. B. Dunning, Jr.) Effects of urbanization on breeding bird community structure in southwestern desert habitats. Condor 91: 416-428.

1992. (with T. A. Parker, III, A. P. Capparella and T. J. Davis) Observations on the *campo*, *cerrado*, and forest avifaunas of eastern Dpto. Santa Cruz, Bolivia, including 21 species new to the country. Bulletin of the British Ornithological Club 112: 86-98.

1992. Frugivory on *Bursera microphylla* (Burseracae) by wintering Gray Vireos (*Vireo vicinior*, Vireonidae) in the coastal deserts of Sonora, Mexico. Southwestern Naturalist 37(3): 252-257.

1992. (with R. M. Zink) Seasonal variation in gene frequencies in the House Sparrow (*Passer domesticus*). Auk 109(3): 658-662.

1994. (with R. M. Zink) Evolution into the Andes: species relationships in the flycatcher genus *Leptopogon*. Auk 111(3): 507-515.

(In press) (with J. Cracraft and S. J. Hackett) Area-relationships in the Neotropical lowlands: An hypothesis based on raw distributions of Passerine birds. Journal of Biogeography.

RÜDIGER BIELER

Associate Curator and Head, Invertebrates, Department of Zoology, Field Museum; Lecturer, Committee on Evolutionary Biology and Biological Sciences Collegiate Division, University of Chicago.

M.Sc., Biology, Geography and Biology-Education, University of Hamburg, 1982.
Ph.D., Zoology, University of Hamburg, 1985.

President, Unitas Malacologica, International Society of Malacology.
President, American Malacological Union.
Editor-in-Chief, Monographs of Marine Mollusca.
North American Editor: Zoological Journal of the Linnean Society.
Scientific Editor, Smithsonian Institution Translations Publishing Program.
Editorial Board Member: American Malacological Bulletin; Malacologia, International Journal of Malacology; Malacological Review; The Nautilus; etc.
Trustee, Board of Directors, Delaware Museum of Natural History.

Evolutionary biology of mollusks, especially Gastropods.

Research concentrates on the evolution, comparative anatomy, zoogeography and reproductive biology of gastropods (snails). Emphasis is placed on the currently unresolved "higher-level" phylogenetic relationships between various gastropod orders and subclasses. How are the marine shell-bearing snails, the sea slugs and the land snails interrelated? Where do they come from? Does the fossil record corroborate our hypotheses? Data are collected by employing a combination of field and laboratory techniques (ranging from collecting by SCUBA diving to serial-section histology and DNA sequencing), and are derived in part from The Field Museum's extensive holdings of Recent and fossil mollusks. More narrowly defined subprojects deal with several groups of marine snail families, including the lower heterobranchs. These are not only of interest due to their unusual anatomical features and still uncertain relationships to other snail groups, but their long-range larval distribution and excellent fossil record also allows to address general biological questions such as; how do high-dispersal marine invertebrate animals speciate? Also continuing is monographic work on worm-snails (an enigmatic group that includes important reef builders in the world's oceans), forming the basis for future phylogenetic and zoogeographic studies. Another ongoing project is the first in-depth survey of marine molluscan biodiversity in the Florida Keys.

Selected Publications

1992. Gastropod phylogeny and systematics. Annual Review of Ecology and Systematics 23: 311-338.

1992. (with P. M. Mikkelsen) Biology and comparative anatomy of three new species of commensal Galeommatidae, with a possible case of mating behavior in bivalves. Malacologia 34: 1-24.

1992. (with P. M. Mikkelsen) (eds.) Handbook of Systematic Malacology. Parts 1-2. Smithsonian Institution and National Science Foundation (Annotated English-language edition of Thiele, J., Handbuch der systematischen Weichtierkunde Teile 1-2).

1993. Architectonicidae of the Indo-Pacific (Mollusca: Gastropoda). Abhandlungen des Naturwissenschaftlichen Vereins in Hamburg (NF) 30: 1-376. G. Fischer, Stuttgart/New York.

1995. Vermetid gastropods from São Miguel, Azores: Comparative Anatomy, systematic position and biogeographic affiliation. Açoreana Supplement 1995: 173-192.

JOHN R. BOLT

Curator, Fossil Reptiles and Amphibians, Department of Geology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago; Associate Professor, University of Illinois at Chicago.

B.S., Geology, Michigan State University, 1962.
Ph.D., Paleozoology, University of Chicago, 1968.

Chair, Department of Geology, Field Museum of Natural History, 1981-1990.
Treasurer, Society of Vertebrate Paleontology, 1993-present.

Early diversification of tetrapods, particularly amphibians, of Mississippian, Pennsylvanian, and Early Permian age (ca. 360 to 270 million years before present)/systematics/comparative and functional morphology/biogeography.

Current studies are focused on: i) Relationships and morphology of primitive amphibians (as well as fish) from a Mississippian (ca. 335 million years before present) locality in southeastern Iowa. The locality has produced hundreds of specimens of the oldest tetrapods known from continental North America. ii) Continuing development of an interactive World Wide Web site for systematic data, which was implemented in 1995 with two colleagues, from the United States and the United Kingdom iii) Fossil evidence for the origin and early evolution of the tetrapod auditory system, and its implications for otic evolution as well as tetrapod relationships. iv) Origin and early evolution of the living amphibians (lissamphibians). I am interested in supervising student research on systematics, morphology, and biogeography of Paleozoic reptiles and amphibians.

Selected Publications

1988. (with R. E. Lombard) Evolution of the stapes in Paleozoic tetrapods: conservative and radical hypotheses. Pp. 37-67. In: B. Fritzsch, M. J. Ryan, W. Wilcznski, T. E. Hetherington and W. Walkoviak (eds.), The Evolution of the Amphibian Auditory System. John Wiley and Sons, Inc.

1988. (with R. M. McKay, B. J. Witzke and M. P. McAdams) A new Lower Carboniferous tetrapod locality in Iowa. Nature 333: 768-770.

1990. Tetrapods and fish from a recently-discovered Middle Mississippian locality in Iowa. National Geographic Research 6: 339-354.

1991. Lissamphibian origins. In: H.-P. Schultze and L. Trueb (eds.), Tetrapod Origins. Cornell University Press.

1992. (with R. E. Lombard) Nature and quality of the fossil evidence for otic evolution in early tetrapods. Pp. 377-403. In: A. Popper, R. Fay and D. Webster (eds.), The Evolutionary Biology of Hearing. Springer Verlag.

1995. (with D. S. Berman, R. R. Reisz and D. Scott) The cranial anatomy and relationships of the synapsid *Varanosaurus* (Eupelycosauria: Ophiacodontidae) from the Early Permian of Texas and Oklahoma. Annals of Carnegie Museum 64: 99-133.

1995. (with R. E. Lombard) A new primitive tetrapod, *Whatcheeria deltae,* from the Lower Carboniferous of Iowa. Palaeontology 38: 471-494.

1996. (with H.-P. Schultze) The lungfish *Tranodis* and the tetrapod fauna from the Upper Mississippian of North America. Special Papers in Palaeontology 52: 31-54.

BENNET BRONSON

Curator, Asian Archaeology and Ethnology, Department of Anthropology, Field Museum; Adjunct Professor, Anthropology Department, University of Illinois at Chicago; Adjunct Professor, Center for Southeast Asian Studies, Northern Illinois University; Research Associate, Center for East Asian Studies, University of Chicago.

B.A., Harvard University, 1960.
Ph.D., University of Pennsylvania, 1976.

Editorial Board, Archeomaterials, 1986-93.
Associate Editor, ACRO Update, an international quarterly newsletter for the study of Asian ceramics, 1995-96.

Economic and social evolution, with special reference to early technology and trade in Asia.

The ancient world had surprising similarities to our own in terms of the importance of commercial competition, the effects of technological progress, and the causes of economic development and decline. In line with these interests I have been involved for a number of years in a program of archaeological and ethnographic work in Asia combined with research on the Asian collections of The Field Museum. I have collaborated with several specialists outside the Museum on studies of early metallurgy in Southeast Asia and China. With my in-Museum colleague, Adjunct Curator Chuimei Ho, I am now engaged in a three-year project that focuses on the early ceramic and metal industries of Southeast China and on the history of international trade in eastern and southern Asia.

I am also pursuing several other collections-oriented research projects. These include studies of recent (AD 1400-1900) East Asian bronzes, of Asian animal-keeping pastimes, of connections between early Southeast Asia and Madagascar as revealed in artifact design and nomenclature, of early glass and glaze chemistry, and of the historical art of the Philippines. At present I am supervising research by Ph.D. students at two local universities.

Selected Publications

1990. (with W. Rostoker) Pre-Industrial Iron: Its Technology and Ethnology. Archeomaterials Press, Philadelphia.

1991. Export Porcelain in economic perspective: The Asian ceramic trade in the 17th Century. Pp. 126-151. In: C. M. Ho (ed.), Ancient Ceramic Kiln Technology in Asia. Centre of Asian Studies, University of Hong Kong.

1992. (with J. C. White) Radiocarbon and chronology in Southeast Asia. Pp. 491-504 (vol. 1) and Pp. 475-515 (vol. 2). In: R. Ehrich (ed.), Radiocarbon and Chronology in the Old World, 3rd ed. University of Chicago Press, Chicago.

1994. The early Southeast Asian metals trade. Pp. 63-114. In: I. Glover, P. Suchitta and J. Villiers (eds.), Early Metallurgy, Trade and Urbanism in Thailand and Southeast Asia. White Lotus Press, Bangkok.

1996. Metals, specialization and development in early eastern and southern Asia. Pp. 177-186. In: B. Wailes (ed.), Craft Specialization and Social Evolution. University Museum, University of Pennsylvania, Philadelphia.

GREGORY A. BUCKLEY

Collection Manager/Research Assistant, Invertebrate Fossils, Department of Geology, Center for Evolutionary and Environmental Biology, Field Museum.

B.A., Hartwick College, 1985.
Ph.D., Rutgers University, 1994.

I joined the Museum in 1990 as Collection Manager and Research Assistant for Invertebrate Paleontology in the Department of Geology. My individual research program has focused principally on the evolution of both mammals and crocodiles. Fieldwork relating to my research on mammals has taken place in both North and South America, with the vast majority occurring in Montana. This work examined the relationships between fossils discovered at a single, very productive site in south-central Montana with those known from other similarly aged localities throughout western North America. A combination of paleontology, geology and geochronologic methods permitted a detailed assessment of this critical period in mammalian diversification.

My current research pertains to the systematic description of Late Cretaceous crocodiles from Madagascar. As part of an international team of paleontologists and geologists, I participated in the recent collection of several spectacular fossil vertebrate discoveries. Although our dinosaur discoveries garner most of the attention, we have discovered more species of crocodile than any other single vertebrate group. The crocodiles, as well as the remainder of the diverse fauna collected thus far, are revealing important clues regarding the unique biogeographic history of Madagascar.

Selected Publications

1988. (with J. Fleagle and M. Schloeder) New primate fossils from Monte Observaçion, Santa Cruz Formation (Lower Miocene), Santa Cruz Province, Argentina. Journal of Vertebrate Paleontology, Abstracts of Papers, 8: 14.

1989. (with J. Hartman, D. Krause and T. Kroeger) Paleontology, stratigraphy, and sedimentology of Simpson Quarry (early Paleocene), Crazy Mountains Basin, south-central Montana. Montana Geological Society 1989 Field Conference Guidebook: Montana Centennial Edition I: 173-185.

1994. (with D. Krause, J. Hartman, N. Wells, C. Lockwood, C. Wall, R. Wunderlich, J. Rabary, and L. Randriamiaramanana) Late Cretaceous mammals. Nature 368: 298.

1995. The multituberculate *Catopsalis* from the early Paleocene of the Crazy Mountains Basin in Montana. Acta Palaeontologica Polonica 40(4): 389-398.

1995. (with J. Fleagle, T. Bown, and C. Swisher) Age of the Pinturas and Santa Cruz Formations. VI Congreso de Paleontología y Bioestratigrafía, Actas: 129-135.

1996. (with C. Brochu) Campanian (Upper Cretaceous) crocodyliforms from Madagascar and their biogeographic implication. Journal of Vertebrate Paleontology, Abstracts of Papers, 16(3): 24.

(In Press) A new species of *Purgatorius* (Mammalia; Primatomorpha) from the lower Paleocene Bear Formation, Crazy Mountains Basin, south-central Montana. Journal of Paleontology.

(In Review) (with C. Brochu) An enigmatic new crocodyliform from the Late Cretaceous of Madagascar. Palaeontology.

WILLIAM C. BURGER

Curator, Vascular Plants, Department of Botany, Field Museum.

B.A., Columbia University, 1953.
M.Sc., Cornell University, 1958.
Ph.D., Washington University, 1961.

Chair, Department of Botany, Field Museum of Natural History, 1978-1985.

Flora of Costa Rica/speciation and species richness in Costa Rican flowering plants/early evolution of angiosperms and processes of angiosperm diversification.

The Flora Costaricensis is an encyclopedia-like review of the native and naturalized plants of Costa Rica, with keys, illustrations, descriptions and short discussions. It is published in parts, each covering a single large family or several smaller families. The work attempts to define and characterize the species and facilitate user identification.

The flowering plants of Costa Rica probably number close to 10,000 species, packed into an area about the size of West Virginia. Taxonomic review of many unrelated families has disclosed repeated geographic and altitudinal patterns, while making it clear that closely related species rarely grow in the same habitat. Analysis of these patterns may give us insights into the speciational processes that have helped produce so rich a flora.

The early evolution of angiosperms is poorly understood, while the origin of angiosperms is still as much an "abominable mystery" as when Darwin so described it. Current thinking about early angiosperm evolution continues a tradition of more than fifty years and is virtually unanimous. By exploring radically different scenarios it may be possible to develop new insights into early morphological trends, or at least challenge the confidence of current thinking in the field.

Selected Publications

1978. The Piperales and the monocots: alternate hypotheses for the origin of monocotyledonous flowers. Botanical Review 43: 345-393.

1981. Heresy revived: the monocot theory of angiosperm origin. Evolutionary Theory 5: 189-225.

1985. Why are there so many kinds of flowering plants in Costa Rica? Pp. 125-136. In: W. G. D'Arcy and M. D. Correa (eds.), The Botany and Natural History of Panama. Missouri Botanical Garden, St. Louis.

1995. (with M. Huft) Family #113 Euphorbiaceae, in Flora Costaricensis. Fieldiana: Botany, n.s. 36: 1-169.

1995. Montane species-limits in Costa Rica and evidence for local speciation on altitudinal gradients. Pp. 127-133. In: S. P. Churchill, H. Balsev, E. Ferero, & J. Luteyn (eds.), Biodiversity and Conservation of Neotropical Montane Forests.

1996. Are stamens and carpels homologous? Pp. 111-117. In: W. G. D'Arcy & R. C. Keating (eds.), The Anther: Form, Function and Phylogeny.

BARRY CHERNOFF

Associate Curator, Fishes, Chair, Department of Zoology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago; Adjunct Professor of Neotropical Zoology, Universidad Central de Venezuela.

B.S., State University of New York at Stony Brook, 1973.
M.S., Adelphi University, 1976.
Ph.D., University of Michigan, 1983.

Vice Chairman, National Committee for International Union of Biological Sciences, NRC/NAS, 1993-1999.
Board of Governors, American Society of Ichthyology and Herpetology, 1985-1989, 1991-1996.
Governing Council, Society of Systematic Biology, 1993-1997.
Visiting Professor of Neotropical Zoology, Universidad Central de Venezuela, 1988-present.
Book Review Editor, Systematic Zoology, 1987-1989.

Systematic biology of South American freshwater fishes and silverside fishes of the world/morphometrics/morphological evolution/systematics/biogeography.

My research is concerned with understanding the patterns and processes involved in morphological evolution. To do this, I integrate phylogenetic studies of fishes with morphometric studies of development in an attempt to evaluate current evolutionary theories. The fishes that I focus on are silverside fishes of the world (Atherniformes) and the selected groups of characiform fishes that live in the fresh waters of South America. These fishes offer an unusual opportunity to study morphological evolution across a variety of habitats and environments. The morphologies of these fishes are often highly influenced by the habitats within which they live. Part of my research focus is to elucidate the patterns of morphological diversity that are due to phylogenetic (historical) factors and the patterns that are due to environmental influences. These studies emphasize general questions about morphological evolution, such as the evolution of complexity, character stasis and the relationship between genetic and developmental evolutionary models.

I would be pleased to supervise students interested in applying developmental, morphological or biochemical data to the resolution of interesting questions in fish evolution and systematics or pursuing projects on morphological evolution in other organisms. The Field Museum has excellent collections of recent fishes, with strong emphases on neotropical freshwater fishes as well as biochemical and morphometrics/image analysis laboratories for use in systematic and evolutionary studies.

Selected Publications

1985. (with F. L. Bookstein, R. L. Elder, J. M. Humphries, G. R. Smith and R. E. Strauss) Morphometrics in evolutionary biology. The geometry of size and shape change, with examples from fishes. Academy of Natural Sciences Special Publication 15: 1-277.

1990. (with A. Machado) Characid fishes of the genus *Ceratobranchia*, with descriptions of new species from Venezuela and Peru. Proceedings of the Academy of Natural Sciences, Philadelphia 142: 261-290.

1992. (with J. G. Lundberg) A Miocene fossil of the amazonian fish *Arapaima* (Teleostei, Arapaimidae) from the Magdalena River region of Colombia - biogeographic and evolutionary implications. Biotropica 24 (1): 2-14.

1996. (with B. S. Dyer) Phylogenetic relationships among atheriniform fishes (Teleostei: Atherinomorpha). Zoological Journal of the Linnean Society 117: 1-69.

1996. (with A. Machado-Allison, and P. A. Buckup) *Bryconops humeralis* and *B. vibex*, dos nuevas especies del genero *Bryconops* Kner (1858) para Venezuela. Acta Biologica Venezuelica 16(2): 43-58.

PETER R. CRANE

Vice President, Academic Affairs and Director, A. Watson Armour III, Curator, Department of Geology, Field Museum; Professor, Department of the Geophysical Sciences, University of Chicago; Lecturer, Committee on Evolutionary Biology, University of Chicago.

B.Sc., Botany, University of Reading, 1975.
Ph.D., Palaeobotany, University of Reading, 1981.

Post-doctoral Research Scholar, Indiana University, 1981-1982.
Schuchert Award, Paleontological Society, 1993.
Bicentenary Medal of the Linnean Society of London, 1984.
Visiting Professor, Bot. Gard. und Inst. für Systematische Botanik der Universität Zürich, 1987.
Visiting Professor, Botany Department, University of Massachusetts, 1989.
Visiting Research Fellow, The Natural History Museum, London, United Kingdom 1990-1993.
Senior Mellon Fellow, Smithsonian Institution, 1993-95.
Editorial Board, Review of Palaeobotany and Palynology, Plant Systematics and Evolution, International Journal of Plant Sciences.
Editor, Paleobiology, 1984-1986.

Paleobotany of land plants, particularly the origin and early evolution of angiosperms.

My research focuses on the paleobotany of land plants and the application of paleobotanical data to understanding large-scale phylogenetic and macroevolutionary patterns in the Plant Kingdom. The early evolution of angiosperms and associated patterns of Cretaceous vegetational change continue to be my primary interest. Other areas of ongoing research include the initial diversification of land plants, the origin of seed plant biology, the evolution of ferns and evolution of water-conducting tissues. Field studies in eastern North America and central Portugal have recovered well-preserved microscopic flowers of early angiosperms and related plants from the mid-Cretaceous (about 100 myr B.P.). Scanning electron microscopy of this material is providing morphological and systematic data, as well as insights into pollination and other aspects of reproductive biology in early angiosperms. Studies of pollen grains preserved *in situ* within flowers also provide a more secure basis for ecological interpretations of the fossil palynological record. These studies and associated syntheses of Cretaceous palynological data are designed to improve understanding of the large-scale biotic and environmental changes that occurred during the critical mid-Cretaceous phase of Earth history.

I will be pleased to supervise students interested in the higher-level systematics and phylogeny of extant or fossil plants, or who wish to apply paleobotanical data to interesting questions in plant evolution or vegetational history.

Selected Publications

1985. Phylogenetic analysis of seed plants and the origin of angiosperms. Annals of the Missouri Botanical Garden 72: 716-793.

1987. (with E. M. Friis and W. G. Chaloner) (eds.) The Origins of Angiosperms and their Biological Consequences. Cambridge University Press, Cambridge.

1989. (with S. Blackmore) (eds.) Evolution, Systematics and Fossil History of the Hamamelidae. Volumes 1 and 2. Oxford University Press, Oxford.

1995 (with E. M. Friis and K. R. Pedersen) The origin and early diversification of angiosperms. Nature 374: 27-33.

1997 (with P. Kenrick) The Origin and Diversification of Land Plants. Smithsonian Institution Press.

WINIFRED CREAMER

Adjunct Curator, Northern Rio Grande Research Project, Department of Anthropology, Field Museum; Associate Professor, Department of Anthropology, Northern Illinois University.

Ph.D., Tulane University, 1983.

Evolution of cultural systems with a focus on archaeology of the southwestern United States.

My research continues to focus on regional demography of the Pueblo people of New Mexico during the Protohistoric period (AD 1450-1680). Field work to estimate the momentary population of 16th century villages has been combined with research training for undergraduate and graduate students. Recent publications and presentations highlight extensive villages that had 1,000 to 3,000 rooms each. Study of archaeological remains suggests these places represent repeated occupation by 200 to 400 people of a specific locality. Previous efforts to calculate regional population appear to have used an exaggerated village size, and resulted in inflated population figures for the Pueblos at the time Europeans arrived in New Mexico.

Undergraduate and graduate students from the University of Illinois at Chicago, Northern Illinois University, the University of Chicago and other institutions continue to participate in project research, along with a dedicated group of volunteers.

Selected Publications

1991. (with J. Haas) Search for the Ancient Ones: Pueblo. National Geographic Magazine October: 84-99.

1992. Regional exchange along the Pacific Coast of Costa Rica, during the Late Polychrome Period, A.D. 1200-1550. Journal of Field Archaeology 19: 1-16.

1992. (with J. Haas) Demography and the proto-historic Pueblos of the Northern Rio Grande: A.D. 1450-1680. Pp. 21-27. In: B. Vierra (ed.), Late Prehistoric and Early Historic New Mexico. New Mexico Archaeological Council, Albuquerque.

1993. The Architecture of Arroyo Hondo, New Mexico. School of American Research Press, Santa Fe.

1993. (with J. Haas) Stress and Warfare Among the Kayenta Anasazi of the 13th Century A.D. Fieldiana: Anthropology, n.s. 21: 1-211.

1993. (Review) Wealth and Hierarchy in the Intermediate Area, F. W. Lange (ed.), Science 260: 245-247.

1993. (Review) The Ancient Americas: Art From Sacred Landscapes, (publication and exhibit). Museum Anthropology 17: 80-85.

1994. Reexamining the black legend: contact period demography in the Rio Grande Valley of New Mexico. New Mexico Historical Review July: 263-278.

1996. (with J. Haas) The role of warfare among the Anasazi of the Pueblo III. Period. Pp. 205-213. In: M. Adler (ed.), A Reexamination of Pueblo III. University of Arizona Press, Tucson.

1996. Developing complexity in the American Southwest: constructing a model for the Rio Grande Valley. Pp. 91-106. In: J. E. Arnold (ed.), Emergent Complexity: The Evolution of Intermediate Societies, International Monographs in Prehistory. University of Michigan, Ann Arbor.

MICHAEL O. DILLON

Curator, Vascular Plants and Head of Phanerogams, Department of Botany, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago.

B.A., University of Northern Iowa, 1969.
M.A., University of Northern Iowa, 1972.
Ph.D., University of Texas at Austin, 1976.

Visiting Professor, Universidad Antenor Orrego, Trujillo, Peru.
Honorary Professor, Universidad Nacional de Cajamarca, Cajamarca, Peru.
Research Associate, Missouri Botanical Garden, St. Louis, Missouri.
Research Associate, Museo de Historia Natural "Javier Prado", Lima, Peru.
Flora Neotropica Commission Member.
Visiting Professor and Curator of Beal-Darlington Herbarium, Michigan State University, 1991-1992.

Systematics of Neotropical Asteraceae and Nolanaceae/floras of Chile and Peru/coastal South American ecology and biogeography/floristic inventories, databases and information management.

My research program involves exploration, description, systematic study and conservation efforts within the New World tropics. Projects involve the study of flowering plants in diverse habitats in the Andean Cordillera, ranging from the hyper-arid deserts of coastal Chile and Peru to mid-elevation mountain forests of northern Peru, and ultimately high-elevation plant communities known as *páramos*, *jalca* or *puna* throughout the Cordillera. Recently, collecting efforts have focused on a large tract of *Selva Alta* a tall forest formation at lower elevations in Amazonian Peru. The objectives of these various studies differ but the botanical information they yield is used to generate floristic inventories of threatened habitats or detailed morphological studies on specific taxonomic groups. This information also allows testing hypotheses of evolutionary relationships and historical biogeography. All projects are conducted in collaboration with local scientific institutions and provide opportunities for interaction and training.

In concert with the data-gathering activities, new methods of information management and dissemination are being pursued. In May 1995, a World Wide Web homepage was launched on the INTERNET and designated “ABIS” for the Andean Botanical Information System. ABIS is still "under construction" but currently the site provides electronic access to collection information from the floristic and systematic investigations of the flowering plants of Andean South America, including literature, floristic data in a hierarchial browser, and color images of plants and habitats (WWW homepage URL: http://ucjeps.berkeley. edu/abis/abisinfo.html).

Selected Publications

1994. (with A. Sagástegui). Studies in the Tribe Liabeae (Asteraceae) in Peru: I. A Revision of *Ferreyranthus*. Arnaldoa 2(2): 7-23.

1995. (with A. Sagástegui, I. Sánchez V., S. Llatas Q. and N. Hensold). Floristic inventory and biogeographic analysis of montane forests in northwestern Peru. Pp. 251-269. In: Biodiversity and Conservation of Neotropical Montane Forests. The New York Botanical Garden, Bronx, NY.

1995. (with A. Sagástegui, S. Leiva, P. Lezama, N. Henshold). Inventario preliminar de la Flora del Bosque Cachil. Arnaldoa 3(2): 19-34.

1996. (with T. J. Vision). Synopsis de *Senecio* (Senecioneae: Asteraceae), para el Peru. Arnaldoa 4(1):23-43.

JOHN J. ENGEL

Donald R. Richards Curator, Bryology, Department of Botany, Field Museum.

B.S., University of Wisconsin-Milwaukee, 1965.
M.S., University of Wisconsin-Milwaukee, 1967.
Ph.D., Michigan State University, 1972.

Council Member, International Association of Bryologists.
Chair, Department of Botany, Field Museum, 1988-1993.

Hepatic systematics and phytogeography of the south temperate and subantarctic regions.

The primary objective of my research program is to come to an understanding of hepatic systematics and phytogeography of south temperate and subantarctic regions. These geographic areas present an ideal natural laboratory to investigate biological questions relevant to evolutionary persistence, dispersibility and survival and evolution of plants faced with environmental change. Within that framework I am engaged in detailed, in-depth (monographic) studies of various groups, including *Chiloscyphus* for Australasia, *Telaranea* for Australasia and *Lepidozia* for New Zealand. My research also focuses on the "Hepaticae of the New Zealand," a three-volume work in collaboration with R. M. Schuster, a Research Associate of The Field Museum. My program includes elements of biogeography, ecology, morphology and phylogeny. I am also investigating problems involving functional morphology of hepatic structures and I am doing so in a broad evolutionary context.

Selected Publications

1980. A monograph of *Clasmatocolea* (Hepaticae). Fieldiana: Botany, n.s. 3: 1-229.

1985. (with R. M. Schuster) Austral Hepaticae V (2). Temperate and subantarctic Schistochilaceae of Australasia. Journal of the Hattori Botanical Laboratory 58: 255-539.

1990. Falkland Island (Islas Malvinas) Hepaticae and Anthocerotae: A taxonomic and phytogeographic study. Fieldiana: Botany, n.s. 25: 1-209.

1990. Studies on Geocalycaceae. I. The taxonomic position of *Chiloscyphus amplectens* (Mitt.) Engel and Schust. together with refinements in *Heteroscyphus* Schiffn. Journal of the Hattori Botanical Laboratory 68: 303-315.

1991. Studies on Geocalycaceae (Hepaticae). II. *Stolonivector,* a new genus from New Zealand. Journal of the Hattori Botanical Laboratory 69: 79-86.

1991. Studies on Geocalycaceae (Hepaticae). IV. *Lamellocolea*, a new genus of Leptoscyphoideae from New Zealand. Journal of the Hattori Botanical Laboratory 70: 63-78.

1992. Studies on Geocalycaceae (Hepaticae). VIII. A revision of *Chiloscyphus* subg. *Notholophocolea* (Schust.) Engel and Schust. Journal of the Hattori Botanical Laboratory 72: 105-115.

1993. Index Hepaticarum Supplementum: 1986-1987. Taxon 42: 373-391.

1994. (with R. M. Schuster) Studies of New Zealand Hepaticae. 7. The status of *Steereomitrium.* Bryologist 97: 63-66.

1994. (with G. Merrill) Studies of New Zealand Hepaticae. 8-13. *Bazzania* and *Acromastigum*. Bryologist 97: 313-320, f. 1-3.

1996. (with R. M. Schuster) Austral Hepaticae. XXI. *Paracromastigum fiordlandiae*, sp. nov. and the delimitation of *Paracromastigum* and *Hyaloepidozia* (Lepidoziaceae). Brittonia 48: 165-173, f. 1.

FERNANDO A. FERNANDEZ

Postdoctoral Research Associate, Department of Botany, The Field Museum.

A. A., Biology, Miami-Dade Community College, 1983.
B. S., Plant Pathology, University of Florida, 1985.
M. S., Plant Pathology, University of Illinois, Champaign-Urbana, 1991.
Ph. D., Mycology/Plant Pathology, University of Georgia, 1994.

Systematics, biology and ecology of Ascomycetes.

My interest in the biology and ecology of Ascomycetes has led me to obtain a broad training in some of the basic aspects of these organisms, particularly their identification and isolation from various substrates such as soil, leaf litter, and chicken litter. I am currently involved in a project studying the systematics and biogeography of the Lasiosphaeriaceae, a poorly known family of the Ascomycetes. Within this family, I have concentrated on the genus *Chaetosphaeria* . The few existing reports and taxonomic studies on this genus are mainly from Europe although it is commonly found, not only in the continental United States but in Puerto Rico and Costa Rica as well. These fungi might be important in the process of natural litter decomposition since they are commonly found on decaying substrates, particularly wood. However, the identification of species of *Chaetosphaeria* is particularly challenging because despite their simple morphology in nature, they are highly variable in culture media under laboratory conditions. The main goals of this project are to: a) survey the number and abundance of members of the Lasiosphaeriaceae, particularly species of *Chaetosphaeria* , in the U.S. A., Puerto Rico, Costa Rica, Panama and Ecuador, b) establish possible phylogenetic relationships among these fungi by using morphological and DNA sequencing studies. In order to achieve these goals I have identified most of our collections of *Chaetosphaeria* to species, have extensively cultured some of these species in artificial media, and have generated preliminary DNA sequences for some of these species. Collection data is already providing important information on occurrence and abundance of these fungi in temperate and tropical areas.

Selected Publications

1988. (with R. D. McClary and J. B. Sinclair). Fungicide and Nematicide Tests 44: 210.

1991. *Cercospora kikuchii* in soybeans, its interaction with *Phomopsis*, microcycle conidiation and nuclear behavior during conidiogenesis. Master's thesis, University of Illinois. Champaign-Urbana, Illinois.

1991. (with D. A. Glawe and J. B. Sinclair). Microcycle conidiation and nuclear behavior during conidiogenesis in *Cercospora kikuchii.* Mycologia 83: 752757.

1994. Taxonomic studies of the *Diaporthe phaseolorum* complex in soybean. Doctoral dissertation, University of Georgia. Athens, Georgia.

1996. (with R. T. Hanlin). Morphological and RAPD analyses of *Diaporthe phaseolorum* from soybean. Mycologia 88: 425-440.

1996. (with C. Riegel and J. P. Noe). *Meloidogyne incognita* infested soil amended with chicken litter. Journal of Nematology 28: 369-378.

CAROL J. FIALKOWSKI

Environmental Educator, Department of Environmental and Conservation Programs, Field Museum; Adjunct Faculty, National-Louis University College of Education; Adjunct Faculty, Chicago State University; Adjunct Faculty, Northeastern Illinois University.

B.A., Social Science, Education, St. Xavier College, 1960.
M. Ed., Environmental Science, National College of Education, 1974.

Chair, Illinois Environmental Education Advocacy Consortium.
Chair, Environmental Literacy for Illinois, 2000.
Co-Chair, National Commission on Urban and Multicultural Environmental Education.
Member, Education Advisory Committee, Association of Science and Technology Centers.
Review Committee, Informal Science Education Grants, National Science Foundation.
Advisory Board, Project Wild in the City.
Peer Review Team, Environmental Education Teacher Training, U.S. Department of Education.

Environmental Education with a focus on urban and undeserved audiences.

My projects apply environmental and pedagogical research to the development of models for environmental programs designed to benefit urban and underserved audiences. Interests include thoroughly crafted evaluation components that add to the literature, become frameworks for continuous improvement, and measure both long-term growth and attitudinal change. Projects involve multiple partnerships from university personnel and research scientists to community based organizations.

My objectives are to provide the learner with the skills and knowledge to be an environmentally literate citizen, so that they may make informed decisions. Interaction with authentic issues, and opportunities to make a difference or take action are essential. Coupling these needs with the conservation biology program at The Field Museum provide an ideal vehicle.

Selected Publications

1990. Education about the Environment. The Public Garden.

1990. (with Alexander, Hansen and Sedzielarz). Science Education Outreach: Museums, Science Centers, and Zoos. Science Education: Issues, Crises and Priorities. Pennsylvania Academy of Science.

1994. Urban Teacher Education in Environmental Science-Let's Start with the Issues and Practitioner Voices. Theory, Practice, Possibilities in Environmental Education, North American Association for Environmental Education.

1994. Service/Action Approach˜Ecological Citizenship, Urban EE Programs: Four Examples. The Environmental Education Toolbox. Workshop Resource Manual, National Consortium for Environmental Education and Training.

1994. Evaluation informs good practice. Journal of Museum Education 19(3).

JOHN J. FLYNN

MacArthur Curator, Fossil Mammals and Chair, Department of Geology, Field Museum; Associate Chair and Lecturer, Committee on Evolutionary Biology, University of Chicago.

B.A., Geology and Geophysics, Yale University, 1977.
M.A, Geological Sciences, Columbia University, 1979.
Ph.D., Geological Sciences, Columbia University, 1983.

Alfred Sherwood Romer Prize (4th Annual), Society of Vertebrate Paleontology, 1982.
Society of Vertebrate Paleontology, Vice President (and President Elect), 1996-present.
Associate Editor, Journal of Vertebrate Paleontology, 1989-1992.
Leader of numerous field expeditions supported by the NSF, NASA, National Geographic Society, etc.

Mammalian systematics and evolution/geochronology and plate tectonics/biogeography.

Research emphasizes a multidisciplinary approach to geologic and biologic problem-solving, incorporating my interests in two different, but related geologic specialties: mammalian paleontology and paleomagnetism. Recent field expeditions (in the United States and South America) and laboratory projects integrating biostratigraphy, paleomagnetic stratigraphy, and radioisotopic dating have included: i) refinement of the global Cenozoic geologic time scale and the South American Cenozoic terrestrial chronology; ii) chronologic and faunal studies of 50 million year old mammal faunas from southwestern Wyoming; iii) new discoveries of fossil mammal faunas in South America, providing a better understanding of South American mammal faunal evolution and biogeography; and iv) constraining the tectonic and uplift history of the Andean Mountain belts. I established a Paleomagnetism Lab with a magnetically-shielded chamber at The Field Museum that is available for staff and student research. Another aspect of my research focuses the anatomy and evolutionary relationships of the mammalian order Carnivora, and its extinct relatives. A new project in collaboration with post-doctoral fellow Michael Nedbal involves DNA sequencing to analyze the higher-level evolutionary relationships and rates of evolution of Carnivora, integrating paleontologic and molecular data.

I am interested in students and collaborators with interests in: i) integration of paleontologic and geologic techniques, particularly those emphasizing patterns of paleobiologic change through space and geologic time; or, ii) any aspect of mammalian phylogeny. The Field Museum has excellent Recent and fossil mammal collections, and geologic, biochemical (DNA sequencing) and morphometric/image analysis laboratories for use by students and staff.

Selected Publications

1986. Correlation and geochronology of Middle Eocene strata from the western United States. Palaeogeography Palaeoecology, Palaeoclimatology 55: 335-406.

1993. (with A. R. Wyss) A phylogenetic analysis and definition of the Carnivora, Pp. 32-52. In: F. Szalay, M. Novacek, M. McKenna (eds.), Mammal Phylogeny: Placentals. Springer-Verlag.

1993. (with A. R. Wyss, M. A. Norell, C. C. Swisher III, R. Charrier, M. J. Novacek, and M. C. McKenna) South America's earliest rodent and recognition of a new interval of mammalian evolution. Nature 365: 434-437.

1995. (with A. R. Wyss, R. Charrier and C. C. Swisher III) An Early Miocene anthropoid skull from the Chilean Andes. Nature 373: 603-607.

1995. (with C. C. Swisher III) Chronology of the Cenozoic South American land mammal ages. Pp. 317-333. In: W. A. Berggren, D. V. Kent and J. Hardenbol (eds.), Geochronology, Time-Scales, and Global Stratigraphic Correlation. SEPM (Soc. for Sedimentary Geology) Spec. Publ. No. 54.

JACK FOODEN

Research Associate, Mammals, Department of Zoology, Field Museum; Emeritus Professor of Zoology, Department of Biological Sciences, Chicago State University.

M.A., Sociology, University of Chicago, 1951.
M.Ed., Science Education, Chicago Teachers College, 1956.
Ph.D., Zoology, University of Chicago, 1960.

Consulting Editor, American Journal of Primatology.
Editorial Board, International Journal of Primatology.

Primate systematics, particularly Asian catarrhines.

My major research effort has been devoted to systematic review of the genus *Macaca*, a widely distributed group of Old World monkeys. Subjects investigated include geographic variation of external, cranial, and molecular characters; natural history; and paleontology. Field work has been conducted in collaboration with local zoologists in China, India, Indonesia and Thailand. To date, fifteen of the nineteen recognized species of macaques have been monographed.

Selected Publications

1986. Taxonomy and evolution of the sinica group of macaques: 5. Overview of natural history. Fieldiana: Zoology, n.s. 29: 1-22.

1987. (with Quan Guoqiang and Luo Yining) Gibbon distribution in China. Acta Theriologica Sinica 7: 161-167.

1988. Taxonomy and evolution of the sinica group of macaques: 6. Interspecific comparisons and synthesis. Fieldiana: Zoology, n.s. 45: 1-44.

1989. (with S. Lanyon) Blood-protein allele frequencies and phylogenetic relationships in *Macaca:* a review. American Journal of Primatology 17: 209-241.

1990. The bear macaque, *Macaca arctoides:* a systematic review. Journal of Human Evolution 19: 607-686.

1991. Systematic review of Philippine macaques (Primates, Cercopithecidae: *Macaca fascicularis* subspp.). Fieldiana: Zoology, n.s. 64: 1-44.

1993. (with G. H. Albrecht) Latitudinal and insular variation of skull size in crab-eating macaques (Primates, Cercopithecidae: *Macaca fascicularis*). American Journal of Physical Anthropology 92: 521-538.

1994. Malaria in macaques. International Journal of Primatology 15: 573-596.

1996. Zoogeography of Vietnamese Primates. International Journal of Primatology 17: 845-899.

ROBIN B. FOSTER

Conservation Ecologist, Environmental and Conservation Programs, and Adjunct Curator of Botany, Field Museum; Research Biologist, Smithsonian Tropical Research Institute.

A.B., Biology, Dartmouth College, 1966.
Ph.D., Botany, Duke University, 1974.

Senior Scientist Associate, Marie Selby Botanical Gardens, 1994-present.
Commission for Flora Neotropica, 1994-present.
Scientific Board, International Center for Tropical Ecology, 1991-present.
Investigador Asociado, Museo de Historia Natural, Lima, Peru, 1990-present.
Senior Ecologist, Conservation International, 1987-1994.
Research Associate, Missouri Botanical Garden, 1984-present.
Executive Committee, International Society for Tropical Ecology, 1976.
Trustee and Research Associate, Institute for Botanical Exploration, 1974-present.
Board of Directors, Organization for Tropical Studies, 1973-1980.
Assistant Professor of Biology, University of Chicago, 1972-1980.

Conservation biology/tropical forest ecology and geography/plant community composition and dynamics; floristics/reproductive biology of plants/environmental education.

At a small scale, I am asking what determines tropical plant community composition, what makes species rare or common, and how and why things change over a long period. I have focused mainly on the Rio Manu in the upper Amazon of Peru, and Barro Colorado Island, Panama -- especially a 50-hectare plot on which my colleagues and I have mapped and measured a quarter-million woody plants and continue to monitor their growth and population changes. We are finding there is remarkable variation in species spatial-distribution. More important, in both sites the first few years of colonization and the role of animals are crucial in determining the local fate of the forest for the next several hundred years.

At the other extreme, I put the small-scale research in context by mapping the large-scale physiographic and floristic differences using diffuse sampling. The objectives are to interpret regional or continental-scale patterns of vegetation and floras and to select priority areas for conservation. This requires rapid sampling of huge areas and rapid identification of plants. The lack of tools and resources for identifying plants in the tropics is a bottle-neck for all researchers and students, and a barrier to public interest. It has provoked me to find new ways to do something about the problem, and to take advantage of the vast resource of tropical collections in the herbarium of The Field Museum.

Selected Publications

1982. The seasonal rhythm of fruit fall on Barro Colorado Island. Pp. 151-172. In: E. G. Leigh, A. S. Rand, and D. M. Windsor (eds.), The Ecology of a Tropical Forest. Smithsonian Press.

1986. (with S. P. Hubbell) Commonness and rarity in a neotropical forest: implications for tropical tree conservation. Pp. 205-231. In: M. Soulé (ed.), Conservation Biology: Science of Scarcity and Diversity. Sinauer Press.

1986. (with J. Arce B., and T. Wachter) Dispersal and the sequential communities in Amazonian Peru floodplain. Pp. 357-370. In: A. Estrada and T. H. Fleming (eds.), Frugivores and Seed Dispersal. W. Junk Publishers.

1992. (with S. P. Hubbell) Short-term dynamics of a neotropical forest: why ecological research matters to tropical conservation and management. Oikos 63: 48-61.

STEVEN M. GOODMAN

Field Biologist, Birds and Mammals, Department of Zoology, Field Museum;Visiting Professor, Université d'Antananarivo, Madagascar; Coordinator, biological inventories and Ecology Training Programme, World Wildlife Fund, Madagascar.

B.S., Biology, University of Michigan, 1977.

Conservation biology/tropical biology/avian and mammalian community ecology/taphonomy/ethnobotany/egyptology.

The fauna of Madagascar and the Eastern Arc Mountains in Tanzania have extraordinarily high numbers of endemic species, many of which are threatened with extinction, primarily as a result of human-mediated habitat destruction and disturbance. One aspect of constructing detailed conservation plans for these biota are faunal surveys that document the current flora and fauna in various threatened sites.

Although it is well documented that a wave of extinction affected large-bodied animals about the time that humans colonized the Madagascar, the knowledge of the island's fauna in the recent past is woefully incomplete. To assess the influence of human activity on the fauna in the recent past, another research program is an investigation of sub-fossil vertebrate deposits. Training of, and collaboration with, Malagasy students is a major component of these programs.

Research on the ethnobotany of cultures in North Africa and south-west Asia has been conducted in recent years. Important questions in understanding the evolution of plant resource utilization are whether or not these cultures use the same basic floristic components in similar manners, and if so, whether this is because of information exchange between these cultures, parallel experimentation, or based on chance. Documentation of the uses of various medicinal plants, before many of these practices disappear, is crucial to answering these questions.

Selected Publications

1990. (with P. C. Gonzales) The birds of Mt. Isarog National Park, Southern Luzon, Philippines, with particular reference to altitudinal distribution. Fieldiana: Zoology, n.s. 60.

1992. (with A. Ghafoor). The ethnobotany of Southern Balochistan, with particular reference to medicinal plants. Fieldiana: Botany, n.s. 31.

1993. (with F. Ravoavy). Identification of bird subfossils from cave deposits at Anjohibe, Madagascar, with a description of a new giant Coua (Cuculidae: Couinae). Proceedings of the Biological Society of Washington 106: 24-33.

1993. A reconnaissance of Isle Sainte Marie, Madagascar: the status of the forest, avifauna, lemurs and fruit bats. Biological Conservation 65: 205-212.

1994. The enigma of anti-predator behavior in lemurs. Evidence of a large extinct eagle on Madagascar. International Journal of Primatology 15: 97-102.

1994. (with D. Halleux) The rediscovery of the Madagascar Red Owl *Tyto soumagnei* (Grandidier, 1878) in north-eastern Madagascar. Bird Conservation International 4: 263-277.

1995. The spread of *Rattus* on Madagascar: The dilemma of protecting the endemic rodent fauna. Conservation Biology 9: 450-453.

1996. A floral and faunal inventory of the eastern slopes of the Re'serve Naturelle Inte'grale d'Angringitra, Madagascar. Fieldiana, Zoology n.s. 85.

LANCE GRANDE

Curator, Fossil Fishes, Department of Geology, Field Museum; Lecturer, Committee on Evolutionary Biology and Biological Sciences Collegiate Division, University of Chicago; Adjunct Professor of Biology, University of Massachusetts; Adjunct Professor of Biology, University of Illinois-Chicago.

B.S., Geology, University of Minnesota, 1976.
M.S., Geology and Zoology, University of Minnesota, 1979.
Ph.D., Evolutionary Biology, City University of New York/American Museum, 1983.

Research Associate, American Museum of Natural History.
Editorial Board, Revista.
Associate Editor, Journal of Vertebrate Paleontology, 1986-1988, 1996-present.
Member, Program Committee and Romer Prize Committee, Society of Vertebrate Paleontology.

Phylogenetic interrelationships/historical biogeography of fossil and living actinopterygian fishes/the relationship between the evolution of organisms, and evolution of the surface of the Earth.

In the most general sense, my research program uses studies of comparative osteology and ontogeny in fossil and living fishes to investigate questions about evolution and historical biogeography. My approach is an interdisciplinary one. I am interested in both fossil and living fishes, so I select taxonomic groups for study that have extant species together with well-preserved fossil species. Groups of particular interest to me are Siluriformes (catfishes), Acipenseriformes (sturgeons and paddlefishes), Amiiformes (bowfins and extinct relatives), Lepisosteiformes (gars and extinct relatives), Osteoglossomorpha (bony-tongues) and several other "lower" teleostean groups.

I am also pursuing studies on ontogeny in the fossil record and late ontogeny in extant species. The different types of intraspecific morphological variation (i.e., ontogenetic vs. non-ontogenetic) and its effect on phylogenetic reconstruction is also part of my recent research program, as is the use of paleontology in systematics and historical biogeography.

I would be particularly pleased to supervise students interested in doing phylogenetic work on major groups of fossil and living fishes. In particular, I would like to support interdisciplinary thesis projects involving detailed osteological analyses that include studies of ontogeny, historical biogeography and/or related topics of general significance. The Field Museum has the best fossil fish collection in North America and an excellent collection of Recent fishes.

Selected Publications

1985. The use of paleontology in systematics and biogeography, and a time control refinement for historical biogeography. Paleobiology 11(2): 1-11.

1986. (with J. T. Eastman) A review of the Antarctic ichthyofaunas, in light of new fossil discoveries. Palaeontology 29(1): 113-137.

1991. (with W. Bemis) Osteology and phylogenetic relationships of fossil and Recent paddlefishes (Polyodontidae) with comments on the interrelationships of Acipenseriformes. Society of Vertebrate Paleontology Memoir 1 (supplement to Vol. II, no. 1, Journal of Vertebrate Paleontology 1-121).

1992. (with W. Bemis) Early development of the actinopterygian head. General observations and comments on staging of the paddlefish *Polyodon spathula.* Journal of Morphology 213: 47-83.

1994 (with O. Reippel) Interpreting the Hierarchy of Nature: From Systematic Patterns to Evolutionary Process Theories. Academic Press.

ANNA GRAYBEAL

Assistant Curator, Amphibians and Reptiles, Department of Zoology, Field Museum.

B.A., Biology, Harvard University, 1987.
Ph.D., Integrative Biology, University of California at Berkeley, 1995.

Stoye Award, American Society of Ichthyologists and Herpetologists, 1992 and 1993.
Ernst Mayr Award, Systematic Biology, 1994.
Editorial Board, Systematic Biology, 1995 - present.

Phylogenetic systematics and evolution of bufonid and other frogs/systematic methods and theory/speciation/species concepts/character evolution/biogeography.

My research interests focus on the evolution of diversity, both macroevolutionary (patterns of character evolution, biogeography) and microevolutionary (population differentiation and speciation). I address these questions using frogs, primarily from the large family Bufonidae ("True Toads") because these organisms display interesting patterns of similarity and differentiation, hybridization, and geographical distribution. My principle source of data is molecular (primarily DNA sequences), although I also work with morphological characters. While the main goal of my macroevolutionary work is to use genetic sequences to determine phylogenetic relationships among frog species and subsequently interpret patterns of character evolution and biogeographical radiation, I maintain a strong interest and curiosity regarding the various aspects of this analytical process, including how to achieve and evaluate support for particular relationships, how to evaluate the phylogenetic utility of genetic sequences, the effects of taxon and character sampling, etc., and enjoy pursuing side projects on these topics. My microevolutionary research is beginning with a study of speciation in several species groups of frogs and toads from North America. The long term goal is to obtain DNA sequences from multiple unlinked genes, and to use coalescent methods to explore microevolutionary processes that may affect or be symptomatic of speciation. These data will also be useful for providing insight into debates over species concepts.

Selected Publications

1993. The phylogenetic utility of cytochrome b: lessons from bufonid frogs. Molecular Phylogenetics and Evolution 2: 256-269.

1994. Evaluating the phylogenetic utility of genes: a search for genes informative about deep divergences among vertebrates. Systematic Biology 43: 174-193.

1995. (with D. C. Cannatella) A new taxon of Bufonidae from Peru, with descriptions of two new species and a review of the phylogenetic status of supraspecific bufonid taxa. Herpetologica 51: 105-131.

1995. Naming species. Systematic Biology 44: 237-250.

(In press) (with J. H. Huelsenbeck and C. W. Cunningham) The performance of phylogenetic methods for a well supported phylogeny. Systematic Biology.

(In press) Phylogenetic relationships of bufonid frogs and tests of alternative macroevolutionary scenarios characterizing their radiation. Zoological Journal of the Linnean Society.

(In press) (with S. Messenger and K. Mingo) Report on the Women in Evolution conference at the University of Arkansas. Systematic Biology.

JONATHAN HAAS

MacArthur Curator, North American Anthropology, Department of Anthropology, Field Museum; External Professor, Santa Fe Institute; Research Associate, Department of Anthropology, University of Chicago; Adjunct Professor, Department of Anthropology, University of Illinois at Chicago.

B.A., Anthropology, University of Arizona, 1970.
Ph.D., Anthropology, Columbia University, 1979.

Review Committee for the Native American Graves Protection and Repatriation Act, 1992-present.
Working group on "Human Societies as Complex Adaptive Systems," Santa Fe Institute, 1988-present.
Task Force on Anthropology and the Environment, Chair, 1991, Steering Committee Member, 1992-1995.
Vice President, Council on Museum Anthropology, 1996-1997, Advisory Board, Human Relations Area Files, Prehistory Database, 1996-present.
Committee on Museums and Native American Collaboration, American Association of Museums, 1991-present.

Evolution of political systems with a focus on the archaeology of the southwestern United States.

My time is fairly evenly divided between projects related to research, collections, and public learning. My current research in the Southwest is being conducted in conjuction with my colleague, Winifred Creamer, Associate Professor of Anthropology at Northern Illinois University, and Adjunct Curator at The Field Museum. Together, we are looking at the effects of European contact and colonialism on the Pueblo peoples of northern New Mexico in the 16th and 17th centuries A.D. The initial focus of the project is on possible changes in the size and distribution of the population of the region during the time just before and after the arrival of the Spanish in 1540. By examining archaeological and ethnohistorical records of the area we are gaining new insights into the effects of Spanish disease and regional warfare on the Pueblo peoples.

I am also working to develop plans for the renovation of The Field Museum's North American Indian halls. The exhibits have been consolidated and alternative ideas are under discussion for how to proceed with renovation. In the collections area, I am continuing with a long term project to inventory and catalog the large Southwestern archaeology collections made by Paul Martin from the 1920s to the 1970s. I am also working with a team to reorganize the anthropology collections to get objects into more appropriate storage facilities and to make the most efficient use of existing space. Repatriation continues to occupy a great deal of my time as we are working with a growing number of Native American tribes. We have major projects going with the Hopi and Arapaho tribes to inventory and photograph the extensive collections from both cultures.

Selected Publications

1990. (ed.) The Anthropology of War. Cambridge University Press.

1993. (with W. Creamer) Stress and Warfare Among the Kayenta Anasazi of the 13th Century A.D. Fieldiana: Anthropology, n.s. 21: 1-211.

1995. (organizer and contributor) J. Buikstra and D. Ubelaker (eds) Standards for Data Collection from Human Skeletal Remains, Arkansas Archeological Survey Research Series 44: 1-206.

1996. Power, Objects, and a Voice for Anthropology. Current Anthropology 37 (Supplement): 1-22.

1996. (with W. Creamer) The Role of Warfare in the Pueblo III Period. Pp. 205-213. In: M. Adler (ed.), The Pueblo III Period in the Northern Southwest. University of Arizona Press, Tucson.

SHANNON J. HACKETT

Assistant Curator and Head, Birds, Department of Zoology, Field Museum.

B.S., University of Victoria, Canada, 1983.
M.S., Louisiana State University, 1987.
Ph.D., Louisiana State University, 1992.

Molecular systematics and biogeography of birds/analysis of molecular data.

My research focuses on determining patterns of phylogeny and relating those patterns to the biogeographic history of southern Central and South America. Despite the widespread use of bird distributional data to support the refugia hypothesis of diversification in the Neotropics, there are surprisingly few phylogenetic studies of Neotropical birds that can be used to assess various causal mechanisms for the high species diversity in Central and South America. I use mainly DNA sequences to derive phylogenies for various groups of Neotropical birds. Along with the work of other scientists, my research casts doubt on the late Pleistocene as the major time period of diversification of Neotropical birds; it appears that much of the diversification is much older than the last glacial period.

From a phylogenetic methodological perspective, I am also interested in the information content of different kinds of data (molecular, morphological, behavioral, ecological) for phylogeny reconstruction. I believe that there has been too little emphasis placed on the design of molecular studies (choice of taxa to be analyzed) and analyses of the information content of DNA sequence data. For example, homoplasy is abundant in many molecular sequence data sets, and the amount of saturation of sites (i.e., at third positions of codons) can result in positively misleading phylogenetic hypotheses. In my research, I am exploring ways of identifying saturated partitions of data and down-weighting those partitions.

One of my current research projects is a molecular phylogenetic analysis of a small family of Neotropical birds, the Pipridae. I am assessing the degree to which different data sets compiled for this family agree/disagree in their estimations of phylogeny and why. I am gathering DNA sequence data from mitochondrial genes and am comparing these data to previously published morphological (syringeal data) and behavioral data and to a data set based on plumages that I am gathering. Another of my research projects focuses at a lower taxonomic level to compare patterns of phylogeny, character evolution (molecular, vocal, morphological, plumage), and biogeography in a series of co-distributed widespread Amazonian bird species.

Selected Publications

1990. (with K. V. Rosenberg) Evolution of Amazonian antwrens: Comparison of genetic and phenotypic differentiation. Auk 107: 473-489.

1992. (with R. T. Chesser) Mammalian diversity in South America: A response to Mares. Science 256: 1502-1505.

1993. Phylogenetic and biogeographic relationships in the Neotropical genus *Gymnopithys* (Formicariidae). Wilson Bulletin 105: 301-315.

1995. (with C. S. Griffiths, J. M. Bates, and N. K. Klein) A commentary on the use of sequence data for phylogeny reconstruction. Molecular Phylogenetics and Evolution 4: 350-353.

1995. Molecular systematics and zoogeography of flowerpiercers in the *Diglossa baritula* complex. Auk 112: 156-170.

1996. Molecular phylogenetics and biogeography of tanagers in the genus *Ramphocelus* (Aves). Molecular Phylogenetics and Evolution 5: 368-382.

LAWRENCE R. HEANEY

Associate Curator and Head, Mammals, Department of Zoology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago.

B.S., Biology, University of Minnesota, 1971.
M.A., Systematics and Ecology, University of Kansas, 1975.
Ph.D., Systematics and Ecology, University of Kansas, 1979.

Research Fellow, Smithsonian Institution, 1986-1988.
Research Associate, Smithsonian Institution, 1988-present.
Research Associate, American Museum of Natural History, 1991-present.
Research Associate, Utah Museum of Natural History, 1994-present.
Honorary Curator, Department of Zoology, Philippine National Museum, 1990-present.
Science Advisor, Center for Tropical Conservation Studies, Silliman University, Philippines, 1992-present.

Mammalian evolution and ecology/evolutionary biogeography/origin and maintenance of patterns of biological diversity/conservation biology/tropical biology.

In spite of the long-term interest of biologists in the dynamics of the processes that influence patterns of biological diversity, a comprehensive understanding has yet to emerge. My current research program focuses on the ecology and evolution of mammals on the islands of Southeast Asia, especially the Philippines, as a natural laboratory where the influence of island area, habitat diversity, degree of isolation, and geological histories may be investigated. Variation in these factors allows direct investigation of patterns of extinction, colonization, and speciation in a remarkably diverse fauna. Studies include analysis of morphological, genetic, and ecological diversification, elevational diversity patterns, evolution of life history traits, reproductive ecology, and plant-animal interactions. Rapid destruction of natural habitats and extinction of native species has led me to integrate formal ecological and evolutionary studies with research and consulting activites on the impact of deforestation. I am actively involved in providing advanced training in conservation biology to scientists from the tropics.

Much of my work includes participation by graduate students from both within and outside of the United States. Past students have studied reproductive ecology of bats, seed dispersal systems, tree squirrel population biology, mammalian paleoecology, evolution and functional morphology of horned mammals, population genetics of mammals in island ecosystems and population biology of tropical birds.

Selected Publications

1984. Mammalian species richness on islands on the Sunda Shelf, Southeast Asia. Oecologia 61: 11-17.

1986. (with B. D. Patterson) (eds.) Island Biogeography of Mammals. Academic Press, London. (initially produced as a special issue of the Biological Journal of the Linnean Society).

1989. (with P. D. Heideman, E. A. Rickart, R. B. Utzurrum and J. S. H. Klompen) Elevational zonation of mammals in the central Philippines. Journal of Tropical Ecology 5: 259-280.

1990. (with E. A. Rickart) Correlations of clades and clines: geographic, elevational, and phylogenetic distribution patterns among Philippine mammals. Pp. 321-332. In: G. Peters and R. Hutterer (eds.), Vertebrates in the Tropics. Mus. Alexander Koenig, Bonn.

1993. (with A. T. Peterson) Genetic differentiation in Philippine bats of the genera *Cynopterus* and *Haplonycteris*. Biological Journal of the Linnean Society 49: 203-218.

NANCY C. HENSOLD

Tropical Collections Specialist, Phanerogams, Department of Botany, Field Museum.

B.S., Michigan State University, 1978.
Ph.D., University of Michigan at Ann Arbor, 1986.

Systematics of Eriocaulaceae; flora of northern Peru.

In an effort to curate our important and growing collection from northern Peru, I attempt to provide identifications for many groups for which no specialist is currently available. My background is in traditional monographic work on a single family of plants, so the challenge of working with the entire flora of a poorly studied region like northern Peru provides an entirely new perspective. I am currently preparing improved, "rapid-assessment" treatments of several groups. Although these treatments will not be the "final word" on any group, they will more adequately represent the biodiversity of the region and its distributional patterns. I also am preparing a checklist of rare and endemic taxa of Cajamarca, Peru. I am generally concerned with ways in which academic taxonomists can better respond to urgent needs for better and more rapid information from the non-taxonomic community.

In addition I am continuing monographic studies of neotropical Eriocaulaceae, currently with the genus *Syngonanthus* sects. *Carphocephalus* and *Dimorphocaulon*.

Selected Publications

1993. (with M. O. Dillon) Asteraceae. In: Brako, L. & J. Zarucchi, Catalogue of the Flowering Plants and Gymnosperms of Peru, In: Monographs in Systematic Botany from Missouri Botanic Garden 45: 103-189.

1995. (with M. O. Dillon, A. Sagástegui, I. Sánchez V., and S. Llatas Q.) Floristic inventory and biogeographic analysis of montane forests in northwestern Peru. Pp. 251-270. In: S. Churchill, H. Balslev, E. Forero and J. Luteyn (eds.), Biodiversity and Conservation of Neotropical Montane Forests. The New York Botanical Garden, Bronx, New York.

1995. Specimen Databases in Research and Collection Management: A Practical Manual for dBase® and WordPerfect® Users. <gopher://fmppr.fmnh.org:70/00/.botany/dbase_manage>.

1996. (with A. Sagastegui A., S. Leiva, P. Lezama, and M. Dillon) Inventario Preliminar de la flora del Bosque Cachil. Arnaldoa 3(2): 19-34.

1996. (with T. Stützel and A. Giulietti) Eriocaulaceae. In: World of Plants, vol. 122. Asahi-Shimbun Press, Tokyo.

(In press) (with T. G. Lammers) Documented chromosome numbers 1996: 4. Chromosome numbers of Campanulaceae. IV. Miscellaneous counts. Sida 17(1).

PATRICK S. HERENDEEN

Adjunct Curator, Fossil Plants, Department of Geology, Field Museum.

B.S., California State University, Long Beach, 1982.
M.S., Michigan State University, East Lansing, Michigan, 1985.
Ph.D., Indiana University, Bloomington, Indiana, 1990.

Visiting Professor, Indiana University, Department of Biology, June-August, 1990.
Research Associate, Department of Botany, The Field Museum, 1993- present.
Postdoctoral Research Fellow, Swedish Museum of Natural History. August 1990-1991.
Postdoctoral Research Associate, Bailey Hortorium, Cornell University. September 1991-March 1993.

Systematics and paleobotany of flowering plants.

My studies address the evolutionary history of plants and in particular the history of large complex groups such as the legumes and laurels, as well as the angiosperms as a whole. My work has focused on understanding systematic and biogeographic relationships within families, and on structural evolution in early angiosperms. Recent work has been directed at two research projects: systematics of the legume family, and the Cretaceous fossil record of flowering plants (angiosperms). My current major legume project is a combined paleobotanical and neobotanical study of the diverse tropical subfamily Caesalpinioideae. This group has a fairly rich fossil record and it will be important to incorporate as many extinct taxa as possible in the cladistic analyses. I have also been pursuing studies of the Cretaceous fossil record of flowering plants. One focus of this research has been a study of Cretaceous fossil floras from the southeastern Atlantic Coastal Plain. I am also involved in a study of structural evolution in the wood of early angiosperms. This project is assessing patterns of evolution in the secondary xylem of Cretaceous angiosperms. Data from this study are facilitating an evaluation of a number of traditional hypotheses of evolutionary patterns in angiosperm wood, particularly evolution of vessel and ray structure.

Selected Publications

1992. (with D. L. Dilcher) (eds.) Advances in Legume Systematics, part 4. The Fossil Record. Royal Botanic Gardens, Kew.

1994. (with P. R. Crane and S. Ash) Vegetation of the dinosaur world. Pp. 347-364. In: G. D. Rosenberg and D. L. Wolberg (eds.), Dino Fest: proceedings of a conference for the general public. Paleontological Society Special Publication 7, University of Tennessee Press, Knoxville.

1995. (with P. R. Crane and A. N. Drinnan) Fagaceous flowers, fruits and cupules from the Campanian (Late Cretaceous) of central Georgia, USA. International Journal of Plant Sciences.

1995. Phylogenetic relationships of the tribe Swartzieae. In: M. Crisp and J. H. Doyle (eds.), Advances in Legume Systematics, part 7. Phylogeny. Royal Botanic Gardens, Kew.

1995. (with P. R. Crane) The fossil history of the monocotyledons. In: P. J. Rudall, P. Cribb, D. F. Cutler, and C. J. Humphries (eds.), Monocotyledons: Systematics and Evolution. Royal Botanic Gardens, Kew.

1996. (with J. A. Keller) Fossil flowers and fruits of the Actinidiaceae from the Campanian (Late Cretaceous) of Georgia. American Journal of Botany 83: 528-541.

1996. (with P. R. Crane) Cretaceous floras containing angiosperm flowers and fruits from eastern North America. Review of Palaeobotany and Palynology 90: 319-337.

CHUIMEI HO

Adjunct Curator, Asian Archaeology and Ethnology, Department of Anthropology, Field Museum; Research Associate, Center of Asian Studies, University of Hong Kong; Guest Curator, East Asian Anthropology, Denver Museum of Natural History.

B.A., University of Hong Kong, 1977.
M.Phil., University of London, 1980.
Ph.D., University of London, 1984.

Collection Committee, Museum of Art, Beloit College, Wisconsin, 1993-96.
Executive Committee, Chinese Ancient Ceramic Society, China, 1993-96.
Vice-Chairman, Committee for Friends of the Museum, Dehua Ceramic Museum, China, 1993-96.
Editor, ACRO Update, an international quarterly newsletter for the study of Asian ceramics, 1993-96.

Early communications between China and other East Asian and Southeast Asian countries, particularly through the study of archaeological ceramics.

The study of interregional relationships among East and Southeast Asian countries through archaeological materials of the last two thousand years has filled in many details about those societies. I have initiated and/or participated in a number of field projects studying ancient ceramic industrial sites in China, Korea, Japan and Thailand. I have also done excavations at early seaport sites in Thailand and Indonesia, where imported ceramics were traded and used. The results have helped to explain the evolution of local economies and interregional trade. I have also conducted research on ceramic ethnoarchaeology aimed at understanding technology and industrial organization in less developed communities of the present day.

Selected Publications

1988. Minnan Blue and White, An Archaeological Survey of Ancient Kiln Sites in South Fujian. British Archaeological Research Centre, Oxford.

1990. (ed.) Ancient Ceramic Kiln Technology in Asia. Centre of Asian Studies, University of Hong Kong.

1992. Trade and manufacture: Guangdong ceramics in the Late Tang Period. Journal of Trade Ceramics 12: 159-184.

1994. Ceramic trade in Asia between 1602 and 1683 AD. Pp. 35-70. In: A. J. H. Latham and Heita Kawakatsu (eds.), Japanese Industrialization and the Asian Economy. London.

1995. (ed.) New Light on Chinese Yue and Longquan Wares. Hong Kong: Centre of Asian Studies, University of Hong Kong.

1996. Social life under the Mongols as seen in ceramics. Transactions of the Oriental Ceramic Society 5: 33-47.

SABINE M. HUHNDORF

Adjunct Curator, Mycology, Department of Botany, Field Museum.

B.S., Biology, University of Illinois, Chicago, 1984.
M.S., Plant Pathology, University of Illinois, Urbana-Champaign, 1987.
Ph.D., Plant Pathology, University of Illinois, Urbana-Champaign, 1990.

Assistant Curator, Mycology, The New York Botanical Garden, 1991-1993.
Martin-Baker Research Award, Mycological Society of America, 1994.
National Research Council Associate, USDA-FS, Forest Products Lab, Madison, Wisconsin, 1995.
Participant in expeditions to Argentina, Brazil, Costa Rica, Cuba, French Guiana, Puerto Rico, Venezuela.

Systematics, biogeography and floristics of Ascomycetes.

My research on fungi focuses on Ascomycetes, specifically Loculoascomycetes and Pyrenomycetes, organisms which are plant pathogens and agents of decomposition. My research has floristic and monographic components. I am currently working on worldwide monographs of *Lasiosphaeria* and *Chaetosphaeria*, two genera that occur on woody hosts. Recent monographic studies include works on the cosmopolitan genus *Leptosphaeria* and the tropical genera, *Xenolophium* and *Pseudotrichia*. Additional studies include treatments of the pantropical genus *Astrosphaeriella* that occurs on palms and bamboos and *Trematosphaeria* found on woody hosts. These systematic studies lead to improved classification and a better understanding of generic relationships in these groups and test theories of speciation and biogeography. My work involves the microscopic examination and assessment of herbarium specimens along with laboratory *in vitro* culture studies of fresh specimens to determine growth and reproductive characteristics.

My floristic work is focused in the West Indies and in French Guiana. In general, Ascomycetes are not well-known and have not been widely collected from many tropical habitats. Areas like the tropical, lowland, rainforest in Saül, French Guiana and the Caribbean National Forest in Puerto Rico offer the possibility to survey and inventory the Ascomycete mycota and ask questions about biology, ecology, distribution and host specificity. These projects involve an active field work program as well as laboratory studies. These surveys will serve as models for assessing Ascomycete biodiversity in other tropical forests and ultimately, the information on fungal biodiversity will lead to a manual for identifying tropical Ascomycetes.

Selected Publications

1992. Neotropical Ascomycetes 1. *Valsonectria cinnamomi* in artificial culture. Mycologia 84: 642-649.

1992. Neotropical Ascomycetes 2. *Hypsostroma*, a new genus from the Dominican Republic and Venezuela. Mycologia 84: 750-758.

1992. The systematics of *Leptosphaeria* species found on the Rosaceae. Illinois Natural History Survey Bulletin 34(5): 479-534.

1993. Neotropical Ascomycetes 3. Reinstatement of the genus *Xenolophium* and two new species from French Guiana. Mycologia 85: 490-502.

1994. Neotropical Ascomycetes 4. *Pseudotrichia guatopoensis*, a new species from Venezuela, with a key to species in the genus. Mycologia 86: 134-137.

1994. Neotropical Ascomycetes 5. Hypsostromataceae, a new family of Loculoascomycetes and *Manglicola samuelsii*, a new species from Guyana. Mycologia 86: 266-269.

1996. (with R. Courtecuisse, G. J. Sammuels, M. Hoff, A. Y. Rossman, G. Cremers, and S. L. Stephenson) Check-list of fungi from French Guiana. Mycotaxon 57: 1-85.

ROBERT F. INGER

Curator Emeritus, Amphibians and Reptiles, Department of Zoology, Field Museum.

B.S., University of Chicago, 1942.
Ph.D., University of Chicago, 1954.

Editorial Board, Zoological Research (Kunming).
Distinguished Scientist, The Field Museum.
Honorary Curator of Reptiles, Sarawak Museum.

Community ecology/tropical amphibians and reptiles/systematics of anuran amphibians.

Although much has been written about the organization and structure of tropical communities of vertebrates, almost nothing is known about variation of those communities within a region over time. I am studying variation in the structure of communities of amphibians in Bornean forests over time (one to twenty years) and space. This program involves work both in the field and in the museum laboratory, and analysis of species diversity at the local and regional levels, relative abundance of species, movements of individuals and division of spatial resources by adults and larvae.

An offshoot of this work is collaboration with Sabah Parks (Malaysia) in a comparison of the amphibian communities inside and outside the limits of Mount Kinabalu Park at three elevations to determine the effectiveness of the park as a conservation unit.

My systematic work concentrates on phylogenetic relations of several familes of anurans that form important components of the fauna of Southeast Asia and adjacent islands. One concern of these investigations is the relation between morphogenetic constraints and ecological distribution of tadpoles. Another concern is the impact of Tertiary geological history on the present distribution of groups of species.

Selected Publications

1986. (with H. K. Voris and K. J. Frogner) Organization of a community of tadpoles in rain forest streams in Borneo. Journal of Tropical Ecology 2: 193-205.

1989. (with E. Nodzenski and R. J. Wassersug) Developmental differences in visceral morphology in megophrynine pelobatid tadpoles in relation to their body form and mode of life. Biological Journal of the Linnean Society 38: 369-388.

1991. Uncoupling of related structural changes in metamorphosing torrent-dwelling tadpoles. Copeia 1990: 1047-1054.

1992. Variation in apomorphic characters in the stream-dwelling tadpoles of the bufonid genus *Ansonia*. Zoological Journal of the Linnean Society 105: 225-237.

1993. (with H. K. Voris) A comparison of amphibian communities through time and from place to place in Bornean forests. Journal of Tropical Ecology 9: 409-433.

1996. Commentary on a proposed classification of the family Ranidae. Herpetologica 52: 241-246.

1996. (with Tan F. L.) The Natural History of Amphibians and Reptiles of Sabah. Natural History Publications, Kota Kinabalu.

WENDY M. JACKSON

Director, Conservation Training Consortium (a consortium of The Field Museum, Chicago Zoological Society, University of Illinois at Chicago, John G. Shedd Aquarium and University of Chicago); Visiting Lecturer, University of Illinois at Chicago.

B.S., Ecology, Ethology and Evolution, University of Illinois at Urbana-Champaign, 1982.
Ph.D., Zoology, University of Washington, Seattle, 1990.

Science, Engineering and Diplomacy Fellow (Sponsored by the American Association for the Advancement of Science), U.S. Agency for International Development, Washington, D. C., 1991-1993.
Postdoctoral Research Associate, Burke Museum, University of Washington, 1990-1991.

Conservation biology/biological diversity/behavioral ecology/evolution of social behavior.

I am interested in exploring multidisciplinary approaches to the conservation of biological diversity. Sustainable solutions to problems in conservation biology must involve people with a wide variety of backgrounds in the natural sciences, as well as people with expertise in economics, sociology and politics. In addition, conservation of biological diversity in tropical countries, where diversity is greatest, can be achieved only through the active involvement of researchers, wildlife managers, community development workers and other professionals from those countries. The Conservation Training Consortium, which I direct, is designed to provide these professionals with the multidisciplinary background necessary for them to provide leadership in conservation biology in their own countries.

While the main focus of the program has been on bringing developing-country professionals to Chicago, we recognize that the impact of the program can be enhanced through follow-up activities in the home countries of the participants. I recently began a training and research program in Kenya with one of the past participants. The program included pilot studies on the causes and consequences of fragmentation of the Kakamega Forest in western Kenya. Kakamega Forest is a remnant of the once vast tropical rainforest that stretched across equatorial Africa, and is home to many species found nowhere else in Kenya. Encroachment on the forest by the rapidly increasing human population poses a serious and imminent threat to the biodiversity of the forest. We plan to continue these pilot projects to find solutions that benefit both the forest and the people.

In addition to my interests in conservation biology, I have a continuing interest in behavioral ecology and the evolution of social behavior, especially of African birds. I am especially interested in the causes and consequences of conspecific brood parasitism in weaverbirds and other birds.

Selected Publications

1992. Estimating conspecific nest parasitism in the Northern Masked Weaver based on within-female variability in egg appearance. Auk 109: 435-443.

1992. Relative importance of parasitism by *Chrysococcyx* cuckoos versus conspecific nest parasitism in the Northern Masked Weaver *Ploceus taeniopterus*. Ornis Scandinavica 23: 203-206.

1993. Causes of conspecific nest parasitism in the northern masked weaver. Behavioral Ecology and Sociobiology 32: 119-126.

(In press) Egg-discriminating ability and egg-color variability in the Northern Masked Weaver. In: (S. I. Rothstein and S. K. Robinson (eds.), Parasitic Birds and Their Hosts: Behavioral, Ecological, and Evolutionary Interactions). Oxford University Press, New York.

JULIAN C. KERBIS PETERHANS

Research Associate, Mammals, Department of Zoology, Field Museum; Adjunct Faculty, Department of Anthropology, University of Chicago; Assistant Professor, Roosevelt University.

B.Sc., Biology, Beloit College, Beloit, Wisconsin, 1974.
M.A., Anthropology, University of Chicago, 1979.
Ph.D., Anthropology, University of Chicago, 1990.

Consultant, United States Fish and Wildlife Service, National Forensics Laboratory 1991-1994.
Post-doctoral Curatorial Associate, African mammals, Field Museum, 1990-1993.
Collection Manager, Division of Mammals, Field Museum, 1987-1989.
Lecturer, Loyola University of Chicago, Department of Anthropology, 1983-1984.
Lecturer, Beloit College, Archaeological Field School.

Biogeography and systematics of African mammals/behavioral ecology of the Carnivora/evolution of the Hominoidea/faunal analysis/taphonomy.

Research programs have been directed in two directions, one zoogeographic, the other taphonomic. For the past six years, small mammal surveys in the mountains astride the Albertine Rift have shown that these mountains house: i) independent small mammal faunas but with numerous elements in common; ii) Africa's richest soricid community, indicating that this area has been fundamental in the origin, diversification and maintenance of African shrews; and iii) Africa's richest endemic small mammal community, speaking to the long term isolation and stability of the region.

Taphonomic projects include wide-ranging inquiries into patterns of predation, specifically among felids and primates, carnivores and ungulates, eagles and primates, and owls and rodents. Data gathered includes analyses of sex and age, species composition, and body part selection and destruction. These analyses are fundamental in establishing predator-specific 'fingerprints' and in deducing sociobiological attributes of prey and predator behavior.

Selected Publications

1995. (with B. Patterson) The Ethiopian water mouse *Nilopegamys* Osgood, with comments on the evolution of semi-aquatic adaptations in African Muridae. Zoological Journal of the Linnean Society 113: 1-21.

1996. (with P. K. Austin) Small mammal component of the Biological Inventory of Kabiranyuma Swamp, Magahinga Gorilla National Park, Uganda. (Unpublished Report, Institute of Tropical Forest Conservation, Bwindi-Impenetrable National Park, Uganda).

1996. (with W. T. Stanley, R. M. Kityo and L. Davenport) New records of bats for Uganda and Burundi. African Journal of Ecology 34: 196-201.

JOHN KETHLEY

Associate Curator, Insects, Department of Zoology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago; Lecturer, Department of Entomology, Ohio State University.

B.S., Botany, University of Georgia, 1964.
Ph.D., Entomology, University of Georgia, 1969.

NIH Post-doctoral Trainee, The Acarology Laboratory, Ohio State University.

Systematics/phylogeny/comparative developmental morphology/zoogeography and cytology of acariform mites.

Research interests lie in two areas: i) chelicerae terrestrialization and the evolution of mites; and, ii) the evolution of meiosis.

Chelicerates, including mites, were among the first arthropods to have colonized land (Devonian or earlier). The contemporary distribution of early lineages appears to reflect their ancestral coastal, fluvial or alluvial habitats. Research is focused on documentation of the global species diversity, community structure, zoogeography and phylogenetic relationships of these microarthropods. Parallel research seeks to integrate paleogeographic, paleoclimatic and tectonic data to clarify contemporary distributions and identify regions that may have been involved in significant extinction events.

Standard paradigms of evolutionary genetics preclude the accumulation of significant biological diversity within wholly thelytokous lineages. Collaborative research with Roy Norton, S.U.N.Y., Syracuse, has documented the existence of a very large monophyletic lineage of entirely thelytokous oribatid mites that he hypothesized to have given rise to an even larger lineage of bisexual mites, the astimata. Parallel collaborative research with Dana Wrensch, Ohio State University, reassessed cytological mechanism of the thelytokois arthropods. Our reinterpretation of the little known pattern of inverted meiosis, where sister chromatids separate in anaphase I, formed the basis of a mechanism that would permit long term success and diversification of thelytokous mites. Our survey of eukaryote cytology indicated widespread occurrence of inverted meiosis in most groups (excluding deuterostomes) sugggesting that inverted meiosis was ancestral and had independently given rise to “normal meiosis” numerous times. We are pursuing molecular and cytological ramifications of this hypothesis.

I would be pleased to work with graduate students interested in either the evolution of chelicerae terrestrialization or meiotic patterns.

Selected Publications

1982. Acariformes: Prostigmata. Pp. 117- 145. In: S. P. Parker (ed), Synopsis and Classification of Living Organisms Vol. 2. McGraw-Hill.

1989. (with R. A. Norton, P. M. Bonamo and W. A. Shear) A terrestrial alicorhagiid mite (Acari: Acariformes) from the Devonian of New York. Micropaleontology 35(4): 367-373.

1990. Acarina: Prostigmata (Actinedida). Pp. 667-756. In: D. Dindel (ed), Soil Biology Guide. John Wiley and Sons, New York.

1993. (with R. A. Norton, D. E. Johnston and B. M. O’Connor) Phylogenetic perspectives on genetic systems and reproductive modes of mites. Pp. 8-99. In: D. L. Wrensch and M. Ebbert (eds.), Evolution and Diversity of Sex Ratio in Insects and Mites. Chapman and Hall, New York.

1994. (with D. L. Wrensch and R. A. Norton) Cytogenetics of Holokinetic chromosomes and inverted meiosis: keys to the evolutionary success of mites, with generalizations of eukaryotes. Pp. 282-343. In: M. Houck (ed.), Mites: Ecological and Evolutionary Analyses of Life-History Patterns. Chapman and Hall, New York.

CHAPURUKHA MAKOKHA KUSIMBA

Assistant Curator, African Archaeology and Ethnology, Department of Anthropology, Field Museum; Research Associate, Institute of African Studies, University of Nairobi, Kenya.

B.Ed. African History and Kiswahili, Kenyatta University, 1986.
Ph.D. Anthropology, Bryn Mawr College, 1993.

Technology/trade, and urbanism on the precolonial Kenya Coast.

Since 1986 I have been carrying out research on the Kenya coast with the aim of understanding the development of complex polities of the East African coast from 700 AD to 1500 AD. I completed the first phase of this project that involved the archaeological and ethnoarchaeological study of iron production in 1992. Since joining The Field Museum in 1994 I have continued archaeological fieldwork on the Kenya Coast with the aim of understanding: i) the role of local craft production, especially iron production, in the development of political and economic relationships between the East African Coast and its Indian Ocean trading partners; ii) the early Indian Ocean trade as a stimulus for technical innovation, economic profit, and as a conduit for the bi-directional transfer of technologies between East Africa, the Middle East, and South Asia; and iii) the role of coastal and interior peoples in the organization, production, use, and trade of local crafts, and the role of productive organization in the development of social stratification. The project is being carried out at the archaeological site of Mtwapa, Kenya and its hinterland. In 1995 I began a collection-based study of the Linton Madagascar collection at The Field Museum in collaboration with Bennet Bronson. The Linton collection includes nearly 3,700 items from all the main ethnic divisions of Madagascar. We have nearly completed a study of the textiles which we hope to publish as an edited volume next year. Other projects I am working on include the study of African beadwork (with Deborah Stokes Hammer) and the Zulu spears (with Peter Gayford) in the anthropology collection at The Field Museum.

Selected Publications

1994. (with D. Killick and R. G. Creswell) Indigenous and imported metals in Swahili sites on the Kenyan coast. MASCA Research Papers in Science and Archaeology 11: 63-78.

1994. Chinese ceramics in the Fort Jesus collection. Kenya Past and Present 26: 55-57.

1996. Kenya's destruction of Swahili cultural heritage. Pp. 210-224. In: R. McIntosh and P. R. Schmidt (eds.), Plundering Africa's Past. Indiana University Press.

1996. Archaeology in African museums. African Archaeological Review 13 (3).

1996. The social context of ironforging on the Kenya coast. Africa: Journal of the International African Institute 63 (3).

1996. (with C. Stanish) Archaeological Research and Community Participation. SAA Bulletin 14 (3).

(In press) The evolution of Swahili city states in East Africa: archaeological research in historical perspective. In: P. J. J. Sinclair (ed.), One World Archaeology Series. Routledge.

(In press) Spatial organization at Swahili archaeological sites in Kenya. In: G. Pwiti and R. Soper (eds.), Proceedings of the 10th Panafrican Congress of Prehistory and Related Studies. University of Zimbabwe Press.

THOMAS G. LAMMERS

Assistant Curator, Vascular Plants, Department of Botany, Field Museum.

B.S., Botany, Iowa State University, 1977.
M.A., Biology, University of Northern Iowa, 1981.
Ph.D., Botany, The Ohio State University, 1988.

Standing Committee for Botany, Pacific Science Association.
Visiting Assistant Professor, Miami University, 1988-1990.
Adjunct Assistant Professor, University of Illinois at Chicago, 1994-present, taught at University of Chicago 1994, 1996 (biodiversity).
Numerous field research expeditions to Hawaiian Islands, Chile, Taiwan, funded by Sigma XI, NSF, William Sherman Turrell Herbarium Fund, National Geographic Society.

Systematics and evolution of the Campanulaceae, especially subfamily Lobelioideae/cytology and cytoevolution; island biology/co-evolution of plants and pollinators.

My research interests are the evolution and classification of flowering plants. Current focus is the family Campanulaceae, in particular subfamily Lobelioideae. Specific goals are to understand the patterns of evolutionary diversification in the group; to identify the biological processes responsible for those patterns; and to provide a sound and useful classification of the group on this basis. In meeting these goals, I embrace the concept that the best results are obtained through the rigorous and objective synthesis of diverse kinds of data. Work at present involves several poorly understood clades in the Hawaiian Islands, Chile and the Caribbean; patterns of chromosomal evolution in the group as a whole; and an attempt to elucidate overall evolutionary patterns in the family.

Selected Publications

1992. Systematics and biogeography of the Campanulaceae of Taiwan. Pp. 43-61. In: C.-I Peng (ed.), Phytogeography and Botanical Inventory of Taiwan. Academia Sinica, Taipei.

1993. Chromosome numbers of Campanulaceae. III. Review and integration of data for subfamily Lobelioideae. American Journal of Botany 80: 660-675.

1993. (with D. L. Kama and N. R. Morin) Campanulaceae. Pp. 310-326. In: L. Brako and J. L. Zarucchi, Catalogue of the Flowering Plants and Gymnosperms of Peru. Missouri Botanical Garden, St. Louis.

1994. (with M. E. Cosner and R. K. Jansen) Phylogenetic relationships in the Campanulales based on *rbc*L sequences. Plant Systematics and Evolution 190: 79-95.

1994. Typification of the names of Hawaiian Lobelioideae (Campanulaceae) published by Wilhelm Hillebrand or based upon his specimens. Taxon 43: 545-572.

1995. Patterns of speciation and biogeography in the endemic Hawaiian genus *Clermontia* (Campanulaceae: Lobelioideae). Pp. 338-362. In: W. L. Wagner and V. A. Funk. (eds.), Hawaiian Biogeography: Evolution of a Hot Spot Archipelago. Smithsonian Institution Press, Washington.

1995. Transfer of the southern African species of *Lightfootia*, nom. illeg., to *Wahlenbergia* (Campanulaceae, Campanuloideae). Taxon 44: 333-339.

1996. A new linear-leaved *Cyanea* (Campanulaceae: Lobelioideae) from Kaua'i, and the "rediscovery" of *Cyanealinearifolia*. Brittonia 48: 237-240.

1996. Proposal to conserve the name *Edraianthus* 1839 against *Pilorea* 1837 (Campanulaceae). Taxon 45: 563-564.

SCOTT LIDGARD

Associate Curator, Fossil Invertebrates, Department of Geology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago.

B.S., University of California at Santa Cruz, Earth and Planetary Sciences, 1976.
M.S., Paleobiology, University of Rochester, Geological Sciences, 1979.
Ph.D., Paleobiology, The Johns Hopkins University, Earth and Planetary Sciences, 1984.

Predoctoral Fellow, Paleobiology, Smithsonian Institution, 1982.
NATO Postdoctoral Fellow, British Museum (Natural History), 1984.
Chair, Association of North America Paleontological Societies.
Associate Professor (Adjunct), Biological Sciences, University of Illinois at Chicago, 1994.

Evolution and ecology of cheilostome bryozoans, particularly the relationships of colonial growth and form/evolutionary paleoecology and the resolution of large-scale patterns in the fossil record/angiosperm diversification and Cretaceous floristic trends.

Research focuses on the roles of different modes of growth in large scale patterns of cheilostome bryozoan evolution, environmental distribution and ecology. My previous work on comparative skeletal ontogenies of zooids within colonies recognized characteristic zooid budding patterns of encrusting cheilostomes. More recently I have synthesized the overriding evolutionary trends in predominant modes of growth in this group, documenting a persistent evolutionary transition in which one mode of growth is supplanted by another during the past 100 million years. In an environmental context, this work has also provided a novel test of paleoenvironmental studies of other groups of marine benthos in which onshore origin was followed by expansion into offshore, deeper water marine environments.

A related research problem involves re-evaluating the role of competition in large-scale evolutionary replacements such as dinosaurs versus mammals or brachiopods versus clams. This work on cheilostome and cyclostome bryozoans has produced surprising results—the pattern of replacement differs when species, genera or families are used as the basis for the analysis.

Collaborative research (with P. R. Crane) examines large-scale floristic patterns during the radiation of angiosperms. We have employed trend surface analyses to demonstrate a striking latitudinal shift (from tropical to boreal) in the pattern of increasing angiosperm dominance through the Cretaceous. This work is part of more comprehensive synthesis of paleolatitudinal and temporal trends in the apparent diversity of all Cretaceous land plants. We have also attempted to clarify the rate and magnitude of angiosperm radiation using the parallel fossil records of leaves and pollen/spores, to provide a deductive test of evolutionary tempo during the diversification of a major group of organisms.

Morphometric analyses of New Zealand bryozoans (Lidgard and Buckley, 1994) indicate that traditional taxonomic practices are inadequate in their ability to distinguish species level taxa in *Adeonellopsis*, and quite possibly in cheilostome bryozoans as a whole. The implications of this result are that currently recognized species may underestimate cheilostome diversity by a factor of two, three or more.

Selected Publications

1993. (with F. K. McKinney and P. D. Taylor) Competition, clade replacement, and a history of cyclostome and cheilostome bryozoan diversity. Paleobiology 19: 352-371.

1994. Toward a morphological species concept in Cheilostomes: phenotypic variation in *Adeonellopsis yarraensis* (Waters). Pp. 101–106. In: P. J. Hayward, J. A. Ryland and P. D. Taylor (eds.), Biology and Paleobiology of Bryozoans. Olsen and Olsen, Fredensborg.

PETER E. LOWTHER

Research Associate, Birds, Department of Zoology, Field Museum.

B.S., Zoology, Iowa State University, 1970.
M.A., Systematics and Ecology, University of Kansas, 1976.
Ph.D., Systematics and Ecology, University of Kansas, 1979.

Elective Member, American Ornithologists' Union; Program Coordinator (Assistant to Secretary of AOU). Editor for North American Bird Bander, Inland Bird Banding Association.

Brood parasitism, population biology of passerine birds.

Research interests are concerned with breeding biology at a population or community level and investigations to help understand brood parasitism. Active projects include monitoring breeding biology of a suburban nesting colony of House Sparrows; study of brood parasitism in birds, specifically Brown-headed Cowbirds, based on field studies and museum collections; and structure of tallgrass prairie bird communities.

Selected Publications

1975. Geographic and ecological variation in the family Icteridae. Wilson Bulletin 87: 481-495.

1977. Selection intensity in North American House Sparrows *Passer domesticus.* Evolution 31: 649-656.

1983. Breeding biology of House Sparrows: intercolony variation. Occasional Papers, Museum of Natural History, University of Kansas 107: 1-17.

1984. Cowbird nest selection. Wilson Bulletin 96: 103-107.

1988. Breeding biology of House Sparrows: patterns of intra-clutch variation in egg size. In: J. Pinowski and J. D. Summers-Smith (eds.), Granivorous Birds in Agricultural Landscapes. PWN-Polish Scientific Publishers, Warszawa.

1992. (with C. L. Cink) House Sparrow. In: A. Poole, P. Stettenheim and F. Gill (eds.), The Birds of North America, No. 12. Philadephia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

1993. Brown-headed Cowbird. In: A. Poole and F. Gill (eds.), The Birds of North America, No. 47. Philadephia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

1994. Bronzed Cowbird. In: A. Poole and F. Gill (eds.), The Birds of North America, No. 144. Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

1995. Ornithology at The Field Museum. In: W. E. Davis, Jr. and J. A. Jackson (eds.), Contributions to the History of North American Ornithology, Memoirs of the Nuttall Ornithological Club, No. 12. Cambridge, Massachusetts.

1996. LeConte's Sparrow. In: A Poole and F. Gill (eds.), The Birds of North America, No. 24. Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

1996. Breeding biology of House Sparrows: observations of a suburban colony. The Meadowlark 5: 2-7.

FRANÇOIS LUTZONI

Assistant Curator, Lichen-forming Fungi, Department of Botany, Field Museum.

B.Sc., Université Laval, Canada, 1987.
M.Sc., University of Ottawa, Canada, 1990.
Ph.D., Duke University, 1995.

Deputy Treasurer, International Association for Lichenology, 1997-2000.
Postdoctoral Research Associate, Department of Biology, Indiana University at Bloomington, 1996.
A.W. Mellon Junior Fellow, Laboratory of Molecular Systematics, Smithsonian Institution, 1994.
Mycological Society of America Graduate Fellowship, 1993.
New England Botanical Club Award for the Support of Botanical Research, 1992.
A. J. Sharp Award, American Bryological and Lichenological Society, 1989.
Lionel Cinq-Mars Award, Honorable Mention, Canadian Botanical Association, 1989.

Molecular and morphological systematics of lichen-forming fungi, and evolutionary studies of symbiosis using lichens as model systems.

My research interest is centered on lichens and symbiosis. It covers five major topics: i) floristics and systematics of lichens using both morphological and molecular data. ii) requirements and consequences for a transition to mutualism during the evolution of fungi; this work is done on a model system including both lichen-forming and closely related non-lichenized *Omphalina* species. Data from this model system are gathered through *in vitro* experiments and molecular evolutionary studies. The data generated are analyzed using comparative methods. iii) macroevolutionary studies of lichenized and non-lichenized Ascomycetes; this research project is aimed toward a better understanding of the relationships among orders of ascomycetes using molecular and morphological data sets. iv) phylogenetic reconstruction theory; I am interested more specifically in combinability testing methods and problems associated with resolving phylogenetic relationships among many taxa. As we try to solve phylogenetic relationships among larger numbers of taxa, the need for multiple data sets becomes increasingly acute. Combinability testing is not only a way to determine if data sets should be combined in their entirety, but is also a tool for exploring the specific characteristics of each data set that cause phylogenetic incongruence. v) cospeciation between lichen-forming fungal species and their algal symbiont *Coccomyxa* (Chlorophyta); I am currently addressing this issue by sequencing the same genes in both the fungal and algal partners of distinct lichen populations for different lichen species.
I would be pleased to supervise students interested in any of the topics mentioned above.

Selected Publications

1988. (with L. Sirois and M. M. Grandtner) Les lichens sur serpentine et amphibolite du plateau du mont Albert, Gaspésie, Québec. Canadian Journal of Botany 66: 851-862.

1994. (with R. A. Vilgalys) *Omphalina* (Basidiomycota, Agaricales) as a model system for the study of coevolution in lichenized fungi. Special Issue of Cryptogamic Botany 5: 82-97.

1994. *Ionaspis alba* (Ascomycotina, Hymeneliaceae), a new lichen species from eastern North America. The Bryologist 97: 393-395.

1994. (with I. M. Brodo) Proposal to conserve the name *Gyalecta suaveolens* Fr. (lichenized Ascomycota) with a conserved type. Taxon 43: 657-659.

1995. (with I. M. Brodo) A generic redelimitation of the *Ionaspis-Hymenelia* complex (lichenized Ascomycotina). Systematic Botany 20: 224-258.

1995. (with R. Vilgalys) Integration of morphological and molecular data sets in estimating fungal phylogenies. Canadian Journal of Botany 73 (Suppl. 1): S649-S659.

STEVEN M. McCARROLL

Preparator and Assistant Collections Manager, Fossil Vertebrates, Department of Geology, Field Museum.

B.S. Geology, Auburn University, 1986.

My current research projects involve the biostratigraphy, biochronology and magnetostratigraphy of the Bridger and Washakie Formations of southwest Wyoming. Fossil mammals have been collected from the Washakie Formation since the 1870s, but much less is known about the Washakie Formation faunas compared to other more fossiliferous formations. The Washakie Formation is harder to get to and collect from than other formations, which has added to its being historically under-studied. The Washakie Formation is, however, very important to the history of North American mammalian evolution. Preserved here are animals from the Bridgerian and Uintan North American Land Mammal ages, and one of the best records of the transition between the Bridgerian and Uintan.

Much more is known about the Bridger Formation faunas than those of the Washakie Formation. Even so, I am continually amazed at what we do not know. Thousands of fossils have been collected from the Bridger Formation, but complete skulls are known from only a handful of taxa. This is even more surprising because the Bridger Formation is known for preserving more complete specimens. In addition to collecting fossils, during our last two field seasons in the Bridger Formation (1994 and 1995), we started collecting paleomagnetic samples from the entire formation. These samples, along with the fossil mammal data and radioisotopic dating, will eventually allow us to correlate the Bridger Formation to the global magnetic polarity time scale, giving us a more accurate temporal framework. This greater temporal control will allow more detailed and accurate studies of all aspects (biogeography, evolutionary biology, systematics, etc.) of the evolution of vertebrate life in North America.

Selected Publications

1996. (with J. J. Flynn and W. D. Turnbull) Biostratigraphy and magnetostratigraphy of the Bridgerian-Uintan Washakie Formation, Washakie Basin, Wyoming. Pp. 25-39. In: D. R. Prothero and R. J. Emry (eds.), The Terrestrial Eocene-Oligocene Transition in North America. Cambridge University Press, Stanford, California.

1996. (with J. J. Flynn and W. D. Turnbull) The mammalian faunas of the Washakie Formation, Eocene Age, of southern Wyoming. Part III. The Perissodactyls. Fieldiana: Geology, n.s. 33: 1-38.

GARY L. SMITH MERRILL

Adjunct Curator, Department of Botany, Field Museum.

B.A., Botany, State University of Iowa, Iowa City, 1962.
M.S., Botany, State University of Iowa, Iowa City, 1964.
Ph.D., Botany, Columbia University, New York, 1969.

Research Associate, Biology, Kansas State University, 1988-1992.
Assistant Professor, Botany, Drew University 1977-1979, 1980-1986.
Taxonomist, Jardin Botánico Nacional, Santo Domingo, Dominican Republic, 1979-1980.
Associate Curator (Bryophyta), New York Botanical Garden, 1969-1976.
Leader and participant in expeditions to arctic Alaska, Brazil, Japan.

Systematics and geography of mosses, particularly Polytrichaceae/floristics of Great Plains mosses/New Zealand Hepaticae.

Current research projects include preparation of treatments of Polytrichaceae (10 genera, 48 secies) for Volume 13 of Flora of North America (currently work is concentrated on the genus *Atrichum*); an outline of a revised and updated classification of the family; study of collections of Polytrichaceae from central America and elsewhere sent to me for identification; and a monographic study of the Australasian hepatic genus *Telaranea* (with J. Engel).

My research has been concerned chiefly with the Polytrichaceae, a family of mosses of world-wide distribution, composed of 24 genera and an estimated 300 species. The family represents an isolated group, with no close living relatives, and fossil record extending back to the Late Cretaceous (ca. 80 million years ago). The group is notable for the structural complexity of both gametophyte and sporophyte generations, and a number of features not found in any other group of bryophytes. They are the only mosses with specialized internal conducting tissues, comparable to those of simple vascular plants.

Selected Publications

1975, 1976. Polytrichaceae. In: Ohashi, H. The Fora of Eastern Himalaya. University Museum Tokyo Bulletin 8: 244-246. and Addendum to the Polytrichaceae of "Flora of Eastern Himalaya" Journal of the Hattori Botanical Laboratory 41: 419-425.

1991. *Oligotrichum denudatum* (Polytrichaceae), a new moss species from Minas Gerais, Brazil. Novon 1: 107-109.

1992. *Ozobryum ogalalense* Pottiaceae), a new moss genus and species from the American Great Plains. Novon 2: 255-258.

1992. Notes on North American Polytrichaceae: *Polytrichastrum* G. Sm. The Bryologist 95: 270-273.

1994. Polytrichaceae. In: A. J. Sharp, H. A. Crum and P. M. Eckel (eds.), The Moss Flora of Mexico. Memoirs of the New York Botanical Garden 69: 1068-1092.

1995. (with M. S. Ignatov) Bryophytes of Altai Mountains. VI. The family Polytrichaceae (Musci). Arcotoa 5: 61-97.

1995. Bryophytes. Pp. 197-198. In: E. T. LaRoe, G. S. Farris, C. E. Puckett, P. D. Doran and M. J. Mac (eds.), Our Living Resources. U.S. Department of the Interior, National Biological Service, Washington, D. C.

1996. (with J. J. Engel) Austral Hepaticea 23. New taxa and new combinations in *Telaranea* Spruce *ex* Schiffn. (Lepidoziaceae). Phytologia 79: 250-253.

GREGORY M. MUELLER

Associate Curator, Mycology and Chair, Department of Botany, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago; Adjunct Associate Professor, Department of Biological Sciences, University of Illinois, Chicago.

B.A., Botany, Southern Illinois University, Carbondale, 1976.
M.S., Botany, Southern Illinois University, Carbondale, 1979.
Ph.D., Botany, The University of Tennessee, Knoxville, 1982.

Associate Editor, Mycologia, 1995-present.
Advisory Panel, Systematic Biology Program, National Science Foundation, 1992, 1993, 1995.
Councilor for Systematics and Evolution, Mycological Society of America, 1993-1996.
Alexopoulos Prize, The Mycological Society of America, 1992.
Visiting Scientist, Institute of Physiological Botany, Uppsala University, Sweden, 1982-1983.
Postdoctoral Research Associate, Dept. of Botany, University of Washington, Seattle, WA. 1984-1985.

Systematics, population biology, biogeography, and ecology of Fungi.

My research program centers on the systematics, ecology and evolution of higher fungi and the mutualistic symbiosis that some of them form termed mycorrhizae. Four long-term projects are currently receiving most of my attention: i) A survey of mushrooms and related fungi of the Costa Rican tropical oak forests. Goals of this study are to: a) develop the first comprehensive survey of higher fungi from the neotropics; b) build scientific infrastructure in Costa Rica through training of graduate students and improving facilities; and, c) screen fungi for anti-AIDS and anti-cancer compounds. ii) A survey of mushrooms and related fungi occurring in northern Illinois and Indiana to determine species composition, distribution and host specificity and to assess the effect of air pollution on fungi in the region. iii) Comparison of biogeographic relationships between macrofungi of eastern North America and temperate easten Asia. Goals of this study are to document macrofungal diversity in China and to determine the taxonomic similarity of the two regions based on detailed morphological analyses and analysis of DNA sequence data of selected taxa. iv) A monographic study of the genera *Hydnangium*, *Laccaria*, and *Podohydnangium*. This work is designed to test various theories of speciation, coevolution (with their obligate tree symbionts) and biogeography of fungi that form ectomycorrhizae. These projects entail an active field work component as well as laboratory studies that include micromorphological analyses (computer-aided light microscopy, SEM and TEM), examination of *in vitro* culture morphology, pairing studies and DNA sequencing. These interrelated projects are providing information on fungal ecology and biology that are crucial to temperate and tropical forest management and conservation.

Selected Publications

1992. Systematics of *Laccaria* (Agaricales) in the continental United States and Canada, with discussions on extralimital taxa and descriptions of extant types. Fieldiana: Botany, n.s. 30**:** 1-158.

1993. (with J. F. Ammirati). Cytological studies in *Laccaria* (Agaricales). II. Assessing phylogenetic relationships among *Laccaria*, *Hydnangium*, and other Agaricales. American Journal of Botany 80**:** 322-329.

1994. (with E. M. Pine) DNA data provide evidence on the evolutionary relationships between mushrooms and false truffles. McIlvainea 11(2): 61-74.

1995. (with R. E. Halling) Evidence for high biodiversity of Agaricales (Fungi) in neotropical montane *Quercus* forests. Pp. 303-312. In: S. P. Churchill et al. (eds.), Biodiversity and Conservation of Neotropical Montane Forests. The New York Botanical Garden Press.

1996. editor (with J. Carranza V.) Fungi of Costa Rica: Selected studies on ecology and biodiversity. Revista de Biología Tropical 44 (4).

JOHN F. MURPHY

Postdoctoral Research Associate, Mycology, Department of Botany, Field Museum.

Deep Springs College, 1978-1980.
B.A., Environmental Biology, Humboldt State University, 1987.
M.S., Biology, Virginia Polytechnic Institute and State University, 1992.
Ph.D., Biology, Virginia Polytechnic Institute and State University, 1995.

Ecology, population biology, and conservation of Basidiomycetes.

My current research activities encompass all Chicago-area fungal biodiversity assessments in which The Field Museum is involved. These assessments are focused on the effects of prairie-oak savanna restoration treatments on fungal species diversity (using both above- and below-ground approaches), the effect of air pollution on local species diversity and the possibility of heavy-metal accumulation by fungi in areas of high pollution deposition. In addition to intensive sampling in this region, I am also using The Field Museum's extensive collections and database to compile a species list of fungi from northern Illinois and Indiana, and to document possible changes over time.

The activities described above dovetail with the Chicago Wilderness initiative, which involves a coalition of agencies interested in maintaining the high biodiversity of the greater Chicago region. In collaboration with G. Mueller, I am investigating the effect of restoration practices on the diversity and distribution of fungi in woodlands being restored to oak-savanna.

My dissertation research included a survey of the fungi occurring on permanent plots established in the southern Appalachians and focused on the population biology and ecology of two species on these plots: *Collybia subnuda* and *Marasmiellus praeacutus*. I am continuing my research on *Collybia subnuda*, since this species is an excellent organism for the study of population genetics and speciation in the gilled fungi.

Selected Publications

1992. Ecology and population biology of two litter decomposing basidiomycetes. Master's thesis, Virginia Polytechnic Institute and State University. Blacksburg, Virginia.

1993. (with O. K. Miller, Jr.) The population biology of two litter decomposing agarics on a southern Appalachian mountain. Mycologia 85(5): 769-776.

1994. (with O. K. Miller, Jr.) Mycorrhizal syntheses with *Alnus serrulata* (Ait.) Willd. Castanea 59(2): 156-166.

1995. Microevolutionary studies in *Marasmiellus praeacutus* and *Collybia subnuda*, two litter-decomposing basidiomycetes. Doctoral dissertation, Virginia Polytechnic Institute and State University. Blacksburg, Virginia.

(In press) (with O. K. Miller, Jr.) Diversity and local distribution of mating alleles in *Marasmiellus praeacutus* and *Collybia subnuda* (Basidiomycetes, Agaricales).

DEBRA K. MOSKOVITS

Director, Office of Environmental and Conservation Programs.

B.S., Biology, Princeton University, 1976.
Ph.D., Biology, University of Chicago, 1985.

Chair, Coordinating Group, Chicago Wilderness.
Co-chair, Science Team, Chicago Wilderness.
Chair, Conservation Training Consortium.

Conservation Biology, particularly anchoring conservation priorities and action plans on a sound biological base; transforming biological information into practical recommendations for conservation and management; finding ways to build personal, meaningful connections between the public and nature.

My main goal is to help connect the Field Museum's rich scientific, collection, and education resources with the immediate needs in conservation biology - in Chicago and worldwide. Through creative means of analyzing data, transforming information into communication, and forming broad partnerships with other institutions and individuals, we should be able to find increasingly effective ways to accelerate the flow of biologically-based recommendations to policy makers, to collaborate in regional plans for conservation, and to help individuals find personal value and enjoyment in nature. My research has focused on the behavioral ecology of birds, primates and tortoises, primarily in the tropics.

Selected Publications

1978. Winter territorial and foraging behavior of the Red-headed Woodpeckers in Florida. Wilson Bulletin 90: 521-535.

1985. (with J. W. Fitzpatrick and D. E. Willard) lista Preliminar das Aves da Estação Ecológica de Maracá, Roraima, Brasil, e Areas Adjacentes. (Preliminary bird list for maraca Ecological Station and surrounding areas.) Papéis Avulsos Zool., S. Paulo 36(6): 51-68.

1987 (with A. R. Kiester) Activity levels and ranging behaviours of the two Amazonian tortoises, *Geochelone carbornaria* and *G. denticulata* in northwestern Brasil. Functional Ecology 1: 203-214.

1988. Sexual dimorphism and population estimates of the two tortoises, *Geoghelone carbornaria* and *G. denticulata* in northwestern Brasil. Herpetologica 44(2): 209-217.

1990. (review) Tortoises and freshwater turtles: an action plan for their conservation. Copeia 1990(2): 597-599.

1990. (with K. A. Bjorndal) Foods of the two Amazonian tortoises (*Geochelone carbornaria* and *G. denticulata*) in northwestern Brasil. Herpetologica 46(2): 207-218.

1996. (with D. F. Stotz, J. W. Fitzpatrick and T. A. Parker III) Neotropical Birds: Ecology and Conservation. The University of Chicago Press.

MICHAEL NEDBAL

Postdoctoral Research Scientist, Department of Geology, Field Museum.

B.S., Biology, University of Illinois, 1989.
Ph.D., Genetics, Texas A&M University, 1995.

Systematics and historical biogeography of eutherian mammals/interactions between taxonomic biases of molecular evolution and methods of phylogeny reconstruction.

My research interests are in molecular evolution, systematics, conservation biology and population biology/population genetics. Specific interests are as follows: i) processes of molecular evolution and how these processes affect patterns of genetic variation within and between species; ii) systematics and biogeography of organisms, especially vertebrates, and combining information from molecular, morphological and paleontological evidence in an effort to unravel patterns of biodiversity; iii) developing experimental approaches for studying genetic variation; iv) using genetic and morphological variation to assess conservation issues and to promote policy involving those issues.

I am currently studying the phylogenetic relationships among the mammalian order Carnivora by integrating molecular, morphological and paleontological data. In concert, these data also will be used to test models of neutrality and the molecular clock hypothesis. Do molecules change at a constant rate through time (molecular clock), or are patterns of episodic change evident, suggesting non-neutral processes? By using fossil calibration dates to split lineages into smaller fragments of evolutionary time we will be able to measure microevolutionary change over a broad range of geologic time.

Selected Publications

1994. (with M. W. Allard and R. L. Honeycutt) Molecular systematics of hystricognathid rodents: evidence from the mitochondrial 12S rRNA gene. Molecular Phylogenetics and Evolution 3: 206-220.

1994. (with D. P. Philipp) Differentiation of mitochondrial DNA in largemouth bass. *Micropterus salmoides*. Transactions of the American Fisheries Society 123: 460-468.

1995. (with R. L. Honeycutt, R. M. Adkins and L. J. Janecek) Mammalian mitochondrial DNA evolution: a comparison of the cytochrome b and cytochrome c oxidase II genes. Journal of Molecular Evolution 40: 260-272.

(In press) (with R. L. Honeycutt) Higher level systematics of rodents (Mammalia, Rodentia): evidence from the mitochondrial 12S rNA gene. Journal of Mammalian Evolution 3.

ALFRED F. NEWTON, JR.

Associate Curator and Head, Insects, Department of Zoology, Field Museum.

A.B., Chemistry, Rutgers University, 1966.
A.M., Chemistry, Harvard University, 1970.
Ph.D., Zoology, Harvard University, 1973.

Editorial Board, Psyche, 1978-1986.
Australian Biological Resources Study.
Councilor, Coleopterists Society (1993-1994).
Field Research program supported by NSF, American Philosophical Society, Ernst Mayr Grant, National Geographic Society.

Phylogeny, comparative morphology and evolution of beetles/historical biogeography/insect association with specialized microhabitats.

My current research revolves around studies on the evolution of the large beetle family Staphylinidae (over 45,000 named species). A long-term study of the higher-level classification and evolution of the group continues by focusing on reconstructing the phylogeny of one of the family's four main lineages. I have nearly completed a monographic study of the 190+ New World species of the genus *Platydracus*, whose species promise to be of special interest for understanding the origin of current distribution patterns of forest-dwelling insects in Mexico and Central America. Collaboration with M. K. Thayer continues on another long-term project to improve knowledge of the staphylinoid beetle fauna of Australia and other southern temperate areas, with the ultimate aim of using this group to help understand the origin of southern disjunct distribution patterns (Australia+New Zealand+Chile) that are very common within the group.

Selected Publications

1982. (with J. F. Lawrence) Evolution and classification of beetles. Annual Review of Ecology and Systematics 13: 261-190.

1984. Mycophagy in Staphylinoidea (Coleoptera). Pp. 302-353. In: Fungus/Insect Relationships, Q. Wheeler and M. Blackwell (eds.), Perspectives in Ecology and Evolution. Columbia University Press, New York.

1992. (with M. K. Thayer) Current classification and family-group names in Staphyliniformia (Coleoptera). Fieldiana: Zoology, n.s. 67: 1-92.

1993. (with J. S. Ashe) Larvae of *Trichophya* and phylogeny of the tachyporine group of subfamilies (Coleoptera: Staphylinidae) with a review, new species and characterization of Trichophyinae. Systematic Entomology 18: 267-286.

1985. South temperate Staphylinoidea (Coleoptera): their potential for biogeographic analysis of austral disjunctions. Pp. 180-220. In: G. E. Ball (ed.), Taxonomy, phylogeny, and zoogeography of beetles and ants. W. Junk, The Hague, Series Entomologia 33.

1991. Coleoptera: Families Sphaeritidae, Synteliidae, Histeridae, Agyrtidae, Leiodidae, Leptinidae, Micropeplidae, Dasyceridae, Silphidae, Pselaphidae, Scaphidiidae, Scydmaenidae. Pp. 324-341, 353-355, 359-365. In: F. W. Stehr (ed.), Immature Insects, Volume 2. Kendall/Hunt Publishing Company, Dubuque, Iowa.

1995. (with M. K. Thayer) Protopselaphinae new subfamily for *Protopselaphus* new genus from Malaysia, with a phylogenetic analysis and review of the Omaliine Group of Staphylinidae including Pselaphidae (Coleoptera). Pp. 219-320. In: (J. Pakaluk and S. A. Slipinski, eds.), Biology, Phylogeny and Classification of Coleoptera. Muzeum i Instytut Zoologii PAN, Warsaw.

MATTHEW H. NITECKI

Curator Emeritus, Fossil Invertebrates, Department of Geology, Field Museum; Lecturer, Committee on Evolutionary Biology and Biological Sciences Collegiate Division, University of Chicago.

M.S., Geology, University of Chicago, 1962.
Ph.D., Paleozoology, University of Chicago, 1968.

Visiting Investigator, USSR Academy of Sciences, 1978.
Guest Scientist, USSR Academy of Sciences, 1981.
Exchange Scholar, National Academy of Sciences, 1984.
Research Scholar, Fulbright-Hays, 1985-1986.
Visiting Professor, University of Oslo, 1991-1992.
Co-Editor, Paleontological Journal (with D. V. Nitecki), Acta Paleontologica Polonica (with J. Dzik).

Problematic fossils/history and sociology of science/theoretical evolutionary biology.

Reconstruction of the history of the biosphere is among the main goals of evolutionary biology, and problematic fossil groups play a pivotal role in this, for it is they that require us to reshape our ideas of the history of life. The problematic fossils that Nitecki studies (cyclocrinitids and receptaculitids) do not fit into any living phylum, and thus represent the record of early experiments with life.

Selected Publications

1979. (with D. F. Toomey) Organic buildups in the Lower Ordovician of Texas and Oklahoma. Fieldiana: Geology, n.s. 2: 1-181.

1982. (with D. C. Fisher) Standardization of the anatomical orientation of Receptaculitids. Paleontological Society Memoir 13: 1-40.

1985. (with A. Hoffman) Reception of the asteroid hypothesis of terminal Cretaceous extinctions. Geology 13 (2): 884-887.

1986. (with A. Hoffman) (eds.) Problematic Fossil Taxa. Oxford University Press.

1988. Evolutionary Progress. (ed.) University of Chicago Press.

1992. (with D. V. Nitecki) (eds.) History and Evolution. SUNY Press.

1993. (with D. V. Nitecki) (eds.) Evolutionary Ethics. SUNY Press.

1994. (with D. V. Nitecki) (eds.) Origins of Anatomically Modern Humans. Plenum Press.

PHILIP P. PARRILLO

Curatorial Assistant, Insects, Department of Zoology, Field Museum.

B.S., Entomology, University of Illinois, Urbana, 1974.

My primary research interests focus on the evolution of a large cosmopolitan subfamily of ground beetles, the Scaratinae (Carabidae: Coleoptera). Several tribal radiations are recognized within scaratines, but few modern studies, particularly those incorporating cladistic approaches, have evaluated the integrity of these groups or the affinities between them. I am currently revising one of these groups, the Forcipatorini, which is exclusively Neotropical. Field work in Ecuador, Bolivia and the Caribbean has provided valuable data toward this study.

Other research interests include the taxonomy of stylogastrine conopid flies, a pantropical group of entomoparasitoids of which I have collaborated in naming twenty-five new Neotropical species. I have recently collaborated in examining the diversity of soil macroinvertebrates along altitudinal transects in Madagascar, which has collaterally led to the discovery of several new species of scaratines. I have also collaborated in examining the feeding ecology of a number of Madagascan birds as revealed from stomach content analysis. Finally, I will be collaborating in testing the suitability of Carabidae as indicators of habitat integrity in Illinois prairies.

Selected Publications

1985. (with S. Camras). Review of New World Stylogaster. Annals of the Entomological Society of America 78(1): 111-126.

1995. (with S. Camras). New Stylogaster and ranges of Conopidae (Diptera) from the Brazilian and Bolivian Amazonia. Acta Amazonica 25(3/4): 221-233.

1995. Activities with insects for children. Crayola Kids Magazine April/May.

1996. (with S. M. Goodman, S. James, and P. Sierwald). Elevational variation in soil macroinvertebrates on the eastern slopes of the Réserve Naturelle d'Andringitra, Madagascar. Fieldiana: Zoology, n.s. 85: 144-151.

BRUCE D. PATTERSON

MacArthur Curator, Mammals, Department of Zoology, Field Museum; Adjunct Professor, Department of Biological Sciences, University of Illinois, Chicago; Adjunct Professor, Department of Biological Sciences, Northern Illinois University; Lecturer, Commitee on Evolutionary Biology, University of Chicago; Profesor Invitado, Museo de Historia Natural, Universidad de San Marcos, Lima, Perú.

B.S., St. Lawrence University, Biology, 1974.
M.S., New Mexico State University, Biology, 1978.
Ph.D., New Mexico State University, Biology (Experimental Statistics), 1981.

Editorial boards of Journal of Mammalogy, Biodiversity Letters, Mastozoología Neotropical.
Chairman, C. H. Merriam Award Committee,
Director, American Society of Mammalogists (1989-1992, 1992-1995).
President, Society for the Study of Mammalian Evolution (1996-1997).

Systematics of Neotropical mammals/historical and insular biogeography/distribution and abundance.

My research is aimed at understanding the spatial and temporal organization of biological diversity, especially factors involved in the diversification and coexistence of living mammals. My field studies amass data and samples for museum-based research by me, students and others. Commonly used approaches include statistical analysis of distribution and abundance, comparative anatomy of an increasing variety of mammal groups (particularly marsupials, bats and rodents), morphometrics and biochemical surveys (allozymes and PCR analyses).

My conceptual contributions are principally focused on a striking distribution pattern termed "nested subsets," which has important consequences for conservation and coevolution. My empirical work helps to describe mammal taxa, identify centers of endemism and elucidate the historical (evolutionary and environmental) relationships among animals and regions. Students working under my direction at the University of Chicago, the University of Illinois at Chicago, Northern Illinois University and the Universidad de San Marcos, as well as interns and visiting scholars from overseas, expand the scope and depth of these studies.

Selected Publications

1995. (with J. C. Kerbis Peterhans) The Ethiopian water mouse *Nilopegamys* Osgood, with comments on the evolution of semi-aquatic adaptations in African Muridae. Zoological Journal of the Linnean Society 113: 1-21.

1995. (with S. M. Goodman and J. L. Sedlock) Environmental Change in Madagascar The Field Museum Press, Chicago.

1995. (with W. Atmar) The nestedness temperature calculator: a visual basic program, including 294 presence-absence matrices. AICS Research, Inc., University Park, New Mexico, and The Field Museum, Chicago. (downloadable at gopher//:fmnh.fmnh.org).

1995. Local extinctions and the biogeographic dynamics of boreal mammals in the Southwest. Pp. 151-176. In: C. A. Istock and R. S. Hoffmann (eds.), Storm over a Mountain Island: Conservation biology and the Mount Graham Affair. University of Arizona Press, Tucson, Arizona.

1996. (with L. Albuja V.) A new species of northern shrew-opossum (Paucituberculata: Canelostidae) from the Cordillera del Cóndor, Ecuador. Journal of Mammalogy 77: 41-53.

1996. The 'species alias' problem. Nature 38: 589.

KATHLEEN M. PRYER

Assistant Curator, Pteridophytes, Department of Botany, Field Museum.

B.Sc., Biology, McGill University, 1976.
M.Sc., Botany, University of Guelph, 1981.
Ph.D., Botany, Duke University, 1995.

Post-doctoral Research Associate, Indiana University (Bloomington), 1996.
Katherine Stern Dissertation Fellowship, Duke University Graduate School, 1994-95.
Lawrence Memorial Award, Hunt Institute, Carnegie Mellon University, 1994.
A.W. Mellon Junior Fellowship, Molecular Systematics Lab, Smithsonian Institution, 1994.
Lionel Cinq-Mars Award (Honorable Mention), Canadian Botanical Association, 1993.
Edgar T. Wherry Award, Botanical Society of America, 1988.

Phylogenetics of pteridophytes using morphological and molecular data/systematics of Marsileaceae, Dryopteridaceae/ontogeny and phylogeny/morphometrics/biogeography.

My primary research focuses on understanding higher-level systematics and phylogeny of extant pteridophytes by integrating evidence from both morphology and molecules (multiple genes). I also use an explicit phylogenetic framework to examine the morphological evolution of various sporophytic and gametophytic characters within ferns, and to gain insight into the evolution of various life history traits that typify ferns. I have a particular interest in the aquatic, heterosporous family Marsileaceae; morphometric information on the ontogeny of leaf form in ferns has been useful in evaluating hypotheses implicating heterochronic evolution in this family. Other areas of current research interest include the integration of information from the fossil record of pteridophytes to further refine our current understanding of relationships; using morphology, isozymes and chromosomal evidence to elucidate the systematics and evolution of cryptic species complexes (including hybrids); biogeographic, monographic, floristic and conservation studies.

I would be pleased to work with students and other collaborators with research interests in using developmental, morphological, or molecular data for resolving systematic or phylogenetic questions in pteridophyte evolution.

Selected Publications

1990. (with G. W. Argus). Rare Vascular Plants in Canada - Our Natural Heritage. Canadian Museum of Nature, Ottawa.

1993. *Gymnocarpium*. Pp. 258-262. In: Flora of North America Editorial Committee (eds.), Flora of North America North of Mexico, vol. 2. Oxford University Press, New York.

1993. (with C. H. Haufler). Isozymic and chromosomal evidence for the allotetraploid origin of *Gymnocarpium dryopteris* (Dryopteridaceae). Systematic Botany 18: 150-172.

1995. (with M. Hasebe, P. G. Wolf, K. Ueda, M. Ito, R. Sano, G. J. Gastony, J. Yokoyama, J. R. Manhart, N. Murakami, E. H. Crane, C. H. Haufler, and W. D. Hauk) Fern phylogeny based on rbcL nucleotide sequences. American Fern Journal 85: 134-181.

1995. (with A. R. Smith and J. E. Skog) Phylogenetic relationships of extant ferns based on evidence from morphology and rbcL sequences. American Fern Journal 85: 205-282.

DAVID S. REESE

Adjunct Curator, Archaeozoology, Department of Anthropology, Field Museum.

A.B., Harvard College, 1977.
Ph.D., University of Cambridge, 1988.

Archaeozoology of the Mediterranean Basin and Near East.

In my research I study animal bones and shells from archaeological sites in the Mediterranean Basin and Near East to determine ancient diets and to reconstruct environments. Specific research interests include the Late Pleistocene and Early Holocene fauna of Mediterranean islands, fauna from Bronze Age Aegean sites and from Greek and Roman sanctuary sites, exploitation of marine resources and the trade of organic remains. Ongoing work in the Museum includes publication of faunal remains from excavations in Greece, Italy, Cyprus, Turkey, Jordan, Israel, Lebanon, Syria, Egypt, Iraq, Iran and Kenya. Some of this material has been sitting unstudied in the Museum since the 1920's.

Selected Publications

1993. Shells and animal bones. Pp. 123-144, In: V. Karageorghis, O. Picard and C. Tytgat (eds.), La Nécropole d'Amathonte Tombes 113-367 VI (Études Chypriotes XIV) A. G. Leventis Foundation, Nicosia.

1993. Animal bones. Pp. 91-95, In: R. Leighton (ed.), The Cittadella in the Protohistoric Period (Morgantina Studies IV) Princeton University Press, Princeton.

1993. (with C. Sease) Some previously unpublished engraved *Tridacna* shells. Journal of Near Eastern Studies 52(2): 109-128.

1994. (with A. H. Simmons) Hippo hunters of Akrotiri. Archaeology 46(5): 40-43.

1994. Recent work in Greek zooarchaeology. Pp. 191-221. In: P. N. Kardulias (ed.), Beyond the Site: Regional Studies in the Aegean Area. University Press of America, Inc., Lanham, Maryland.

1994. (with C. Sease) An unpublished stone palette. Journal of Near Eastern Studies 53(4): 285-294.

1995. The Pleistocene Vertebrate Sites and Fauna of Cyprus. Bulletin No 9 Geological Survey Department, Nicosia.

1995. The Minoan fauna. Pp. 163-278. In: J. W. Shaw and M. C. Shaw (eds.), Kommos I(1) The Kommos Region, Ecology, and Minoan Industries. Princeton University Press, Princeton.

1995. Equid sacrifices/burials in Greece and Cyprus: an addendum. Journal of Prehistoric Religion IX: 35-42.

1995. Marine invertebrates and other shells from Jerusalem (Sites A, C and L). Pp. 265-278. In: I. Eshel and K. Prag (ed.), Excavations by K. M. Kenyon in Jerusalem 1961-1967 IV. British Academy Monographs in Archaeology 6. The British School of Archaeology in Jerusalem. Oxford University Press, Oxford.

1996. (editor and contributor). The Pleistocene and Holocene Fauna of Crete and its First Settlers. Monographs in World Archaeology No. 28. Prehistory Press, Madison, Wisconsin.

ALAN R. RESETAR

Collection Manager, Division of Amphibians and Reptiles, Department of Zoology.

B.S., Biology, Purdue University, 1978.
M.L.S., Library and Information Science, University of Wisconsin, 1986.

Co-coordinator, Historical Trends Section, Declining Amphibian Population Task Force-Central Division
Member, Indiana Nongame Program Amphibian and Reptile Technical Advisory Committee

Distribution and ecology of Chicago area amphibians and reptiles

My projects center around the diverse herpetofauna of the Chicago area, particularly that of the "dune region" in northwest Indiana. In cooperation with the National Park Service, National Biological Service, and Indiana Department of Natural Resources, I collect data on the distribution and ecology of this herpetofauna. In spite of large scale habitat disruption and destruction, there are still sizable remnants left of the patchwork of habitats that make the region unique. These habitats include prairie, marsh, mesophytic and hydromesophytic forest, bog, fen, savanna, foredune, and old field. Field work consists of opportunistic collecting as well as the use of techniques such as drift fence and funnel trap sampling and frog call surveys. From 1974 to 1995, I compiled data on over 2,100 live specimens that were released after data collection. Data were collected on locality, habitat, microhabitat, date and time of capture, activity at time of capture, body size, and other factors for each specimen. My work has documented range contractions and extensions and provided insight into the habitat use of various species, species richness of several habitats, annual activity cycles, conservation problems, and management of rare species.

Selected Publications

1993. The eastern massasauga (*Sistrurus c. catenatus*) in Indiana: A preliminary historical survey. Pp. 138-141. In: B. Johnson and V. Menzies (eds.), International Symposium and Workshop on the Conservation of the Eastern Massasauga Rattlesnake, Metro-Toronto Zoo, Canada.

In press. Sources for locating historical information on amphibian populations. In: M. Lannoo (ed.), The Status and Conservation of Midwest Amphibians, Iowa University Press.

OLIVIER C. RIEPPEL

Curator, Fossil Amphibians and Reptiles, Department of Geology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago; Adjuct Professor of Biological Sciences, Northwestern University.

Diploma in Zoology, University of Basle, 1974.
M.Sc., Vertebrate Paleontology, University College London, 1975.
Ph.D., Zoology, University of Basle, 1978.

Foreign Member of the Linnean Society of London, 1992.
Council, Society of Systematic Biologists, 1994.
Associate Editor, Journal of Vertebrate Paleontology, 1993-1995.
Associate Editor, Zoological Journal of the Linnean Society, 1992-present.
Society of Vertebrate Paleontology: Romer Prize Committee, 1993-present; Honorary Membership Committee, 1993-present.

My research concentrates on the analysis of phylogenetic relationships of marine Mesozoic reptiles; I am currently involved in a global revision of the Triassic stem-group Sauropterygia. Having completed the revision of Sauropterygia from the Germanic and Alpine Triassic (western Tethyan province), I am now moving towards the analysis of Triassic Sauropterygia from Israel and China (eastern Tethyan Province). From this systematic work emerge most interesting patterns of dispersal and diversification of stem-group Sauropterygia in correlation with the development of the Tethyan sea. The analysis of phylogenetic relationships of Sauropterygia within the reptiles as a whole has produced highly unconventional results with respect to the placement of turtles, and thus opened long-standing problems of higher level relationships within Reptilia. A field program in the marine Middle Triassic of the western United States targets the collection of marine Triassic reptiles in northwestern Nevada and more recently, in Wyoming.

Selected Publications

1994. The status of the sauropterygian reptile *Nothosaurus juvenilis* from the Middle Triassic of Germany. Palaeontology 37: 733-745.

1994. Osteology of *Simosaurus gaillardoti*, and the phylogenetic interrelationships of stem-group Sauropterygia. Fieldiana: Geology, n.s. 28: 1-85.

1994. (with R. Wild). *Nothosaurus edingerae* Schultze, 1970: diagnosis of the species and comments on its stratigraphical occurrence. Stuttgarter Beiträge zur Naturkunde B 204: 1-13.

1995. The status of *Anarosaurus multidentatus* Huene (Reptilia, Sauropterygia), from the Lower Anisian of the Lechtaler Alps (Arlberg, Austria). Paläontologische Zeitschrift 69: 287-297.

1995. The genus *Placodus*: systematics, morphology, paleobiogeography and paleobiology. Fieldiana: Geology, n.s. 31: 1-44.

1995. (with Lin K). Pachypleurosaurs (Reptilia: Sauropterygia) from the Lower Muschelkalk, and a review of the Pachypleurosauroidea. Fieldiana: Geology, n.s. 32: 1-44.

1996. (with R. Wild). A revision of the genus *Nothosaurus* (Reptilia, Sauropterygia) from the Germanic Triassic, with comments on the status of *Conchiosaurus clavatus*. Fieldiana: Geology, n.s. 34: 1-82.

ANNA C. ROOSEVELT

Curator of Archaeology, Department of Anthropology, Field Museum; Professor, Department of Anthropology, University of Illinois at Chicago; Research Associate, American Museum of Natural History

B.A., History, Stanford University.
M.A., Anthropology, Columbia University.
Ph.D., Anthropology, Columbia University.

Fellow, American Academy of Arts and Sciences. MacArthur Prize Fellowship, 1988-93. Bettendorf Medal, Santarem, Brazil, 1996. Phi Beta Kappa Visiting Scholar, 1993-94 . Research Fellow, Center for Remote Sensing, Boston University. Seven Research Grants from the National Science Foundation and National Endowment for the Humanities. Editorial Board: Latin American Antiquity, Latin American Anthropology Review, Prehistory Press. Board of Directors: American Association for the Advancement of Science, Rainforest Alliance, Academic and Educational Programs for the Americas, Task Force on the Environment, American Anthropological Association.

Human ecology and cultural evolution/environmental archaeology/geoarchaeology.

My research focuses on the changing relationship of humans and environments. My current research project in the Brazilian Amazon (1983 to present) has uncovered a long sequence of human occupation. It begins about 11,000 years ago with cave-painting Paleoindians who subsisted on forest fruits, fish, and game. Subsequently, people in fishing villages began to make pottery, the earliest in the Americas, at c. 8000 to 5,000 years ago. Later, people began farming and by A.D. 1000 had settled in towns and built large earthworks. They traded their fine crafts long distances and fought each other for political control. I and my graduate students also are working to bring knowledge of long-term human adaptation in the Amazon to conservation and development planning in the region.

Selected Publications

1980. Parmana: Prehistoric Maize and Manioc Subsistence along the Amazon and Orinoco. New York: Academic Press.

1989. Resource management in Amazonia before the European conquest: beyond ethnographic projection. Pp. 30-61. In: D. Posey and W. Balee (eds.), Natural Resource Management by Indigenous and Folk Societies in Amazonia, New York Botanical Garden: Advances in Economic Botany, No. 7.

1991. Moundbuilders of the Amazon: Geophysical Archaeology on Marajo Island, Brazil. Academic Press, New York.

1991. Determinismo ecologico na interpretacao do desenvolvimento social indigena de Amazonia. Pp. 103-141, In: W. Neves (ed.), Origens, Adaptacoes, e Divesidade Biologica do Homen Nativo da Amazonia. Museu Paraense Emilio Goeldi, Belem.

1991. (with R. Housley, I. Imazio da Silveira, S. Maranca, and R. Johnson) Eighth millennium pottery from a shell midden in the Brazilian Amazon. Science 254(5038): 1621-1624.

1993. The rise and fall of the Amazon chiefdoms. Pp. 255-384. In: A. C. Taylor and P. Descola (eds.), Le Remontee de L'Amazone: Anthropologie et Histoire des Societes Amazoniennes. L'Homme 33: 126-128, Special Issue. Paris.

1994. (ed.) Indians of Amazonia from Prehistory to the Present. University of Arizona Press, Tucson.

1995. The Excavations at Corozal, Venezuela: Stratigraphy and Ceramic Seriation. Yale University Publications in Anthropology, no. 82, New Haven.

THOMAS S. SCHULENBERG

Conservation Zoologist, Environmental and Conservation Programs, Field Museum; Research Associate, Ornithology, Department of Zoology, Field Museum; Field Team Leader, Rapid Assessment Program, Conservation International.

B.A., Zoology, Humboldt State University, 1976.
M.S., Zoology, Louisiana State University, 1981.
Ph.D., Evolutionary Biology, University of Chicago, 1995.

Editorial Board, Bird Conservation International.

Avian systematics and biogeography/evolutionary biology of birds/conservation biology.

Tropical ecosystems support high levels of diversity when compared to regions in temperate latitudes. Many of these tropical areas currently face unprecedented levels of human modification or total destruction, presenting serious threats to tropical biodiversity. It is widely known that patterns of diversity and endemism vary within the tropics. The factors underlying this variation are much less understood, yet strategies for the conservation of tropical habitats must take these factors into account to be successful. My research focuses on documenting these patterns of diversity, both within and across taxa, and on using this knowledge to target conservation efforts more effectively.

Exisiting knowledge is very uneven, as a few tropical sites are very well-known, yet large areas remain poorly-studied; such gaps in our knowledge also hinder conservation efforts. The Rapid Assessment Program (RAP), a collaborative project between The Field Museum and Conservation International, is designed to quickly and effectively fill in such gaps. RAP uses our existing knowledge, satellite imagery and overflights to identify poorly-explored areas with high conservation potential, and sends small, interdisciplinary teams of highly-trained biologists into the field to make on-the-ground evaluations and conservation recommendations based on biological data.

Ultimately, the fate of tropical ecosystems rests in the hands of local communities and governments. Many sectors of society in tropical countries are showing an increased appreciation of the importance of tropical habitats, and interest in their preservation. Often, however, there are too few biologists able to provide the information needed for local conservation efforts. I am involved in several initiatives to train local biologists in rapid field survey techniques and to develop tools that can be used to help identify, and then survey, tropical birds.

Selected Publications

1982. (with M. D. Williams) A new species of antpitta (*Grallaria*) from northern Peru. Wilson Bulletin 94 :105-113.

1983. Foraging behavior, eco-morphology, and systematics of some antshrikes (Formicariidae: *Thamnomanes*). Wilson Bulletin 95: 505-521.

1985. (with L. C. Binford) A new species of tanager (Emberizidae: Thraupinae, *Tangara*) from southern Peru. Wilson Bulletin 97: 413-420.

1985. (with T. A. Parker, et al.) The avifauna of the Huancabamba region, northern Peru. Pp. 169-197. In: P. A. Buckley et al.(eds), Neotropical Ornithology. Ornithological Monographs No. 36.

1991. (with S. M. Goodman) The rediscovery of the Red-tailed Newtonia *Newtonia fanovanae* in southeastern Madagascar with notes on the natural history of the genus *Newtonia*. Bird Conservation International 1: 33-45.

1995. (with N. J. Collar) (eds.) In memory of Ted Parker. Memorial volume, Bird Conservation International.

CATHERINE SEASE

Conservator and Collections Manager, Department of Anthropology, Field Museum.

A.B., Anthropology, Bryn Mawr College, 1969.
B.Sc., Conservation, Institute of Archaeology, University of London, 1977.

Over the past twenty-five years, I have worked as an archaeological conservator on numerous excavations in England, the Mediterranean and the Middle East. The knowledge and experience gained from this work formed the basis of a manual of conservation techniques for the field archaeologist. My involvement five years ago as an expert witness in a case involving stolen antiquities served to broaden my interests to include the ethics and philosophy of archaeological conservation in general and the role of conservation in the antiquities trade in particular. While I continue to work on excavations, my current efforts involve working on publications that explore the ethics, philosophy and methodology of archaeological conservation.

Within the museum setting, I am concerned with ethnographic as well as archaeological artifacts. My research interests fall into two main categories. One centers around the nature of materials and the technology involved in turning them into artifacts. Materials analysis and characterization enables me to become familiar with a wide variety of materials that have been in our collections for many years. I can see how they deteriorate and under what conditions and apply this information to the care and treatment of objects. Current work involves studying sulphide corrosion on Tibetan silverwork and identifying and characterizing the plastics used in objects collected in the 19th century. My other research focuses on exhibit-related conservation issues. In conjunction with others, I have been instrumental in developing two new technologies, light-piping and humidity modules, to ensure the appropriate environmental conditions for objects on exhibit. All of my museum-based work has practical applications in helping us to take better care of the anthropology collections in the museum.

Selected Publications

1996. (with L. S. Selwyn, S. Zubiate, D. F. Bowers and D. R. Atkins) Problems with Coated Silver: whisker formation and possible filiform corrosion. Studies in Conservation 41: 195-205.

1995. (with D. Thimme) The Kanakariá Mosaics: the conservators' view. Pp.122-130. In: K. W. Tubb (ed.), Antiquities: Trade or Betrayed. Archetype Books, London.

1995. First aid treatment for excavated finds. Pp. 29-46. In: N.P. Stanley Price (ed.), Conservation on Archaeological Excavations. Second Edition. Rome, ICCROM.

1994. A Conservation Manual for the Field Archaeologist, Archaeological Research Tools Series No. 4. Fourth Edition. Institute of Archaeology, University of California, Los Angeles.

1993. Light piping: a new lighting system for museum cases. Journal of the American Institute for Conservation 32: 279-290.

PETRA SIERWALD

Adjunct Curator, Insects, Department of Zoology, Field Museum; Research Associate, Department of Entomology, National Museum of Natural History, Smithsonian Institution.

M.Sc., (Staatsexamen) Biology, Geography, Biology-Education, University of Hamburg, 1982.
Ph.D., (Dr. rer. nat.) in Zoology, University of Hamburg, 1985.

Postdoctoral Fellow, Smithsonian Institution, Washington, D. C., 1985-1986.
Researcher under German National Science Foundation Grant, 1986-1988.
Research Associate, Delaware Museum of Natural History, Wilmington, Delaware, 1989-1990.

Evolution of copulatory organs in spiders/systematics of the Lycosoidea, especially phylogenetic systematic and biogeography of the spider family Pisauridae/systematics and behavior of North American black widow spiders.

Widow species vary in their mating systems and exhibit sexual dimorphism in form of very small males in some species. Studies of the copulatory behavior in five of the six North American species revealed autapomorphic species-specific characters as well as synapomorphic characters, leading, combined with morphological characters, to the begining of a phylogenetic analysis. In addition to pursuing the systematic work on the group, my research will focus in the next year on the behavior and mating systems of three Latrodectus species occurring in Florida: the Floridian red widow, the eastern black widow and the brown widow. Through observations in the field I will collect data on a number of mates for males and females, male-male interaction and possible competition for access to females, female-male interaction, and female-female interaction and competition for males.

The large family of nursery web spiders (Pisauridae) is distributed in Africa south of the Sahara, with some members occurring in southeast Asia. Previous systematic research lead to the definition of several monophyletic groups within the large family. Ten South American genera were removed and have been placed into their own family (Trechaleidae). Currently, my research focuses on another monophyletic group I defined, the subfamily Pisaurinae, consisting of eighteen mainly African genera, with some representatives in Asia. The program includes: species level revision of genera, cladistic analysis of generic relationships, and analysis of the peculiar Africa-Asian distribution pattern of the group.

Investigations continue into the ontogeny of female copulatory organs for a diverse group of aranaean taxa. The objective of the study is to define the groundplan of the female copulatory organs for the clade Entelegynae, which comprises seventy percent of all spider species.

Selected Publications

1989. Morphology and ontogeny of female copulatory organs in American Pisauridae, with special reference to homologous features. Smithsonian Contributions to Zoology 462: 1-24.

1989. Notes on the behavior of *Thalassius spinosissimus*. Psyche 95(2): 243-252.

1990. Morphology and homologous features in the male palpal organs in spiders, with special reference to Pisauridae (Arachnida: Araneae). Nemouria 35: 1-70.

1993. Revision of the spider genus *Paradossenus*, with notes on the family Trechaleidae and the subfamily Rhoicininae (Araneae: Lycosoidea). Review Arachnologique 10(3): 53-74.

(In press) Phylogenetic analysis of pisaurine nursery web spiders (Araneae: Lycosoidea: Pisauridae). Journal of Arachnology.

WILLIAM F. SIMPSON

Chief Preparator & Collections Manager, Fossil Vertebrates, Department of Geology

B.S., Zoology, Western Illinois University.

Visits to Field Museum when I was young cemented my fascination with the field of paleontology. Undergraduate training in zoology and geology helped prepare me for research in graduate school which combined vertebrate paleontology and structural geology. I studied fossil mammals from a geologically complex portion of "badlands" in South Dakota. What started out 30 million years ago as simple "layer-cake geology" has become confused due to extensive faulting caused by the Black Hills Uplift and a subsurface feature, the Chadron Arch. Unraveling the structural geology of the area was an interesting and necessary component of my research. It allowed me to accurately map the area and assemble a stratigraphic column of the many layers from which I was collecting fossils. I used data from the field to identify the primary direction of movement on the faults, as well as data from satellite photos which showed large-scale features related to the faulting. The faulting turned out to be a combination of ancient movements in one direction followed by a reversal of movement resulting in the present conditions. Following this research, I was able to accurately collect fossils from this complex but paleontologically rich set of rocks and assemble a list of fossil mammals longer than any previously published from the Whitneyan Land Mammal Age.

The laboratory component of this research in 1979 led to a three-year position in the Field Museum preparation labs. I now manage the prep labs as well as the vertebrate paleontology collections. In the laboratory we prepare new fossils we have collected by removing the rock around them so they can be seen and studied by our four vertebrate paleontology curators. Then these specimens are incorporated into our research collection which is used by researchers inside and outside the museum. The search for fossils has resulted in my participation in a wide variety of field projects. Recent expeditions include looking for fossil mammals in Chilean Andes in 1993 and 1997, looking for dinosaurs in sub-Saharan Africa in 1993, quarrying for fossil fish in Wyoming in 1995 and looking for dinosaurs and mammal-like reptiles in Madagascar in 1996.

Selected Publications

1985. Geology and paleontology of the Oligocene Harris Ranch Badlands, Southwestern South Dakota. In: Martin, J. E. (ed.), Fossiliferous Cenozoic Deposits of Western South Dakota And Northwestern Nebraska. Dakoterra: 2(2): 303-333.

1996. Renovating Riggs' Laboratories: modernization of the vertebrate paleontology preparation labs at Field Museum. Journal of Vertebrate Paleontology 16(3): abstract supplement; Abstract of talk presented at 56th annual meeting of Society of Vertebrate Paleontology in New York.

JOHN SLAPCINSKY

Collection Manager, Division of Invertebrates, Department of Zoology, Field Museum.

B.A., Biology, George Mason University, 1988.
M.A., Biology, University of Virginia, 1991.

Though much research has been devoted to the effects of land management practices, such as prescribed burns on restoring and maintaining plant communities in prairie and savanna habitats, the effects of these practices on soil organisms inhabiting these areas is largely unknown. I am currently studying the impact of land management practices on the species composition and abundance of terrestrial mollusks in local forest preserves. Data from this study will also be used to pinpoint snail species that might make good indicators of habitat quality in local prairies and savannas for use in assessments of site quality.

I am also interested in interactions between native land snail species and species accidentally and deliberately introduced through commerce. Bermuda, one of the most isolated island groups in the world had a largely endemic land snail fauna. Since human colonization, the number of snail species on Bermuda has greatly increased with the addition of many accidentally introduced species. In addition, several predatory snail species were deliberately introduced to control introduced herbivorous snails. I am investigating effects of the introduction of these snails on Bermuda's endemic snails.

DJAJA DOEL SOEJARTO

Research Associate, Vascular Plants, Department of Botany, Field Museum; Professor, University of Illinois at Chicago.

B.Sc., Biology Academy, Bogor, Indonesia, 1962.
M.A., Biology, Harvard University, 1965.
Ph.D, Biology, Harvard University, 1969.

Head of Botany Section, University of Antioquia, Medellin, Colombia, 1969-1974.
Adjunct Associate Professor, Department of Pharmagonosy and Pharmacology, University of Illinois Medical Center, 1979-1983.
Associate Professor of Pharmacognosy, Department of Medicinal Chemistry and Pharmacognosy, University of Illinois Medical Center, 1983-present.
Professor of Pharmacognosy, 1989-present, University of Illinois at Chicago.

Plant systematics of *Saurauia* (Actinidiaceae)/field surveys for anti-cancer and anti-AIDS drugs in southeastern Asia/surveys for naturally occurring sweetening agents in plants/ethnobotanical field studies in tropical forests.

Field studies in recent years have been in conjunction with National Cancer Institute sponsored programs searching for anti-cancer and anti-AIDS compounds in plants, particularly in southeastern Asia. Current research includes the intensive sampling of a single forest test-site in order to estimate medicinal potential of rain forests in general. This work includes ethnobotanical work with indigenous people, precise plant-identification and extensive literature review.

Systematic studies have focused on the taxonomy of the New World species of *Saurauia*, which includes trees that are an important component of evergreen forests, especially in cooler montane forest formations, and on the flora of Palawan (Philippines). The latter study is a contribution in the development of the resources of Palawan by the Government of the Philippines, for the well being of the people of Palawan and the Philippines in general.

Selected Publications

1982. Actinidiaceae. Pp. 1-48. In: G. Harling and B. Sparre (eds.), Flora of Ecuador No. 17.

1984. Actinidiaceae. Pp. 1-25. In: A. Gomez-Pompa et al. (eds.), Flora de Veracruz (Mexico) fascicle 35.

1986. (with C. Gyllenhaal) Research on Colombian medicinal plants: roles and resources for plant taxonomists. Caldasia 15: 199-217.

1989. (with A. D. Kinghorn) Intensely sweet compounds of natural origin. Medical Research Review 9: 91-115.

1989. *Saurauia oroquensis*, a new Colombian species of Actinidiaceae. Brittonia 4: 28-31.

1991. (with C. Gyllenhaal, C. Lewandowski, and N. R. Farnsworth) Why do medical sciences need tropical rain forests? Transactions of the Illinois State Academy of Science 84: 65-76.

1991. Medicinal plants of Seberida (Riau Province, Sumatra, Indonesia). Journal of Ethnopharmacology 31: 217-237.

1993. Logistics and politics in plant drug discovery: the other end of the spectrum. Pp. 98-111. In: A. D. Kinghorn and M. F. Balandrin (eds.), Human Medicinal Agents from Plants. ASC Symposium Series, American Chemical Society, Washington D. C.

CHARLES S. STANISH

Associate Curator and Chair, Department of Anthropology, Field Museum; Research Associate, Department of Anthropology, University of Chicago; Adjunct Professor, Department of Anthropology, University of Illinois at Chicago.

Ph.D., A.M., The University of Chicago, 1985.

Editorial Board Member, Prehistory Press, South America.
Vice President, Chicago Archaeological Society.

The archaeology of the Lake Titicaca Basin, South America/settlement archaeology/the evolution of agricultural systems/the evolution of complex political systems.

For the last twelve years, I have been studying the prehispanic civilizations of southern Peru and western Bolivia in the high southern Andes. My research began in a small valley in far southern Peru. My team and I discovered dozens of archaeological sites that dated from AD 900 to the Spanish Colonial Period. We specifically studied the ancient irrigation systems as they changed and collapsed over time. We learned that progressive drought and population increases ultimately caused the collapse of the agricultural system by the 15th century.

In 1987 I began a new project in the Titicaca Basin of southern Peru. The first settled villages in the Titicaca Basin began around 2000 BC. By 200 BC, archaic states controlled vast areas of agricultural land and built impressive irrigation systems. We have studied these societies paying special attention to the rise and fall of ancient agricultural systems. In the last five years, we have discovered almost 500 new sites.

In 1994, we began a second project on the Island of the Sun, in the middle of Lake Titicaca in Bolivia. We surveyed the Island and discovered 180 archaeological sites. We will built a small research center on the island last summer, and continued our archaeological survey and excavations.

Over the past several years, I have published a number of scientific papers and a book on my research in the southern Andes. Our research continues in Peru and Bolivia supported by the National Science Foundation. We plan to return every year to continue our study of the ancient civilizations of the Titicaca Basin.

Selected Publications

1991. A late prehispanic ceramic chronology for the Upper Moquequa Sierra, Peru. Fieldiana: Anthropology, n.s. 16: 1-68.

1992. Ancient Andean Political Economy. University of Texas Press, Austin.

1993. (with E. de la Vega M. and K. L. Frye) Domestic architecture of Lupaqa area sites. Pp. 1-12. In: M. Aldenderfer (ed.), Domestic Architecture in South Central Andean Prehistory. University of Iowa Press.

1993. (with M. Aldenderfer) Domestic architecture, household and the past in the south-central Andes. Pp. 83-94. In: M. Aldenderfer (ed.), Domestic Architecture in South Central Andean Prehistory. University of Iowa Press.

1996. South America. In: Oxford Encyclopedia of Archaeology. Thames and Hudson, London and New York.

1996. Inca economic organization. In: Oxford Encyclopedia of Archaeology. Thames and Hudson, London and New York.

1996. (with C. Kusimba) Archaeological Research and Community Participation. SAA Bulletin 14(3).

WILLIAM T. STANLEY

Collection Manager, Division of Mammals, Department of Zoology, Field Museum.

B.A., Biology and Zoology, Humboldt State University, 1986.
M.A., Biology, Humboldt State University, 1991.

My interest in the natural history of mammals began on family safaris while growing up in Kenya. Helping my mom catalogue ethnographical objects at the National Museums of Kenya solidified my fascination with natural history collections. While working on a Masters Degree in Biology at Humboldt State University, I had the chance to participate in the preparation of a rotting gray whale skull that had washed up on the beach, and knew at once that I had found my niche. In 1989, I joined The Field Museum as Collection Manager in the Division of Mammals, one of the largest collections of mammal specimens in the world. Each summer I return to East Africa to study small mammals that inhabit the mountain forests of Tanzania, particularly the Eastern Arc Mountains (EAM), in collaboration with Tanzanian biologists.

Our investigation of the EAM forest mammalian fauna is important because of the number of endemic plants and animals that are found in the upper montane areas of these mountains, and how poorly these organisms are understood. Since 1991, we have been investigating the natural history of small mammals (shrews, bats and rodents) of the EAM in an effort to document aspects of their natural history and elucidate the biogeographical history of the group. The Eastern Arc Mountains are considered by several biologists as a priority conservation area in tropical Africa and the information we are collecting is critical for developing conservation strategies for the region. Training of Tanzanian biology students is an important aspect of this ongoing project.

Selected Publications

1995. (with S. M. Goodman, W. D. Newmark and K. M. Howell) The Ambangulu Forest, West Usambara Mountains, Tanzania: a threatened Eastern Arc forest. Oryx 29: 212-214.

1996. (with J. C. Kerbis-Peterhans, R. Kityo and L. Davenport) New records of bats in Uganda and Burundi. African Journal of Ecology 34: 196-201.

1996. (with S. M. Goodman and R. Hutterer) Notes on the insectivores and elephant shrews of the Chome Forest, South Pare Mountains, Tanzania (Mammalia: Insectivora et Macroscelidea). Zoologische Abhandlugen Staatliches Museum fur Tierkunde Dresden 49: 131-147.

DOUGLAS F. STOTZ

Conservation Ecologist, Environmental and Conservation Programs, Field Museum; Lecturer, Center for Evolutionary Biology, University of Chicago.

B.S., Biology, University of Arizona, 1978.
Ph.D., Evolutionary Biology, University of Chicago, 1990.

Avian evolutionary biology, diversity and endemism in the Neotropics, avian community ecology, ecomorphology, conservation biology.

My main research interest focuses on understanding the causes and consequences of the extremely high diversity of birds in Neotropical forests. I have considered two basic issues: i) How is diversity maintained ecologically? and ii) How does the morphology of a species relate to its ecological role? The high species diversity within tropical genera and families makes these ideal for studying the interface between ecology, behavior and morphology. On a broader scale, I am interested in the ecological basis for geographic patterns of species diversity and endemism, especially as this relates to differences in the major biogeographic units of humid forest. My current focus is on documenting and understanding the patterns of avian diversity and endemism along elevational gradients in Central and South America.

My interest in diversity feeds directly into my concern with conservation biology. Biological data can be used much more effectively in developing conservation strategies in the Neotropics. The information on the distribution, ecology and taxonomy of birds is the most accurate and detailed available for any taxonomic group. These data can be used to help guide decision-making and planning for Neotropical conservation. I have recently completed a book, with three colleagues, that analyses avian distribution and ecological patterns to set priorities for conservation action in the Neotropics. I will continue to focus on developing biological data relevant to conservation in the Neotropics, and ensuring that these data are used.

Selected Publications

1990. (with S. M. Lanyon and D. E. Willard) *Clytoctantes atrogularis*, a new species of antbird from Brazil. Wilson Bulletin 102: 571-580.

1992. (with R. O. Bierregaard, M. Cohn-Haft, J. Smith, P. Petermann, A. Whittaker and S. Wilson) The status of North American migrants in central Amazonian Brazil. Condor 94: 608-621.

1992. Specific status and nomenclature of *Hemitriccus minimus* and *Hemitriccus aenigma*. Auk 109: 916-917.

1993. A hybrid manakin (*Pipra*) from Roraima, Brazil, and a phylogenetic perspective on hybridization in Pipridae. Wilson Bulletin 105: 348-351.

1993. Geographic variation in species composition of mixed species flocks in lowland humid tropical forests of Brazil. Papeis Avulsos de Zoologia (São Paulo) 38: 61-75.

1995. (with M. Van Sluys) Padrões de visitação a *Vriesea neoglutinosa* por beija-flores no Espírito Santo, sudeste do Brasil. Bromelia 2: 27-35.

1996. (with J. W. Fitzpatrick, T. A. Parker III, and D. K. Moskovits) Neotropical Birds: Ecology and Conservation. University of Chicago Press, Chicago, Illinois.

1996. (with M. Galetti). *Miconia hypoleuca* como espécie-chave para aves frugívoras no sudeste do Brasil. Revista Brasileira de Biologia 56: 435-439.

(In press) (with J. W. Fitzpatrick) A new species of tyrannulet (*Phylloscartes*) from the Andean foothills of Peru and Bolivia. Ornithological Monographs.

JOHN TERRELL

Curator, Oceanic Archaeology and Ethnology, Department of Anthropology, Field Museum; Adjunct Professor of Anthropology, Northwestern University; Visiting Professor, University of Illinois at Chicago.

A.B. *magna cum laude* with Highest Honors in Anthropology, Harvard College, 1964.
Phi Beta Kappa, Harvard College, 1964.
A.M., Harvard University, 1968.
Ph.D., Harvard University, 1976.

1992 Morton H. Fried Prize, American Anthropological Association (shared with R. L. Welsch and J. Nadolski).

The anthropology and prehistory of the Pacific Islands/ecological and biogeographical approaches in the social sciences/history and theory of science/epistemology .

In 1996, while working in a remote corner of New Guinea neglected by anthropologists for most of this century, John Edward Terrell and an international team of scientists discovered a missing link in the origins of the Pacific Islanders. The expedition recovered evidence that cultural practices of the first people to colonize Polynesia more than 3,000 years ago may have evolved on the Sepik coast of northern Papua New Guinea, and not in southeast Asia as most experts have thought. With funding from the National Science Foundation, the expedition's seven archaeologists--from the United States, Australia, and Papua New Guinea--found pottery shards, bones, and other traces of ancient life on the limestone foothills around the quiet town of Aitape, ninety miles east of Papua New Guinea's border with Indonesia, on the island's northern coast. Between 2,000 and 4,500 years ago this part of New Guinea must have been an extremely inviting piece of real estate, with huge lagoons filled with fish and shellfish and good swamplands for growing sago palms, the area's most important source of food. People had easy canoe access to the open sea and, therefore, to communities elsewhere on the great Melanesian sailing routes between Indonesia and the more distant islands of the Pacific. Around 4,000 years ago, people first started making pottery in the Aitape area. The oldest pottery sherds found on the Aitape hills suggest that the ornate style of prehistoric pottery called Lapita ware used by the first inhabitants of Polynesia can be traced back to Aitape--specifically, to a kind of pottery that Terrell calls Sumalo ware, after one of the hills at Aitape where it has been found. What we are finding, is what archeologists have been looking for ever since they first linked Lapita pottery with the Polynesians. We now have definite evidence that the ancestors of the Polynesians didn't migrate directly from southeast Asia. They were clearly living in northern New Guinea for a very long time before some people finally left Melanesia to colonize Polynesia. These findings are going to change the way we think about the history of people in the Pacific.

Selected Publications

1996. (with P. J. Stewart) The paradox of human population genetics at the end of the Twentieth Century. Reviews in Anthropology 25: 13-33.

(In press) Lapita as history and culture hero. In: J. M. Davidson, G. J. Irwin, F. Leach, A. K. Pawley and D. Brown (eds.), Pacific Culture History. New Zealand Journal of Archaeology Special Publication Otago.

MARGARET K. THAYER

Adjunct Curator, Insects, Department of Zoology, Field Museum.

Sc.B., Biology, Brown University, 1973.
Ph.D., Biology, Harvard University, 1985.

Advisory Panel member, Biotic Survey and Inventory Program and Research Collections Program, National Science Foundation; Officer, Systematics, Morphology, and Evolution section, Entomological Society of America, 1995-1997 (Chair 1997); International and Editorial Boards, Annales Zoologici and Dugesiana; President, Coleopterists Society, 1995-1996; Treasurer, Coleopterists Society, 1987-1991.

Systematics, biology, and evolution of world Staphylinidae (especially Omaliinae)/historical biogeography, especially of austral regions/faunistic studies of North American and southern hemisphere temperate Staphyliniformia.

Research has focused on the systematics, evolution and biogeography of basal elements of the large and ancient beetle family Staphylinidae (rove beetles). Many of these lineages are restricted to either northern or southern temperate areas of the world. A major work in progress on the forty plus genera of the tribe Omaliini will begin to make that worldwide, mainly temperate-zone, group accessible for phylogenetic and large-scale historical biogeographic studies.

Taxonomically broader fieldwork-based faunistic work on the southern continents is another part of my research program, in collaboration with A. F. Newton. The staphyliniform faunas of Australia, New Zealand, Chile and South Africa are highly endemic at the specific level, but strongly interconnected at generic and higher levels. This work is expanding knowledge of the diversity, distribution and biology of the Staphyliniformia of those regions and also, in the long term, knowledge of apparently ancient biogeographic relationships among the regions.

As a contribution to local conservation and habitat restoration efforts, I have recently begun work on Chicago-area rove beetles, compiling published information on the fauna as a whole and doing sampling of areas targeted for restoration work as part of the Swallow Cliff Restoration Effects project based at The Field Museum.

Selected Publications

1985. The larva of *Brathinus nitidus* LeConte and the systematic position of the genus (Coleoptera: Staphylinidae). Coleopterists Bulletin 39(2): 174-184.

1985. Revision, phylogeny, and biogeography of the austral genus *Metacorneolabium* Steel (Coleoptera: Staphylinidae, Omaliinae). Pp. 113-179. In: G. E. Ball, (ed.), Taxonomy, Phylogeny, and Zoogeography of Beetles and Ants. Series Entomologica 33, Dr. W. Junk Publishers, Dordrecht.

1987. Biology and phylogenetic relationships of *Neophonus bruchi*, an anomalous south Andean staphylinid (Coleoptera). Systematic Entomology 12: 389-404.

1992. Discovery of sexual wing dimorphism in Staphylinidae (Coleoptera): "*Omalium*" *flavidum*, and a discussion of wing dimorphism in insects. Journal of the New York Entomological Society 100(4): 540-573.

1995. (with A. F. Newton) Protopselaphinae new subfamily for *Protopselaphus* new genus from Malaysia, with a phylogenetic analysis and review of the Omaliine Group of Staphylinidae including Pselaphidae. Pp. 219-320. In: J. Pakaluk and S. A. Slipinski (eds.), Biology, Phylogeny, and Classification of Coleoptera. Muzeum i Instytut Zoologii PAN, Warszawa.

1996. (with J. Klimaszewski and A. F. Newton) A review of the New Zealand rove beetles (Coleoptera: Staphylinidae). New Zealand Journal of Zoology 23: 143-160.

WILLIAM D. TURNBULL

Curator Emeritus, Fossil Mammals, Department of Geology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago; Research Associate, University of Texas (Texas Memorial Museum).

Ph.D., University of Chicago, 1967.

Bibliographic compiler for Saugetierkundliche Mitteilungen from 1955-65.
Vice-president and President of the Society of Vertebrate Paleontology, 1976-1977, 1977-1978.
Co-leader, three expeditions to Australia (1963-4), (1966-7), (1976-7) and leader of many field trips into the Washakie Basin of Wyoming (1956-96).

Mammalian systematics, evolution, ecology and zoogeography, especially North American Eocene and Mesozoic faunas, Australian Tertiary and Pleistocene faunas/functional morphology of mammalian masticatory apparatus/paleopathology/taphonomy/basicranial anatomy of marsupials/group origins and replacements.

Current research involves: i) the mammalian fauna of the Washakie Formation (southwest Wyoming) and the stratigraphic sequence of the deposits of the formation (uintatheres, marsupials, titonotheus, artiodectyls, Tillodonts, and several other works in progress); ii) Late Tertiary and Pleistocene mammalian faunae of Australia; iii) functional anatomy and restoration of the masticatory musculature of the Eocene taeniodont, *Stylinodon*,; and iv) the multituberculates of the Early Cretaceous (Trinity Group) of north Texas.

Selected Publications

1991. *Protoptychus hatcheri* Scott, 1895: the mammalian faunas of the Washakie Formation, Eocene Age, of southern Wyoming. Part II. The Adobetown Member, middle division (=Washakie B), TWKa/2 (in part). Fieldiana: Geology, n.s. 21: 1-33.

1992. (with B. Patterson, W. Segall and T. Gaudin) The ear region in Xenarthrans (Edentata: Mammalia). Part II. Pilosa: sloths, anteaters, paleanodonts and a miscellany. Fieldiana: Geology, n.s. 24: 1-79.

1993. (with E. L. Lundelius, Jr. and R. H. Tedford) Plio-Pleistocene mammalian fauna at Smeaton, Victoria. Pp. 429-440. In: P. A. Jell (ed.), Ken Campbell Festschrift, Association of Australian Paleontologists. Brisbane.

1995. The problem of the uintathere molars (once more). Pp. 261-265. In: R. J. Radlonski and H. Renz (eds.), Proc. 10th Int. Symposium on Dental Morphology. Berlin.

1995. Trinity mammal jaws from the Early Cretaceous of north Texas. Pp. 266-270. In: R. J. Radlonski and H. Renz (eds.), Proceedings 10th International Symposium on Dental Morphology. Berlin.

1995 (with T. J. Gaudin, J. R. Wibel and J. A. Hopson) Reexamination of the evidence for the cohort epitheria (Mammalia: Eutheria). Journal of Mammal Evolution. 3(1): 31-79.

1996. (with S. M. McCarroll and J. J. Flynn) The Mammalian forms of the Washakie Formation Eocene age, of southern Wyoming. Part III. The Perissotactyls. Fieldiana: Geology, n.s. 33: 1-38.

1996. (with S. M. McCarroll and J. J. Flynn) A review of the biostratigraphic and magnetic polarity correlations of the Washakie Formation, Washakie Basin, Wyoming Chapter 2, Pp. 25-39. In: D. R. Prothero (ed.), The Terrestrial Eocene-Oligocene Transition in North America. Cambridge University Press.

1996. (with R. Richards and C. S. Churcher) Distribution and size variation in North American short-faced bears, *Arctodus simus*. In: K. M. Stewart and K. L. Seymour (eds.), Churcher Festschrift volume. Royal Ontario Museum Publications in Life Sciences.

JANET R. VOIGHT

Associate Curator, Invertebrates, Department of Zoology, The Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago.

B.S., Biology, Iowa State University, 1977.
Ph.D., Ecology and Evolutionary Biology, University of Arizona, 1990.

Ecology and evolution of cephalopod molluscs, deep-sea biology/reproductive biology/marine biogeography.

My research uses phylogenetic reconstruction based on morphological and anatomical characters to assess distributional and evolutionary patterns, especially of deep-sea animals. Octopuses, cephalopod mollusks, are my taxon of choice. Members of this clade occur from the epi-pelagic waters near the sea surface to benthic habitats on the abyssal plain, and in all intermediate habitats. The identification of natural groups within this ubiquitous marine clade promises to reveal historical patterns of diversification of marine animals. The comparative anatomical studies on which my phylogenetic work is based are also vital to providing insight into the biology and ecology of these little-known and very rarely observed animals, demonstrating the power preserved specimens have in elucidating mechanisms of mate choice, sperm competition and foraging strategies.

Selected Publications

1991. Ligula length and courtship in *Octopus digueti:* a potential mechanism of mate choice. Evolution 45: 1726-1730.

1991. Enlarged suckers as an indicator of male maturity in *Octopus*. Bulletin of Marine Science 49: 98-106.

1991. Morphological variation in octopod specimens: reassessing the assumption of preservation-induced deformation. Malacologia 33: 241-253.

1992. Movement, injuries and growth of members of a natural population of the Pacific pygmy octopus, *Octopus digueti*. Journal of Zoology London Society 228: 247-263.

1993. The association between distribution and octopodid morphology: implications for classification. Zoological Journal of the Linnean Society 108: 209-223.

1993. The arrangement of suckers on octopodid arms as a continuous character. Malacologia 35: 351-359.

1994. (with R. A. Lutz) Close encounter in the deep. Nature 371: 563.

1994. Morphological variation in shallow-water octopuses (Mollusca: Cephalopoda). Journal of Zoology, London 232: 491-504.

1995. Sexual dimorphism and prey partitioning in mid-water octopus (*Cephalopodia bolitaenidae*). Biological Bulletin 189: 113-119.

1995. (with S. E. Walker) Geographic variation in shell baits in the deep-sea snail *Gaza*. Deep-Sea Research 42: 1261-1271.

HAROLD K. VORIS

Curator and Head, Amphibians and Reptiles, Department of Zoology, Field Museum; Lecturer, Committee on Evolutionary Biology, University of Chicago; Adjunct Professor, Department of Biological Sciences, University of Illinois, Chicago Campus.

B.A., Biology, Hanover College, 1962.
Ph.D., Biology Department, University of Chicago, 1969.

Hanover College Alumni Achievement Award, 1983.
Hanover College Honorary Doctor of Science Degree, 1992.

Ecology and systematics of aquatic snakes in the old-world tropics/ecological and life history interactions of pedunculate barnacles and decapod crustaceans/comparisons of old-world tropical rain forest amphibian and reptile communities.

In fresh water swamps and marine estuaries in Borneo and Thailand, in collaboration with colleagues and students, I am exploring how aquatic snakes budget their activities between the two major life zones, land and water. In these semi-aquatic tropical habitats there are assemblages of snakes belonging to several independent lineages that have evolved aquatic habits. Each lineage represents an independent evolutionary experiment and each species within each lineage, an example of how life activities can be partitioned between these two life zones. Through comparisons between lineages, and among species within lineages, we are gaining insights into the reasons why these fundamentally terrestrial vertebrates have re-invaded the sea so often through evolutionary history.

In the Straits of Johore between Malaysia and Singapore and along the coast of southern Thailand we are studying ecological and life history interactions between small goose barnacles and their hosts, marine crabs and sea snakes. Our work has focused on mechanisms of colonization and details of the life history of the barnacle larvae, cyprids and adults. Most recently we have published a study that explores the relationships among the degree of plate armament on different species of these barnacles, the types of host they select, and the locations on the hosts that they colonize.

In the lowland tropical rain forests of Borneo, Robert Inger and I maintain a long-standing interest in the natural changes that occur from place to place and through time in communities of amphibians and reptiles. Recently our findings have been applied to the issue of world-wide declining amphibian populations, and we have both foreign and domestic graduate students working on amphibian populations in Borneo.

Selected Publications

1989. (with W. B. Jeffries and C. M. Yang) A new mechanism of host colonization: pedunculate barnacles of the genus *Octolasmis* on the mangrove crab, *Scylla serrata*. Ophelia 31(1): 51-58.

1991. (with E. Lading and R. B. Stuebing) A population size estimate of the yellow-lipped sea krait, *Laticauda colubrina*, on Kalampunian Damit Island, Sabah, Malaysia. Copeia (4): 1139-1142.

1992. (with W. B. Jeffries and S. Poovachiranon) Age of the mangrove crab, *Scylla serrata*, at colonization by stalked barnacles of the genus *Octolasmis*. The Biological Bulletin 182(2): 188-194.

1993. (with R. F. Inger) A comparison of amphibian communities through time and from place to place in Bornean forests. Journal of Tropical Ecology 9: 409-433.

1995. (with R. F. Inger) Frog abundance along streams in Bornean forests. Conservation Biology 9(3): 679-683.

(In press) (with D. R. Karns) Habitat utilization, movements and activity patterns of *Enhydris plumbea* (Serpentes, Homalopsinae) in a rice paddy wetland in Borneo. Herpetological Natural History.

MEENAKSHI WADHWA

Assistant Curator, Meteoritics and Mineralogy, Department of Geology, Field Museum; Visiting Scholar, University of Chicago.

B.S., Geology, Panjab University, 1988.
M.S., Geology, Panjab University, 1989.
Ph.D., Earth and Planetary Sciences, Washington University, 1994.

Member, Meteorite Nomenclature Committee.
Member, Meteorite Working Group.

Processes and time scales involved in the formation histories of meteorites from trace element and isotopic studies.

I am interested in a variety of meteorite groups, ranging from primitive ones (among them, enstatite chondrites, eucrites and mesosiderites) to some of the youngest known meteorites (i.e., the SNC or "martian" meteorites). The focus of my research on these widely diverse objects has been two-fold, i) to decipher the processes involved in their formation using trace element (particularly, rare earth element) distributions in their minerals; and ii) to determine their time scales of formation using long lived (Samarium-Neodymium and Rubidium-Strontium) and short lived (Manganese-Chromium) chronometers. The goals of my research program, through the studies mentioned above, are to gain a better understanding of meteorite formation events in the solar system, and in particular, to resolve the chronology of such events in early solar system history.

Selected Publications

1993. (with B. L. Jolliff, L. A. Haskin and R. O. Colson) Partitioning of REE-saturating minerals: theory, experiment, and modelling of whitlockite, apatite, and evolution of lunar residual magmas. Geochimica et Cosmochimica Acta 57: 4069-4094.

1993. (with R. P. Harvey, H. Y. McSween, Jr. and G. Crozaz) Petrography, mineral chemistry, and petrogenesis of Antarctic shergottite LEW88516, Geochimica et Cosmochimica Acta 57: 4769-4783.

1994. (with H. Y. McSween, Jr. and G. Crozaz) Petrogenesis of shergottite meteorites inferred from trace and minor element microdistributions. Geochimica et Cosmochimica Acta 58: 4213-4229.

1995. (with G. Crozaz) Trace and minor elements in minerals in nakhlites and Chassigny: clues to their petrogenesis. Geochimica et Cosmochimica Acta 59: 3629-3645.

(In press) (with H. Y. McSween, Jr., D. D. Eisenhour, L. A. Taylor and G. Grozez) QUE94201 shergottite: crystallization of a martian basaltic magma, Geochimica et Cosmochimica Acta.

(In press) (with G. Lugmair) The age of the eucnite “caldera” from convergence of long - and short - lived chronometers. Letter to Geochimica et Cosmochimica Acta.

(In press) (with E. K. Zinner and G. Grozez) Mn-Cr systematics of sulfides in unequilibrated enstatite chonollites. Meteoritics and Planetary Science.

PETER J. WAGNER

Assistant Curator, Department of Geology, Field Museum.

B.S., Anthropology / Zoology, University of Michigan, 1986.
B.S., Geology, Michigan State University, 1988.
M.S., Geology, Michigan State University, 1990.
Ph.D., Geophysical Sciences, University of Chicago, 1995.

Paleozoic molluscan systematics/macroevolution.

My research focuses on morphologic and phylogenetic diversification, concentrating primarily on Paleozoic gastropods and rostroconchs (an extinct taxon that might include the ancestors of scaphopods). Estimates of phylogenetic relationships among species form the bases for most of my studies. These estimates then are integrated with other (e.g., morphometric or paleoecologic) data in order to test many macroevolutionary hypotheses. Studies that I have conducted to date include: i) testing for increasing constraints on morphologic evolution; ii) delimiting the underlying patterns of long-term evolutionary trends; and iii) testing for shifts in evolutionary dynamics (e.g., rates of speciation or extinction or rates of morphologic change. Present research includes analyses of extant gastropod anatomical data to test predictions derived from paleontological analyses. I also work on methodological aspects of phylogenetic and morphospace analyses, including: i) contrasting the implications of parsimony with the observed fossil record; ii) using computer simulations to evaluate the performance of different methods for estimating phylogenies; iii) using real data and computer simulations to explore how different phylogenetic methods might be biased in their implied evolutionary patterns; and iv) contrasting different metrics of morphospace occupancy to examine the effects of phylogenetic and nonphylogenetic metrics.

I am interested in collaborating with researchers studying: i) general macroevolutionary questions, especially from phylogenetic and/or morphospace perspectives; ii) aspects of the early Paleozoic radiations of marine invertebrates; iii) the systematics and evolutionary history of early Paleozoic taxa (especially but not exclusively molluscs); and iv) general methodological issues pertaining to comparative biological research.

Selected Publications

1995. Stratigraphic tests of cladistic hypotheses. Paleobiology 21: 153 - 178.

1995. Testing evolutionary constraint hypotheses with early Paleozoic gastropods. Paleobiology 21: 248-272.

1995. Diversification among early Paleozoic gastropods contrasting taxonomic and phylogenetic data. Paleobiology 21: 410-439.

1995. (with D. H. Erwin) Phylogenetic tests of speciation hypotheses. Pp. 87-122. In: New Approaches to Studying Speciation in the Fossil Record. Columbia University Press, New York.

1996. Contrasting the underlying patterns of active trends in morphologic evolution. Evolution 50: 990-1007.

(In press) Patterns of morphologic diversification among the Rostroconchia. Paleobiology 23.

(In press) Phylogenetics of the earliest gastropods. Smithsonian Contributions to Paleobiology.

ALAKA WALI

Associate Curator, Circum-Caribbean and Central America, Department of Anthropology, Field Museum and Director, Center for Cultural Understanding and Change; Senior Ethnographer, Harlem Birth Right Project of the New York Urban League.

B.A., Radcliffe College (Harvard University), 1974.
Ph.D., Columbia University, 1984.

Impact of economic and social change on social organization and cultural identity.

I joined the Museum as Director of the Center for Cultural Understanding and Change (CCUC) and Visiting Associate Curator in October of 1994. My research program has concentrated on understanding the impact of global economic restructuring on the ways in which people organize themselves and constitute their social identities. As an applied anthropologist, my aim has been to use the results of the research to formulate more humane solutions to social problems. This research has taken place in two different sites: Central and South American "hinterlands" and urban areas in the United States. In the Central and South American context, I researched the ways in which indigenous people have confronted massive disruption to their use of land and resources as a result of national development schemes. In the urban United States, I have researched the obstacles to resource acquisition for economically disadvantaged groups and the ways in which local social organization forms and cultural strategies can be incorporated into grass-roots empowerment programs. I am also interested in exploring the obstacles and opportunities for anthropologists to disseminate what they know about culture to the general public.

As Director of CCUC I hope to expand efforts in the anthropology department to create local links in Chicago on research and public education programs, work closely with public programs and education on new exhibits, and work closely with the Center for Evolutionary and Environmental Biology (CEEB) to foster interdisciplinary approaches to the understanding of the human-environment interface.

Selected Publications

1989. Kilowatts and Crisis: Hydroelectric Power and Social Dislocation in Eastern Panama. Westview Press, Boulder, Colorado.

1990. Living with the land: Ethnicity and development in Chile. Grassroots Development, (14:2), Journal of the Inter-American Foundation. Arlington, Virginia.

1990. When planning fails: unanticipated consequences of resettlement in eastern Panama. Practicing Anthropology 12: 3.

1992. Multiculturalism: an anthropological perspective. Report from the Institute for Philosophy and Public Policy 12:1, University of Maryland, College Park, Maryland.

1992. (with M. Jenakovich, K. Fraser and L. Samberg). I Wish: Stories of Children Growing Up in Washington, D. C. National Association of State Boards of Education Monograph, Arlington, VA.

1993. (with S. Davis) Indigenous Territories and Tropical Forest Management in Latin America. Monograph of the Environment Department, The World Bank, Washington, D.C.

1993. The transformation of a frontier: state and regional relationships in Panama, 1972-1990. Human Organization 52: 2.

1994. (with S. Davis) Indigenous land tenure and tropical forest management in Latin America. Ambio 23: 8.

1995. La política de desarrollo y las relaciones entre Región y Estado: el Caso del Oriente de Panamá, 1972-1990. Mesoamerica (16)29: 125-158.

JEFFREY A. WALKER

National Science Foundation Postdoctoral Research Fellow in the Biosciences
Related to the Environment, Department of Zoology, Field Museum

B.A., Geology, University of Pennsylvania, 1988.
Ph.D., Anatomical Sciences, State University of New York at Stony Brook, 1995.

Constraints on the evolution of morphological systems.

My research focuses on the effects of size and, especially, shape on the biomechanics of organisms and the consequences of these effects on organismal physiology, behavior, ecology, microevolution, and macroevolution. The fundamental principle that guides my research is the tenet that an animal, from conception to death, continually performs a series of tasks ultimately related to fitness, including searching and acquiring food, escaping predators, defending territories and finding mates. I have generally employed geometric morphometric methods to describe patterns of shape variation. I use hydrodynamic modeling, experimental manipulation and comparative data to explore questions such as: i) is the performance of fitness-related tasks influenced by the biomechanical consequences of morphometric variation; ii) how do shape and performance effect the physiology, behavior, and ecology of an organism, and finally; iii) does the relationship between shape and performance influence, or bias, the array of morphotypes observed among individuals, populations, species and higher taxa?

Selected Publications

1993. Ontogenetic allometry in the threespine stickleback using landmark data. Pp. 193-214. In:L. F. Marcus, E. Bello and A. Garcia-Valdecasas (eds.), Contributions to Morphometrics Museo Nacional Ciencias Naturales, Madrid.

1993. (with M. A. Bell, G. Orti and J. P. Koenings) Evolution of pelvic reduction in threespine stickleback: a test of competing hypotheses. Evolution 47: 906-914.

1996. Principal components of body shape variation within an endemic radiation of threespine stickleback. Pp. 321-334.In: L. F. Marcus, M. Corti, A. Loy, G. Naylor and D. E. Slice (eds.), Advances in Morphometrics. NATO ASI Series, A:Life Sciences, Vol. 284 Plenum Publishing, New York.

1996. (with A. R. Biknevicius and B. Van Valkenburgh) Incisor size and shape: implications for feeding behaviors in sabertooth "cats". Journal of Vertebrate Paleontology 16: 510-521.

In press. Ecological morphology of lacustrine threespine stickleback *Gasterosteus aculeatus* L. (Gasterosteidae) body shape. Biological Journal of the Linnean Society.

In press. (with M. W. Westneat) Labriform propulsion in fishes: Kinematics of flapping aquatic flight in the bird wrasse, *Gomphosus varius (*Labridae). Journal of Experimental Biology.

LEE A. WEIGT

Biochemistry Laboratories Manager, Field Museum.

B.A., Zoology, Miami University 1982, 1985.
M.S., Zoology, Miami University 1982, 1985.

The geologically recent rise of the Isthmus of Panama and the impact of this event on the animals and their gene pools forms the basis of my collaborative research efforts. I address this with two systems; i) the isthmus as a *bridge* between South and Central America and its significance to tungara frogs; and, ii) the isthmus as a marine *barrier* between the eastern Pacific and Caribbean shrimp fauna.

Molecular phylogenies are under construction for the tungara frog, with concurrent studies of female selection on male mating calls and population genetics. Allozyme, mating call and mtDNA results to date from more than thirty populations across a 5,000 km transect from Mexico to Venezuela will be supplemented with nuclear gene sequences in target areas. By comparing the phylogenetic relationships of the taxa in a historical and geographical perspective, this will allow us to test several other hypotheses including historical barriers to gene flow, rates of molecular evolution and rates of behavioral character change.

The snapping shrimp genus *Alpheus*, has more than 100 species and hosts the taxonomically deepest sampling to date of "geminate" species pairs ("twins" formed by the rise of the ishtmus), with fifteen pairs and their related species. We currently have morphological, reproductive behavioral, allozyme and mtDNA data and anticipate collecting nuclear gene sequences in the near future. Our work indicates that many of the "species" are actually sibling or cryptic species complexes, so the actual number of species may be much higher than previously thought.

Selected Publications

1993. (with N. Knowlton, L. A. Solorzano, D. E. K. Mills and E. Bermingham) Divergence in proteins, mitochondrial DNA, and reproductive compatibility across the Isthmus of Panama. Science 260: 1629-1632.

(In press) (with M. J. Ryan and A. S. Rand) Allozyme and advertisement call divergence in the tungara frog, *Physalaemus pustulosus*. Evolution.

(In press) (with N. Knowlton) Species of marine invertebrates: a comparison of the biological and phylogenetic species concepts. In: Claridge, M. F., H. A. Dawah, and M. R. Wilson (eds.), Species: The Units of Biodiversity. Systematics Association Special Volume, Chapman and Hall, London.

(In press) (with K. Summers, E. Bermingham, S. S. McCafferty and L. Dahlstrom) Phenotypic and mitochondrial DNA divergence in three species of dart-poison frogs with contrasting parental care behaviour. Journal of Heredity.

ROBERT L. WELSCH

Adjunct Curator, Department of Anthropology, The Field Museum; Visiting Associate Professor, Department of Anthropology, Dartmouth College; Visiting Curator, The Hood Museum of Art, Dartmouth College.

B.A., Northwestern University, 1972.
M.A., University of Washington, 1976.
Ph.D., University of Washington, 1982.

The anthropology and material culture of Papua New Guinea.

Work proceeded cataloging a collection of more than 1,000 ethnological specimens collected along the Sepik Coast of New Guinea in 1993-94 during the A. B. Lewis Project Expedition. In September and October I accompanied the team of archaeologists on the Aitape Archaeological Expedition. Work proceeded on the NEA grant to study the art of the Papuan Gulf at the Hood Museum of Art at Dartmouth College. In May, I was curator on an exhibition of Melanesian Art at the Hood Museum, which ran until the end of June. Also at the Hood Museum, I consulted on an exhibition of Vanuatu slit gongs and tree fern figures giving a gallery talk in March. I also consulted on an exhibition of Melanesian art that Miami University of Ohio Art Museum, giving a gallery talk in June.

Selected Publications

1985. The distribution of therapeutic knowledge in Ningerum: implications for primary health care and the use of aid posts. Papua New Guinea Medical Journal 28: 67-72.

1988. (with A. F. Afdhal) The rise of the modern Jamu industry in Indonesia: a preliminary overview. Pp. 149-172. In: S. van der Geest and S. R. White (eds.), The Context of Medicines in Developing Countries: Studies in Pharmaceutical Anthropology. Kluwer Academic Publishers, Dordrecht.

1990. (with J. Terrell) Trade networks, areal integration, and diversity along the north coast of New Guinea. Asian Perspectives 29: 156-165.

1991. Traditional medicine and Western medical options among the Ningerum of Papua New Guinea. Pp. 32-55. In: L. Romanucci-Ross, D. Moerman and L. Tancredi (eds.), The Anthropology of Medicine: From Culture to Method.

1991. (with J. Terrell) Continuity and change in economic relations along the Aitape Coast of Papua New Guinea, 1909-1990. Pacific Studies 14(4): 113-128.

1992. (with J. Terrell and J. A. Nadolski) Language and culture on the North Coast of New Guinea. American Anthropologist 94(3): 568-600.

1993. Captain Cook's Voyages of Discovery, originally compiled by J. Barrow, and published in 1860, with a new introduction by R. L. Welsch. Academy Chicago, Chicago.

1994. Pig feasts and expanding networks of culutural influence in the upper Fly-Digul Plain. Pp. 85-119. In: (A. J. Strathern and G. Stürtzenhofecker, eds.), Migrations and Transformations: Regional Perspectives in New Guinea. University of Pittsburgh Press, Pittsburgh.

1996. Language, culture, and data on the north coast of New Guinea. Journal of Quantitative Anthropology 6: 209-234.

MARK W. WESTNEAT

Assistant Curator and Head, Fishes, Department of Zoology, Field Museum.

B.A., Biology, The College of Wooster, 1984.
Ph.D., Zoology, Duke University, 1990.

D. Dwight Davis Award, American Society of Zoologists, 1990.
Raney Award in Ichthyology, American Society of Ichthyologists and Herpetologists, 1988.
Nomination by American Association of Museums for NSF's Alan T. Waterman Award, 1993.

Functional morphology of vertebrates, with emphasis on behavioral kinetics and muscle physiology during feeding and locomotion.

Current studies address the integration of phylogenetic systematics with comparative biomechanics and functional morphology. My research goals in systematics include the resolution of relationships among species and higher level taxa in the fishes of the tropical, marine family Labridae (the wrasses). Character analysis of labrid fishes to date has followed a traditional morphological focus, but data are now being sought from color patterns, behavior, function and perhaps molecules in an attempt to establish a broad character data base to aid tree construction among the 600 labrid species. The functional morphology of feeding and locomotion in living fishes is being studied by high speed film and video analysis of behavior. Using comparative anatomy, theory from mechanical engineering, and new image and motion analysis techniques, the musculoskeletal mechanisms of feeding and swimming are being described in fishes of the Labridae, Carangidae and Scombridae. The goal is to document the mechanisms of force transfer from muscle through connective tissue to skeleton in feeding and locomotor systems. Combined with a phylogenetic hypothesis, this research program tries to clarify the patterns of evolution of functional systems in fishes.

Selected Publications

1993. (with W. Hoese, C. A. Pell and S. A. Wainwright) The horizontal septum: mechanisms of force transfer in the locomotion of scombrid fishes (Scombridae, Perciformes). Journal of Morphology 217: 183-204.

1993. (with J. H. Long, B. Hoese and S. Nowicki) Kinematics of birdsong in sparrows: functional correlates of beak and head motion. Journal of Experimental Biology 182: 147-171.

1993. A phylogenetic hypothesis for the tribe Cheilinini (Labridae: Perciformes). In: Proceedings of the ASIH symposium on Percomorph phylogeny, D. Johnson (ed.), Bulletin of Marine Science 52: 351-394.

1994. Transmission of force and velocity in the feeding mechanisms of labrid fishes. Zoomorphology 114: 103-118.

1995. Feeding, function, and phylogeny: analysis of historical biomechanics and ecology in labrid fishes using comparative methods. Systematic Biology 44: 361-383.

1995. Systematics and biomechanics in ecomorphology. Environmental Biology of Fishes 44: 263-283.

(In press) Functional morphology of aquatic flight in fishes: mechanical modeling, kinematics, and electromyography of labriform locomotion. American Zoologist.

(In press) (with V. Arreola) Mechanics of propulsion by multiple fins: kinematics of aquatic locomotion in the Burrfish, *Chilomycterus schoepfi*. Proceedings of the Royal Society of London.

DAVID WILLARD

Collections Manager, Division of Birds, Department of Zoology, Field Museum

B.A., Carleton College, 1968.
Ph.D., Princeton University, 1975.

My research interests focus on community structure and migration of birds. Before coming to the Field Museum in 1976, I studied the feeding ecology of herons at Brigantine National Wildlife Refuge in New Jersey and the avian fish-eating community of a Neotropical forest in Manu National Park.

Since my arrival in Chicago, my research interests have focused on a local scale while continuing international research. At the local scale, I have spent the last 18 years gathering a large database of spring and fall migrants from along the Chicago lake front. In collaboration with Doug Stotz, I am using this database to study the patterns and timing of bird migration in this region. At the international level, I have continued to conduct studies on the elevational distributions of tropical montane birds. Over the years, this research has lead me to do field work in the Andes and Tepuis of South America, the mountains of Sibuyan Island in the Philippines and the Ruwenzori Mountains of Uganda.

Selected Publications

1995. (With S. M. Goodman and P. C. Gonzales) The birds of Sibuyan Island, Romblon Province, Philippines, with particular reference to elevational distribution and biogeographic affinities. Fieldiana: Zoology, n.s. 82: 1-57.

1991. (with M. S. Foster, G. F. Barrowclough, R. W. Dickerman, P. F. Cannell, S. L. Coats, J. L. Cracraft, and J. P. O'Neill) The birds of Cerro de la Neblina, Territorio Federal Amazonas, Venezuela. Fieldiana: Zoology, n.s. 65: 1-80.

1991. (with S. M. Lanyon and D. F. Stotz) *Clytoctantes atrogularis*, a new species of antbird from western Brazil. Wilson Bulletin 102: 571-580.

1990. (With J. W. Fitzpatrick) *Cercomacra manu*, a new species of antbird from southwestern Amazonia. Auk 107: 239-245.

1985. Comparative feeding ecology of twenty-two tropical piscivores. Ornithological Monographs 36: 788-797.

QIUXIN WU

Collections Manager, Mycology, Department of Botany, Field Museum.

M.S., Microbiology-Mycology, Chinese Academy of Sciences, 1986.
Ph.D., Botany-Mycology, University of Tennessee, 1991.

An interesting biological phenomenon is that eastern North America and eastern Asia, although separated by a vast expanse of water for millions of years, share some common species that cannot be found anywhere else in the world. Extensive data exist on the relationship between the plants and animals of China and eastern North America. However, knowledge of species diversity and distribution of fungi in many areas of the world is sparse, and the relationship between the fungi of eastern North America and eastern Asia is not yet known. My current research project is aimed to help solve this problem by: i) obtaining preliminary data on the biodiversity of macrofungi (i.e. mushrooms and related fungi) in China and comparing these data to the mycota of eastern North America; and, ii) testing several general biogeographic hypotheses by investigating morphological and genetic divergence and variability among and within geographically isolated populations of species that have presumed eastern Asia and eastern North America - Central America disjunct distributions using direct DNA sequencing techniques.

In this bi-national cooperative project, the investigators and student participants conduct joint scientific expeditions in the United States and China. This provides an opportunity for gaining firsthand experience on the mycota of each country and for establishing an infrastructure for continued cooperation between the Chinese and United States mycological community. The main products of the project include joint scientific publications and databases, baseline information for maintaining forest ecosystems in subtropical and temperate regions, and new evidence for understanding biogeographic relationships.

Selected Publications

1991. (with R. H. Petersen) *Auriscalpium vulgare*: mating system and biological species. Mycosystema 4: 25-31.

1992. (with R. H. Petersen) A new species of *Clavicorona* from Japan. Mycotaxon 45: 123-129.

1992. Mating tests and systematics in higher Basidiomycetes. Acta Mycologica Sinica 11(4): 249-257.

1995. (with G. M. Mueller) The genus *Craterellus* (Basidiomycetes, Aphyllophorales) in Costa Rica and Colombia. Documents Mycologiques XXV (98-100): 487-496.

1995. (with K. W. Hughes and R. H. Petersen) A reevaluation of taxa of *Clavicorona* subg. *Ramosa* based on morphology, sexual compatibility and laccase electrophoretic patterns. Sydowia 47(1): 89-124.