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Introduction to the Symposium and Volume

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In 2003, the California Academy of Sciences celebrated its 150th year of existence. Founded on 4 April 1853 by seven amateur naturalists with an abiding interest in the flora and fauna of their new surroundings, the Academy has grown to be one of the major research and public natural history museums in the world. As a public museum, it has devoted no less than 130,000 square feet of space to public exhibits. It has managed an on-site aquarium, ranked as one of the finest anywhere. It built from ground up its own planetarium, star projector included, which was hand crafted in the Academy's instrument shop, a holdover from the Second World War when it repaired optical equipment for the Navy. And, the Academy's leadership role in its outreach programs includes such innovative productions as *Science in Action*, a long-lived public television program under the guidance of and starring the late Academy Curator and Superintendent of the Academy's Steinhart Aquarium, Earl Stannard Herald; this program preceded *Nova* and other science education programs that are now so popular on television.

Although founded in 1853, the Academy, then known as the California Academy of Natural Sciences, a name subsequently shortened to California Academy of Sciences in 1868 during the presidency of Josiah Dwight Whitney, did not have its own museum building until 1874, when it acquired a lease on the recently vacated First Congregationalist Church on Dupont Street. It was there that the museum and its "cabinet" were opened to the public in 1876, during the hours of 9 a.m. and 4 p.m. daily, and there it remained until 1891. In 1891, the Academy moved lock-stock-and-barrel to a magnificent building built for it on Market Street, in downtown San Francisco. This event was made possible by the generosity of San Francisco hotel magnate, philanthropist, and recluse James Lick, who donated the land to the Academy in 1876 and additional moneys for the building on his death. In 1882, again through the generosity of other persons of wealth, namely Leland Stanford and Charles Crocker, the Academy acquired its first major materials for public exhibit from Henry Augustus Ward of Rochester, New York. This, plus the ethnographic, botanical, and zoological specimens, especially from Western North America, that Academy members had been donating over the 30-plus years of its existence, and the multiple donations of literally

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RESEARCH COLLECTIONS in large natural history museums, botanic gardens, and other institutions of natural history preserve samples of the worlds' biodiversity, living and extinct. They support not only research by scientists and students training to become the next generation of systematists and students of evolution, but they provide much of the information that the institutions' Education and Public Exhibits Departments use to teach students, teachers, and the public-at-large of the of the facinations of the richness of their environment, of the joys of understanding its diversity, and of the need to engage in conservation and preservation of their natural heritage. Shown here are a few samples from the research collections of the California Academy of Sciences: (A) Entomology (Insects); (B) Anthropology (Human cultural artifacts); (C) Ornithology (Birds); (D) Ichthyology [Fishes]. Photos by Dong Lin. The California Academy of Sciences is home to moree than 18 million specimens.

thousands of books by the Smithsonian Institution (all duplicates from its own library, through the kindness of Smithsonian Secretary Joseph Henry) propelled the Academy into one of the world's leading institutions devoted to the study of natural history.

The devastating earthquake and fire of 18 April 1906 that engulfed San Francisco and its Academy of Sciences might have spelt *fin* to its noble efforts to play a leading role in natural history research and education but, nearly 10 years later almost to the day, the Academy reopened in its new home in Golden Gate Park, in two buildings, one devoted exclusively to public exhibits, the other to research. Even during 1906 to 1916, when the Academy's departments were scattered throughout the city, its curators and their colleagues at neighboring institutions, the University of California at Berkeley and Stanford University, carried on an aggressive program of research and field work.

In 1917, in response to a bequest to the City of San Francisco by Ignatz Steinhart, and with the approval of the voters of San Francisco, the Academy was asked to take on administration of the newly authorized Steinhart Aquarium, which was to be build on land immediately adjacent to the newly opened Academy halls. The Steinhart Aquarium opened to the public in 1923.

Dynamic institutions like the California Academy of Sciences never cease to grow, never cease to look for innovative ways to reach out to the public and to conduct research. The exploration and interpretation of the wonders of the natural world are the bread and butter of natural history museums like the Academy and its sister institutions, other natural history museums, botanical gardens, and, in recent years, zoological gardens or zoos.

After nearly 90 years, some of the Academy's buildings showed their age. No longer could simple maintenance or even substantive upgrading meet the seismic requirements for public buildings; neither could patchwork changes meet the needs of an institution that was looking ahead to the 21st century, nor to the requirements of its research program, with its ever expanding collections and demands for space to house them, nor to those of an institution that was seeking innovative ways of reaching out to the public-at-large to inform it about the environment in which its people live and work and about how best to conserve its heritage in that natural world.

But, the Academy is not alone in this venture. Other institutions of natural history face similar concerns, and to share solutions to these problems, we organized this symposium — to look at the past, to look at the present, and to look into the future! Our symposium participants have done their homework. Each contributor surveys a different aspect of museum life. Yet, none is neglectful of the whole and their collective stories are revealing.

Dr. Sally Kohlstedt leads off with an overview of the museum movement in the United States dating from 1794 when Charles Willson Peale rented space in the recently built Philosophical Hall in Philadelphia to open a public gallery to display his collection of art and natural history artifacts. Kohlstedt traces the development of the buildings themselves that house museums of natural history inasmuch as they distinctly reflect the changing perceptions and even the needs of the community in which they are located.

Dr. Pamela Henson provides an overview of the development of a national science from its beginnings during the Colonial era to the establishment of the Smithsonian Institution and its National Museum of Natural History, with special reference to the Institution's first Secretary, Joseph Henry and his entrepreneurial Assistant Secretary, Spencer Fullerton Baird. Baird is responsible for establishing the protocols for many aspects of today's natural history museums in the United States. But, beyond the nation's capitol, regional differences have imprinted themselves.

Dr. Barbara Ertter looks at both regional and disciplinary aspects of the museum movement. She focuses on California and, notably, on botany in the San Francisco area where three natural history museums came into being during the second half of the 19th century. Her contribution deals

more with the human aspect of museums, the clash of personalities, and how these influenced the location of museums and related programs.

Natural History Museums place their numerous artifacts on display for the public to see. Just how much the public learns from what they see, aside from being awed by the strange creatures before them, prompted people like Charles Willson Peale and his successors in museums to find better ways in which to exhibit their wares. Hanna Rose Shell deals with one of the most successful of these innovators, William Temple Hornaday, who, in the late 19th century, developed what was to become a widely accepted way of presenting material to the public, the habitat group, and to inform the public about emerging issues of conservation long before it became a household topic.

The Smithsonian Institution and notably its National Museum of Natural History, formerly the United States National Museum, has had a deep and lasting impact on the modern natural history museum movement in the United States. It is also the second oldest surviving public natural history museum of its kind in the country that has major commitments to both public education and research programs in the natural sciences. Only the Academy of Natural Sciences in Philadelphia, founded in 1812, is senior, and the California Academy of Sciences, founded in 1853, its immediate junior. Therefore, it is always a matter of considerable interest to see how the National Museum has fared over the years, and this is the subject of Dr. Ellis L. Yochelson's interesting essay which deals with the ups and downs of the administrative history of the institution from its founding to the present day.

Not all institutions of natural history are museums, and not all deal with a panoply of natural history disciplines. There are others, and some have narrower foci, such as the United States Geological Survey, founded in 1879, and the Scripps Institution of Oceanography, established in 1903. The former, for many decades the premier scientific agency of the United States government, is the subject of a contribution by Dr. J. Thomas Dutro, Jr., who looks at the program of one of the Survey's divisions, the Paleontology and Stratigraphy Branch, and the people and programs that occupied its attention from immediately following the Second World War to its demise in the late 1990s.

Too often, natural history museums neglect much of the natural history associated with more than two-thirds of the Earth's surface, most often because (save for aquaria fish) the oceans and their depths do not lend themselves to public display and their scientific study often requires resources that are beyond the means of the museums themselves. Dr. Ronald Rainger presents a birdseye view of one institution, the Scripps Institution of Oceanography, now part of the University of California, San Diego, whose programs are devoted almost exclusively to the study of the seas and to the education of future generations of young scientists to continue the work of their forebearers. Rainger supplies the political and economic history context necessary to understand the history of Scripps.

University-based natural history museums are not new; they have been around for a long time, but they are responsible to a different audience than the large, free-standing, public museums. They sponsor research and field work, as do the large public natural history museums. But their clientele are the students, undergraduate and graduate, and their programs are largely tailored to these ends. Dr. Jere Lipps, in his contribution on the Museum of Paleontology at the University of California, Berkeley, treats us to an insider's view of that venerable program, which leads us to the observation that institutions devoted to the study of the natural sciences are, in reality, not so different from one another despite the venue of their operations.

The 21st century is now upon us; it is in its infancy; there are 95 years left before the century clock strikes the witching hour again. That is a goodly span of time and museums, like all other

human endeavors, must take a moment to step back, look at the past, evaluate the present, and after gazing thoughtfully into the crystal ball, make some predictions for the future. For natural history museums, this is an especially demanding time; they are vulnerable to changes in society that may view their activities as not relevant to its needs. For instance, during the 20th century, experimental biology in general, and more recently studies at the molecular level of organization, have eclipsed organismal biology and pushed natural history studies further into the background of the biological sciences. With increasing concerns about the environment, a renaissance of sorts came into play during the late 1980s and 1990s in the guise of biodiversity and environmental studies, and this was enhanced by the application of biomolecular techniques to the study of plant and animal genealogies, phylogenetics.

Thus, a burning question today is how can museums and other institutions of natural history remain relevant in the light of the changes that have taken place in the study of plant and animal relations and in the light of the public's perception of what it needs to know about the environment. We have gained insights from our retrospective review of museums. We now come to the prospective overview. To do this, we asked several people who have given much thought to these matters to give us the benefits of their insights.

John Farnum, museum consultant to the California Academy of Sciences, assisted the Academy's staff in developing plans for the new Academy facilities that are scheduled for construction in Golden Gate Park this next year. Farnum minces no words; museums of natural history are in danger of becoming irrelevant unless they adapt to the changing needs of society. He lays out what he believes are the problems and offers suggestions for addressing them. He stresses that museums should work together as a networked community of information/experience providers to take advantage of the multiple channels for communication that can emphasize both actual and virtual experiences to attract attention and better inform and educate the public.

Museum directors and their colleagues in their respective institutions are attempting to address many of the concerns raised by Farnum, at different levels, depending on their situation. Drs. Scott Sampson and Sarah George, chair of the Department of Paleontology and Director of the Utah Museum of Natural History respectively, talk about a State University-based natural history museum and how it plans to meet the needs of the 21st century in the design of its new facility in Salt Lake City. In a like manner, Dr. Warren Allmon, Director of the Paleontological Research Institution in Ithaca, New York, a regional museum that has both public and research facilities, reveals much about how he and his colleagues went about planning for their newly constructed Museum of the Earth, which opened to the public in late 2003.

Dr. Peter Raven, Director of the Missouri Botanical Gardens in St. Louis, Missouri, offers thoughts about another kind of natural history museum, one that maintains large numbers of living plants, both native and exotic, in both large outdoor gardens and in glass-enclosed hothouses, as well as a large research herbarium, which stores hundreds of thousands of carefully dried plants that are mounted on sheets of paper and kept for study by scientists and students. He uses this as a point of departure to address nagging questions of how to stay relevant in both the public eye and in the research community in the 21st century.

Following Raven, Dr. David Kavanaugh, Director of Research at the California Academy of Sciences, describes in some detail, how he and his colleagues went about planning for the research needs of the Academy in its "museum of the future." Lastly, Dr. J. Patrick Kociolek, Executive Director of the California Academy of Sciences, closed the symposium with a summary statement of how the Academy planned for its new facilities, how it engaged people, both internal and external to the institution, in the planning process, and what it expects to achieve as a result of the years of preparation that have gone into the design of its new museum.

Dr. Terrence Gosliner, Provost of the California Academy of Sciences, prepared a brief epilogue for the volume, which clearly shows that the response of institutions of natural history to meet the ever changing needs of society is as much an internal as it is an external desire inasmuch as science itself is an ever evolving intellectual endeavour.

Acknowledgments

We want to thank the speakers, now authors, for their thoughtful and perceptive contributions in addressing the most fundamental question before us, can museums of natural history sponsor programs in the natural sciences in the 21st century that are both relevant to society and relevant to the advancement of scientific knowledge. We also thank many of these same colleagues who went the extra mile and helped with the review of the submitted manuscripts. In this regard, we must single out Dr. J. Thomas Dutro, Jr., U.S. Geological Survey [ret.], Washington, D.C., who read and critiqued all of the manuscripts in their penultimate format. Those who kindly critiqued individual articles are acknowledged in each essay. Finally, we gratefully acknowledge the sponsoring role of the Pacific Division of the American Association for the Advancement of Science, especially its current Executive Director, Roger Christianson, and of the administration of the California Academy of Sciences for both encouragement and participation in the program.

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TESTING NEW CONCEPTS IN MUSEUM DISPLAYS: LIVE ANT EXHIBIT AT THE "TEMPORARY" QUARTERS OF THE CALIFORNIA ACADEMY OF SCIENCES' NATURAL HISTORY MUSEUM IN DOWNTOWN SAN FRANCISCO

An innovative exhibit, a fully self-contained colony of live Trinidad army ants, which integrates a broad range of biodiversity and phylogenetic concepts, including habitat utilization and resource partitioning, morphological adaptations, population survival, and communal behavior. The exhibit is supported by explanatory materials and minidisplays which are arranged around the central terrarium.