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Success Story: The History and Development of the Museum of Paleontology at the University of California, Berkeley

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The University of California Museum of Paleontology (UCMP) has diverse roles in the university, national and international science and education communities, providing resources for research, teaching and outreach. These programs developed over the last 150 years, and are substantial mainstays of the natural history program at UC Berkeley. UCMP's history is rooted in the formation of the State of California, and its early decisions about resources and education. After an initial attempt to gather information on the mineral and natural historical wealth of California, the Legislature appointed J.D. Whitney as State Geologist and Director of the Geological Survey of California (1860–1874). Some of the Survey's collections formed the foundation of the paleontological, zoological and botanical museums of the University of California, founded in 1868.

Joseph LeConte, the first geologist, natural historian and botanist appointed to the faculty of the university, encouraged paleontology through his lecturing, particularly on evolution and fossils, his students, and his acquisition of fossil collections for the university. His most brilliant student, John C. Merriam became the first professor of paleontology, and though his interactions with Annie Alexander, a wealthy woman with a paleontological avocation willing to support the field at Berkeley, the first Department and later Museum of Paleontology were formed in 1909 and 1921. Although developments were not always smooth, a strong and internationally-recognized paleontology program emerged before World War II, followed by increasing strength and diversity of programs in the years after the war.

Strong educational programs were assembled in the Department of Paleontology, and the Museum continued to gather fossils until it now has the largest fossil collection in any university in the world and second in size only to the Smithsonian in the USA. In the last decade and a half, the paleontology program has emerged at the top in America, in large part because of the research and educational resources of UCMP. In addition, a very powerful Internet-based outreach program for the public, teachers and students attracts millions of visitors and international attention. UCMP, its associated faculty and its students are a highly regarded, unique resource of the University of California that continues to inform studies of conservation biology, biodiversity, evolution, systematics, paleoenvironments, astrobiology, and environmental biology. Paleontology at Berkeley interfaces with a larger number of other disciplines in the life and earth sciences than ever before and it continues to make significant contributions on all fronts of research, teaching and outreach. UCMP and the paleontology program are very big on-going success stories!

Visitors to the University of California at Berkeley often ask questions about the Museum of Paleontology (UCMP): "What is the Museum of Paleontology? Where is it? Why does it exist?

Who uses it? When will it go extinct?" These are not easy questions to answer for a museum that traces its beginning back 150 years ago, to even before the founding of the University that houses it, that has had many hundreds of faculty, staff and students, plus a few benefactors, and that contains more fossils than any other museum in the USA save the Smithsonian Institution. Its history is rich, its services are diverse, the accumulation of so many fossils has involved many different kinds of efforts, and all its people had personalities, goals and wishes that were seldom focused identically. Although paleontology has been an important discipline on the Berkeley campus since its founding in 1868, UCMP was not formally established until 1921. Nevertheless its collections, traditions, associations with departments, and early personalities are interwoven with the earliest history of the State of California and the University of California. UCMP is and always has been a multifaceted and complicated organization! This essay is a summary of this complexity starting in the 1840s through the present, and even with some projections into the future.

UCMP has usually been closely associated with the paleontology faculty and students in the former Departments of Paleontology or Geology and the current Departments of Integrative Biology and Earth and Planetary Sciences (Table 1). Together the museum and departments have been on-going success stories, and their histories are intertwined. The program has had a few difficulties and many major victories along the way, but it has always moved forward and been a center for paleontology, geology and evolutionary biology in the West. The work goes on with the same vigor and rigor today as past UCMP paleontologists used. Indeed, the University of California can be justly proud of the paleontology program, UCMP and their century and a half of work and contributions!

What is the Museum of Paleontology?

UCMP is a research and educational center of the UC Berkeley campus. Its mission is to support research, teaching and outreach in paleontology, sedimentary geology, evolutionary biology, systematics, molecular biology, and, increasingly, conservation and environmental biology. As the possibility that life may be discovered on other planets arises, UCMP is also involved in astrobiology. To do all this, it maintains and keeps track of the second largest collection of fossils in the United States and largest of any university in the world. These collections provide the basis for much of the rest of the work and mission of UCMP. UCMP has seven laboratories, much equipment, pertinent reference papers and books, computer facilities for science, outreach and data base activities, and archives of documents and photographs related to past UCMP activities and people. These are the things that make its mission achievements outstanding.

One thing UCMP is not: A display museum in the usual sense that most people understand one as a place to visit to see fossils. It has, for the most part, only a few displays (Fig. 1); instead it is more akin to a library with cabinets full of fossils that tell separate stories about life in the past, just waiting for scientists to unravel. And unravel these life stories they have done!

UCMP is one of eight museums for which managerial responsibility lies with the Office of the Vice Chancellor for Research. The museum itself is simply organized. A Director, who must be a faculty member in the Academic Senate, heads it (Table 2). The Director reports to the Vice Chancellor for Research. Faculty curators are members of campus departments (they are not employed by UCMP) who maintain research and teaching interests commensurate with the UCMP mission (Table 1). They act primarily in an advisory capacity to the Director and museum, and they work to develop the collections. Over the years, the paleontology program has had a number of highly skilled and competent scientists working on the collections (Table 3). Without them, UCMP could not have become what it is, but their achievements, as important as they have been, were not

TABLE 1. Faculty in paleontology and/or Faculty Curators of UCMP, 1869–2004. Many graduate students and visiting scientists were appointed as instructors or lecturers at various times. Likewise, many had temporary positions in UCMP. Most of these Faculty Curators remained associated with UCMP after their retirement.

Faculty Curators in UCMP or its Antecedents and Their Departments.	*Discipline*	*Dates at UCB and UCMP **
Joseph LeConte, Geology & Natural Sciences	Geology, Natural History & Botany	1869–1901
John C. Merriam, Paleontology	Vertebrate paleontology	1894–1921
Bruce L. Clark, Paleontology	Invertebrate paleontology	*1918–1945
John P. Buwalda, Geology	Vertebrate Paleontology	1921–1926
Chester L. Stock, Geology	Vertebrate Paleontology	1921–1926
Charles L. Camp, Zoology	Vertebrate paleontology	*1922–1930
Paleontology		*1930–1960
William Diller Matthew, Paleontology	Vertebrate paleontology	*1927–1930
Ruben A. Stirton, Paleontology	Vertebrate paleontology	*1949–1966
Ralph Chaney, Paleontology	Paleobotany	*1931–1957
Robert M. Kleinpell, Paleontology	Micropaleontology	*1946–1973
J. Wyatt Durham, Paleontology	Invertebrate paleontology	*1947–1975
Emeritus		*1975–1996
Donald E. Savage, Paleontology	Vertebrate paleontology	*1949–1987
Emeritus		*1987–1999
Ralph Langenheim, Paleontology	Invertebrate paleontology	*1952–1957
Zach Arnold, Paleontology	Micropaleontology	*1957–1978
Wayne L. Fry, Paleontology	Paleobotany	*1957–1988
F. Clark Howell, Anthropology	Human evolution	1970–1991
Emeritus		1991–
Human Evolution		*1996–
Joseph T. Gregory, Paleontology	Vertebrate paleontology	*1960–1975
Emeritus		*1975–
William B. N. Berry, Paleontology	Invertebrate paleontology Environmental geology	*1960–1989
Geology		*1989–
William A. Clemens, Paleontology	Vertebrate paleontology	*1967–1989
Integrative Biology		*1989–2003
Emeritus[1]		*2003–
Timothy D. White, Anthropology,	Human paleontology	1977–1988
Integrative Biology		*1989–
Carole S. Hickman, Paleontology	Invertebrate paleontology & Paleobiology	*1978–1989
Integrative Biology		*1989–
A. Roger Byrne, Geography	Palynology	*1979–
Charlotte Brunner, Paleontology	Micropaleontology	*1979–1987
Kevin Padian, Paleontology	Vertebrate Paleontology	*1980–1989
Integrative Biology		*1989–
Jere H. Lipps, Paleontology	Micropaleontology &and Paleobiology	*1988–1989
Integrative Biology		*1989–
Roy L. Caldwell, Zoology	Animal Behavior	1970–1989
Integrative Biology	Invertebrate evolution	*1989–
James W. Valentine, Integrative Biology	Paleobiology	*1990–1993
Emeritus		*1993–
Anthony Barnosky, Integrative Biology	Vertebrate paleontology	*1990–
Lynn Ingram, Geography	Isotope paleontology	1995–1998
Earth & Planetary Sciences		1998–
		*1996–
Walter Alvarez, Geology	Extinction theory	1977–
		*1991–
David Stoddart, Geography	Coral reefs	1986–2001
		*1991–2001
Nan Crystal Arens, Integrative Biology	Paleobotany	*1993–2001
David R. Lindberg, Integrative Biology	Invertebrate paleontology	*1994–

[1] Clemens retired from the faculty in 2003, but was recalled to be Interim Director of UCMP in 2003–2004.

FIGURE 1. *Tyrannosaurus rex* exhibited in the spiral stairway outside the Museum of Paleontology on the ground floor of the Valley Life Sciences Building. The *T. rex* is an exact replica of a specimen collected in Montana by the Museum of the Rockies and purchased by UCMP and the Dean of Biological Sciences. The cast was erected by Mark Goodwin and his crew over three months with an opening of the exhibit, the *T. rex* Expo in September, 1995. Photograph by Jack Penkethman, 2001.

recorded in detail because many of them were short-term employees, students or volunteers. Now professional paleontologists (all have Ph.D.s) are employed as Museum Scientists by UCMP. They are in charge of the collections and laboratories, and provide expertise in certain groups of organisms. One of them oversees the entire scientific operation of the museum, while four others are directly responsible for the maintenance of the collections, curation of new materials into them, and certain laboratories under the general supervision of the Director. Graduate students associated with the Faculty Curators use the collections on material that they know well, and undergraduates are also hired to work in the collections where they perform a variety of specimen-based or database tasks. Visiting Scholars and Researchers come to UCMP to work on research projects of their own or in conjunction with Faculty Curators or Museum Scientists. UCMP also employs a preparator, a molecular biologist, an outreach specialist, an administrative assistant, and several other support staff. Overall, the museum involves the activities of about 12 staff, 18 Faculty curators, usually about 20 graduate students and a variable number of undergraduates, plus occasional visiting researchers. UCMP has not always been organized this way, but the current arrangements are complete, efficient and functional.

The chief responsibility of the museum is the development and maintenance of collections of fossils and related materials used in research, teaching and outreach. These collections are quite complex too. They contain representatives of every major lineage of life, from bacteria to vertebrates, from just about every geological time segment from the early Precambrian to the Recent, and from places all over the globe, although most are from western North America. These collections have grown for nearly 150 years and continue to grow now. Not all of the specimens are fossils; indeed UCMP has about ½ million modern invertebrates, thousands of pollen grains from liv-

ing plants, a collection of cleared modern leaves, the skeletal elements of many living vertebrates, and modern representatives of foraminifera, radiolaria, coccolithophorids, and other microorganisms. These modern specimens form an important collection, for paleontologists need comparative material from living organisms to understand the relationships, ecology and function of extinct forms. Some of these collections are unique, for example the J.G. Cooper collection of non-marine snails made for the Geological Survey of California in the early 1860s, and provide ecologic guidelines for what California was like before its massive development.

The UCMP collections contain millions (billions or tril-

TABLE 2. Directors of the University of California Museum of Paleontology, 1921–2004.

Dates	*UCMP Paleontologist*	*UCB Ph.D.*
1921-1927	Bruce L. Clark, Invertebrate paleontologist	1914
1927-1930	William D. Matthew, Vertebrate paleontologist	
1930-1935	Charles L. Camp, Vertebrate paleontologist	
Fall 1935	Samuel P. Welles, Vertebrate paleontologist	1940
1936-1949	Charles L. Camp, Vertebrate paleontologist	
1949-1966	Ruben A. Stirton, Vertebrate paleontologist	1940
1958-1960	*Robert M. Kleinpell, Micropaleontologist	
1967-1968	*Donald E. Savage, Vertebrate paleontologist	1949
1968-1971	Donald E. Savage, Vertebrate paleontologist	1949
1971-1975	Joseph T. Gregory, Vertebrate paleontologist	1938
1975-1977	*William B. N. Berry, Invertebrate paleontologist	
1977-1988	William B. N. Berry, Invertebrate paleontologist	
1988-1989	William A. Clemens, Jr, Vertebrate paleontologist	1960
1989-1997	Jere H. Lipps, Micropaleontologist	
1996-1997	*David R. Lindberg, Invertebrate paleontologist	
1998-2003	David R. Lindberg, Invertebrate paleontologist	
2003-2004	** William A. Clemens, Jr, Vertebrate paleontologist	1960

* Acting Directors. **Interim Director

TABLE 3. Some of the scientific staff of the fossil collection 1880–2004. UCMP was established with a staff in 1921. Many students and temporary assistants were also employed over the years in UCMP but they cannot be included here. These scientists made substantial contributions to the museum in terms of research, curation, and innovation. This list is incomplete.

JamesJohn Rivers	Curator of the University Museum.	1880s & 1890s
Eustace L. Furlough	Curator and preparator	1917–1926
Ruben A. Stirton	Curator of mammals	1929–1949
Samuel P. Welles	Museum Paleontologist	1930–1978
Joseph Peck	Museum Scientist in invertebrate paleontology	1948–1988
John Hutchison	Senior Museum Paleontologist	1964–1993
J. D. Gouge	Museum Scientist in Recent Microorganisms	1960s–1970s
Gordon Hornaday	Museum Scientist in Micropaleontology	1960s–1970s
Howard Schorn	Museum Paleontologist	1964–1993
Mark Goodwin	Museum Specialist	1978–
Robert Takagi	Museum Scientist in Invertebrate Paleontology	1960s–1990
David Lindberg	Research Paleontologist	1982–
Laurie Bryant	Museum Scientist	1987–1989
Karen Wetmore	Museum Scientist in Micropaleontology	1991–2000
Anthony Fiorillo	Museum Scientist	1992–1995
Susan Jenks	Museum Scientists in Molecular Biologist	1995–1997
Martin F. Wojciechowski	Museum Scientist in Molecular Biologist	1998–2001
Pat Holroyd	Museum Scientist in Vertebrate Paleontology	1995–
Diane Erwin	Museum Scientist in Paleobotany	1995–
Jane Mason	Preparator	1997–
Sharon Mosel-Lynch	Museum Scientist in Molecular Biologist	2001–
David Haasl	Museum Scientist in Invertebrate Paleontology	2002–
Kenneth Finger	Museum Scientist in Micropaleontology	2002–

lions, if each microfossil were counted!) of specimens; many hundreds of thousands are numbered and curated into individual trays in storage cabinets, and many others are still in collection plaster jackets or rocks. They are divided into five parts, each of which is overseen by dedicated Museum Scientists, and several sub-parts: Micropaleontology (mostly the microscopic fossilized and modern remains of tiny single-celled organisms, especially foraminifera, radiolaria, and various groups of single-celled algae), Palynology (fossil and modern pollen and spores), Paleobotany (fossil plants), Invertebrate Paleontology (representing sponges through sea squirts), and Vertebrate Paleontology (all vertebrate animals except humans). Each of these very large collections has subcollections of type specimens (those that have been illustrated or documented in the scientific literature), including primary (holotypes, paratypes) and secondary types. In total, about 40,000 type specimens are cataloged by UCMP and are listed (in part) on-line at www.ucmp.berkeley.edu. A collection of modern organisms containing DNA that has been analyzed in the museum's molecular phylogenetics lab is also developing. Teaching collections of fossils and modern organisms used in courses taught at UC Berkeley, including beginning courses for freshmen all the way to advanced graduate specialty courses, are also maintained by UCMP.

Some very special collections are housed in UCMP. These include collections made by organizations or individuals other than the faculty, staff and students of the museum. The special collections have great significance because they were donated to UCMP. These include, for example, the Geological Survey of California collection of invertebrate fossils made between 1860 and 1863 (Fig. 2), the Whitfield Paleozoic invertebrate collection made in the 1870s and 1880s, the Crawfordsville (Indiana) crinoid collection also made in the 1880s, the T. Wayland Vaughan collection of 627 slides of larger foraminifera donated to UCMP when Vaughan was Director of the Scripps Institution of Oceanography, the Loeblich and Tappan life time collection of over 6000 microfossil samples, the Los Angeles County Museum of Natural History's paleobotany collection, the UCLA Microfossil Type Collection, the UC Riverside Fossil Mammal Collection, the U.S. Geological Survey invertebrate fossil collection, the Lambert modern coral collection, the Thomas and Beatrice Burch Hawaiian sample collection, several very large microfossil and invertebrate collections donated by oil companies, and many more.

FIGURE 2. Fossil ammonite originally described by Gabb (1864b) in the first volume of the Geological Survey of California from fragments as *Criocera percostatus* and reconstructed as an evolute form. In the second GSC paleontology volume, Gabb (1869:138, pl. 24, fig. 19) recognized that he had placed several fragments of a heteromorph ammonite together, based on new material including this specimen donated by C.D. Voy to the University of California, and he reassigned the species to *Ancyloceras percostatus* (Gabb). Later, Anderson (1938) recognized that the Voy specimen represented a new genus and species, *Shastoceras californicum*. Image by Lorraine Cazassa, 2004.

UCMP has a large specimen preparation, micropaleontology preparation, acid preparation, thin-section and histology, general use, DNA extraction, and molecular sequencing laboratories. The full resources of the Berkeley campus are available as well, including stable isotope, electron

microscope and chemical analysis laboratories. The molecular sequencing laboratory, known as the Molecular Phylogenetics Laboratory (MPL), is jointly operated with the University and Jepson Herbaria. MPL provides paleontologists with another kind of historical record that can be used to interpret relationships between groups and comparisons to the fossil record of evolutionary events. All of these laboratories are well equipped and are used by UCMP faculty, staff, Visiting Scholars, graduate and undergraduate students, and occasional visitors from elsewhere. Without these laboratories and equipment, much of the study of fossils would not be possible.

Where is the Museum of Paleontology?

This question is not easy to answer, for the museum has moved several times, has occupied more than one building at a time, and some of its best known contributions occupy no space at all but reside only in memory on its computers that provide linkages to the World Wide Web (Scotchmoor and Lipps, 1995). The growth of the collection, faculty and staff over the years and the increasingly sophisticated laboratory requirements have forced paleontology to move five times since 1873 (Table 4). At first courses in natural history were held in Oakland (1869–73), and then moved to South Hall (Fig. 3), constructed in 1873 and which still stands today, where a museum was opened that displayed fossils, among other natural history items. In 1911, the space had become too crowded so the Bacon Arts and Library Building was renovated, renamed Bacon Hall (Fig. 3), and paleontology moved into it (Wagner 1969). Later buildings were the Hearst Mining Building, with collections stored around the balconies, the Earth Sciences Building (now McCone Hall), and finally in 1995, the Valley Life Sciences Building (VLSB) (Fig. 4).

Table 4. Buildings occupied by paleontology at the University of California from 1873–2004. Joseph LeConte and his fossil collections and museum, Department of Paleontology and the University of California Museum of Paleontology from 1873 to 2004 (partially from Gregory 1995). Asterisks (*) indicate facilities used chiefly for storage only.

Name of Building	*Dates of Occupation*	*Campus Location*	*Functions. and Reasons for Moving*
South Hall	1873–1911	Central Campus	Exhibit of fossils, faculty offices.
			Too crowded.
*California Hall	Late 1800s–1911	Central Campus	Storage in basement.
			Moved to Bacon Hall.
Bacon Hall	1911–1930	Central Campus	Exhibits, collections, offices.
			A. Alexander initiated move with President Wheeler because collections were unsafe there.
*Campanile	1914–present	Central Campus	Storage. Four floors are filled with fossils, mostly from Rancho La Brea.
Hearst Mining Building	1931–1961	East Campus	Exhibits, collections, offices.
			Moved to new Earth Sciences Building (now McCone Hall) built for Paleontology, Geology and Geography.
*UC Storage Facility, Richmond	1961–1981	City of Richmond	Bulk storage and large specimens.
			Closer storage available at Clark Kerr Campus and Marchant Building.
Earth Sciences Building (now McCone Hall)	1961–1995	North Campus	Collections, offices, exhibits.
			Paleontology consolidated with Integrative Biology and faculty and UCMP moved to renovated Life Sciences Building, renamed the Valley Life Sciences Building.
*Clark Kerr Campus (Dwight-Derby)	~1982–present	South of main campus.	Large specimen preparation lab and storage for bulk specimens and collections.
*Marchant Building	~1982–present	6701 San Pablo Ave.	Bulk storage area (large specimens, old exhibits, casts, and others).
Valley Life Sciences Building	1995–present	West Campus	Collections, offices, labs. UCMP occupies most of the west wing of the lower floor. Some public exhibits in halls.

The museum for sometime has had such a large collection that it can't be stored in a single place, so UCMP now has five different areas (Table 4) to keep its collection. The main research collection and museum is in VLSB in a facility designed and built for them. The cabinets containing the specimens are mounted on compactors that nearly double the storage space of the room. Seven laboratories and Museum Scientists' offices are distributed near the collections. Faculty curators also have offices and laboratories in VLSB or McCone Hall, but these are departmental not museum spaces. UCMP has another laboratory at Clark Kerr Campus, where specimens that are too large to be handled in VSLB are processed. The Clark Kerr Campus facility also houses storage areas for large collections and specimens, such as whales and dinosaurs, and the Loeblich and Tappan collection of microfossils, all processed material collected by them around the world. The Campanile (or Sather Tower) was completed in 1914 and has five very tall floors (Fig. 5). Four of them belong to the Museum of Paleontology and they're filled chiefly with vertebrates from the Pleistocene Rancho La Brea collected between 1906 and 1913. McCone Hall, the old Earth Science building that was vacated when the museum moved to VLSB, still houses the palynology collection. UCMP has special areas in the Marchant Building at 6701 San Pablo Avenue, Berkeley, a general facility of the university, with whale, dinosaur and other bulky specimens and items stored in them.

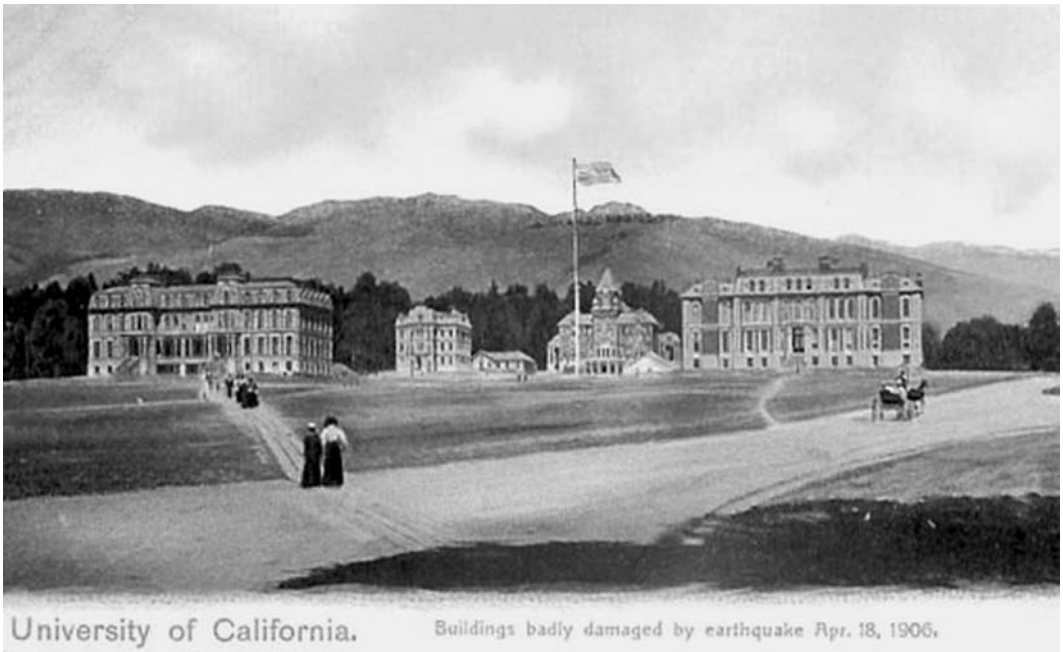

FIGURE 3. The first two buildings housing paleontology at the University of California. In this view looking northeasterly, the Berkeley campus stands as it was from about 1881 through the early 1900's (see Pickerell and Dornin, 1968). In 1873, LeConte moved into South Hall (right) to teach geology, natural history and botany (Fig. 11) and to organize a museum with geological and fossil materials. The newly organized Department of Paleontology (1909) was housed there until 1911, when it and the Geology Department moved to Bacon Hall (center, behind flag pole). Paleontology and Geology stayed in Bacon Hall until 1930 when both moved to the Hearst Mining Building (not shown). North Hall (left), Bacon Hall and the Mechanical Arts Building and annex (left of Bacon Hall) were demolished, but South Hall still stands as the campus's oldest building, just south of the Campanile. It was renovated in 1968–70 and seismically upgraded in 1986–88 (Braunstein, 2003). From a Charles Weidner chromolithograph post card from 1906 with the caption "University of California. Buildings badly damaged by earthquake, April 18, 1906". Post card is numbered 17. Printed in Germany. From the J.H. Lipps collection.

FIGURE 4. The Museum of Paleontology moved into new quarters on the ground floor (lower right) of the Valley Life Sciences Building in 1995. Image by J.H. Lipps, 2004.

WHY DOES UCMP EXIST?

UCMP exists because of the role paleontology played in the early history of the state and university, and its continuing importance to the economy of the state and education of its students. UCMP's history thus tracks the development of the State of California, starting when California was part of Mexico, to the description and interpretation of fossil biotas throughout the state and the west, through the oil boom before and after World War II, to the modern study of paleobiology and its use in evolution and environmental studies.

Paleontology in California before 1900 can be divided into two parts, the period from American explorations and intrusions into Mexican California to the publication of volume 2 of the Geological Survey of California in 1869 and the period starting in the 1890s (Merriam 1921). The history of the University of California Museum of Paleontology is tied to both of these periods, although the UCMP itself was not yet even an entity. The events in the 1840s and 1850s shaped later decisions by the State that got the Museum of Paleontology's collections off to a beginning and made the University the center for paleontology in the west. Paleontology at UC Berkeley after 1900 can likewise be divided into two parts: the era of Annie Alexander as beneficiary and visionary and the post World War II through modern period.

FOUNDATIONS OF PALEONTOLOGY AT THE UNIVERSITY OF CALIFORNIA, BERKELEY

The first scientific interest in fossils in the state was by John C. Fremont during his military operations in Mexican California from 1843–44. He had no geologist, but he collected fossils anyway which were later described by James Hall (Hall 1845; Hall and Fremont 1845). When the United States finally declared war on Mexico in May 1846, Fremont, who had been in California agitating for independence, subdued parts of the state, and later accepted the surrender of Andres

Pico in January 1847, ending the fighting in California, but not the rest of Mexico. Just before California officially became part of the United States under the Treaty of Guadalupe Hidalgo with Mexico (Feb. 2, 1848), gold was discovered at Sutter's Mill on the American River (January 24, 1848). Word spread slowly at first (Ryan 1971), to Sacramento, then San Francisco in May, across the Pacific to Hawaii and up the coast to Oregon, but it was not until President James Knox Polk addressed Congress on December 5, 1848, on the abundance and value of gold in California that a country-wide gold rush began (Bieber 1948). The gold-seekers headed west in huge numbers ("The 49'ers"), creating a need for information about the resources of the new territory. Up to this time, the geology of California had been generally ignored, although Philip Tyson and James Dana had traveled through the region, and they immediately reported on the geology of the deposits and of California (Dana 1849; Tyson 1850).

FIGURE 5. The Campanile (Sather Tower) has five floors, four of which are assigned to UCMP for the storage of fossils. Since its construction in 1914, it has served to store the invaluable Rancho La Brea vertebrate collections made by J.C. Merriam between 1906 and 1913. Image by J.H. Lipps, 2004.

When California was admitted to the Union in 1850, the new State Legislature soon decided to survey it for natural resources. J.B. Trask, a physician enamored with geology and a founder of the California Academy of Sciences, was asked in March 1853 by the Senate to provide information on the geology of the state, during which some fossils were found but not described. Later that year, Trask was appointed to make studies of the Sierra Nevada and Coast Ranges (Trask 1854, 1855, 1856). His appointment and money received from the Legislature ($5000 for his 1853 report plus $2000 for his expenses) for further studies have been construed as the First Geological Survey of California, but no official act declared that or appointed Trask as State Geologist (Leviton and Aldrich 1982). Apparently, his title of State Geologist, with which he was listed in the San Francisco City directory, was honorific and not official (Leviton and Aldrich 1982). Later, Trask returned to his medical practice, and stopped listing himself as a geologist. At the same time, W.P. Blake was requested by A.D. Bache of the Coast Survey to write a paper on the geology and geography of the coast from Bodega Bay, north of San Francisco, to San Diego. Blake found fossils, including microfossils, at various points along the coast (Blake 1854, 1855). He continued his geo-

logic and paleontologic work with the Pacific Railroad Surveys (Williamson 1856). In the meantime, Jules Marcou published two geologic maps of the United States that showed California consisting broadly of just several types of rocks and some of these were in incorrect relationships with one another (Marcou 1854, 1855).

All of this activity then prompted the California Legislature to consider an official survey of the natural resources of the entire State, including animals and plants. Joseph LeConte, who later played an important role in the University of California's paleontological development, wrote from South Carolina to encourage the formation of the survey and recommended W.P. Blake to lead it. But the Legislature asked Josiah D. Whitney, a well-known geologist whose book on the *Metallic Wealth of the United States* (Whitney 1854) was surely influential in the appointment of a geologist to survey a state well known to have such riches. Thus, in 1860, just 10 years after statehood, California had its first official State Geologist and the first Geological Survey of California. Because of the confusion surrounding Trask's earlier work, the Geological Survey of California has been called the Second Geological Survey or the Whitney Survey, but in fact it was the first and only Geological Survey of California, and remains so today even though the California Division of Mines and Geology was given the pseudonym of the California Geological Survey by the Director of the Department of Conservation in 2002.

Whitney was a great scientific geologist who understood that good science had to underlie applied geology, the chief reason that the Legislature appointed Whitney and formed the Survey to begin with (Nash 1963; Oakeshott 1971). By December 1860, Whitney had acquired his field staff (Fig. 6) consisting of William H. Brewer (party chief), James T. Gardiner (mining engineer), Richard Cotter (packer) and Clarence King (geologist), and began work. This work included observations on the geology, geography and natural history of the state (Farquhar 1940), as well as the collection of fossils all over the state and even beyond and the study of fossils contributed by individuals (Trask, Mills, Voy) and those held by the California Academy of Sciences. Others were asked to collect and contribute with pay to the Survey as well, including J.G. Cooper, a natural history collector and expert on marine and terrestrial mollusks (Coan 1981). A variety of other living organisms was also collected and later studied (Nash 1963). W.M. Gabb and F.B. Meek were employed by Whitney to study the fossils (Fig. 7).

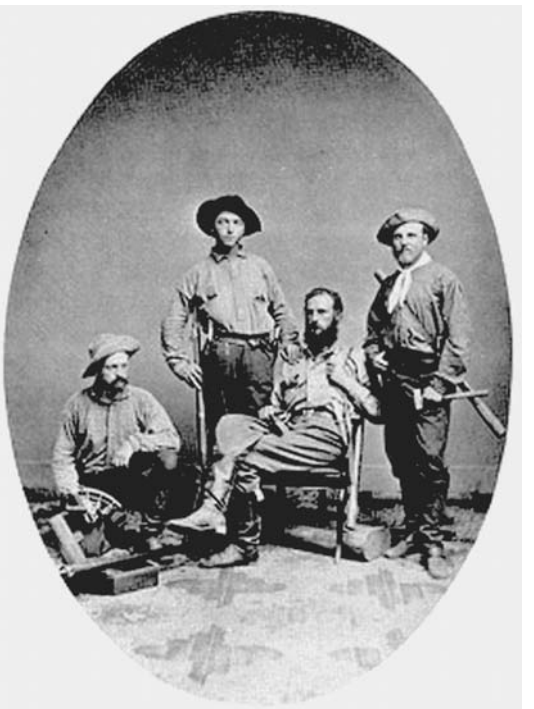

FIGURE 6. The Geological Survey of California field party of 1864 consisting of William H. Brewer (party chief), James T. Gardiner (mining engineer), Richard Cotter (packer) and Clarence King (geologist). California Division of Mines and Geology photograph.

The first volume published by the Survey dealt with Paleozoic and Mesozoic paleontology of California (Gabb 1864a, 1864b; Meek 1864a, 1864b). This beautifully-produced book with gold embossing of an ammonite (taken from Pl. 13, fig. 17 of *Ammonites chicoensis* Trask) on the front cover and the seal of the Survey on the back (Fig. 8) was a disappointment to the State

FIGURE 7. The Geological Survey of California, December 1863. Left to right: C. Averill, W.M. Gabb, W. Ashburner, J.D. Whitney, C.F. Hoffmann, C. King, and W.H. Brewer. California Division of Mines and Geology photograph.

Legislature (Nash 1963; Oakeshott 1971), as was the second volume on the Tertiary paleontology of California (Gabb 1869). Indeed, the Legislature did not understand Whitney's focus on such mundane matters and his seeming neglect of the economic aspects of the work (Nash 1963). Like all state geological surveys from the first one in North Carolina in 1823 to the 51 current surveys (including Puerto Rico), the California Legislature expected that its survey would focus on applied matters (Hendrickson 1961; Nash 1963). It thus cut funding to the Survey. Whitney did not help matters, however, with his direct and blunt style of speaking and writing. In a rather famous geological quote, Whitney said *"It is not the business of a geological surveying corps to act . . . as a prospecting party."* He told the Legislature *"We have escaped perils by flood and field, have evaded the friendly embrace of the grizzly, and now find ourselves in the jaws of the Legislature"* (Whitney 1862, 1863a, 1863b, 1863c). His budget continued to be cut and by 1867, no more money was available. The conflict with the Legislature made it impossible for Whitney to complete the Survey's publications as planned, and much of its results appeared later in publications not associated with the Survey or California. By 1874, the Geological Survey of California was over, and it was directed to deposit the fossils and other materials it had collected in the State University at Berkeley by virtue of the Organic Act of 1873, which Whitney agreed to do (Whitney 1873).

The fossils collected by the Geological Survey of California thus formed the basis of the collection that was to become UCMP's. However, not all of them were deposited with the University. Whitney took some with him upon his appointment as Professor of Geology at Harvard and placed them in the Museum of Comparative Zoology, and Gabb took most of his type specimens to the Academy of Natural Sciences of Philadelphia (Stewart 1928, 1930). The University of California ended up with 107 types (Fig. 2) of which about 30 are gastropods and 48 are bivalves (Merriam 1895; Stewart 1928, 1930) together with a few hundred specimens of miscellaneous invertebrate

FIGURE 8. The ammonite and the seal of the Geological Survey of California embossed on the front and back covers respectively of the first official volume (Palaeontology) published by the GSC in 1864. Images by Susie Lipps, 2004, from the original binding of the 1864 book.

fossils. In addition, the types of J.G. Cooper's modern mollusks were deposited in the university's collection with duplicates going to the California Academy of Sciences (Coan 1981). Thus the collection of Museum of Paleontology had a significant but hectic beginning!

Starting Paleontology at the University of California.

The University of California, formed from the College of California and its lands in Oakland and on the hill slopes 4 miles to the north, was chartered on March 23, 1868. Soon thereafter, the Regents started to appoint faculty members, and with that, began the first of several contentious issues that characterized paleontology at Berkeley throughout much of its history. J.G. Cooper, who had collected all over California including the lands to be occupied by the new university for the Geological Survey of California, wanted the faculty position in natural history. To this end, he solicited signatures, including those of Joseph Henry and Spencer Baird of the Smithsonian Institution, on a petition to the Regents requesting his appointment (Coan 1981). However the petition arrived too late, the Regents having already appointed Joseph LeConte to the position and an embittered Cooper wrote to Baird that LeConte had been elected because of the strength of the southern influence among the Regents. He added that the university was "being made into a perfect asylum for ex-rebel professors" (Coan 1981), with obvious reference to LeConte and his brother. Whether or not Cooper would have been an effective professor, LeConte surely was a very positive influence on paleontology.

Joseph LeConte (Fig. 9) arrived at the University of California in 1869 as the first geologist, natural historian and botanist appointed to the University. In 1857 he held the Chair of Chemistry and Geology at South Carolina College in Columbia, SC (Armes 1903). During the Civil War, Columbia was burned by General T. Sherman; and life became difficult. Joseph lost all his possessions (property and slaves), but he optimistically believed that he could still succeed. When the College reopened in 1866, Joseph and his older brother John, a physicist, began teaching once again. However, the two of them became wary of the attitude of the South Carolina State

Legislature toward the College, and when they heard about the newly forming University of California, they both applied for faculty positions. They were hired in 1868, John in November, the first of the faculty and initially acting President of the University, and Joseph in December (Armes 1903). Joseph arrived after John in September, 1869, to begin his duties. The LeContes went on to establish outstanding records as teachers and to have a large impact on the new University and science in general. John and Joseph taught initially in buildings at the former College of California in Oakland. When the university's first buildings on its hillside site were completed in 1873, the Le Contes took up lectures in South Hall (Fig. 3). For some time, they and the students commuted by horse-car to the new campus from Oakland until housing could be built in the newly developing town of Berkeley. In 1874, Joseph LeConte finally moved to Berkeley.

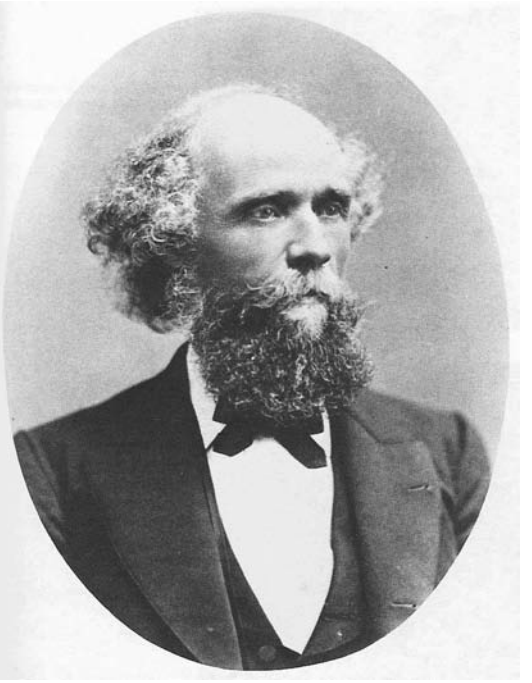

FIGURE 9. Joseph LeConte, about 1875. Courtesy of the Bancroft Library.

The LeContes were highly respected and received many honors, including the naming of buildings, streets, awards, and natural formations for them. John LeConte went on to be President of the University from 1876–1881. John, not Joseph, is remembered on the modern Berkeley campus by John Lawrence LeConte Hall, dedicated in 1923 and located in the central campus area. It is appropriately occupied by the Physics Department. The LeContes are also remembered in other ways—the north side of the Berkeley campus by LeConte Avenue, LeConte Science Magnet School in Berkeley, near UCLA where a street in Westwood was named after Joseph by Herbert Foster, a Berkeley graduate who admired him, in Westwood again where Joseph LeConte Junior High School is located, Mt. LeConte in the Sierra Nevada near Lone Pine, California, LeConte Cascade on the Tuolumne River, the Joseph LeConte Memorial Lodge (Sierra Club) in Yosemite, Mt. LeConte and LeConte Lodge in the Great Smoky Mountains near Gatlinburg, Tennessee, a LeConte Club in the Mountain National Bank of Gatlinburg, by LeConte Hall at the University of Georgia and LeConte College at the University of South Carolina, named for both brothers, and by the annual LeConte Award now given by the Department of Integrative Biology at Berkeley to an outstanding undergraduate student. Joseph's son Joseph Nesbit LeConte, also a Berkeley professor and Sierra Club member, has a number of features named for him. Joseph LeConte died on an outing with his daughter in his beloved Yosemite in 1901 and is buried in Mountain View Cemetery in Oakland (Fig. 10).

Joseph LeConte significantly influenced the development of paleontology at the University of California in three ways: he lectured and wrote not only on geology but on evolution and life of the past (Fig. 11), he acquired still more collections of fossils for the University, and he influenced students. Indeed, the success of the paleontology program at Berkeley can be traced directly to him. LeConte was very concerned about paleontology and evolution, and he reconciled them with religion, at least in his own mind (Armes 1903; LeConte 1888b). He never did research on evolution but he became the foremost American proponent of evolution (Stephens 1982) in the late 1800s. ".

. . I was an evolutionist, thorough and enthusiastic. Enthusiastic, not only because it is true, and all truth is the image of God in the human reason, but also because of all the laws of nature it is by far the most religious, that is, the most in accord with religious philosophic thought. It is, indeed, glad tidings of great joy which shall be to all peoples." (Armes 1903). He uses "enthusiastic", most likely, in its older meaning of "inspired by God". Indeed, the *Oakland Tribune* called LeConte "The Prince of evolutionists" in 1897. Although he was not a particularly religious person, he founded or helped four new churches in Berkeley. Clearly, he believed that religion was important in the lives of ordinary people, yet he emphasized that the evidence for evolution demonstrated its truth. His textbooks on geology (LeConte 1878, 1888a) combined physical and historical geology with about half of each devoted to the history of Earth and life on it. Over half of the 903 illustrations in the 1878 book are of fossils, which like all illustrations in the book, he selected and supervised their renderings (Armes 1903). Some of them are reproduced from the Palaeontology volumes of the Geological Survey of California. He even had a chapter about the antiquity of humans. His smaller and briefer book (LeConte 1888a), designed for high school students, also included much paleontology. His interest in paleontology is evident in his lecture material as well, which he used almost entirely to write his textbook (LeConte 1878). As he said, *"My textbook,* Elements of Geology*, was simply the embodiment of my daily class lectures, but far less discursive and illustrative and therefore far less interesting than the viva voce lectures"* (Armes 1903).

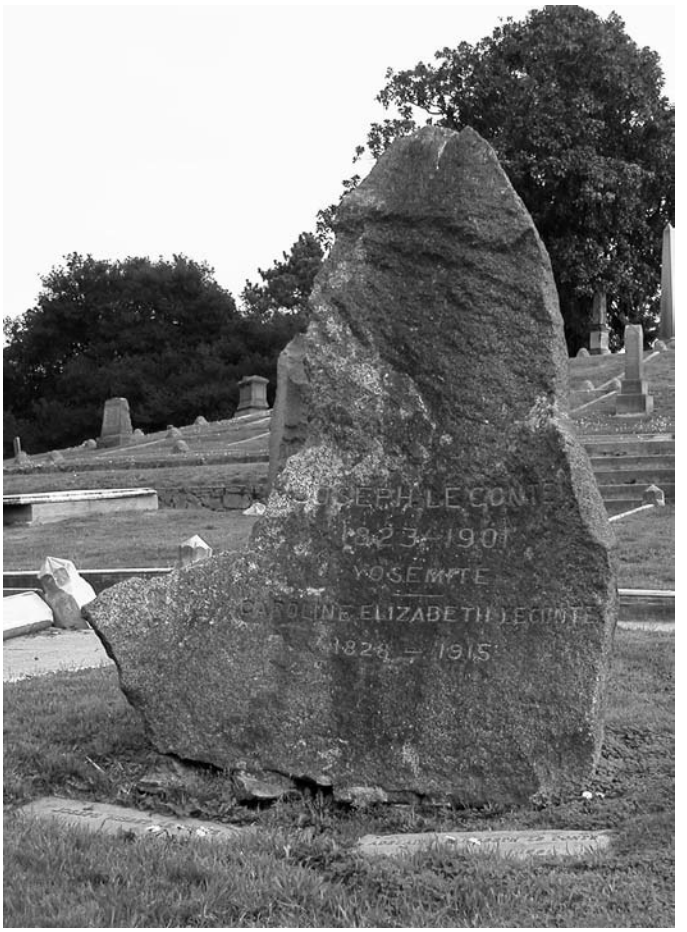

FIGURE 10. Grave of Joseph LeConte and his wife in Mountain View Cemetery, Oakland, California. The headstone is a piece of granite carried from LeConte's beloved Yosemite Valley on his death there in 1901. Image by J.H. Lipps, 2004.

LeConte continued to acquire yet more outstanding fossil collections for the University. He purchased a Paleozoic invertebrate collection from Robert P. Whitfield of the American Museum of Natural History, an outstanding crinoid collection made at Crawfordsville, Indiana, from Prof. A.D. Bassett of Wabash College (Lane 1963), and others. The Crawfordsville crinoid collection contained 121 "packages and pieces" including several slabs with up to 16 crinoids on them for $1000, a significant amount of money for 1883 (Van Sant and Lane 1964). Lane points out that

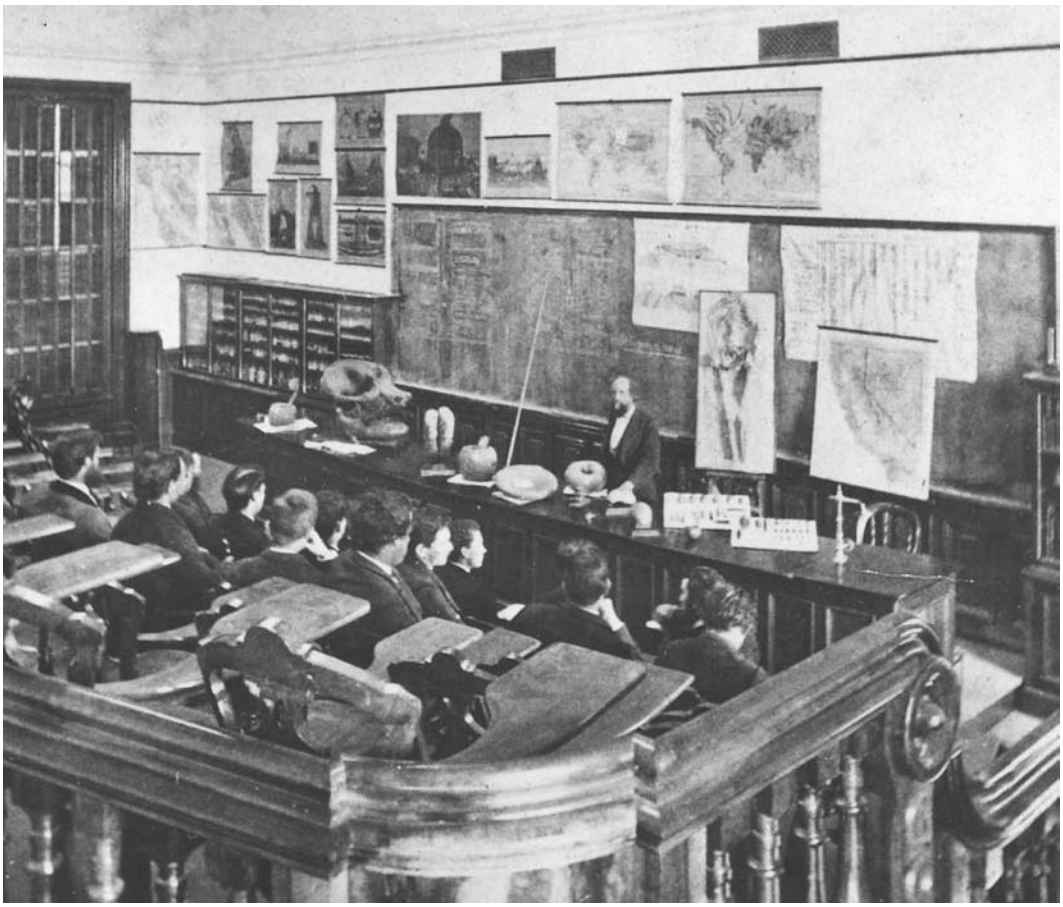

FIGURE 11. Joseph LeConte lecturing in South Hall during the 1880s. From the Bancroft Library, used with permission.

Bassett's salary at Wabash College was only $1500 a year, so that his fossil business must have made him quite wealthy for a college professor (Van Sant and Lane 1964). LeConte also encouraged people to donate collections to the university. The San Francisco financier F.L.A. Pioche left his natural history collection of minerals, fossils and mollusks, to the university when he died in 1872 (Dalin and Fracchia 1974). The C.D. Voy collection, purchased by D.O. Mills of San Francisco and given to the University along with his own mollusk collection, was particularly important. The Voy collection of fossil plants formed the basis of Lesquereux's report presented to Whitney as a contribution to the Geological Survey of California. These fossil plants (Fig. 12) from the auriferous gravels were not the original ones collected by the Survey, for those had been destroyed in a fire (Lesquereux 1878), but were collected by C.D. Voy from the same area that the Geological Survey of California had collected. Whitney arranged to have them published by Harvard's Museum of Comparative Zoology as a contribution to the Survey. LeConte displayed many of the fossils he accumulated in the Museum of Natural History in South Hall and as demonstrations in his courses (Fig. 11).

A Paleontology Program Develops

During LeConte's tenure at Berkeley, his best known student was John C. Merriam (Fig. 13), who, inspired by LeConte's textbook on geology, came to Berkeley for an undergraduate degree, and then went on to study with the famed paleontologist Karl A. von Zittel in Munich for his Ph.D. Merriam returned to Berkeley as professor of paleontology in 1894 in the geology department. Soon he was teaching a complete array of undergraduate and graduate paleontology courses (Table 5), including several on vertebrate history. Helping him were a number of students and graduates, some of whom achieved high standing in paleontology themselves, such as Loye Holmes Miller, an avian paleontologist who helped to found the Zoology Department at UCLA, and Chester Stock, who became an assistant professor at Berkeley (Table 1), and then moved to the California Institute of Technology where he started a highly regarded paleontology program in the new geology department there. Many of the famous early California paleontologists were trained at Berkeley under Merriam.

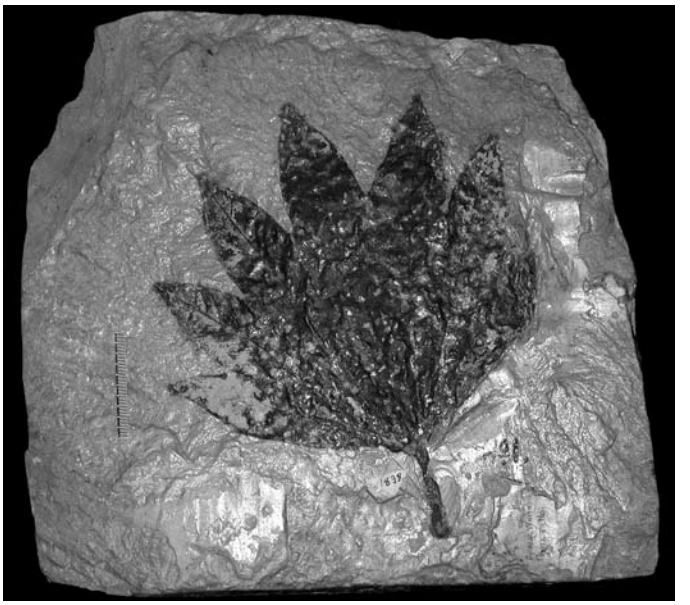

FIGURE 12. Fossil leaf collected by C.D. Voy from the Sierra Nevada auriferous gravels that had been collected originally by the Geological Survey of California. The GSC collection of fossil plants burned in a fire, so Whitney asked Lesquereux to study the Voy collection from the same site donated to the University of California by D.O. Mills. Lesquereux (1878) named this *Aralia whitneyi* (now *Macginitiea*) for the former State Geologist. Image by Lorraine Cazassa, 2004.

TABLE 5. The first courses in paleontology, taught by J.C. Merriam at Berkeley in the early 1900s. They formed the framework for the paleontology program into the 1980s. Some (*) are still taught.

Paleontology 1.	General Paleontology.
Paleontology 102.	Invertebrate Paleontology*
Paleontology 103.	Invertebrate Faunas of the Pacific Coast
Paleontology 104.	Vertebrate Paleontology*
Paleontology 105.	History of Vertebrate Life in North America
Paleontology 206.	Seminar in Paleontology*
Paleontology 207.	Individual Research*

Merriam's teaching was highly regarded, and it attracted many students to his lectures, including Miss Annie Alexander (Figs. 14–15), a wealthy newcomer to the Bay Area. Alexander, born and raised in Hawaii and recently moved to Oakland, attended one of Merriam's courses in 1900 and was thrilled by it. This began a lifelong enthusiasm for paleontology and its support at the University of California. Alexander, a remarkable woman, was vital to the development of paleontology, vertebrate biology and botany at Berkeley; her life and contributions are well told by Stein (2001). Soon after taking Merriam's course, Alexander organized expeditions to collect fossils from many places and ages. This work continued until 1906 when she organized an expedition to Alaska to collect examples of living animals, bears in particular. This trip was stimulated by C. Hart Merriam (no relation to John C.) who was particularly interested in bears. She

FIGURE 13. John C. Merriam, ca. 1920. Courtesy of the UCMP archives.

FIGURE 14. Annie Alexander posing with her brother's shotgun in the mountains northeast of Bly, Oregon, mid-June, 1901, on a three month collecting trip to Fossil Lake. Alexander supplemented the collecting party's food supply with fresh game (see also Stein 2001, illustration of Alexander aiming shotgun from a sitting position). Courtesy of the UCMP archives.

still continued her deep interest in paleontology and supported J.C. Merriam's research and many more fossil collecting trips until 1920. Her contributions to UC paleontology were many: financial support to faculty and the University, collecting expeditions across the west, donation of specimens, encouragement to UC paleontologists, support of students, persuasion applied on behalf of paleontology on several Presidents of the University, and endowment of the UC Museum of Paleontology. These contributions continued for nearly 50 years, and paleontology still benefits from her largesse (Stein 2001). Without Alexander, paleontology would not have thrived at Berkeley. With her, paleontology became a renowned discipline on the campus built on the foundations laid and the collections developed by LeConte, Merriam and her.

Merriam was also an exceptional researcher, fossil collector and prolific author of many papers on vertebrate paleontology and a few on invertebrates of western North America. Much of this was made possible through the financial support of Annie Alexander. His work on the vertebrates of the Pleistocene Rancho La Brea in Los Angeles, including a note on the occurrence of human bones (Merriam 1914), was outstanding. He and L.H. Miller, then in Los Angeles, together with others excavated the tar-soaked sands and asphalt from 1905–1907 and in 1912–13 with funds from the University Regents. Later in 1913, the Los Angeles County Supervisors were given exclusive excavation rights to the tar pits, thus ending Merriam's collecting (Heric 1969) but not his studies of the material. His remarkable and huge collection was sent to Berkeley, studied by Merriam and his students including Stock, and stored in the Campanile on campus where it remains today. Merriam continued his studies on other faunas as well. He was an important expert on the paleontology and geology of the John Day fossil beds in Oregon, where he had run Berkeley expeditions for about

20 years starting in 1899 (Miller 1950). Merriam studied the fossils, describing them in detail, and the stratigraphy, naming several formations in the area (Merriam and Sinclair 1907). During this work, Merriam proposed that the fossil beds be made a state park and preserved for posterity. In 1974, the John Day fossil beds were declared a U.S. National Park Service National Monument. This became an important role for Berkeley paleontologists later on as additional important fossil sites were studied and deemed worthy of preservation as parks and monuments.

FIGURE 15. Annie Alexander watching the excavation of fossils on the Saurian Expedition, 1905, Humboldt County, Nevada, led by John C. Merriam. Courtesy of the UCMP archives.

Merriam was very highly regarded on the Berkeley campus and was invited to deliver the second Berkeley Faculty Research Lecture in 1914, quite a distinguished honor, on the "Paleontology and Historical Geology, Extinct Faunas of the Mojave Desert: Their Significance in a Study of the Origin and Evolution of Life in America" (Merriam 1915a). He wrote a number of general interpretive papers, even on human evolution (Merriam 1919), and many excellent monographic works, often coauthored with his students and others. By 1915, Merriam was able to provide a useful sketch of the history of life on the Pacific Coast, mostly based on research that used the collections at Berkeley (Merriam 1915b).

Annie Alexander also became a great supporter of vertebrate biology, and Merriam fostered her efforts in this endeavor. She met Joseph Grinnell for the first time in the hall at the Throop Polytechnic Institute, later transformed into the California Institute of Technology, in Pasadena while organizing another collecting trip to Alaska in 1907, and, after a brief conversation, left. But Grinnell remembered that she had been acknowledged in J.C. Merriam's paleontological publications as a collector and financier of his research. Grinnell believed that she was a serious supporter of science, and so he wrote her an impressive letter about collecting in the wilderness that attracted Alexander's attention and interest (Stein 2001). Thus began a long, cordial and highly productive relationship with Grinnell that led to the formation of the Museum of Vertebrate Zoology (MVZ) at Berkeley in 1908 and his appointment as its first Director. The establishment of the MVZ required significant negotiation with President Benjamin Wheeler and the Regents, for Alexander wanted complete control of the museum and its research agenda (Stein 2001). This proposal and her plans were supported by J.C. Merriam with a strong statement that such a museum would greatly aid instruction and research at the University, as well as provide comparative material for research in paleontology, geology and anthropology. Her proposal was rejected by the Regents,

because giving her control of a University facility would be a violation of the Organic Act of 1868. The matter was settled diplomatically by Wheeler, and Alexander accepted his compromise that would allow her to continue to direct the affairs of the new museum along with Grinnell.

Paleontology also continued to develop, with Alexander's support in all ways, although it had more problems, however, because it was part of geology and its collections were part of that department. Paleontology also included a much wider area of study than vertebrate biology, because it required understanding the geology and ages of fossil sites, and of course it included the discovery and description of a wide range of invertebrates and microfossils. Paleontology thus had an inextricable relationship with geology, as it still does. The relationship between the geologists and paleontologists in South Hall became difficult. Alexander did not like this strain between the geologists and her paleontologist, and with money and appeal to President Wheeler, a Department of Paleontology was created in 1909 with Merriam as its Chairman (Stein 2001). The fossil collections became part of this department. A year later, she pushed for new quarters, the ones in South Hall having become too crowded (Wagner 1969). In 1911, the Paleontology Department and its collections along with the Geology Department moved into Bacon Hall (Fig. 3), the renovated Bacon Arts and Library Building built in 1881 (Wagner 1969).

The fossil collection continued to grow, chiefly through the work of Alexander, Merriam, and students and staff. By 1915, the Paleontology Department had a collection totaling over 150,000 invertebrate, 15,000 vertebrate and 3000 plant fossils, of which several hundred were type specimens (Evermann 1915). It was the most significant fossil collection on the west coast for it contained far more fossils than any other museum west of the Mississippi, including such places as Los Angeles's Museum of History, Science and Art, which had the notable collection of Rancho La Brea material, and San Francisco's California Academy of Sciences (Evermann 1915), which had had extensive collections of fossils collected by Trask, Cooper and others that were destroyed in the Great Earthquake and Fire of 1906. South Hall at Berkeley had come through the same earthquake relatively safely (Fig. 3) as did the fossil collection therein. This collection was referred to informally as a museum of paleontology, but UCMP itself did not yet exist.

The University of California Museum of Paleontology

Until the appointment of Bruce Clark, an invertebrate paleontologist, to the faculty in 1918, the Paleontology Department consisted of only Merriam. Merriam had taught, with the help of students and graduates as instructors (Fig. 16), a broad set of courses (Table 5). The beginning paleontology course was attended by 250 students at a time. The future of paleontology looked glorious and Annie Alexander was pleased. She had great hopes and had invested much money in Merriam's paleontologic research and her own collecting expeditions. However, Merriam had additional goals, as his interests moved towards administration and the scientific community beyond Berkeley. In 1920, he became Dean of the Faculty and then he left Berkeley at the end of the year to accept the presidency of the Carnegie Institute from 1921 to 1938 in Washington, D.C. He continued to be associated with Berkeley and stayed involved with paleontology there, with the blessing of the campus administration who thought of him as a positive figure to have associated with the university. Much of his Berkeley-based work was published in Carnegie publications. Annie Alexander was greatly disappointed by this change of emphasis in Merriam, his move and the lack of acknowledgment of the University. A sometimes bitter relationship, which had been simmering for several years, developed between them (well described by Stein 2001, chapter 17).

The departure of Merriam did not end his input to the Paleontology Department, much to Alexander's frustration. She was unable to counter this interference, so she brought pressure on the University to establish a Museum of Paleontology separate from the Department. She proposed that

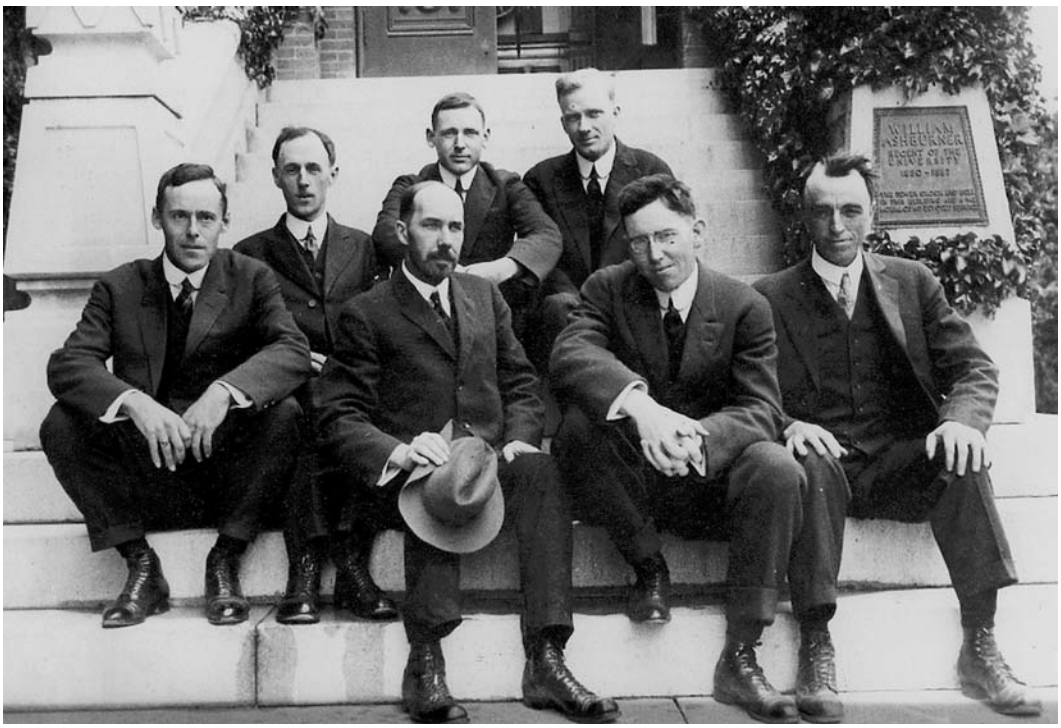

FIGURE 16. Faculty and instructors of the Department of Paleontology. Top row, left to right: E.L. Packard, W.S.W. Kew, J.O. Nomland. Bottom row, left to right: John P. Buwalda, John C. Merriam, Chester Stock, and Bruce L. Clark. Circa 1915. If the date on this photograph is correct, then only Merriam was a professor at that time, although Buwalda, Stock and Clark were appointed professors in geology a few years later. Courtesy of the UCMP archives.

she would increase her funding to the museum through her own resources, if the university would do likewise (Stein 2001). However, Merriam was to have nothing to do with the new museum. The University accepted her proposal and established the Museum of Paleontology in 1921 with Professor Bruce Clark as its director. In the meantime, Merriam lobbied from Washington first that no one be appointed in his former position as chairman of the Department of Paleontology, and then for the appointment of Ralph Chaney as chairman, leading to so much indecision and discord that paleontology once again became part of the Department of Geology. The fossil collections passed to the new Museum of Paleontology but were housed with the departments. Clark remained a professor in geology, which had also added two vertebrate paleontologists in 1921 to its faculty: Chester Stock and John Buwalda, both students and collaborators of Merriam's (Buwalda and Merriam 1916; Merriam and Stock 1921, 1925; Merriam et al. 1925). In the museum, Clark was joined a year later by Charles Camp, a student of Grinnell who held a position in the Department of Zoology. Merriam, now aided by Stock, was still involved in the affairs of the department and UCMP so much so that Clark decided in 1926 to resign the directorship of UCMP. After much delay, the University appointed Ralph Chaney, a paleobotanist from Iowa, as Director of UCMP, but Alexander objected sternly to this because she believed this was more interference from Merriam, and she withdrew all support for the museum (Stein 2001). The administration then changed its course and recanted its offer to Chaney. Buwalda and Stock left Berkeley in 1926 for positions in the newly forming Geology Department at Cal Tech.

Shortly thereafter, in 1927, the university appointed William Diller Matthew (Fig. 17) as direc-

tor of the Museum of Paleontology and chairman of the reestablished Department of Paleontology (Gregory 1996b; Stein 2001). He had been at the American Museum of Natural History for 33 years and had an outstanding record of high quality research and publication in vertebrate paleontology. With his appointment and the departure of Merriam's collaborators, tranquility fell on the museum and department. Alexander's hopes were once again renewed and she began anew her annual donations of support to the museum. This feeling of accomplishment and hope lasted only three years before Matthew passed away from kidney failure in 1930. This began yet another round of dispute in paleontology. Alexander met with President Gordon Sproul and they agreed that Charles Camp should be appointed director of UCMP, if she would continue her support of its activities, but Sproul decided that Ralph Chaney, Merriam's own choice, would become chairman of the Department of Paleontology. Alexander was dismayed and began a series of negotiations with Sproul and the Regents. Nevertheless, Chaney was appointed, and soon difficulties between the museum and the department ensued. Much of this revolved around how Alexander's gifts to the museum would be used; Merriam and Chaney, she believed, wanted to be involved in the museum's affairs, and to this she objected. She again met with Sproul to explain her desires of complete separation of the museum from the Department of Paleontology, physically and financially, with separate staffs for each. Camp would be totally in charge of the museum and the others would have no say in its operation at all. She told Sproul that if he implemented these things, then her level of support would remain; if not she would withdraw it. The university agreed to her demands, and the two units and their leaders were separated completely (Stein 2001).

FIGURE 17. William Diller Matthew, bust sculpted by his daughter, Margaret Matthew Colbert. At least two copies were cast in the laboratories of the American Museum of Natural History by Otto Falkenbach (Anonymous 1946). One copy was donated to the Osborn Library of the American Museum and the other to the Matthew Memorial Library of the University of California, Berkeley. This image is of the Berkeley copy, now housed in the offices of the Museum of Paleontology in the Valley Life Sciences Building. Image by Lorraine Cazassa and Sarah Rieboldt.

Alexander then decided to approach Sproul about new and safer facilities for UCMP. The museum was moved to Hearst Memorial Mining Building in 1931 where it remained for 30 years. During this time, the administration of the museum and department were sometimes joined under one person appointed as Director and Chairman and at other times they were separately administered (Tables 2, 6). While tensions existed between various factions of the department and museum, as is common in small organizations anyway, the two units, one supporting research and the other carrying out academic functions, ran fairly smoothly. In 1934, Annie Alexander thus endowed UCMP with the significant funds she had promised in 1921. She continued her research support as well over the years and in 1948 made a final contribution to the UCMP endowment. In 1948, she also established two graduate student scholarships, one in paleontology and one in ver-

tebrate zoology. These are still administered by UCMP and MVZ. At the time of her death in 1950, she had donated substantial and nearly equal sums to the UCMP and MVZ as endowments and much over the past half century to support the research and students in each museum. Both museums today benefit from her generosity and foresight.

Annie Alexander's support for field work in paleontology continued after 1930 significantly. Now she was supporting the work of Charles Camp and Sam Welles, who often teamed up together on big projects. These included excavations of ichthyosaurs near the ghost town of Berlin, Nevada, the discovery in Arizona of *Dilophosaurus*, the spitting dinosaur incorrectly but famously portrayed in the movie *Jurassic Park* (Crichton 1990; DeSalle and Lindley 1997), work in New Mexico (Fig. 18), and many other projects, most of which involved students too. Welles was famous for his field prowess — he could find fossils where no one else ever could (Camp 1969).

TABLE 6. Chairs of the Department of Paleontology.

Term	*Chairman*
1910–1920	John C. Merriam
1927–1930	William D. Matthew*
1931–1939	Ralph Chaney
1940–1946	Charles L. Camp*
1947–1948	J. Wyatt Durham**
1949–1955	Ruben A. Stirton*
1956–1959	J. Wyatt Durham**
1960–1965	Joseph T. Gregory
1966–1975	Donald E. Savage
1976–1987	Willam B. N. Berry*
1988–1989	Willam A. Clemens*
1991–1994	Jere H. Lipps* (Chair of Integrative Biology)

* Simultaneously director of UCMP. ** acting chairman

From February 19 to October 29, 1939, and May 25 to September 29, 1940, the San Francisco Bay area hosted the Golden Gate International Exposition on Treasure Island to celebrate the openings of the San Francisco-Oakland Bay Bridge (1936) and the Golden Gate Bridge (1937), the economic strength of the Bay Area, the unity of the Pacific, and the hope that the Bay Area would be a gateway to the Pacific Rim. The Exposition was crowned by elaborate buildings and sculptures of all sorts by many artists. UCMP participated with its own exhibit, featuring the sculptures of William Gordon Huff (Fig. 19). On the opening day of the Exposition, well over 100,000 people visited. As a result of the popularity of the Exposition, it was extended for another summer season in 1940. UCMP still has the Huff sculptures in its collection of non-fossil materials.

World War II and the Development of Modern Paleontology

World War II impacted the paleontology program significantly, as it did so many others at Berkeley and elsewhere. The staff and faculty were busy with war efforts, some having enlisted in the service. The collections were of some concern, since the west coast of the United States was designated a combat zone. Vanderhoof reported ". . . attention has already been given to the preservation of types from destruction. Some thought has even been given to the preservation of paleontologists, but they, of course, can be replaced." (Vanderhoof 1942). Charles Camp at age 50 served part time in the Coast Guard, Sam Welles was in Electrical Engineering in the Engineering Science War Training Program (Stirton 1944), and Vanderhoof joined the Manhattan Project. World War II made the practice of paleontology difficult at Berkeley, as everywhere.

After the war, the paleontology program regained its vitality. Three new faculty appointments in micropaleontology, invertebrate paleontology, and vertebrate paleontology created a strong center in all paleontology. R.M. Kleinpell, D. Savage and J.W. Durham joined Camp and Chaney, and in the museum, Ruben Stirton and Sam Welles, forming a powerful group that covered all of paleontology. Annie Alexander's interests began to move toward plants, largely under the influence of her partner Louise Kellogg. The two of them spent many months collecting plants and donating

them to the University Herbarium. This and other diversions caused Alexander to become less involved in the ordinary operations of the Museum of Paleontology. She still maintained an interest in and support for UCMP, however, but now paleontology was mostly on its own. In 1950, Annie Alexander passed away.

Charles Camp, who had established himself as a foremost reptilian paleontologist by virtue of his collecting and publishing activities, trained a continuing line of vertebrate paleontologists (Gregory 1996a). His interests were wide and included history of the west and of paleontology, as well as book collecting. He wrote outstanding descriptive and interpretive monographs and papers on various fossil reptiles. He and Sam Welles collected late Triassic ichthyosaurs (*Shonisaurus populari)* from near Berlin, Nevada (Fig. 20), an area of 1153 acres that was set aside by the State of Nevada as Berlin-Ichthyosaur State Park. Camp and Welles excavated 40 of the animals (Camp 1980), recognized the uniqueness of the occurrence and petitioned Nevada to preserve the site. *Shonisaurus populari*, the largest ichthyosaur known, has been adopted as the Nevada State Fossil (Rowland 1999).

FIGURE 18. Sam Welles, Museum Paleontologist, supervising an excavation with his field party in New Mexico, about 1937. From the Welles Archive, UCMP.

Ralph Chaney remained a faculty member in the department and a Faculty Curator in UCMP. He worked on the fossil floras of the west and taught paleobotany for many years from 1931 to 1957, producing students and publications. One of his major accomplishments was the documentation of the history of Redwoods in North America. As part of this work, he went to China and returned with seeds and seedlings of the imperfectly known Dawn Redwood, thought to have been extinct but discovered by Chinese workers to be living in parts of China. Two of Chaney's specimens still grow outside McCone Hall.

Ruben Stirton, who had been a curator in UCMP since 1930, was appointed to the faculty in 1949, as Professor, Chair of the Department of Paleontology, and Director of UCMP (Gregory 1997b). He continued a vigorous program of mammalian paleontology, teaching and involvement with campus activities. He wrote a textbook of general paleontology (Stirton 1959), organized a major field expedition to Australia to document the early history of marsupials there, published

extensively on many groups of mammals, developed the UCMP collections, and tutored many vertebrate paleontologists who have gone on to make major contributions to the field.

Robert M. Kleinpell, who in 1938 had established a Miocene biostratigraphy of California (Kleinpell 1938) based on his Ph.D. dissertation at Stanford University, was appointed to the faculty and UCMP in 1946. His work on foraminiferal biostratigraphy provided one of the fundamental exploration tools for the thriving oil industry. Until his retirement in 1974, he produced a long line of students in micropaleontology as well as a number of influential and important works on fossil foraminifera and biostratigraphy of California. He and his students developed a very large collection of foraminiferal samples and slides that formed an outstanding resource in foraminiferal work. Kleinpell was regarded as the foremost Californian micropaleontologist by the oil industry and academics alike, and a student of the history of the field itself (Kleinpell 1971, 1972).

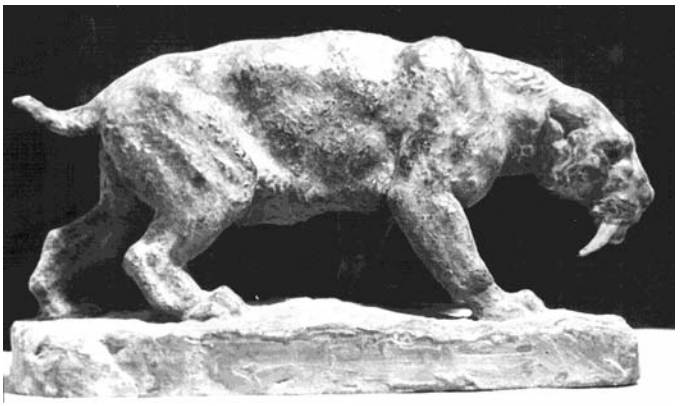

FIGURE 19. A sculpture of the Sabre-Tooth Cat *Smilodon californicus* done by William Gordon Huff for the Golden Gate International Exposition, 1939–1940. The Exposition included pavilions and exhibits by most countries around the Pacific and others from Europe and South America. UCMP had its own exhibit which included a number of Huff's sculptures. From the UCMP archives.

FIGURE 20. Charles Camp's cabin at his ichthyosaur dig near the ghost town of Berlin, Nevada. Camp constructed his cabin from lumber borrowed from some of the buildings in Berlin and at Union, another ghost town also nearby. Camp and Welles and their assistants and students used this cabin from 1955 to the 1960's for living, laboratory work, storage, and packing fossils. Photograph by J.H. Lipps, 1994.

J. Wyatt Durham was named to the faculty and museum in invertebrate paleontology in 1947. He, too, had many students, and he published widely on many groups of invertebrates and their history. He dealt with their biostratigraphy, paleoecology and evolution, and held strong opinions on continental drift, and later, plate tectonics. His collecting activities took him far away to collect both modern and fossil animals. He was especially attracted to and collected from the amber deposits of Chiapas, Mexico.

Donald Savage continued on as a faculty member after finishing his Ph.D. in the Department of Paleontology under Stirton in 1949 (Gregory 1997a). His work featured the description and stratigraphy of vertebrate faunas throughout the west. Savage collaborated with geologists to document the radiometric ages of the vertebrate ages used across western North America. He too had a number of outstanding students. He was well known as a craftsman in making displays of fossils.

Savage also worked hard to have the Sabre-tooth Cat, *Smilodon californicus*, from Rancho La Brea, declared the California State Fossil in January 1974 (Fig. 19).

Sam Welles, who received his Ph.D. in paleontology in 1940 at Berkeley, decided that he did not want to be a faculty member but would rather dedicate himself to the collection and description of vertebrate fossils (Gregory 1997c). Welles specialized on reptiles and worked closely with Camp in the field although he treasured his own numerous and major contributions. He described the plesiosaur *Hadrotherosaurus alexandrae* and dinosaur *Dilophosaurus*, among many other accomplishments. Welles believed that the chief goal of a paleontologist was to collect fossils in the field before natural processes destroyed them, and he was very good at that task.

Biology and Paleontology

For more than 100 years, paleontology in the US had been steeped in the tradition of description and stratigraphy out of necessity, with some exceptions dealing with the history and development of the biota. This of course continued at Berkeley, but as the next decades unfolded, a more biological emphasis developed. In 1955, the Department had six paleontologists on its staff covering all subdisciplines of paleontology (Fig. 21). Two years later, the department hired Zach Arnold, a protozoologist working on foraminifera. This first step into paleobiology was continued with further hires (Table 3) in functional morphology of vertebrates and invertebrates, paleoceanography, paleoecology, evolutionary paleontology, and paleobiology. These faculty hires replaced previous faculty who retired, passed away or moved to other places, thus maintaining a level of seven paleontologists in the department. During this period from 1960 to 1989, UCMP and the Department moved once again into the new Earth Sciences Building together with Geology and Geography (1961).

Under the leadership of Director William Berry (1975–1988), outreach was established as an important activity of UCMP, the collections began a long period of computerization, the collections were provided adequate housing, the Friends of Fossils organization of interested people was established, the Young People's Lecture Series was started, an enormously successful UCMP Open

FIGURE 21. Faculty of the Paleontology Department, UC Berkeley, about 1955. Clockwise from top left: Ralph W. Chaney, Ruben A. Stirton, Robert M. Kleinpell, Charles L. Camp, J. Wyatt Durham, Sam Welles, Ralph L. Langenheim, and Donald E. Savage. Welles was never a professor in the department, but served as an instructor for a time and as a Museum Paleontologist. From the UCMP archives.

House took place each year, the Blackhawk Fossil Quarry in Danville was acquired assuring its preservation, an agreement was reached for a major UCMP Hall in the proposed Museums at Blackhawk in Danville, and an annual conference of all paleontologists in the University of California (all campuses) was initiated and later changed to include paleontologists from any college or university in California (Gregory 1998). Importantly, Berry was involved in campus discussions on the reorganization of biological sciences at Berkeley, and he negotiated for new Museum of Paleontology facilities in the proposed renovation of the Life Sciences Building. Berry became the first Director who was also Chair of the Department in over two decades since Stirton last occupied both positions in 1955. The joining of both administrative positions brought paleontology together as a whole, with research and academic goals intertwined. This work was continued and expanded by later Directors.

The reorganization of biological sciences changed a good deal for paleontology. The Department of Paleontology was disestablished and included with other biology departments in the reorganization. A new Department of Integrative Biology was formed in 1989 by the merging of faculties of paleontology, zoology, botany and other biology disciplines into a single large department. The paleontology department had seven faculty members at that time, six of whom joined the new biology department and one who joined the Geology Department but remained a Faculty Curator in UCMP. Although they joined new departments, the faculty and students remained in the Earth Sciences Building (now McCone Hall) while awaiting the renovation of the Life Sciences Building. In 1995, the faculty in the merged Department of Integrative Biology moved into the renamed Valley Life Sciences Building, along with UCMP, MVZ, the University and Jepson Herbaria, and the Biosciences and Natural Resources Library. The move of UCMP took most of a year with just the moving vans and crews working eight hour days for nearly 6 weeks, shuttling the short distance between McCone Hall and VLSB. In this same period, the University of California budget was decreased about 20%, which resulted in early retirements, layoffs and financial cuts in most programs. The early 1990s were years of turmoil as the departments and museums adjusted to these rapid changes within the university and their own settings. Faculty and students found themselves in new relationships to their colleagues, the collections were closed and moved over several years, and budget restrictions affected everyone. UCMP, although suffering loss of some staff and budget, received no cuts deeper than those imposed on other units of the university, thus preserving its integrity and strengths. It lost one Faculty Curator and several museum staff who chose early retirement.

In spite of the turbulent times during the early 1990s, UCMP took on a new role as an independent research organization not directly associated with a department, as it had been for several decades. Now it provides services of various sorts to a wide diversity of users as described above. It maintains close affiliations with the Department of Integrative Biology as many of its Faculty Curators and most of its graduate students come from that department. However, it operates separately from any other unit, although it is a member of the Berkeley Natural History Museums (BNHM). In 1994, the Museum of Paleontology, the Museum of Vertebrate Zoology, the University and Jepson Herbaria , the Essig Museum of Entomology, and the University Botanical Garden joined together with the help of the Vice Chancellor of Research to form the BNHM. The BNHM is a powerful consortium sponsoring lectures, workshops and research projects, and facilitating student interactions. The campus administration recognizes the importance of the museums as unique research, teaching and outreach organizations that few universities anywhere have.

UCMP also provided fossil displays at several venues: the Petrified Forest National Park, the University of California at Davis, the California Academy of Sciences, the Doe Library on campus, and the Big Fresno County Fair, where attendance was over ½ million visitors at UCMP's

exhibits. The President of the University acknowledged the role of the museum and University in Central Valley affairs with a special message to the citizens made through the museum's exhibit. UCMP aided in the establishment of the Stewart Valley Fossil Site under the auspices of the Bureau of Land Management. As the University began an association with the Museums at Blackhawk in Danville, California, UCMP began a fossil exhibition, following the negotiations of three directors over nearly a decade. A well-designed hall for paleontology ("Explorations of Ancient Life") was developed and displays mounted, with its grand opening in 1991. The paleontology exhibit hall was very popular with schools and the public, with attendance of over 50,000 each year. Although the paleontology exhibits were scheduled for a three-year run, the hall remained open to the public for over six years. The Museums at Blackhawk ran an extensive outreach program, with lectures and workshops done in association with UCMP. A particularly successful outreach effort was a community dig at the Blackhawk Fossil Quarry near the museums run by UCMP and the Museums at Blackhawk (Fig. 22). Families came on the weekends in the summer to dig for fossils, which were then curated into the UCMP collections. The visitors did not mind as their work was valued by the museums. Later, the Blackhawk Quarry was part of the "Trail through Time", a collaborative effort of UCMP and the Mt. Diablo State Park and its volunteers. Trails were marked that led through the rocks exposed on the flank of Mt. Diablo, from late Miocene to Jurassic in age, some 150 million years of geologic time. Each year, a Trek through Time along the Trail hosted many hikers. Negotiations are now underway with the Mt. Diablo State Park to transfer the Blackhawk Fossil Quarry to its ownership and care.

FIGURE 22. A community dig at the Blackhawk Fossil Quarry, 1993, consisting of families. The community digs continued for several years with several hundred children and their parents taking part. The digs were supervised by Museums at Blackhawk and UCMP personnel. Photo by J.H. Lipps, 1993.

UCMP also promoted international activities. It sponsored several major scientific meetings during the 1990s: American Malacological Union 1991, Forams 1994, and the North American Paleontology Convention 2001. New collaborations with the Paleontological Institute of the Russian Academy of Sciences started in 1993 with an exchange of scientists and students. As part of this, Berkeley students were supported by the Graduate Division for work related to their research. The museum has its own publication, *Paleobios*, where scientific reports may be published. It is widely distributed to countries all over the world.

As the budgets were restored in the following years, UCMP recovered its full complement in paleontology staff and facilities. Indeed, the paleontology program, centered on UCMP, was judged number one in America by *U.S. News and World Report*, an honor that the campus administration is proud of. The paleontology faculty, staff and past students continued to demonstrate their involvement in the affairs of international societies of paleontology (Table 7). Many Berkeley paleontologists have been honored by the Paleontological Society Medal, membership in the National Academy of Sciences, and other awards (Table 7). In all ways, UCMP has been a success story.

TABLES 7A–E. UCMP affiliates who were Presidents and Awardees of Paleontological Societies and the National Academy of Sciences.

A. Paleontological SocietyPresidents and Medalists

UCMP Paleontologist	*UCB Ph.D. in Paleontology*	*PS President*
John C. Merriam, Professor & Director		1917
William D. Matthews, Professor & Director		1922
Ralph W. Chaney, Professor & Director		1939
Chester Stock, past student	1917	1945
J. Wyatt Durham, Professor	1941	1966
James W. Valentine, Professor		1974*
Warren O. Addicott, past student	1956	1980
Jere H. Lipps, Professor & Director		1997
UCMP Paleontologist	*UCB Ph.D. in Paleontology*	*PS Medal (Instituted 1963)*
Ralph W. Chaney, Professor & Director		1970
J. Wyatt Durham, Professor	1941	1988
Daniel I. Axelrod, past student	1938	1990
Malcolm C. McKenna, past student	1958	1992
James W. Valentine, Professor		1996
Jack A. Wolfe, past student	1960	2000

B. Presidents of the Society of Vertebrate Paleontology

UCMP Paleontologist	*UCB PhD in Paleontology*	*SVP President*
Charles L. Camp, Professor & Director		1945
Chester Stock, past professor and student	1917	1947
R. A. Stirton, Professor & Director	1940	1950-51
Joseph T. Gregory, Professor & Director	1938	1957-58
Samuel P. Welles, Museum Scientist & Director	1940	1961-62
Paul O. McGrew, past student	1935	1967-68
Donald E. Savage, Professor & Director	1949	1971-72
Theodore Downs, past student	1951	1972-73
Wann Langston, Jr., past student	1952	1974-75
Malcolm C. McKenna, past student	1958	1975-76
S, David Webb, past student	1964	1978-79
Richard H. Tedford, past student	1960	1979-80
Michael O. Woodburne, past student	1966	1988-89
William A. Clemens, Professor & Director	1960	1992-94.

C. Cushman Foundation for Foraminiferal Research President

UCMP Paleontologist	*CFFR President*
Jere H. Lipps, Professor & Director	1976-77* & 2001-02

*Served before appointment to the Berkeley faculty.

D. Members of the National Academy of Sciences

Paleontologist	*Year Elected*
Joseph Le Conte	1875
John C. Merriam	1918
Ralph W. Chaney	1945
F. Clarke Howell	1972
James W. Valentine	1984
Walter Alvarez	1991
Timothy White	2000

E. Palaeontological Association Lapworth Award

James W. Valentine, 2004

WHO USES UCMP?

UCMP today is used by a wide variety of people both within and without the University of California at Berkeley. Campus users are the most frequent visitors to the collections and laboratories but the general public experience UCMP constantly through its award-winning web site. In addition, visiting scientists and school groups also come to the museum to examine fossils or hear lectures. Several thousand people actually come to the museum or use its collections in courses or demonstrations each year, excluding the many thousands that attend open houses, lectures and special exhibits. More than 3 million people use the museum's on-line services each month.

Undergraduates

A huge number of Berkeley undergraduate students use the teaching collections and exhibits of the museum in their course work. The courses range from Biology 1 through graduate level courses. For example, Biology 1 laboratory sections use fossil brachiopods in exercises in cladistics, others use the *Tyrannosaurus rex* exhibit (Fig. 1) to learn about function and locomotion in animals. In Integrative Biology 158 and Environmental Sciences and Policy Management 107, "Biology and geomorphology of tropical islands", taught at Berkeley's Gump Research Station on Moorea, French Polynesia, a collection of various mollusks, corals and foraminifera from the reef and lagoon at Moorea are studied by juniors and seniors to learn to identify them before the students try to do it in the field. All paleontology courses use the teaching collections as well (vertebrate paleontology, invertebrate paleontology, marine micropaleontology, and paleobotany). Similar teaching collections have been provided to other campuses of the University for the use of their students as well. Undergraduates also occasionally do research for senior thesis in the museum collections.

Researchers

UCMP Faculty Curators and Museum Scientists, and graduate and undergraduate students associated with faculty all use the collections and laboratories for research. In particular, graduate students associated with Faculty Curators use the collections and facilities of the museum in their academic work, and their dissertations and theses materials are deposited into the collections and copies of their works are placed in the museum's library. Part of the job of faculty, Museum Scientists and students is collections development and conservation, and they have accumulated and curated by far the majority of the collections as part of their research activities. They have worked on all continents in rocks of all ages, with the result that all of this activity for more than a century has resulted in thousands of scientific publications that have documented the history of life in California, the United States, and much of the rest of the world.

In addition, other faculty, both at Berkeley and other UC campuses, and visiting scientists and graduate students from around the world use UCMP and contribute materials to it. Some faculty at other campuses of the University of California or of the California State University system collect fossils, and curate them into the UCMP system for permanent deposition, even though they retain the collections at their own campus for their and their students use. Specimen loans are made to scientists at other institutions as well. UCMP also has a teaching function, in which a good deal of effort is expended on the development and maintenance of teaching collections used in departments at Berkeley and some other campuses. The collections are open to anyone with a need to study fossils.

The Public

UCMP has a very strong public and kindergarten though college outreach program. Parts of this program started years ago, as the staff realized that UCMP had a unique appeal to the general public, but a concerted effort started in the early 1990s to reach very large numbers of people, teachers and students. Now UCMP has a diverse outreach program, including teacher workshops, lecture series, curriculum development, K-12 tours of the museum, an annual open house, and an award-winning website. These activities service thousands of people with general interests and teachers and students in K-16 grades, as well as Berkeley students. The UCMP website (*www.ucmp.berkeley.edu*) contains more than 10,000 pages of information about paleontology, geology, evolution, biodiversity, and history of science as well as K-12 teaching materials. It is now accessed about 3 million times a month from over 700,000 different domain names. This web outreach started in 1993 when graduate students noticed that a new internet format was being introduced, the World Wide Web. Immediately, the museum organized its own site, which was one of the first 50 or so on the Internet. Since then, an outreach staff was hired and grants were received to develop an extensive on-line outreach program. This has been designed and developed not only by the staff but also the efforts of many graduate students. It is still one of the top sites on the WWW for which UCMP has won many awards. UCMP opened two new websites this year. *The Paleontology Portal* (www.paleoportal.org), in collaboration with the Paleontological Society, the Society of Vertebrate Paleontology, and the U.S. Geological Survey, and funded by the National Science Foundation, will provide access to information about geologic time periods, paleoenvironments, and ancient life in particular geographic regions. The second site *Understanding Evolution* (*http://evolution.berkeley.edu*), funded by the National Science Foundation and the Howard Hughes Medical Institute, assists teachers, their students, and the general public to better understand the processes, patterns, and importance of evolution. In *Explorations Through Time* (*http://www.ucmp.berkeley.edu/education/explotime.html*), funded through NSF-funded Instructional Materials Development, combines the scientific expertise of UCMP with teacher professional development to make a series of interactive, inquiry-based digital modules used in classrooms. These activities are assisted by an advisory board of teachers that help develop, pilot and evaluate programs designed for the K-12 classroom.

UCMP also has a long history of providing professional development opportunities and classroom resources for teachers in the natural sciences. These include annual short courses for teachers and workshops in local school districts as well as at annual meetings of the California Science Teachers Association, the Geological Society of America, the American Geophysical Union, and the Society of Vertebrate Paleontologists, for a combined audience of more than 600 teachers annually. UCMP's short courses, lectures and field trip for teachers and the general public provide the latest information on a wide variety of topics — evolution, history of California, geology of the west, and history and environment of San Francisco Bay, as examples. Usually these programs take place on a weekend with lectures on Saturday and field programs on Sunday. These have included topics ranging from evolution through the history of San Francisco Bay to field trips on the Bay and the geology of a vineyard in the Napa Valley. On occasion the museum has sponsored, sometimes in conjunction with other University units, field expeditions that are open to interested people. For example, expeditions to Montana and Alaska dinosaur beds, the oldest animals on the White Sea, Russia, and fossils from Israel have been very successful.

For decades, the museum has held open house one weekend each year. In the past, they were special days designated by UCMP, when the collections, preparation and particularly outstanding fossils were demonstrated to the public. Since 1995, these UCMP open houses have taken place as part of Cal Day, the general campus open house. Thousands of people tour the campus, and many

of them come by UCMP to see the latest in fossil discoveries and research.

Exhibits are a small part of UCMP's activities, largely for lack of space and the academic environments where it has been housed. Nevertheless, a few exhibits have always been part of UCMP. Currently, the museum displays a few outstanding fossils in the foyer of the VLSB, including a *Tyrannosaurus rex* (Fig. 1). The *T. rex* is a cast, an exact replica in foam and plastic, of a very complete specimen collected in Montana by a Museum of the Rockies team, which included UCMP people. The cast, standing in the circular stairwell of VLSB, is seen by hundreds of school children and thousands of other people each year.

When will UCMP go extinct?

Because the museum maintains large collections, has a significant endowment, and supports so many diverse and important activities for so many people, it is a permanent part of the University of California at Berkeley, as it has been for many decades. As paleontology in general expands into environmental analyses, conservation biology, astrobiology, biometrics, biodiversity, and other emerging new fields where it can make a contribution, it will continue to fulfill an important role in the university and general public. Its preeminence in the field should continue unabated! UCMP should survive for many more decades.

Acknowledgments

In spite of a wealth of help and information on various aspects of UCMP and its history provided by many people, I have decided for this article to restrict myself to published accounts and archived images. Much remains to be documented by discussions with past and present faculty, staff and students, study of oral histories, manuscripts, letters, and administrative documents, but that would result in a rather long book! Nevertheless, I am indebted to many people for assistance of various sorts in gathering the information I used here. In particular, I am indebted to Professor Joseph Gregory for his series of UCMP History articles in the UCMP News and discussions with me. Among the Faculty Curators, past and present, I thank William Berry, William A. Clemens, the late J. Wyatt Durham, David Lindberg, and the late Donald Savage, and, from among the Museum Scientists and Paleontologists, the late Sam Welles, Diane Erwin, Kenneth Finger, Mark Goodwin, David Haasl, Pat Holroyd, and Howard Hutchison for interesting discussions and pointers about the history of UCMP and help locating various materials, fossil and otherwise, that clarified much of what has been written. Cheri Branson, Judy Scotchmoor, David Smith, Robin Walker, Colleen Whitney, Lorraine Cazassa and Sarah Rieboldt provided assistance in finding or acquiring images, books and letters, while former UCMP student Edward Mitchell (Ph.D. 1967) told me much about his oral history of Charles Camp, now housed in Berkeley's Bancroft Library, and other sources of historical information. I was also privileged to talk with Vanderhoof at the Santa Barbara Museum of Natural History in 1960, Ruben Stirton when I was an undergraduate visitor to UCMP in 1962, and Robert M. Kleinpell in 1968. Those memories kindled other leads and made this paper all the more interesting for me to write. Susie Lipps helped me in many ways including the location of Joseph LeConte's grave and information about his relatives. I thank all of these people and A.E. Leviton and M.L. Aldrich of the California Academy of Sciences for organizing the symposium that resulted in this volume and for their incredible patience.

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