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# Resolution of Respect

Professor Paul Schultz Martin

1928–2010

One of the giants of paleoecology has died. By any measure, Paul Martin led an extraordinary life and has left us with a rich legacy that goes well beyond his scholarly achievements. Broad interests and limitless curiosity took Paul down geographical and intellectual paths reserved only for the bravest and most creative of souls. His courage and his keen powers of observation and synthesis fueled a scientific career that flourished for six decades. Paul Martin's fascination with the natural world was contagious to anyone willing to sit on his lap and listen. Once you left his lap, nothing pleased Paul more than to see you take one of his ideas and run with it in an entirely new direction. Paul was a talented and generous mentor, colleague, and friend. Anyone who spent more than a few minutes with Paul knew that "The Age of Discovery" was alive and well.



In the mid-1950s, just after getting his Ph.D. in zoology at the University of Michigan, Paul Martin began to investigate how plant communities had changed over the time periods that could be measured by radiocarbon dating, roughly the last 40,000–50,000 years. Soon he was floored by the fact that the plant communities in North America (and elsewhere in the Americas) had developed alongside rich faunas of large mammals, yet nearly all of these large mammals had died out at the end of the last ice age, only about 12,000 years ago. The long list of departed large American mammals included ground sloths, giant armadillos, mammoths, mastodons, camels, horses, sabertooths, lions, giant bears, and many others. Although glacial-to-interglacial climate changes had altered the distributions of plants, no botanical extinction was evident. Something was fishy in the New World, and Paul Martin set about, as only he could, to figure out why all those large American mammals died out.

Paul believed one thing distinguished this massive extinction event from all others in the fossil record—the first arrival of humans in the Americas. Working closely with a long list of archaeologists, geologists, paleontologists, botanists, zoologists, and mathematicians through the decades, Paul accumulated abundant evidence supporting his idea that most species of large mammals, not just in North America, but in Central and South America as well, were hunted to extinction by early Americans.

This idea became known as the Pleistocene Overkill Model or Blitzkrieg. It was his leadership role in the debates about the cause(s) of these extinctions for which Paul was so widely renowned and respected.

Paul Schultz Martin was born in Allentown, Pennsylvania on 22 August 1928 to Daisy S. Schultz and Francis Earl Martin. He was an only child whose parents gave him abundant opportunities to explore rural Pennsylvania during the Great Depression. Paul's mother and father were both avid gardeners and self-trained naturalists who taught their son about natural history mainly by cutting him loose for self-planned adventures, a teaching method that Paul would use effectively as a university professor. Paul's informal training also included working alongside his father (a veterinarian) and his uncles (dairy farmers) in the piedmont of southeastern Pennsylvania. His childhood interests were just as broad as those he honed as an adult. Paul was fascinated by climate, weather, geology, plants, and vertebrates of any sort, and how all of these things interacted; ecology was in Paul's blood from his earliest memories. He also was deeply interested in how people influenced the natural world.

Young Paul Martin's enthusiasm for birds already was strong, but it really took off when he borrowed binoculars at age 14 and set off to learn all that he could about the local birdlife whenever school and work permitted. Birds provide a visually conspicuous excuse to get outside, to cover lots of ground, and to become sensitive to habitats. (Right away you learn that Bobolinks don't live in oak forests, nor will you find a Red-eyed Vireo in a cattail marsh.) Paul explored distinctive bird-watching locales within a day's drive of his home, such as Hawk Mountain and the New Jersey Pine Barrens.

Only a few weeks after his 17th birthday, Paul enrolled as a freshman at Cornell University. Immediately he began to interact with a large, active, highly dedicated group of biologists that included, aside from professors Arthur A. Allen and Peter Paul Kellogg, a number of older students returning from military service in exotic places such as Panama (Ed Reilly), India (Bill Dilger, Steve Eaton), and New Caledonia (Dwain Warner). During their gatherings at Fernow Hall, Paul became enthralled with the prospect of visiting the tropics, and it was pretty clear that an ability to collect and prepare specimens of birds was going to be his ticket.

The first such opportunity for this tall lad with sharp bird-watching skills arose in January 1948, when Paul accompanied Ernest P. (Buck) Edwards and Roger P. Hurd to Tamaulipas in northeastern Mexico to collect vertebrates (especially birds) for Dr. George M. (Doc) Sutton. Paul was smitten by the lifestyle of rural Mexicans, and by the Mexican countryside, which can change rapidly over short distances because of the interplay of changing elevation, geology, and climate. As the trogon flies, only tens of kilometers separated the Tamaulipan tropical dry forest from moist forest from cloud forest from pine-oak woodland. The resulting plant and animal communities were populated by species both familiar and exotic to someone grounded in the northeastern United States. In the foothills and mountains of Tamaulipas, Paul collected and prepared specimens of birds, and recorded other species by sight or sound.

The Mexican birds, as interesting as they were, did not exist in a vacuum for Paul, who became more and more interested in understanding how tropical floras and faunas came to be. What sort of history could account, for example, for hickory and sweet gum trees (familiar to Paul from his youth in Pennsylvania) growing in the cloud forest alongside purely tropical trees such as figs and podocarps? While as a Cornell undergraduate he would make two more trips to Mexico that focused on collecting

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birds as far south as Michoacan (variously with Buck Edwards, Bill Heed, Dick Robins, Doc Sutton, and Charles Sibley), Paul was being drawn toward organisms that didn't fly away when approached, namely plants, amphibians, and reptiles. The botanical side of Paul's love for Mexico would continue well past his retirement in 1989, as evidenced by *Gentry's Rio Mayo Plants*.

Paul Martin received his B.A. in Zoology from Cornell in 1951. He was married now to another Cornell zoology student, Marian Wallach. Paul had contracted Guillaine Barre syndrome (later diagnosed as polio) on a trip to Mexico, leaving him able to walk only with difficulty. Slogging up and down steep karst terrain with a shotgun was much less feasible than before, and an interest in organisms more sedentary than birds was better suited to his new level of mobility. Paul moved from Cornell to the University of Michigan, where he got an M.S. (1953) and Ph.D. (1956) in zoology by studying the biogeography of amphibians and reptiles in the Gómez Farías area in southern Tamaulipas, the world's northernmost tropical cloud forest. His dissertation advisor was Charles F. Walker. The monograph that Paul published as a result of his dissertation research was ground-breaking. While it was based largely on field collections of amphibians and reptiles, Paul wrote about his topic from a historical standpoint that included careful consideration of how the ice age might have affected the past and present distribution of amphibians and reptiles and their habitats.

It was during his postdoctoral fellowships at Yale University (Edward S. Deevey, Jr.) and the University of Montreal (Pierre Dansereau) in 1956 and 1957 that Paul Martin's interest in understanding the past really blossomed. With the development of radiocarbon dating only several years earlier, Paul's timing was perfect to study ancient distributions of plants and animals on a broad scale with a much improved chronology. After learning from Ed Deevey the methods of palynology (the study of pollen), Paul began to investigate how plant communities had changed over the time periods that could be measured by radiocarbon. A vast experience with vertebrates would allow Paul to interpret data on fossil pollen from the perspective of both the plants and the animals that consumed the plants.

In 1957, Paul moved from Montreal to Tucson with Marian and their three young sons (Andy, Neil, and Tom). Professor Ted Smiley hired Paul to work at the University of Arizona's innovative Geochronology Laboratory, a perfect venue for studying the relationships through time of plants, animals, climate, and humans. With its nearness to the deserts and mountains of the southwestern United States and northern Mexico, and with newly established programs in tree-ring dating and other aspects of paleoecology, the University of Arizona seemed ideal to Paul. After working with the poorly preserved pollen of Willcox Playa and alluvial sequences, Paul focused on the largely untapped wonders of high-quality long-term preservation of organic materials in dry climates, such as the dung of extinct ground sloths in dry caves, which contained remains of the plants that these lumbering animals had eaten during their last centuries on earth.

Paul took an office in the Desert Laboratory, a set of three stone buildings constructed in 1903 by the Carnegie Institution. The Desert Lab was built on Tumamoc Hill, an extinct volcano that overlooked Tucson from the west. Through the years, the Desert Lab (also called by those working there "Tumamoc Hill" or simply "The Hill") has been a bastion of academic freedom, creativity, and prolific scientific research. The botanical magazine *Plant World* was edited by two Desert Lab scientists, Francis Lloyd and Forrest Shreve, from 1906 through 1919, when it was turned over to the Ecological Society of

America and re-named *Ecology* in 1920 (J. E. Bowers, 2010, *Desert Plants* 26:25–40). During his first year in Tucson, Paul Martin (with fellow Mexico-lover Byron Harrell) published a paper in *Ecology* entitled “The Pleistocene history of temperate biotas in Mexico and eastern United States” that set the stage for much of Paul’s future paleoecological research.

On Tumamoc Hill, Paul was surrounded by the native plants and animals he loved. He also was immersed in a rich history of ecological research, and in a diverse set of colleagues from the University of Arizona and elsewhere. Paul Martin thrived on Tumamoc Hill from 1957 until he vacated his Desert Lab office in 2008, an interval of time equivalent to  $1\sigma$  on a high-quality radiocarbon date. The permanent vegetation plots on Tumamoc Hill, established in 1906 and monitored ever since, are the oldest in the world. These plots now have spanned  $2\sigma$  of radiocarbon time, a small fact that exemplifies how important Tumamoc Hill has been in showing that ecology and paleoecology blend into one another.

Administered through most of Paul’s tenure by the Department of Geosciences, the Desert Lab was the most interdisciplinary setting imaginable. Well before it became intellectually fashionable to be interdisciplinary, the professors and students on The Hill were doing it. Nobody on The Hill had any hang-ups about the departmental categorization of your past or future diplomas—archaeologists were studying pollen records (and vice versa), botanists were studying Quaternary geology (and vice versa), zoologists were doing vegetation surveys, and so forth. The utter lack of disciplinary hang-ups on The Hill nourished our spirit of collaboration, with Paul Martin, a Professor of Geosciences who had three degrees in zoology and an undying love of plants, leading the pack. (In the long term, this stuff probably evens out; I may be the only Curator of Birds with a Ph.D. in Geosciences.)

Paleoecology was the uniting theme for the students on Tumamoc Hill with highly varied academic backgrounds. With apologies to those whose names I have overlooked, here is a quick run-down of some of the scientists who were trained on The Hill and obtained advanced degrees at the University of Arizona, with Paul Martin either chairing their graduate committees or being an important influence: Dave Adam, Martha Ames, Julio Betancourt, Vorsila Bohrer, Ben Brown, Tony Burgess, Bill Byers, Ken Cole, Pat Fall, Bonnie Fine, Vance Haynes, Dick Hevly, Gerald Kelso, Jim King, Paul Leskinen, Jim Mead, Pete Mehringer, Mary Kay O’Rourke, Art Phillips, Norrie Robbins, Jeff Saunders, Jim Schoenwetter, Geoff Spaulding, Tom Stafford, Dave Steadman, Bob Thompson, Tom Van Devender, Pete Van de Water, Bob Webb, Fred Wiseman, Wally Woolfenden. Their careers have gone in every possible disciplinary direction, and few things could make Paul happier.

Starting in the early 1970s, Paul and his students began a major program of studying the superbly preserved plant and animal remains in ancient packrat middens. The plant macrofossils in these middens could be identified to species, and therefore could track in detail how southwestern plant communities had changed during and after the last ice age. The hundreds of thousands of identified plant bits revealed no extinction, the same conclusion as reached by picking apart dung of extinct ground sloths, which were eating plants 12,000 years ago that still are common in Arizona and New Mexico. Paul enjoyed working closely with radiocarbon dating experts such as Doug Donahue, Vance Haynes, Tim Jull, Austin Long, and Tom Stafford, who involved him in the latest innovations in dating techniques.

Paul Martin’s infatuation with the mystery of Pleistocene extinctions only grew through time. He

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took an idea that started in North America and expanded it to a global scale, finding a clear relationship between the first arrival of humans and extinction of animals in places as far from his home base as Australia and the Pacific islands. Conversely, Paul and his colleagues found that Africa and Eurasia told a very different story. Here, the late Pleistocene loss of large mammals was gradual, a phenomenon attributed to being sympatric with evolving humans, and therefore having a long history of trying to avoid human predation. Paul's interest in extinctions anywhere on earth also helped to quench his thirst for adventure, including such daring escapades as flying north-to-south across all of South America, Africa, and Madagascar with the renowned bush pilot Ike Russell. Dropping in from the sky wherever Ike's tiny plane could touch down (landing strips optional, and no guarantee of finding fuel), Paul visited colleagues and fossil sites in the most remote of localities. Even though he was one of the most avid readers I have ever known, Paul believed firmly in the need to see things first hand.

More scientists subscribe to Paul's Pleistocene Overkill Model than was the case when it first caught my attention nearly 40 years ago, although a number of nonbelievers remain. At the risk of offending them, but with a strong conviction that Paul Martin has been right all along, I note that not one of Paul's scholarly rivals ever could match his command of so many different subjects. Paul always found the trees themselves to be interesting, but he also saw the entire forest. I've never seen anyone as conversant, knowledgeable, and just plain interested in, so many different topics as Paul.

Paul published prolifically throughout his career, including major edited volumes on Pleistocene extinctions in 1967 and 1984 that brought the debate up to date. He always invited participation from colleagues on all sides of the issue. In 2005, a full 16 years after he retired from the University of Arizona, Paul summarized his thoughts on Pleistocene extinctions in the book *Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America*. Paul's unique talent for connecting the past to the present came through loud and clear in this heartfelt book.

In 1978, his marriage to Marian having ended some time before, Paul married Mary Kay O'Rourke, a palynologist originally from upstate New York. Mary Kay and Paul have lived ever since in the Armory Park Historic District of Tucson. They have had many notable adventures together, beginning with numerous camping trips to northern Mexico (especially Sonora), a visit to the Galápagos Islands in 1980, and to Australia in 1981 and 1988. When Paul became heavily involved in a huge botanical project in the Río Mayo region of southern Sonora and Chihuahua in the late 1980s, Mary Kay began to spend less time camping with Paul in the wilds of Mexico so that she could pursue her own interests a little more. Now she is an Associate Professor in the University of Arizona's Mel and Enid Zuckerman College of Public Health, as a specialist in human exposure assessment to environmental agents including biologicals, metals, and pesticides. As Paul's health declined in recent years, Mary Kay has stood steadfastly and unselfishly at his side. We all admire her efforts.

In 1999 Paul received the Distinguished Career Award from the American Quaternary Association, and in 2008 he was selected as an Honorary Member of the Society of Vertebrate Paleontology. He passed away on 13 September 2010. Aside from his dear wife Mary Kay O'Rourke, Paul is survived by his sons Andy Martin (with wife Sarah and daughters Molly and Jane), Neil Martin, and Tom Martin (with wife Hazel).

Written by David W. Steadman

### Publications of Paul Schultz Martin

1951

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Black robin in Tamaulipas, Mexico. *Wilson Bulletin* **63**, 340.

1952

A new subspecies of the iguanid lizard *Sceloporus serrifer* from Tamaulipas, Mexico. *Occasional Papers of the Museum of Zoology, University of Michigan* **543**, 1–7.

1954

Birds and biogeography of the Sierra de Tamaulipas (with C.R. Robins and W.B. Heed). *Wilson Bulletin* **66**, 38–57.

1955

Herpetological records from the Gómez Farías region of southwestern Tamaulipas, Mexico. *Copeia* **1955**, 173–180.

Zonal distribution of vertebrates in a Mexican cloud forest. *American Naturalist* **89**, 347–361.

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1957

The Pleistocene history of temperate biotas in Mexico and eastern United States (with B.E. Harrell). *Ecology* **38**, 468–480.

1958

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Pleistocene ecology and biogeography of North America. Pp. 375–420 in “Zoogeography” (C.L. Hubbs, ed.). *AAAS Publication* **51**.

1959

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1960

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Pollen analysis of coprolites. Pp. 101–104 in “A survey and excavation of caves in Hidalgo County, New Mexico” (M.F. Lambert and J.R. Ambler, eds.). *The School of American Research Monograph* **25**, Santa Fe, NM.

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1963

*The Last 10,000 Years: A Fossil Pollen Study of the American Southwest*. University of Arizona Press, Tucson, 87 pp. 2<sup>nd</sup> printing 1970.

Early Man in Arizona, the pollen evidence. *American Antiquity* **29**, 67–73.

Geochronology of pluvial Lake Cochise, southern Arizona. II. Pollen Analysis of a 400-meter core. *Ecology* **44**, 436–444.

1964

Detection of fresh and fossil pollen with fluorochromes (with S.J. Shellhorn and H.M. Hull). *Nature*

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1965

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1966

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1967

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Pleistocene overkill. *Natural History*, December, 32–38.

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1969

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1971

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1977

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1981

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