

TUCSON'S BEST-KEPT SECRET MAY BE THE 90-YEAR-OLD DESERT LABORATORY

FROM THE HILL OF



written by NANCY WALL

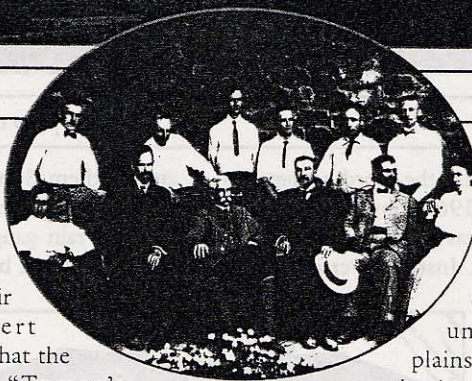
Lawrence Clark Powell once said, "If Tucson has an acropolis, this is it—the Hill of the Horned Toad." He was referring to Tumamoc Hill, where for the last 90 years, just minutes from the heart of Tucson, research scientists have been carrying out their

work at the Desert Laboratory so quietly that the Lab has been called "Tucson's best-kept secret."

The name comes from *chú-ma-maik*, the Tohono O'odham word for horned lizard. One of the city's real treasures, Tumamoc is well known to ecologists throughout the world. However, few visitors—or even residents who live right

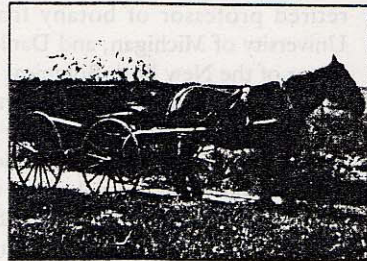
under its shadow on the west side of the city—know the rich story of this 869-acre plot of land or the role the Desert Laboratory has played in the way Tucson has developed. Now the secret is getting around, with a 90-year anniversary celebration on November 19 open to a limited number of guests.

The story of the Desert Laboratory started just after the turn of the century—back when Tucson was a small town, the Santa Cruz



River still had water in it yearround, and the speed limit for automobiles was seven miles per hour. The Carnegie Institute took a long look at the Great American Desert and wondered what it was that enabled plants to survive—even flourish—under such extreme conditions. The great plains had been tamed and made agriculturally productive, and the desert offered a last, tough frontier.

Perhaps envisioning family farms scattered across the vast expanses of creosote and mesquite, the leaders of the Institute were hoping to find some practical use for this challenging land and thereby boost the nation's economy. So in 1903 they founded the Desert Laboratory, soon to become a pivotal site in the science of ecology. Tucson community leaders, eager to have this facility, donated the land. Here began many of the country's first ecological studies, some of which would eventually embrace the entire Sonoran Desert region.



ON TUMAMOC HILL, A WORLD-PIONEER FACILITY IN THE STUDY OF ECOLOGY

THE HORNED TOAD



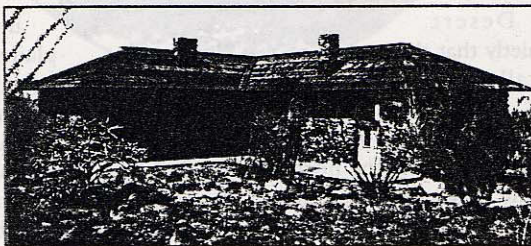
color photography by WILLIAM LESCH

It may surprise some people to learn that the word *ecology* was not coined in the United States in the 1960s, but in Germany more than 100 years ago. The discipline was somewhat slow to be accepted. Ecology wasn't a single science. Instead it crossed over boundaries into several—botany, biology, earth sciences, and hydrology, to name a few. Nevertheless, the early Tumamoc researchers, beginning with William Cannon (who later wrote the book *Root Habits of Desert Plants*) eagerly began exploring this landscape, foreign to most of them. Cannon was soon joined by Volney M. Spalding, a retired professor of botany from the University of Michigan, and Daniel T. MacDougal, the former director of the New York Botanical Garden.

Spalding's name is an important one: he established some of the earliest study plots in the world in which the progress of every plant in a grid was to be charted over a long period of time. Some of these original study plots are still in use today, offering the most extensive knowledge available about the life of several desert plants—most prominently the saguaro. MacDougal, who was put in charge of the Desert Laboratory, brought in several other eminent researchers,

among them Burton Livingston, a plant physiologist, and Godfrey Sykes, a geographer and explorer who would later install a whole series of rain gauges along Mexico's *Camino del Diablo*. Another researcher hired by MacDougal, Forrest Shreve, devoted the better part of 40 years to an impressive body of research on North American deserts and the way they work. Shreve is the name most closely associated with the first phase of the Desert Lab's history—his wife Edith, a chemist, physicist, and plant physiologist, was the first woman to do research on the Hill.

Forrest Shreve was a quiet man, far more concerned with pursuing his work than promoting his own reputation. His contributions in plant ecology were sometimes overlooked during his lifetime, but today he is widely recognized for determining the influence of aridity on desert vegetation. Unable to accept the idea that competition among plants was the deciding factor in surviving these harsh conditions, he took it upon himself to study patterns of cold-air drainage, soil moisture, rainfall, and climate on saguaros and other plants that must have seemed very odd indeed to this Easterner. During his first decade here,



historical photographs courtesy of ARIZONA HISTORICAL SOCIETY LIBRARY (26693,42930,43988,63840)

THE STORY OF
THE DESERT
LABORATORY



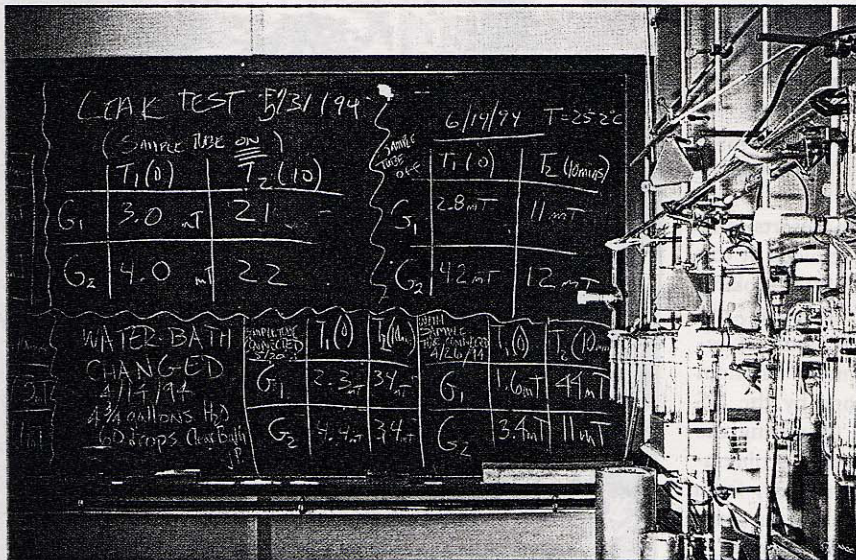
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activity on Tumamoc flourished, with so many visiting scientists living on the Hill in tents that Shreve referred to it as a village. After a 13-year project, he and Burton Livingston published *The Distribution of Vegetation in the United States as Related to Climatic Conditions* in 1921. Shreve was elected president of the Ecological Society of America the following year, and *Plant World*, the journal he had established years earlier, became *Ecology*, the official publication of that organization. He was made director of the Desert Lab in 1928.

The Lab has been through numerous changes over the years, and the Depression ushered in some of the most radical. The Carnegie Institute no longer had the funds to invest as heavily in research as they once had. They were also growing somewhat disenchanted with Shreve, who in the process of studying the desert had been seduced by its beauty and integrity, growing to appreciate it for what it was rather than wanting to adapt it to serve the country's agricultural needs. Nor was the Institute wholeheartedly enthusiastic about the number of field trips into the Sonoran Desert that Shreve's work required. Starting in 1930, he and Ira Wiggins covered approximately 10,000 miles of desert in Arizona, California, and Mexico—traveling over terrible roads and carrying their drinking water from Tucson—to prepare for the publication of *Plant Life of the Sonoran Desert*. Although the Carnegie Institute published this work, now the classic in its field, it was obvious that Shreve's interest was not focused on "taming" the

desert and making it more "useful." In her excellent biography of Shreve, *A Sense of Place* (University of Arizona Press, 1988), Janice Emily Bowers reveals clearly the gap between the Carnegie Institute's mission and Shreve's when she quotes him saying that "the most significant lesson that the desert dweller can learn from a familiarity with its plant and animal life is to regard himself not as an exile from some better place but as a man at home in an environment to which his life can be adjusted without physical or intellectual loss."

In an attempt to continue the research already established on Tumamoc Hill, the Carnegie Institute offered the whole project to the University of Arizona in 1940 for the sum of \$1. The U of A was not yet prepared to take on the cost of maintenance and turned them down. The Desert Laboratory, along with several other Carnegie-funded research stations, was closed. The buildings and grounds of Tumamoc Hill were taken over by the US Forest Service for its Santa Rita Range Experiment Station. Shreve was given



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office space until his retirement, and the Institute even continued to fund his projects to some extent. But with the closing of the Laboratory and the death of Shreve in July 1950, the first great era of ecological research came to an end. Some of the original study plots were minimally maintained during this period, but many were destroyed through the granting of easements and the loss of records.

Then, in 1960, what might be considered the first renaissance of the Desert Lab occurred when the university, now ready to take on the financial responsibility of running the place, bought it from the Forest Service (paying considerably more than \$1) for a geochronology lab. Terah Smiley, the first director, hired Dr. Paul Martin, a man who followed the example of Forrest Shreve and made the Desert Laboratory his life's work. During his tenure, Martin has collected and identified plants over thousands of miles

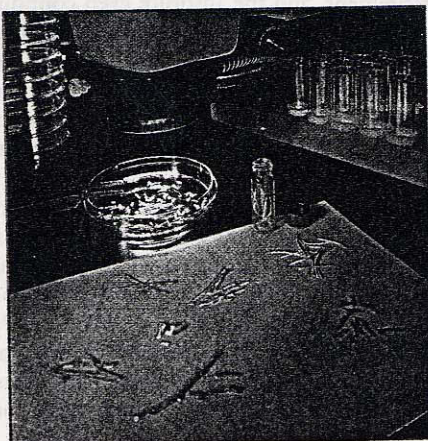
in eastern Sonora, particularly the Sierra Madre, bumping along roads that have improved only somewhat since Shreve's time in an old pickup truck with (it is rumored) bald tires. His research on the disappearance of large Pleistocene mammals has led to his belief that early man was more responsible for their demise than the more usually cited climatic changes. And his work, along with that of Desert Museum researcher Dr. Tom Van Devender, has revealed that the Tucson Mountains and Tumamoc Hill itself were, surprisingly, once a piñon, oak, and juniper woodland. As Martin says, "Mysteries start at home, in this case on the edge of Tucson, in view, within reach, even underfoot."

In the late 70s, Martin encouraged Dr. Raymond Turner of the United States Geological Survey (USGS) to move his research project office to Tumamoc, thus forming an alliance between that agency and the University of Arizona that continues today. Turner had already been monitoring what remained of Spalding's original study plots for some time, keeping several of them going. Today 16 are still in place—priceless records of the activities of 80 years, carefully documented by Turner's method of repeat photography. His photographs show clearly the explosions and diebacks of vegetation that no scientist could either have predicted or observed during a lifetime, for the essence of the desert is change. A desert is the result of exceptional droughts followed by exceptional rainfall, harboring what Dr. Tony Burgess calls "an incredibly rich mixture of organisms." One reason the early studies frustrated those who funded them was unpredictable findings. As Burgess points out, institutions are founded on predictability and generally find variance difficult to deal with. When Turner resumed photographing the original plots that the early researchers had photographed, he found few predictable patterns—something that has frustrated 20th-century scientists who have tried to control the desert rather than learning to live by its inscrutable logic.

Water, of course, is the most limiting factor in deserts, and also the least predictable. While much of Tucson rejoiced at the far greater than usual rainfall during the winter of 1993, looking forward to an unusual display of wildflowers in the spring, the ramifications for Tumamoc Hill engendered a more complex response. An abundant growth of annual grasses, many of them non-native varieties introduced throughout Arizona by the US Soil Conservation Service during the 1930s, dried up during the hot spring months to create a real fire hazard. And a proliferation of packrats, rodents that take their moisture primarily from cactus, cleared out 30 years' growth of baby saguaros in some areas—not to mention bringing on a corresponding increase in the number of kissing bugs, the noxious blood-sucking "guests"

that inhabit packrat nests and sometimes find other hosts in the form of the nearest human beings.

Deserts seem to be very much holding their own in a world where many other ecosystems are either dying out or being destroyed, so the research being done at the Desert Lab has become increasingly important. Today Tumamoc Hill is



experiencing something of a second renaissance. Although Martin and Turner have retired, both continue to carry out their research and advisory work on the Hill—and theirs will be four tough shoes to fill. In the spirit of the early researchers, these two are still devoting enormous energy to the projects taking place there, and the past couple of years have brought new areas under the jurisdiction of the Lab.

It would be impossible to discuss all the work of the past 90 years, but along with everything already mentioned, there have been studies of the Hill's first human inhabitants, the effects of flooding in deserts, packrat middens and fossil remains of plants and animals, and seasonal change in airborne pollen. Today, the Hill is a research site for the U of A's Departments of Geosciences and Ecology and Evolutionary Biology, the Laboratory of Tree Ring Research, and the USGS.

Although the average Tucsonan may know little about the specifics of the research carried out on the Hill, it has certainly impacted the city's ever-growing awareness of the beauty and practicality of desert landscaping. As the population soared right after the Second World War, new transplants to the desert attempted to bring Kansas, Indiana, or New Jersey with them in



the form of lush green lawns and non-native trees requiring much more water than is naturally available in this climate. By the 1950s, the city seemed to be headed toward an artificial ecosystem plunked down in the middle of the surrounding desert. Then concerns about water and growing problems with allergies among those who had left the Midwest in search of allergy relief triggered a change of consciousness. Today much of the grass is gone and more and more people are turning to vegetation that is adapted to a desert climate rather than running up exorbitant water bills in an attempt to keep non-native plants alive through the hot, dry days preceding summer monsoons.

In promoting the study and appreciation of desert ecology, the Desert Laboratory has contributed heavily to the unique character of Tucson—hailed in Michael Hough's book *Out of Place* (Yale University Press, 1990) as a model city that knows and rejoices in its environment rather than trying to turn the desert into something other than what it is. Given the nature of deserts, we can make no accurate predictions about the future, but it does seem certain that the lessons learned from long-term studies on Tumamoc Hill will continue to help us adjust to the inevitable changes.



Nancy Wall, whose interests include Shakespeare, Mexican tile, snakes, lizards, and India, is a frequent contributor to TGG.

The 90th anniversary event offers a rare opportunity for visitors and residents alike to enjoy a part of Tucson's history not usually accessible to the public. Shuttlebuses will take guests from a nearby parking lot up the narrow, winding road to a collection of volcanic-rock buildings dating back to the early 1900s. To commemorate nearly a century of work, some of today's resident scientists will give layman-oriented talks about the activities of the past 90 years.

Dr. Paul Martin, Professor Emeritus of Geosciences from the University of Arizona and still an active researcher, will lead a panel discussion with old-timers as well as some of newest members of the Tumamoc

team on the past, present, and future of the Lab. Participants will include Dr. Jay Quade, a young geochemist and soil scientist whose name is already widely respected in those fields; Drs. Julio Betancourt and Robert Webb, USGA scientists who have tackled several highly visible issues, from the influence of Lake Powell on the Grand Canyon to the possible responses of plants

to an increase in atmospheric CO₂ at the end of the last ice age; Dr. Raymond Turner, noted saguaro ecologist and retired USGS botanist; Dr. Betsy Pierson, a young USGS ecologist who is continuing some of Turner's long-term research on saguaros; and Dr. Tony Burgess, now dividing his time between projects on the Hill and Biosphere 2. In the library, visitors can view displays of historical photographs, among them a series taken of the *Camino de Diablo* (Devil's Highway) by renowned Tucson photographer Tad Nichols. Throughout the afternoon, informed guides, some in period costume, will lead walking tours, and Janice Emily Bowers and other authors connected with Tumamoc will be available to sign books.

Because of space limitations, attendance at the Desert Laboratory's 90th anniversary celebration will be limited. For information, phone 629-9455.