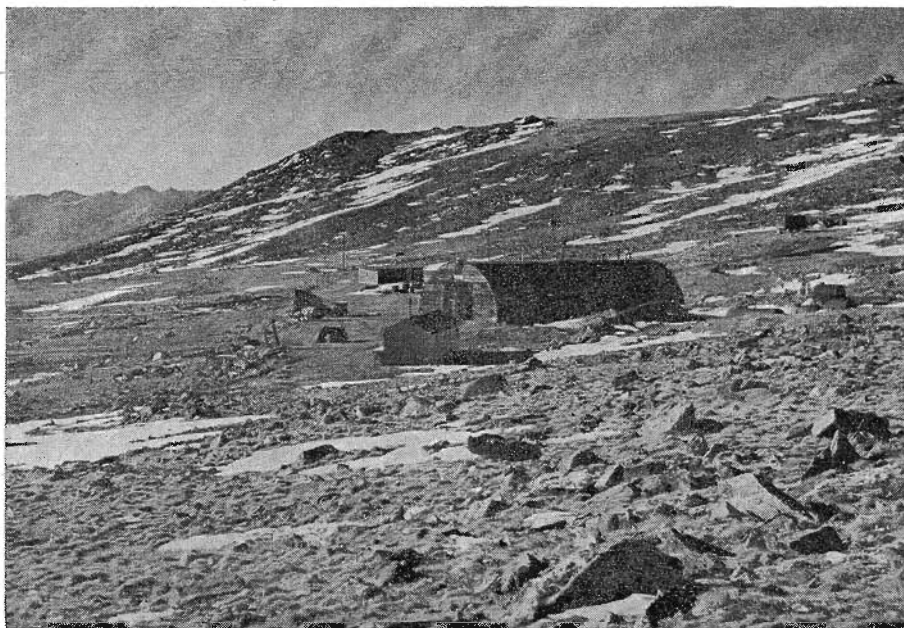


WHITE MOUNTAIN

This is the Sixth Article in the Current *Westways* Series
on the Activities of Scientific Research Institutions
and Laboratories in Southern California

High and Dry Research



• The Barcroft Laboratory is above the timberline at 12,470 feet. It is the highest place of year-round habitation in the United States and the Weather Bureau's highest reporting station

“WHEN GETTING STARTED, a decade ago, we were only a wart on the little finger of a great university. Today we're fast becoming one of America's most important centers for high-altitude studies of animals and men.”

Husky, black-haired Dr. Nello Pace, director of the University of California's White Mountain Research Station, was speaking.

“Sounds like boasting, doesn't it?” he grinned. “But it happens to be true.”

We were standing on a treeless ridge atop the rugged mountain range which lies just east of the Owens Valley. Above us, jutting into the cobalt blue sky, loomed 14,250-foot White Mountain Peak. Below zigzagged the steep, rocky road over which we had bumped in a pick-up truck. In wintertime, transportation over the snow is by weasel.

“To our laboratories here in the White Mountains have come not only scientists from Berkeley, UCLA, Davis, Cal-Tech and Stanford,” said Dr. Pace, “but also from the University of Arizona, Dartmouth, Penn State, Wesleyan, Duke, North Carolina, the University of Paris and many others.

“About sixty scientific papers have been published on research done here—mostly in the biological sciences.”

The University of California's White Mountain Research Station consists of three separate laboratories:

1. The Crooked Creek Laboratory—located in an arid mountain meadow at the 10,150-foot level where several wooden buildings stand amid grey-green sagebrush and bristlecone pines.

By Andrew Hamilton

2. The Barcroft Laboratory—dominated by a king-sized Quonset hut at the 12,470-foot level where the barren landscape resembles a Hollywood set designer's idea of the moon.

3. The Summit Laboratory—a two-room stone hut perched on the very top of 14,250-foot White Mountain Peak, which offers a breath-taking view of three states (California, Nevada and Utah).

The Summit Laboratory is the world's fourth highest scientific center, exceeded only by Chacaltayn, Bolivia (17,050), Morococha, Peru (14,900 feet), the Mont Blanc, France (14,280 feet). The Barcroft Laboratory is tenth highest while the Crooked Creek Laboratory is twenty-second highest.

The three laboratories are linked by a steep dirt road that runs north of the Big Pine-Tonopah highway near the top of Westgard Pass. The adventurous motorist can drive to the Crooked Creek Laboratory over a recently-improved twenty-mile stretch if his car is in good mechanical condition and if he has a spare tire and plenty of water and gasoline.

But a locked gate and a sign that states “Road Closed To Vehicular Public Travel Beyond This Point” discourages visitors from driving to Barcroft and Summit. They lie within a twenty-square-mile area that has been set aside by the U.S. Forest Service for high altitude research and the protection of natural fauna and flora.

White Mountain Peak was so named by the Mono Indians, who called it “Tos-toya”—“toso” meaning light-colored rocks, “toya” meaning mountain. The dolomite formations on its western slopes make it appear to be covered with year-round snow patches.

Scientists first became interested in the White Mountains in 1948 when the Naval Ordnance Test Station at China Lake chose White Mountain Peak as a missile observation site. The Navy built the Crooked Creek Laboratory to support

observations at the peak. In 1951, Crooked Creek was taken over by the University of California, which then bulldozed the road to the top and built the Barcroft and Summit laboratories.

Dr. Pace recalls how the transfer took place on September 1, 1951.

"Here are the keys and here is the inventory," said the supply officer of the Naval Ordnance Test Station. It was that simple.

The University of California operates the three laboratories with a permanent maintenance staff of four men headed by Paul Manis. The budget of \$55,000 a year is contributed by the Regents of the University, the Office of Naval Research

The peak on which the laboratory is located also bears his name.

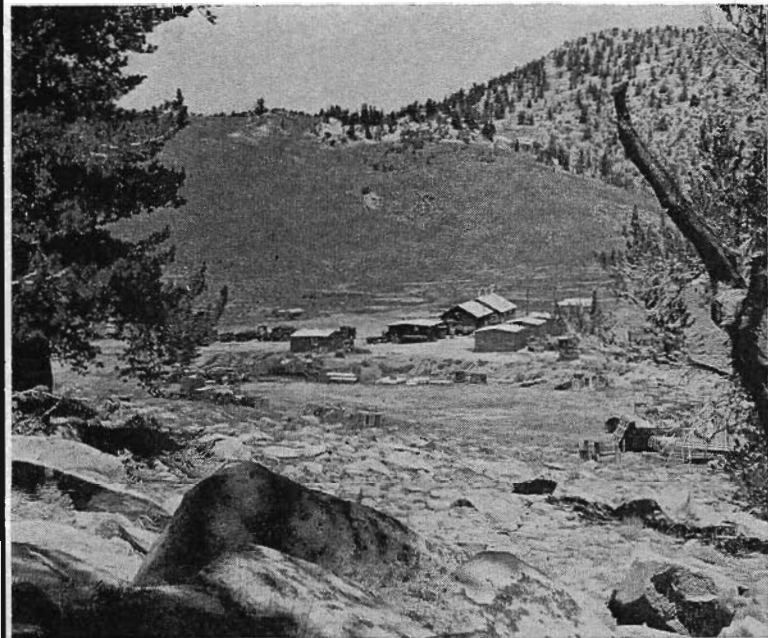
Barcroft is also the highest reporting station in the U.S. Weather Bureau system. Average July daytime temperatures are a pleasant 54 degrees, but winter temperatures may skid to 20 below. When bitter winds howl, the needle on the anemometer climbs to 90 knots and sticks there because it can go no higher.

Barcroft is centered around a large, two-story Quonset hut. Within are five small research laboratories, a dormitory with twenty-four bunks, a kitchen and a dining room, a billiard table ("the best \$50 bargain we ever picked up," said Dr. Pace), and a library of 300 books

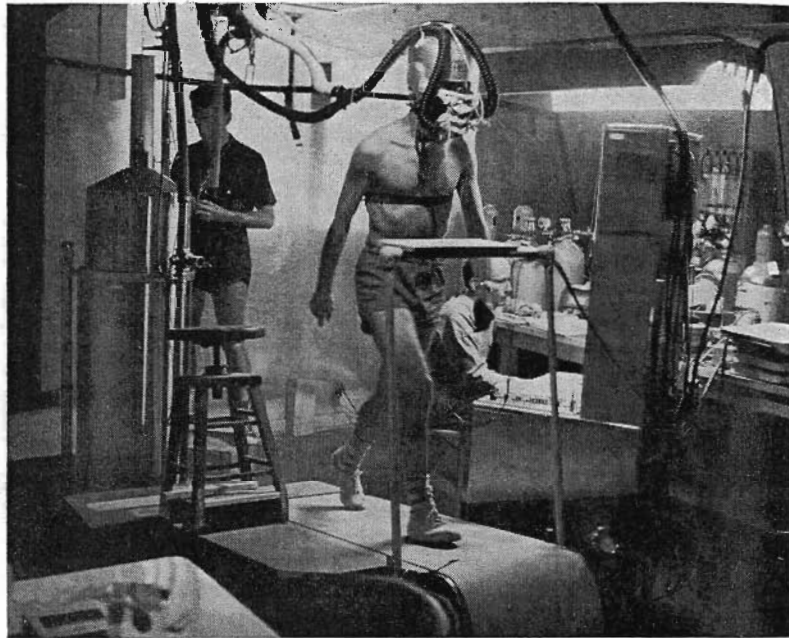
dent mothers gave only one-third or one-fourth as much milk at high altitudes, and that the babies literally starved to death. Why didn't the mothers produce more milk? That's the riddle the scientists are working on now. They suspect it may be because the animals don't store enough carbohydrates. But always the question, "Why?"

Interesting experiments with poultry have been conducted by Dr. H. Arthur Smith and Dr. Wilbor O. Wilson of Davis. They found that chickens taken to Barcroft lost as much as one-third of their body weight and stopped laying eggs. But turkeys, raised from day-old poults, seemed to thrive. Why the differ-

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● Crooked Creek Laboratory is located in an arid meadow at 10,150 feet. It was turned over to the University of California in 1951 by the United States Navy which had used it for missile observations



● Professors Pierre Dejours of the University of Paris (left) and R. H. Kellogg of the University of California (right) are measuring the work performance of a graduate student at the Barcroft Laboratory

and the National Science Foundation. In addition, individual research projects are financed by the National Institutes of Health, the National Science Foundation, the Office of Naval Research and other agencies.

"We also scrounge about \$200,000 worth of stuff a year," said Dr. Pace. "My business manager, Harry Pike, can spot a war surplus bargain 500 miles away."

The military look is obvious at all three laboratories. Navy jeeps and ambulances (still bearing the Red Cross emblem) scurry up and down the road. An Army x-ray machine is used in the Barcroft Laboratory. Air Force tanks hold surplus fuel oil.

Major share of the White Mountain research is done at the 12,470-foot Barcroft Laboratory—highest place of year-round habitation in the United States. The laboratory was named after Sir Joseph Barcroft, a physiologist from Cambridge University, England, one of the great names in high-altitude research.

and journals on high-altitude research. A nearby spring supplies running water and a power line from the Owens Valley provides electricity.

"A number of us helped with Barcroft, but most of it was built by Bill Roche with his own hands," said Dr. Pace.

Roche, who stays at Barcroft the year around, is also in charge of the animal houses that contain 700 rats and mice, 135 chickens, scores of guinea pigs, ground squirrels, deer mice, marmots, dogs, cats and other animals used in biological research. One dog has become so accustomed to the laboratory routine that he offers his paw in greeting whenever Roche comes near.

Dr. Pace, Dr. Sherburne F. Cook and others from Berkeley have studied the activities of rats and mice at high altitudes. For example: at sea level about one percent of newborn mice die, but at 12,470 feet some 60 to 70 percent die. Why was this?

Further studies showed that the ro-

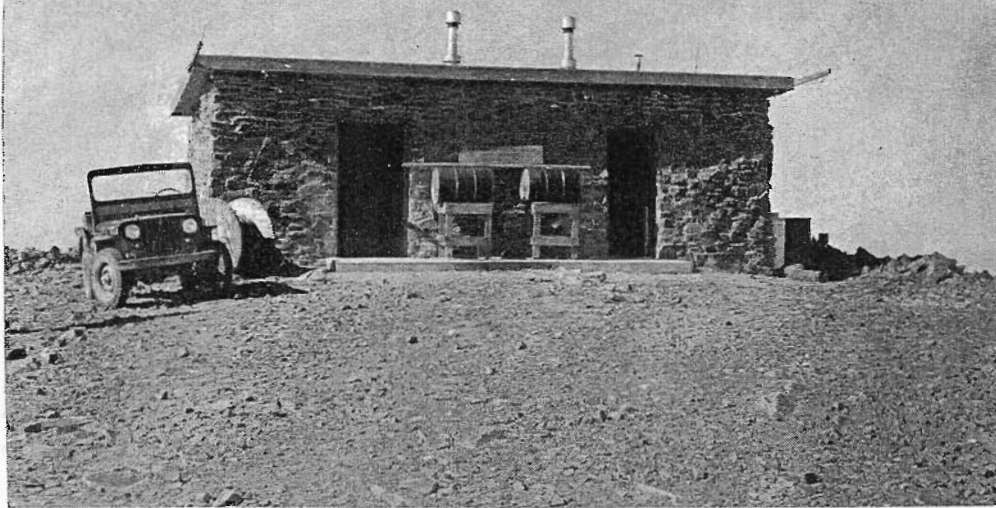
ence between chickens and turkeys?

Dr. Max Klieber, also from Davis, transported sheep to Barcroft to find out how the altitude affected them. Using Carbon 14 as a radioactive tracer, he was able to compare their metabolism with sheep that lived near sea level.

Dr. Raymond J. Hock, formerly of the Air Force Aeromedical Laboratory in Alaska, is doing interesting research on the hibernation of native marmots, ground squirrels and deer mice. It has been suggested that his experiments might have practical application when man makes long-distance space flights and must conserve his energy. Dr. Hock is resident scientist at the White Mountain Research Station. He and Bill Roche spend the entire year at Barcroft.

Although biological experiments are stressed at the Crooked Creek, Barcroft and Summit laboratories, a fair amount of research in other fields has been done.

Dr. Vern O. Knudsen, Dr. Leo P. Del-sasso and Dr. Robert E. Leonard, all of the UCLA physics department, meas-

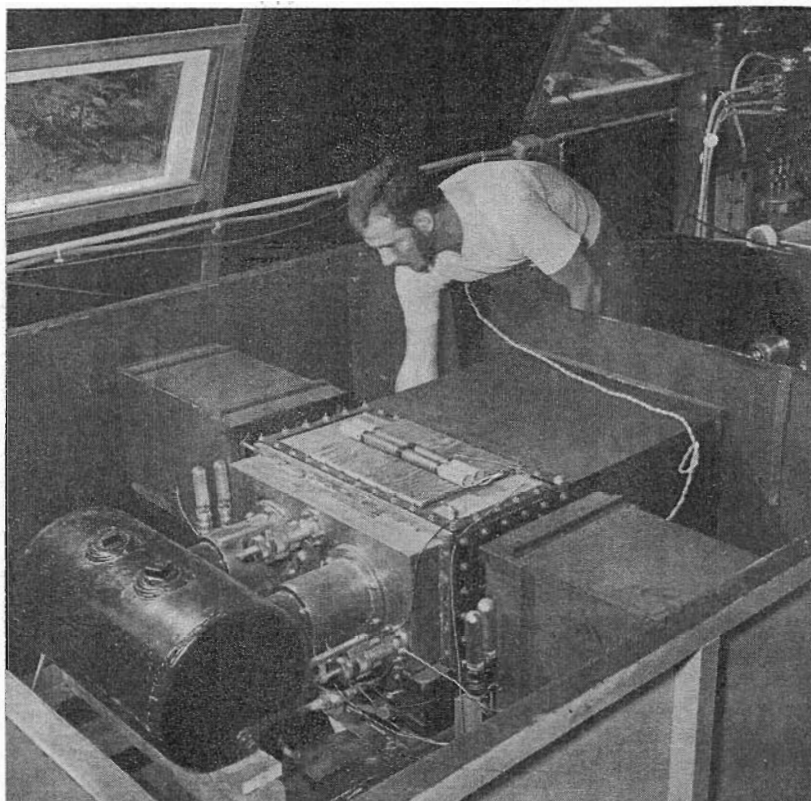


• The Summit Laboratory atop White Mountain Peak (14,250 feet) is a two-room stone hut. It's the world's fourth highest science center

by about one third. Within a week you will have recovered at least half the lost ability. At the end of two weeks you will have recovered more. This suggests that it takes the human body considerable time to adjust to high altitudes."

Scientific interest in the effect of altitude is more than academic. The recreational use of mountains—especially in the West—is increasing year by year. Thousands of people leave their valley and sea-level homes to go to 8,000-9,000- and 10,000-foot mountain resorts to hike, rock-climb and ski.

Dr. Pace and fellow scientists would like to know exactly how much stress is put on the human body in such strenuous activity. It is known that exercise in the mountains can produce altitude sickness—with its symptoms of dizziness, headache and nausea. But does altitude sickness produce any lasting damage?



• Physicists from the University of North Carolina and Duke University used a cloud chamber to study cosmic rays at the Crooked Creek Laboratory. A great many scientists make use of the laboratories—biologists, botanists, geologists, and physiologists



• Experiments were conducted on poultry by Professor A. H. Smith, left. At this height chickens suffered badly, but turkeys thrived

ured the speed of sound in the dry upper atmosphere. Another UCLA project, under the direction of Dr. Robert E. Holzer of geophysics, investigated the electric charge of thunderstorms.

A group of physicists from the University of North Carolina and Duke studied cosmic rays at the Summit Laboratory. A botanist from the University of Arizona made studies to determine the age of bristlecone pines on the White Mountain Range.

But perhaps the most interesting experiments—at least to the layman—are performed on human beings. Many scientists have served as their own guinea pigs. These have included Dr. Pace himself, Dr. Ralph H. Kellogg, Dr. Burton E. Vaughan and Lt. Erwin R. Archibald,

all of Berkeley. Physiologists from abroad have also come to participate in these studies. Dr. P. O. Astrand and his wife, both from Stockholm, and Professor Pierre Dejours of the University of Paris have worked with the Berkeley group.

Stripped to their shorts, the subjects jog on a treadmill or pedal a stationary bicycle to see how much work a man can put out at high altitudes. Electrodes taped to the skin measure the pulse rate and skin temperature. Special instruments measure the oxygen and carbon dioxide content of the lungs.

"Anyone who has climbed a high mountain peak knows the effect of lack of oxygen," said Dr. Pace. "On the first day, a man's ability to perform work is cut

Perhaps certain drugs can be found to speed adjustment at high altitudes. (They are not known at present.) A broader application of high altitude research may concern the treatment of diseases in which oxygen in the blood stream is reduced, or in which the oxygen-carbon dioxide balance is disturbed. Such diseases include silicosis, acute asthma or heart attacks.

Not long ago old-timers in the Owens Valley would tell you confidentially that White Mountain Peak was really higher than Mt. Whitney. The reason it was kept secret was that "it would be too much trouble to change all the maps and geography books."

This is a legend without basis of fact. Mt. Whitney, with an elevation of 14,495 feet, is incontrovertibly higher.

Today White Mountain Peak's reputation need not rest on rumor, legend and enigma. In the hard, precise world of science, it is assuming its place as one of the world's most important research centers.