

THE OBSERVATORY ON MOUNT WHITNEY

BY ALEXANDER McADIE.
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The mention of Mount Whitney, culminating point of the Sierra and highest spot in the United States, excluding Alaska, brings before the minds of most of us a series of mental pictures connected with the discovery and general history of the peak. The mountain was first seen from Mount Brewer by members of the Geological Survey of California in 1864 and was named after the distinguished head of the Survey. It was first climbed, as far as can be ascertained, on August 18, 1873, by Lucas, Bigole, and Johnson, and ingloriously named Fisherman's Peak. Clarence King had climbed what he supposed was Whitney in 1871; but in reality the peak now known as Sheep Mountain (shown in the photograph) lying to the south, also known as Old Mount Whitney and Mount Corcoran. While in New York on September 1, 1873, he learned of his mistake, and, hastening west, climbed the right peak, September 19, 1873. On September 6th of the same year Carl Rabe climbed the peak, carrying to the summit a mountain mercurial barometer, - Green, No. 1554, - and made the first determination of the mountain's height. This particular barometer was again carried to the summit by McAdie and Le Conte with other instruments on July 8, 1903.



The Observatory on the summit of Mt. Whitney, 14,502 Feet
Dr. W.W. Campbell Photo - 1909

In July, 1881, Professor Langley's party went into camp near what is now known as Langley's Lakes. The expedition entered the region by way of Lone Pine, crossing the divide south of the summit and camping at an elevation of approximately 12,000 feet. The importance of the observations then made has not been fully understood nor appreciated even by scientific workers. To the people at large comparatively little has been made known. In the coming years, as the various problems of solar and stellar atmospheres press for solution, a truer appreciation of Langley's high-order work in connection with the solar constant and the absorption of energy by the earth's atmosphere will be had. Not the least in his long line of honors, it seems to me, is the credit due him for farsightedness and sagacity in selecting the site, suitable for work, and the attempt to demonstrate the truth of his belief.



The Summit of Mt. Whitney, 14,502 Feet
Dr. W.W. Campbell photo

Of the last scientific expedition to the summit, the Campbell-Abbot party of August-September, 1909, more will be said further on in this paper; but it is of more than passing significance that from the vantage ground of Whitney should come the first authoritative knowledge of the probable amount of water vapor and oxygen in the atmosphere of our neighboring planet, Mars.

So far as the writer knows the first men to spend a night on the summit of Mount Whitney were Michaelis, Nanry and Keeler, of Professor Langley's party. Observations of temperature and vapor pressure were made at intervals September 2nd to 5th, 1881. Twenty-eight years afterwards, August 28th to September 4th, 1909, continuous records

were obtained of pressure, humidity and temperature for the entire period by McAdie while a member of the Campbell-Abbot party.

The object of the 1909 expedition was twofold: first, to continue Langley's work and redetermine the value of the solar constant; second, to study the absorption lines due to water vapor and oxygen in the atmospheres of Mars and the Moon. The main party left Lone Pine with Mr. W. L. Skinner as guide August 23rd, and camped for two nights and three days at a height of 10,300 feet. Dr. Abbot preceded the party several days. Mr. G. F. Marsh of Lone Pine had been on the summit since July 8th, superintending the erection of the observatory. Of Marsh I think I voice the sentiment of the entire party that he was a host in himself. To him more than to any other one man is due the successful completion of the trail and the building of the observatory. One instance of his devotion was deeply appreciated by all of us at the time and we are not willing now to pass it by in silence. The night before the arrival of the main party a violent thunderstorm swept the summit. The men employed in finishing the building, not without good reason, sought safety below. Marsh remained at his post with Dr. Abbot.



Eastern Face of Mt. Whitney from Lone Pine Trail
U.S. Department of Agriculture Photo

From the very scattered notes in my Journal, under date of August 28th, I gather:

"Reached observatory 1 :15 P.M. Abbot and Marsh opened the door. Whole party well soaked. Many peals of thunder with distant lightning; hair on mules' necks bristling. A rather near flash just as we reached the summit. Felt a

sharp stinging pain in right temple. At 1:50 P.M. all present and accounted for, with four visitors from Lone Pine. Fourteen animals in our pack-train. Two of the mules, Jack and Lucky, were specially honored because they carried the mirrors safely to the top. These are flat, silver-on-glass mirrors, one about nineteen inches and the other seventeen inches in diameter. If accident had befallen these en route the party would have turned back, for there would have been no way to make spectrograms."

More than once on the way up the Director's heart was in his mouth, as some particular animal, loaded with delicate instruments, would jeopardize his burden. There was some quiet jesting between the rest of us, concerning the relative value of ourselves and our mute asinine friends. Coming down from the summit a week later one of the mules fell from the trail. We spent more than an hour trying to get him back; but had to abandon him, even after getting him back to the trail. The elevation was 13,700 feet, so recorded by our barograph, which fortunately was on the person of the writer. Two hours later, at an elevation of about 13,000 feet, in crossing one of the snowfields, four mules and a saddle horse, loaded with mirrors, photographic material, hygrograph and thermograph, lost their footing and glissaded the snow fields. It seemed as if the animals must surely be killed and the packs smashed to kindling; but fortunately there were no projecting rocks and the injuries were mostly flesh wounds. Owing to good packing and careful wrapping, the damage was not of much consequence. And we could not repress a certain feeling of exultation that it happened when we were coming down rather than when ascending.

Much has appeared in public prints recently concerning the possibility of life on the planet Mars. Some spectrograms of Mars and the Moon obtained at the Lowell Observatory, near Flagstaff, Arizona, in the winter of 1908, led to the conclusion that there was water vapor present in the atmosphere of Mars. It should, however, be pointed out that these spectrograms were made in January and February, and that so far as can be ascertained in the absence of instrumental records at the place of observation, the air columns contained much water vapor and that there is therefore a valid objection to accepting these, inasmuch as the intensification of the band may be simply due to the presence of the vapor in our own atmosphere. It also appears that the photographs of the planet were made soon after dark, while those of the Moon were taken several hours later and at a drier period of the night. The special purpose of Dr. Campbell's work therefore was to get spectrograms of Mars and the Moon under the most favorable condition: i. e., when there was a minimum amount of water vapor in the Earth's atmosphere. Mount Whitney seemed to offer an ideal exposure. Here, if anywhere the spectra would be least influenced by the water vapor and oxygen in our own atmosphere. As far back as 1894, when examining the spectrum of Mars at Mount Hamilton for evidence of water vapor, Campbell had realized the need of repeating the work from some level above the water vapor strata. Mount Whitney, altitude 4420 meters (14,502 feet) above sea level, in a region of extreme dryness and accessible at the time, appealed to him as the best suited place. Therefore, when the planet was again near the Earth and high above the horizon, he planned to attempt spectroscopic work from the summit of Whitney. Mr. William H. Crocker generously defrayed the expenses of the party. To make sure of the availability of the site, Campbell and Abbot made a preliminary trip in 1908, and remained one night

on the summit, August 24th. As a result of their report Dr. Walcott, Secretary of the Smithsonian Institution, authorized the building of a small observatory and shelter from the Hodgkin's fund. May we not hope that this is the nucleus of a great aerophysical observatory where work shall be done that will both add luster to American science and justify in fullest measure the aim of the Smithsonian Institution in its purpose to diffuse knowledge throughout the world for the welfare of men.

Of the results of the expedition it may be said very briefly that while weather conditions were in the main stormy, there were two excellent nights for the astronomers, with an amount of vapor in the air, only a very small fraction of that present during all previous observations. Six excellent spectrograms of Mars and the Moon were obtained, and Dr. Campbell draws the conclusion on this evidence that while there may be water vapor in Mars, it is exceedingly small in amount. It is indeed doubtful if there is much difference between Mars and the Moon, so far as water vapor and oxygen are concerned. For the observations in detail and an exhaustive discussion of the question, the reader is referred to Lick Observatory Bulletin No. 169, by Dr. W.W. Campbell.



Old Mount Whitney (Sheep Mountain) – The Little Mountain is Mount McAdie.
Dr. W.W. Campbell Photo

With regard to the weather records obtained, we must hurry over the record, which may some time be published in full elsewhere. The weather was clear from July 8th until August 18th, when there was a thunderstorm with four inches of snow. On August 19th there was another thunderstorm with three inches of snow. Fair weather followed until August 26th, when severe thunderstorms occurred. On August 28th there were hailstorms, snowstorms, thunderstorms at intervals. During every night of our stay,

freezing temperatures occurred and on five consecutive nights the temperature fell to 26° F., or even lower. The mid-day temperatures were about 50°F.

We had no instruments for recording the direction and velocity of air movement. One of the most interesting meteorological features of the mountain and indeed of the whole section, is the prevalence of uprising currents. Ultimately we hope there will be proper instrumental means for detecting and recording the flow and counterflow of the air over the peak. There were also marked changes in short intervals in the amount of water vapor present. Our humidity records, which were continuous throughout the week and which we believe to be the first records of such character ever made at an elevation exceeding 10,000 feet, show variations in humidity ranging from 5 per cent to 98 percent. During mid-day hours the humidity would rise as a rule to above 80 percent, while between 2 A. M. and 5 A. M. extremely low humidities were recorded, ranging from 3 to 11 per cent.

One other feature remains to be mentioned; that is the electrification of the air. There must have been tremendous potential differences between the cloud masses and the boulders on top of the mountain. But this is only one of many lines of research which ought to be undertaken on the summit of Whitney.

We are under obligations to Dr. Campbell for his unfailing courtesy throughout and his permission to use various photographs; also to the Director of the Smithsonian Institution, Dr. Walcott, for permission to use data and illustrations prepared by Dr. Abbot.

But there is a side to the story of Whitney other than the purely scientific; and Sierrans, ever lovers of the beautiful, hold dear some memory pictures of men and hours associated with the not unkindly peak. In one of these, two agile mountaineers are toiling in the deep snow, battling hard to gain the summit. Theirs was the first attempt to climb Whitney in winter. For the sake of the adventure and also for the purpose of leaving instruments at the summit whereby a record of minimum temperatures might be obtained, these two risked life and limb. Thus is knowledge gained that wisdom may follow and the welfare of men be promoted. The story of the adventure is graphically told in the journal notes of one of the party. From March 2d to March 10th, 1905, these two Sierrans were out on the mountain side. We see them in fancy as they stand on the ledge at an elevation of over 13,000 feet, where one misstep on the treacherous snow would send them over the precipice. Baffled when the prize was within reach, they turn backward facing the far-sweeping snowfields in which they had slept and over which they had plodded day and night.

In the second of these memory pictures there moves a solitary figure, strolling leisurely near the summit as the summer night falls. Neither night nor fear daunt him. Self-reliant and indifferent to what may befall so far from human help, he wanders where his fancy leads, free as the air around him. Unlike the rest of us, he courts not the comforting support of comrade-ship and takes the unbroken way through pass and over crag. His love of the mountains and that tenderness for Nature, pure and undefiled, came

from Highland forebears. A roamer in many lands, his wistful eyes have searched the hidden places of glade and crevasse in regions unexplored. He has wandered farther and seen more than the men of his generation; but his heart turns ever homeward to the "Mountains of the Light." There fittingly the picture leaves him. In the sombre gloom of the depths around him (for Whitney's sides are steep and sheer), in the deepening shadows, in the sweep of the wind, he finds friendship; communing with old friends, while night with a thousand eyes of splendor watches over all.