MOUNTAIN SITES FOR ASTRONOMICAL OBSERVATIONS.*

BY PROFESSOR O. STONE.

The question of employing mountain sites for Astronomical Observations is one of considerable importance, and two papers, recently published, add materially to the meagre literature on this subject. The first of these is a report of a series of observations on Mt. Ætna made by Professor Langley during a visit to Europe in the winter of 1878.

The lower portion of Mt. Ætna is described as densely inhabited and covered with rich vegetation. At an elevation of about 2000 feet, however, this suddenly ceases, and above this, with the exception of a few uninhabited plantations of chestnut trees which extend to an altitude of 4000 or 5000 feet, there exist only wastes of lava. At an elevation of some 4200 feet a station was established in a hut built of lava, known as "Casa del Bosco."

Professor Langley remained upon the mountain from Christmas until January 14. His instruments consisted of a 3¼ inch telescope loaned by the superintendent of the U. S. Naval Observatory and a spectroscope provided with a Rutherford speculum metal grating of 17,296 lines to the inch, and with collimating and observing telescopes of 1.1 inch aperture and 14 inches focal length.

On clear nights, at ordinary elevations, Professor Langley does not recognize steadily more than six stars in the Pleiades, and on an ordinary clear night at Allegheny he cannot steadily see the companion of Polaris with less than two inches aperture. On Mt. Ætna, however, he could see steadily, notwithstanding the moonlight, nine stars of the Pleiades, with the naked eye, the companion of Polaris, with an aperture of 1.6 inch and 11m. companions of β Leporis and a Tauri, and ι and σ Orionis with 3¼ inch. From this he concludes that stars of about two thirds the brightness of those visible in England under like telescopic power can be seen on Ætna at the elevation of Casa del Bosco. As far as transparency was concerned, a noticable advantage over stations at a lower altitude was also shown by observations of the sun.

The results in regard to steadiness of definition were not so satisfactory. Although there was probably less tremor in the stars as seen from Mt. Ætna than would have been the case at a lower station, the difference was not great.

The other paper referred to is the report of Mr. Burnham to the Trustees of the "James Lick Trust" of Observations made on Mt. Hamilton with reference to the location of the Lick Observatory.

Mt. Hamilton seems to have been first suggested as a site for the observatory by Professor Holden in 1874, and afterwards approved by Professor Newcomb. The elevation of the summit is 4250 feet, or only a little greater than that of Professor Langley's station at Casa del Bosco. On this summit Mr. Burnham erected a temperary observatory in which was mounted the magnificent six inch Clark refractor, with which nearly all his double star discoveries had been made. It was equatorially mounted with circles and driving clock. The eye-pieces gave powers up to 400. In addition, a set of meteorological instruments were employed.

Mr. Burnham remained upon Mt. Hamilton just 60 days, from August 17 to October 16, with the exception of three days, September 21–23, spent in San Francisco. As the seeing was first class for the 14 nights immediately preceeding the 3 days he was absent, it is fair to presume the same conditions continued. During the whole time only 11 nights were cloudy or foggy, and of the remaining nights there were 42 when the seeing was *first class* and 7 when it was medium, and *no poor* nights when the sky was clear. Besides obtaining remarkable results in the examination of delicate test objects, a search was made for new doubles, and at the close of the report Mr. Burnham gives a catelogue with observations of 42 such objects, 10 of which have a distance of less than 1″. A great many objects were examined by daylight but the air, during the greater part of the day at least, appeared to be no steadier than would be ordinarily found elsewhere.

In conclusion, Mr. Burnham says: "So far as one may judge from the time during which these observations were made, there can be no doubt that Mt. Hamilton offers advantages superior to those found at any point where a permenent observatory has been established. * * * * * * The ease with which close pairs can be seen, almost down to the horizon, will be apparent from the southern declination of many of the new double stars. * * * * Close pairs can be observed at least down to 42° south declination. * * * * *

"What has been said about the advantages of Mt. Hamilton for astronomical purposes, is of course, based upon what was seen during the time spent on the mountain. This was my first visit to the Pacific coast, and hence I have no personal knowledge concerning other seasons of the year. From inquiries in various quarters I am satisfied there was nothing about this season unusual, and there seems to be every reason for supposing, as the same cloudless sky and dry air prevails from about March until the commencement of the rainy season, near the close of the year, that the whole of this interval would be equally favorable for the use of the telescope.'

One of the most remarkable and interesting conditions observed was the dryness of the atmosphere. The average difference between the wet and dry bulb thermometers was 18°.4 during the first five weeks of Mr. Burnham's residence on Mt. Hamilton and every night was first class when this difference reached 15° and upwards.

Notwithstanding, however, the advantages of a mountain site for an observatory, there are many drawbacks. Even the loneliness of the situation is a disadvantage to the greatest activity. Taking everything into consideration, therefore, probably as favorable a location as any for the next great American observatory is to be found on the plateaus of Colorado.

*Observations on Mount Etna, by S. P. Langley. From the *American Journal of Science*, Vol. XIX, July, 1880.

Report to the Trustees of the "James Lick Trust," of Observations made on Mt. Hamilton with reference to the location of Lick Observatory; by S. W. Burnham. Chicago, 1880.

We have received the following publications from the U. S. Department of the Interior (Bureau of Education).

THE INDIAN SCHOOL AT CARLISLE BARRACKS which acquaints educators and school officials with the interesting experiments of training Indian children in the knowledge and usages of civilized life, in progress during the past eight months at Carlisle Barracks.

VACATION COLONIES FOR SICKLY SCHOOL CHILDREN This subject has for some time received the attention of this department, and as early as 1872 papers by that distinguished and benevolent physician, J. M. Toner, M. D., of Washington, were published, advocating free camping grounds or parks, where poor children and their parents could lodge during the excessive heat of summer.

PROGRESS OF WESTERN EDUCATION IN CHINA AND SIAM. This is an interesting account of the progress of Western ideas and educational methods in China and Siam, forwarded to the department by the United States Minister at Peking, and the United States Consul at Bangkok.

LEGAL RIGHTS OF CHILDREN. This is an elaborate report covering nearly a hundred pages, and treats of the rights of children in the various States of the Union, including education, and also a comparative view of the systems of education in the different States established to give force and effect to those rights, and thus assure the welfare of the individual and the State.