to be 'quartz gold,' their receipt to us being so marked. This mortar was probably about 10 feet under the surface. It was 300 yards from the other one and on Sec. 20, being therefore the S.E. ¼ of N.E. ¼. It was found in 1901. The pestles were discovered with it; they were in pay dirt.

Those occurrences add one more instance to the list of stone implements which have been found in the auriferous gravels of the Pacific coast. The writer fully realizes the criticism which has been brought to bear upon them and the skepticism with which their authenticity is regarded by many. The Waldo case may be stated upon the testimony of Mr. Wimer and Mr. Pfefferly and may add its contribution to the general mass of evidence regarding the antiquity of man in the far west.

J. F. Kemp.

ASTRONOMICAL NOTES.

THE NEW SOLAR OBSERVATORY OF THE CARNEGIE INSTITUTION.

The Carnegie Institution of Washington has established a solar observatory on Mount Wilson, near Pasadena, southern California, under the direction of Professor George E. Hale, former director of the Yerkes Observatory. The late Secretary Langley, of the Smithsonian Institution, whose bolometric studies of the solar radiation during many years have added so much to our knowledge of the sun, was active in urging the claims of such an observatory. He desired to see the observatory established in a tropical or subtropical region, with a large equipment and endowment, especially for the study of the solar radiations and their possible fluctuations.

The Mount Wilson Observatory is the outcome of much thought and investigation by different astronomers, and may be depended upon to furnish splendid results. Mr. Langley, however, in a communication to the committee on astronomy of the Carnegie Institution, in 1902, made the following statement:

> It has thus far proved, and, so far as can be seen, always will prove, impossible to determine from near sea-level with any precision by any observations, however careful or long continued, the 'constant' of solar radiation. There is no good way to eliminate the complex effect of atmospheric absorption except to observe at the highest practicable altitude, preferably near the tropics, but most certainly in a dry and clear atmosphere, and preferably where there are two stations in view of each other, the first of which is at a notably greater altitude than the second, though the latter is itself at least some thousands of feet above sea-level. Temporary expeditions with meager outfits have gone from time to time to high mountain stations for solar observations, and small meteorological stations have even been longer continued. What is needed is rather a permanent astrophysical observatory equipped with the most powerful and refined modern apparatus for solar research and located at the highest and clearest station it is practicable to occupy.

These are very strong words from a very eminent authority. It may not be out of place to inquire whether Mount Wilson fulfils the required conditions. Those who have read Professor Hale's description of the conditions which exist on the mountain during a large part of the year, and have seen the results already accomplished, will gladly acknowledge that Mount Wilson offers exceptional advantages for such an observatory. That it is the best which the world furnishes, or that the 'last word' can be said from it in regard to the solar constant may be doubted. The institution on Mount Wilson will undoubtedly justify itself, and is probably the best site which could be occupied under the circumstances. There may be several elevations, however, which more closely meet the conditions imposed by Mr. Langley. The writer is familiar with one, which could hardly meet the requirements more exactly if it had been made to order after that communication was written. The volcanic peak, El Misti, near Arequipa, Peru, rises to an altitude of 19,000 feet. It looks down upon the Arequipa station of the Harvard Observatory, whose altitude is 8,000 feet. The whole region is extraordinarily dry and clear. From the summit of El Misti the sky is most strikingly dark and free from haze. This summit is readily accessible by a mule-trail during nearly the whole year, and its use as a permanent station presents few difficulties

other than those associated with mountain sickness. In this region the railway reaches an altitude of more than 14,000 feet, and some of the moutains rise to more than 20,000 feet. Probably no other part of the world can furnish lofty mountains which are as accessible as those of southern Peru and northern Chile.

Much of the extremely valuable work which has been planned by Professor Hale for the solar observatory on Mount Wilson, whose altitude is 5,886 feet, could not be carried on, perhaps, at an elevation of 19,000 or 20,000 feet; but for certain problems, especially that of the solar constant, it may be that the future will demand the fulfillment of the conditions imposed by Dr. Langley.

DOUBLE VARIABLE STARS.

Two interesting cases have recently been discovered by Mrs. Fleming, at the Harvard Observatory, of double stars, both of whose components are variable. That two variable stars should be close together, where variables occur in large numbers, as in the dense globular clusters, or to a less degree in the Magellanic clouds, would not be especially surprising. Even here, however, as a matter of fact, very few really close doubles are found. In the sky as a whole, away from such special regions, the number of known variables in the 40,000 square degrees of the sky is not much more than 600, or one in 67 square degrees. The chance, therefore, that two of them should come within a few seconds of arc of each other, unless there is some physical connection between them, is extremely small.

The first double-variable consists of the well-known variable star *S Lupi* and a close companion, distant only 13″, so close, indeed, that it may often have been mistaken for *S Lupi* itself, especially when it was bright and *S Lupi* faint. *S Lupi* has a period of 346 days, and varies in light about three and a half magnitudes, between 9.6 and 13.1. The close companion varies between 10.4 and 12.8, and its period appears to be irregular.

Another variable pair has just been announced. The components are 40″ apart. The first component varies between the magnitudes 10.0 and 10.6, and the second, between 10.0 and 12.4. It will be of the greatest interest to determine whether there is any relation between the light-changes of the components, but this has not yet been possible.

It is well known to astronomers that Mrs. Fleming has discovered nearly 200 variable stars by examination of photographic spectra, made with an objective prism, in connection with the work of the Henry Draper Memorial. By discovering that the spectra of long-period variables usually contain the bright lines due to hydrogen, she has been able to 'pick up' large numbers of variables of this class, while engaged in other spectroscopic studies. It would have been quite impossible for a single observer, or, perhaps, for half a dozen, by visual methods, to find such a number in a lifetime. The results illustrate the power of photographic methods when the correct interpretation has been found. In this, as in some other lines of astronomical discovery, it would be almost a waste of time for an observer, unless for purposes of recreation or amusement, to carry on the investigation visually. He would succeed about as well as a person who should attempt to race on foot with a fifty-horsepower automobile. This seems really a pity, as there is undoubtedly a greater charm, at least to the outsider, in the older method. An observer sitting at a desk with photographs about him, in a pleasant room in broad daylight, appeals to the imagination much less than the old-time astronomer, who was supposed to sit through the long, cold night with his eye glued to his telescope. However, there are many fields in which the visual observer still has the advantage.

POSITION OF THE AXIS OF MARS.

IN a communication to the *Monthly Notices* of the Royal Astronomical Society, Professor Percival Lowell, director of the Lowell Observatory, gives an account of his observations of the polar cap of Mars, for the determination of the position of the martian axis. He also compares the results of his own determinations at three oppositions with those of Schiaparelli, Lohse and Cerulli. From a study of all the determinations Professor Lowell arrives at the conclusion that the most probable values are

as follows: Pole of Mars, R. A. 317°.5; Dec., 54°.5. Epoch 1905. Tilt of martian equator to martian ecliptic, 23° 59′. This value of the inclination of the martian equator is somewhat less than that which has been generally accepted heretofore.

RECENT COMETS.

During the year 1905 three comets were discovered for which orbits were determined. Two of them were found by Giacobini, and the other by Shaer. So far during the present year two comets have been discovered, by Brooks and Kopff. None of these has been of much popular interest. For an unusually long period no spectacular object, such as the great comets of 1843, 1858, 1881 and 1882, has appeared. One may appear at any time, but of this there is no certainty. However, Halley's periodic comet will be due about 1910, and it will probably be bright.

S. I. Bailey.

SAMUEL PIERPONT LANGLEY.

At a memorial meeting of the board of regents of the Smithsonian Institution, on March 6, the following resolutions were passed:

Resolved, That the Board of Regents of the Smithsonian Institution express their profound sorrow at the death, on February 27, 1906, of Samuel Pierpont Langley, Secretary of the Institution since 1887, and tender to the relatives of Mr. Langley their sincere sympathy in their bereavement.

That in the death of Mr. Langley this Institution has lost a distinguished, efficient and faithful executive officer under whose administration the international influence of the parent Institution has been greatly increased, and by whose personal efforts two important branches of work have been added to its care—the National Zoological Park and the Astrophysical Observatory.

That the scientific world is indebted to Mr. Langley for the invention of important apparatus and instruments of precision, for numerous additions to knowledge, more especially for his epoch-making investigations in solar physics, and for his efforts in placing the important subject of aerial navigation upon a scientific basis.

That all who sought the truth and cultivated science, letters and the fine arts, have lost through his death a co-worker and a sympathizer.

That the Executive Committee be requested to arrange for a memorial meeting to be held in Washington.

That Doctor Andrew D. White be invited to prepare a suitable memorial which shall form a part of the Records of this Board.

SCIENTIFIC NOTES AND NEWS.

Sir George Darwin, K.C.B., Plumian professor of astronomy, will represent the University of Cambridge at the celebration of the two hundredth anniversary of the birth of Benjamin Franklin by the American Philosophical Society.

At a meeting held at the Mansion House, on February 27, the Lord Mayor of London presiding, Lord Halsbury moved "That, in view of this being the fiftieth year of the foundation of the coal-tar color industry, it is desirable that steps should be taken to memorialize the event and to do honor to Dr. W. H. Perkin, the founder." After this motion had been supported and carried, Lord Rayleigh moved "That an appeal be made in this country and abroad for subscriptions for the purpose of carrying out the following objects: (1) The presentation to Dr. Perkin for his life time of an oil portrait of himself, executed by an eminent artist, the portrait to become the property of the nation at his death. (2) The execution of a marble bust of Dr. Perkin to be placed in the rooms of the Chemical Society. (3) The establishment of a 'Perkin Research Fund' for the promotion of chemical research to be administered through the Chemical Society." After this motion had been supported by Sir William Ramsay and Sir Henry Roscoe and carried, arrangements were made for the appointment of a general committee and an executive committee for carrying out the objects of the resolution.

Dr. Hans Dreisch, of Heidelberg, has been appointed Gifford Lecturer in Aberdeen University for 1907–9.

The University of Heidelberg has conferred the Victor Meyer prize on Dr. Ernst Stern for his investigations in organic chemistry.

Dr. Robert Koch will return to East Africa, in April, to continue his investigations