tufty balls, resembling cumulous clouds. These white heads are invariably bent or turned, as if slightly doubled

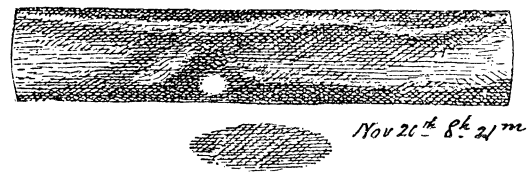

FIG. 1.

under, toward the south, and are generally partially or wholly imbedded in the inner edge of the south portion of the equatorial band. These heads soon become isolated into a regular white spot, the train gradually fading out. All the objects in the equatorial zone move with a very great velocity in the direction of rotation, invariably n a contrary direction to that pursued by the slowly moving red spot, which is really the only object that has a backward motion on the planet. Indeed it would not be a bad comparison were we to compare the red spot to a mighty city built on the shore of a vast and swiftly flowing river, which is constantly being filled with drift, and an occasional glistening mass of ice, tearing its way past the city with a velocity of not less than six thousand

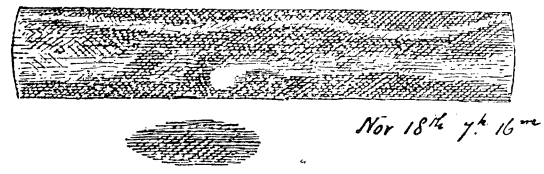

FIG. 2.

miles a day. In such a comparison the city would need be as great in area as three-fourths that of our entire earth, and the river fully sixteen thousand miles in breadth!

One of these swiftly moving bright spots was observed on Nov. 18th (Fig. 1). It had probably existed some few days before that date, but bad weather had prevented observations of the planet.

As it passed very close to the red spot that object afforded a capital means of illustrating its motion.

On the 18th it was situated on a meridian with a part of the red spot about ⅓ its length preceding the following end.

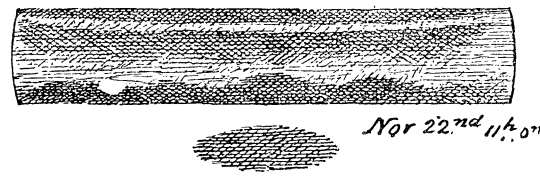

FIG. 3.

This spot was bright with the fainter train following in its wake. On the 20th it was near the preceding end of the red spot (Fig. 2), and had isolated itself more from its train, being partially imbedded in the inner edge of the south band. On the 22d it had left the red spot far behind (Fig. 3), and was smaller and paler, apparently the size of satellite I, then nearing transit. By the 23d it had advanced still further (Fig. 4), and was nearing the west limb when the red spot was central in transit. It was smaller and appeared to vary in brightness.

Bad weather since the 23d has prevented any further observations of this remarkable object.

The pen and ink drawings show the rapid progress of the spot The first sketch was made when the red spot's following end was in transit; the three others when the

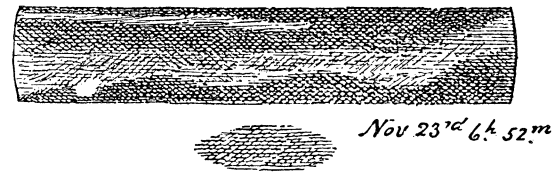

FIG. 4.

spot was central. To save space the sketches only show the great equatorial band and the red spot.

E. E. BARNARD.

Nashville, Tenn., Nov. 29.

THE NOVEMBER LEONIDS, 1880.

BY EDWIN F. SAWYER.

In the years 1846–47 and 1849, at the November 11–15 epoch, meteors were recorded in considerable numbers, doubtless representing the perihelion passage of a minor cluster of meteors in the cometary-meteor orbit. Last year, both in Europe and America, these meteors were found to be unusually numerous from the 11th to the 15th of November, and the earth probably encountered the minor cluster of 1846 at its return to perihelion. In anticipation that the shower would, this year, at the nodal passage, be of some little intensity, preparations were made for observing the same, but owing to cloudy weather observations could only be obtained on the 11th and 12th; but the indications, at these early dates, were that a large number of shooting stars would be recorded on the 13–14th, and as observed elsewhere such proved to be the case. At Cambridgeport on the 11th, during a two hours watch, from 14h. 30m. to 16h. 30m., 14 meteors were recorded, of which 6 were Leonids. On the 12th, during an hours watch only, from 16¼h. to 17¼h., in a sky more than half overcast, 6 others were noted, equal to at least 15 Leonids per hour for one observer in a clear sky. At the Haverford College Observatory, Penn., Mr. Isaac Sharples, assisted by three other observers, recorded 52 meteors in about an hours watch on the 13th from 3h. 30m. to 4h. 20m., of which 28 were Leonids. Mr. Sharples says, that at the end of the watch, when the sky become overcast, meteors were falling at the rate of two a minute and promised much.

From W. F. Dunning, Esq., F. R. A. S., we learn that the weather was generally unfavorable for observing purposes in England at the November epoch, so that the observations as recorded in this country have a special value, being, so far as heard from, the only ones obtained during the dates on which the Leonid shower is in play. As in the year 1849, meteors were also numerous at this epoch, we may expect a return of the Leonids as a minor shower during the next two years.

Cambridgeport, Dec. 5, 1880.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

THE WHITE SPOT ON JUPITER.

To the Editor of SCIENCE:

The white spot seen passing the great red spot on November 18, 20, etc., and situated on the inner edge of the south equatorial band, was observed again on December 2, the first night for observing since November 23. The white spot was in mid-transit some time

before the red spot had begun to appear at the east limb. It has kept up its rapid motion with probably no particular change in appearance.

From the observed transits of November 22 and December 2, its rotation period is 9h. 50m. 19.4s. It gains 5 m. 18 s. on the red spot at each rotation, or 12 m. 48 s. per day. Should this spot continue permanent for one month longer it will have made the circuit of Jupiter and again be seen passing the great red spot on the night of January 4. On that night the white and red spots will transit together at 11 h. 39 m.

E. E. BARNARD.

NASHVILLE, TENN., *December* 6.

To the Editor of SCIENCE:

Last night I viewed Swift's Comet, and found that the Ephemeris computed by Mr. Upton, of the Naval Observatory, Washington, answered quite closely, and was from note book as follows:

SWIFT'S COMET.

Northfield, Minn., Mean Time, 10h. 52m.
R. A. 3h. 32m.
Dec. 51° 28′.

The Comet was well seen, having about the brightness of a seventh magnitude star. Our clock refractor, of aperture of 8¼ inches, was used with power of 50.

Latitude of Observatory, 44° 27′ 40.77″. Longitude from Washington, 1h. 4m. 23.02s., which has been recently determined telegraphically by aid officers of the Coast Survey. Respectfully yours,

WM. W. PAYNE.

NORTHFIELD, MINN., Dec. 2, 1880.

ASTRONOMICAL MEMORANDA.—(Approximately computed for Washington, D. C., December 13, 1880):

	H.	M.	S.
Sidereal time of Mean Noon	17	31	2
Equation of time		5	14

mean noon *following* apparent time.

The *Moon's* phases for the month are:

	D.	H.	M.		D.	H.	M.
New Moon	1	9	48	First Quarter	8	1	30
Full Moon	15	22	28	Last Quarter	24	1	49
New Moon	30	20	48				

We have the somewhat unusual occurrence of two new moons in the month, and both of them cause partial eclipses of the sun. The eclipse of the first was invisible in the United States; that on the morning of the thirty-first is partially visible. The sun rises eclipsed and remains so until a little after nine o'clock, nearly three-quarters of its disk being covered at the time of greatest obscuration. In addition to these solar eclipses there will be a total eclipse of the moon December 15–16, invisible in the United States, but visible in Central Asia.

Mercury may be seen during the week rising about an hour before the sun, and 5° farther north.

Venus now crosses the meridian nearly three hours after the sun, and is steadily growing brighter as she approaches the earth.

Mars has reached a sufficiently great distance from the sun to be readily seen about an hour before sunrise close to the eastern horizon. It is 2° farther north than the sun, and is easily recognized by its red color. Mars and Mercury are in conjunction on the 23d.

Jupiter and *Saturn* have changed but little their relative positions, Saturn crossing the meridian at 7h. 53m., a few minutes after Jupiter. The brilliant markings upon Jupiter's belt have been attracting universal attention.

Uranus, crossing the meridian about 5 o'clock in the morning, is in R. A. 11h. 1m. 26s. decl. + 7° 6.2′.

Neptune rises about midnight and reaches the meridian at 9 o'clock, at an altitude of 48°.

The Great Nebula in Orion situated around the small quadruple star θ Orionis (the central one of three stars which form Orion's sword-hilt) will be found of great interest to all possessing good telescopes. It rises at 6 P. M., and is just visible as a nebulous mass to the naked eye.

In a communication to the Colorado Academy of Science, Prof. George Davidson, of the U. S. Coast and Geodetic Survey, has placed upon record the somewhat unusual occurrence of a naked eye observation of one of Jupiter's satellites. The station was Monticello, overlooking the Sacramento Valley, 3,125 feet above the sea level. Jupiter, at an elevation of 8°, was slowly rising through a smoky atmosphere, without the least radiation. The third satellite was noticed first by Prof. Davidson, below the disk and somewhat to the left, and was readily seen by four other persons, when attention was called to the phenomenon. Its position was afterwards confirmed by the aid of a field-glass. The satellite remained visible for about twenty minutes, and was finally rendered invisible by the moonlight. On subsequent nights with much clearer sky and no moon, no satellites could be made out with certainty by the unassisted eye.

There is a very ingenius instrument in use at the Greenwich Observatory to record automatically the duration of sunshine through the day. It consists of a glass globe hung within a hemispherical cup of slightly greater diameter. This cup is lined with a strip of paper covered with stencil ink. While the sun is shining, the globe, which is entirely exposed upon the roof, acts as a burning glass, and causes a continuous line to be made upon the paper. This line will be broken, however, as often as the sun's light is obscured by clouds, and thus a determination of the amount of sunshine for the day will be obtained.

M. Martin is engaged in polishing the object glass of the large refracting telescope now building at the Paris Observatory. The diameter of this exceptional lens is 73 centimetres, and its weight 200 kilograms. The quality of the glass having proved defective, it has already broken twice, and the operation is now being made on the third casting. —*Nature.*

We learn from *Nature* that Prof. Bell, together with M. Janssen has been making some experiments at Meudon, upon the application of the photophone to the study of sounds which occur on the sun's surface. "A solar image 0.65m. in diameter" was explored with the selenium cylinder, but no very marked results were obtained.

Schmidt calls the attention of observers to a sharp black spot in the northern part of Jupiter's belt, which gives a time of rotation=9h. 55m., while the heavy white clouds in the middle of the belt give 9h. 50m.

W. C. W.

WASHINGTON, D. C., December 8, 1880.

A new optical milk test has been invented by Messrs. Mittelstrap, Magdeburg. A given quantity of milk, and also of water is examined by looking through different thicknesses until opacity is reached. The vessel holding the liquid has a glass bottom, and in its cover a vertical graduated tube in a slide, with glass closing its lower end. Light is thrown up from below by means of an oblique mirror, or from a direct source. The tube (through which one looks) is moved in the slide until the light disappears, and at this point the scale is read off. Professor Maercker has made experiments with this apparatus, and states it to be very accurate; the greatest difference between the determination of fat in milk, with it, and by chemical analysis, being an average of 0.1 per cent. The usefulness of the instrument applies only to fresh milk, and for skim-milk a special tube is prepared.