JUPITER'S NEWLY DISCOVERED MOONS AND SOLAR CYCLONES---BY MARY PROCTOR

"A golden globe, brown-belted—such as Jove,
Four moons attendant on his wheeling way;
A fifth—so tiny— nestles near the round
Of his vast orb, lately caught
By keen-eyed Barnard on Urania's peak.
Through the translucent air."

ARTHUR MEE.

THE poet astronomer could now add a few more lines to the above, recording to the marvelous discovery which has lately been made of two new moons attending the Prince of Planets. Our knowledge of his stately retinue has been increased by means of the camera, the celestial detective which captured the truants.

Early in December of last year Prof. Charles D. Perrine of the Lick Observatory, California, was examining some photographs which had been taken of the planet Jupiter. In the region west of the planet he detected the image of an unknown body, and comparing the photographs he found that it had changed its position from night to night. During the first week of January he made observations which enabled him to determine whether the unknown body was a new moon in attendance on Jupiter, or merely one of the asteroids. These are tiny planets which circle around the sun in the space between Mars and Jupiter, and one of them might easily have been mistaken for a Jovian moon.

What a thrill of surprise must have passed through the astronomer's mind when he found that all the positions of the faint object as depicted on a series of photographic plates could be perfectly reconciled as due to the movements of one small body revolving round Jupiter. Details concerning the discovery are few as yet, but the moon is probably at a distance from the planet five or six times greater than that of the outermost of the other five moons. (The outermost moon is 1,169,000 miles from Jupiter.)

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While the five moons all move in the same direction round Jupiter, the newcomer, that is the sixth moon, moves in a reverse direction. The same surprising observation has been made with regard to Phoebe, the new tiny satellite of Saturn, discovered by Prof. W. H. Pickering in August, 1898. The discovery has lately been confirmed by Prof. Barnard, who succeeded in detecting the satellite visually with the great Yerkes refractor.

Jupiter's sixth moon shines with a brightness equal to that of a star of the fourteenth magnitude, (magnitude referring to brightness and not size.) It is, therefore, too faint to be seen with the unaided eye, so that a telescope of ten or twelve inches is required to make it visible.

Scarcely had the astronomical world recovered from its surprise at the discovery of the sixth moon of Jupiter when further news came from the Lick Observatory announcing that Prof. Perrine had discovered a seventh moon. The discovery was made on Jan. 6, the day following the announcement with regard to the sixth moon. Prof. Perrine was examining some of the photographic plates when he again detected a faint body which changed its position from night to night. From its motion, the probabilities were in favor of its being another Jovian moon, but at the same time the possibility existed that it might be one of the asteroids.

Observations extending over several weeks were made, but unfavorable weather during the month of January made it difficult to secure satisfactory photographs of this faint object until Jan. 28. Even this attempt did not remove doubts on the subject, and it was not until Prof. Perrine examined some photos secured on Feb. 21 that he was able to decide definitely that the new body was a moon of Jupiter. Like the sixth moon, the seventh is at quite a distance from Jupiter, and so faint that it is beyond the field of any but the most powerful telescopes.

Is it possible that these new moons may be termed newcomers in more senses than one? Did they originally belong to the family of Jupiter, or have they been captured by its immense power of attraction? Its mass is about 316 times that of the earth, and it is by far the largest of all the planets—larger, in fact, than all the rest united. It is also the most important member of the family of the sun, and its great power of attraction is held responsible for vast gaps and blank spaces where asteroids should be.

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Not only has the giant planet caused disturbances amid the tiny planets which form the asteroidal group, but it has been even known to capture comets! These visitors from space occasionally drift into the solar system, and usually return whence they came, unmolested. Some, however, happening to approach too near the giant planets have been captured, forming, as it were "comet-families." The comets composing these families have been captured by the planet to which they stand related. For instance, Saturn is credited with two comets, Uranus with two, and Neptune with a family of six. Jupiter's family of comets includes thirty, and in 1886 a comet which passed between Jupiter and its innermost moon, (that is within about 100,000 miles of the planet's surface,) was torn into four fragments.

Now if the planet Jupiter has been so successful in capturing comets, why should it not meet with a like success among the asteroids? Naturally suspicion is aroused when two new moons have been so suddenly added to the giant planet's family. How is it that they have so far evaded detection, and that the keen eyes of the astronomers have failed to observe them either by means of the more powerful telescopes or by examination of photographic plates? May not these little bodies now held in bondage by the capturing planet have been formerly members of the family of asteroids? Perhaps they ventured too near the giant planet, and were made captives against their will!

No such mystery clings around the discovery of the fifth moon of Jupiter, although the event proved to be one of the most interesting chapters in the history of astronomy in the nineteenth century. The discovery was made in 1892 by Prof. Barnard at the Lick Observatory. This tiny object, with a diameter not exceeding 100 miles, is only 112,500 miles from the centre of the planet around which it revolves, its period being nearly twelve hours. It is of the thirteenth magnitude, and is nestled so close to the planet Jupiter that it is almost lost in the glare of light. In fact, the light which Jupiter sheds on this little moon is equal to the combined lustre of more than 860 full moons. The fifth moon cannot be seen with the unaided eye, and is only visible in the most powerful instruments.

The four other moons are large enough to be seen easily with an opera glass, and the first and third have actually been seen with the naked eye by a few persons possessing unusually good eyesight. The third satellite is much the largest, having a diameter of about 3,600 miles, somewhat larger than the planet Mercury. The others are between 2,000 and 3,000 miles, all of them larger than our moon but less massive.

They were discovered by Galileo in 1610, within a few weeks after his invention of the telescope. Their names are Io, Europa, Ganymede, and Callisto—Io being the nearest to the planet. These names are seldom used, however, the moons being referred to by the Roman numerals I., II., III., IV.

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Io is I., Europa II., Ganymede III., and Callisto IV., in the order of their distance from the planet. The fifth moon discovered by Prof. Barnard is known as V., although its path is between Jupiter and Io, and therefore should be I., but too much confusion would result in renumbering the moons, so it is always referred to as the fifth moon, or V.

Every owner of an opera glass can find much entertainment in observing the larger moons of Jupiter. With a telescope one can plainly see the disappearance of the moons in the shadow of the planet, their reappearance, and also the transits of their shadows as round, black dots moving across the disc of Jupiter. To those who take interest in such observations: "Time cannot stale their infinite variety."

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The immense group of sun spots lately observed indicate the most tremendous disturbances one can possibly imagine taking place upon the surface of the sun. They cover an area of 3,000,000,000 square miles, wherein vast masses of glowing gas are projected upward from the sun with inconceivable rapidity, falling back upon its blazing surface in a shower of fiery rain.

A sun spot in every stage of its career is a vast opening in the cloud-laden atmosphere of the sun, a region from which the luminous clouds have been cleared away over many millions of square miles and to a depth amounting to often as much as 10,000 miles. The earth at the bottom of such an abyss would be like "a boulder in the crater of a volcano."

Precisely as distance reduces the seeming size of these yawning chasms, so distance, partly, and the absence of a medium to convey the sound reduce to utter silence a noise and clamor compared with which every form of upro

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Jupiter's Satellites

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known on the earth fades into insignificance. It is a problem of great difficulty to know how these disturbances are brought about—that is, not referring to their actual cause, the recognition of which may be regarded for the present as beyond the range of astronomical vision, but as to the manner in which they begin, proceed, and terminate.

A mistaken notion prevails that sun spots affect the weather, but the results obtained by attempting to make a period of sun-spot phenomena accountable for unusual weather on the earth have proved not only unsatisfactory, but contradictory. However, there is an undoubted connection between the periods when sun spots are more numerous than usual and magnetic storms upon the earth.

For instance, in 1859 and 1883, when great storms seemed to be agitating the surface of the sun, magnetic storms with brilliant exhibitions of the Aurora Borealis attracted worldwide attention. On the 1st of September, in the year 1859, vivid auroras occurred in latitudes where auroras are as rare as rain in Peru. They were observed at Rome, in the West Indies, and even within eighteen degrees of the equator. On this same occasion the magnetic needle at the Kew Observatory was violently disturbed, and in many places it was impossible to send telegraphic messages. The cause of these unusual magnetic disturbances was traced to a very large sun spot, which was conspicuous on the sun's surface at that time. From Aug. 28 till Sept. 4 auroras were visible every night all over the world.

According to Prof. Young, we do not yet know "whether the solar disturbance causes the terrestrial, or whether both disturbances are due to some external influence."

MARY PROCTOR.

Current Events.

Teacher, (whose hobby is current events)—Who led the unfortunate strikers in St. Petersburg? Will one of the smaller boys please answer?

Silence.

Teacher, (somewhat sternly)—Can no one tell? (Indicating a new member of the class) Sammy, surely you know who led the strikers in St. Petersburg?

Sammy, (badly frightened)—I—I didn't, Ma'am. We just moved over from Hoboken last week.

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