

The Mystery of Jupiter's "Great Red Spot"

Astronomers Watching Eagerly the Mighty Convulsions of the Giant Planet, Suspecting That They May be Observing the Birth of a New Moon



1—How the Great Red Spot Appeared to the Astronomer Dennett in 1879.

2—Progress of the Mysterious Spot on April 15, 1916.

3—Protuberance of the Spot on the Surface of the Planet as It would Appear if Seen in Profile.

4—How the Astronomers Think the Projection Will Shape Itself in a Few Years.

5—When the Mighty Expelling Force Finally Drives the Spot Clear of the Planet's Surface.

6—How the Great Red Spot Will Look When It Takes Its Position as a New Moon of Jupiter.



If You Were Standing on One of Jupiter's Moons the Planet Would Appear as Above to Your Eye, and the Landscape on Jupiter's Nearest Moon Would Be Probably About as Represented by the Artist.

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NO planet in the solar system is so fascinating to watch through the telescope as the huge planet Jupiter, which is a world in a state of chaos about as different from our own planet as it is possible for two planets to be that were probably formed from a common parentage—the sun—aeons ago. Jupiter is a semi-sun composed chiefly of dense gaseous vapors of many elements and their compounds whirling in rapid rotation. It has no surface such as our own planet has, though it may have a pasty core of molasses-like consistency which we cannot see lying far beneath its dense atmosphere. The continual change taking place on this planet which makes it such an interesting object to observe is entirely atmospheric. Small spots of intense white, red, brown or greenish vapors continually fit rapidly across its disk. They are probably dense vapors of various elements and their compounds, and they pass one another with the terrific relative velocity of three hundred or more miles per hour, which is

several times the velocity of the swiftest tornado that ever swept over the surface of the earth. Broad belts lying parallel to the planet's equator, alternately white and reddish-brown in color and varying in number from time to time, are the most conspicuous feature of the planet's atmosphere. They also are gaseous vapors and they are drawn parallel to the equator by the rapid spinning of the planet on its axis, which is accomplished in less than ten hours, though its diameter is ten times that of the earth. Next to the belts the most prominent feature of the planet is the Great Red Spot which first attracted attention forty-odd years ago, when it appeared as a faint pinkish oval at the southern border of the south equatorial belt. It was about seven thousand miles wide and about thirty thousand miles long. A year after its appearance it had deepened to a brick-red, which color it retained for seven or eight years. It then began to fade to a pale pink, and more, as if it were sinking back beneath a cloud of whitish vapors. At present it is not in any way conspicuous in appearance, but is arousing special interest, for the reason that the theory has been advanced that the Great Red Spot, as it is still called in spite of its faded appearance,

is a satellite in process of making, and that it will in time separate from the planet and enter upon an independent existence. The Great Red Spot is not in any sense a fixed marking on the planet. It is slowly drifting through the planet's atmosphere along the south equatorial belt, and it exerts, besides, a repellant action upon all small spots near it, which always turn aside for it and carefully skirt its edges. If it is ever to leave the planet and enter upon an independent existence, some terrific force, either internal or external, must accomplish this result. To overcome the gravitational attraction of the planet for objects at its surface and hurl an object entirely beyond the control of the planet an initial velocity of thirty-seven miles per second would be required. To convert the object into a satellite revolving in circular orbit close to its surface would call for an initial velocity of twenty-six miles per second. Chaotic as are the conditions in the atmosphere of Jupiter, there does not seem to be any evidence that any force so powerful is at work within this planet at the present time, and certainly no exceptionally great external force is acting upon the planet at present.

Granted that there is at work within the planet's interior a force so powerful that it is gradually expelling this object 7,000 miles wide and 30,000 miles long from the surface of the planet, what will be the fate of the newly expelled satellite? It can be shown that under such circumstances, unless the force were sufficiently great to hurl the object to a distance of at least one hundred and ten thousand miles from the centre of the planet, it would in a very short time be torn into fragments by tidal strains set up by the attraction of Jupiter for a mass so close to its surface and it would be pulverized and distributed about the planet in the form of a ring of minute particles, similar to the Rings of Saturn.

If hurled suddenly to a greater distance than 110,000 miles it would set up most serious disturbances, or "perturbations" as the astronomer would call them, in the present orderly satellite system of Jupiter. All of the orbits of the nine satellites of Jupiter would be changed in form by the presence of the intruder. The largest satellite of Jupiter is about three thousand five hundred miles in diameter, the smallest less than one hundred. The Great Red Spot is seven thousand miles wide and thirty thousand miles long.

We do not know its depth, but it would certainly make a satellite considerably larger than the earth and would far outrank in size any of the present members of Jupiter's family. The mischief it would cause when suddenly launched into the orderly Jovian system would be correspondingly great. The Great Red Spot, so the records show, did not put in its first appearance some forty years ago. It was observed, it seems, at least one hundred years ago. It appears to be a semi-permanent marking, with its periods of appearance and disappearance. If it had any intentions of parting from the parent mass, this would probably have been accomplished ages ago when Jupiter was more in a state of turmoil than it is to-day and when greater internal forces were at work than are in evidence at the present time.

The belief has also been held and is still favored by many astronomers that our own satellite, the moon, formerly was a part of the earth, and that it gradually separated from the earth in the past when the earth was spinning far more rapidly than it is to-day, that the separation took place as a result of this rapid rotation and that the present conditions were brought about as a result of tidal reactions.

There have been found to be very serious objections to this belief, one of them being the one we mentioned above in connection with the Great Red Spot, that even if the satellite separated from the parent mass it would be torn to pieces by tidal strains and distributed about the planet in the form of a ring of small fragments before its gradual withdrawal to a safe distance could be accomplished.

Our own satellite, the moon, unlike Jupiter, is in some ways very similar to our own planet. Astronomers as a rule have emphasized the fact that it is a dead world because it has little if any atmosphere and no water—though it has an abundance of snow and hoar-frost. The fact that it keeps always the same face toward the earth gives it a day equal to fourteen of ours in length and a night equally long.

It is as a result subject to great extremes of temperature. During the long lunar night the temperature must drop to at least one hundred degrees below zero and during the intense heat of the lunar day it must rise—in direct sunlight—nearly to the boiling point. The existence of life on the moon has always been regarded as an impossibility. Certainly in the human form life on the moon is out of the question.

Those who have most carefully studied the lunar surface, however, have frequently expressed their disapproval of the view that the moon is a dead world and the number of those who insist that they have seen abundant evidence of change in lunar markings is increasing. Professor W. H. Pickering, who has probably studied the lunar markings more exhaustively than any other astronomer of to-day, insists that continual change is taking place upon the moon, and more recently has advanced evidence to show that there are signs of a progressive growth of what is apparently some form of vegetation during the lunar day.

Any form of life on the moon would necessarily perish at the coming of the lunar night, its brief period of existence



Section of the Surface of Our Much-Scarred Moon, Which Some Astronomers Believe Was Thrown off from Our Earth Just About as, Perhaps, Jupiter Is Now Throwing off a New Moon.

being measured by only fourteen of our days. Biologists have shown, however, that certain seeds and certain forms of life are not destroyed by intense cold and can resist prolonged temperatures far below zero. There is no reason why there should not be upon the moon certain forms of life adapted to their peculiar environment, just as there are upon the earth; for instance, forms of life existing under the most varied conditions. There are to be found in the depths of the sea organisms that are living under a pressure of several tons to the square inch. If we did not know this was true we would say it was impossible. Biologists have also found that there are certain organisms to which oxygen is poison, a most significant and interesting discovery. The rarity of the atmosphere on the

moon has also been given as sufficient proof that life could not exist there, yet the possibility has always been recognized that close to the surface and within the crevices of the lunar rocks and in depressions of the surface life-supporting gases might exist. Whatever one may think of the possibilities of life upon the moon, it seems as if we are gradually awakening to the fact that our own satellite is not quite so dead a world as we have been insisting it must be, in the sense that no changes in its surface features ever take place. We may interpret the facts as we please, but those who have devoted the most time to a study of the lunar features, including such careful observers as Elger and Pickering, are agreed that there is continual evidence of change taking place upon the surface of our satellite.