From the Knickerbocker.

THE RINGS OF SATURN.

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The rings which encircle the planet Saturn, may be considered as among the most grand and wonderful phenomena of the universe. This phenomenon was first perceived by Galileo, in the year 1610, soon after the invention of the telescope ; but its real nature was not at first apprehended. He imagined that Saturn was ' in the shape of an olive,' and that this planet consisted of two small globes attached to a larger one ; one of these globes being placed on one side, and another upon the other side. In the above year, he published his discovery, in a Latin sentence, the meaning of which was, that he had seen Saturn appearing with three bodies. After viewing the planet in this form for two years, he was surprised to see it become quite round, without its adjoining globes, and to remain in this state for some time ; and, after a considerable period, to appear again in its triple form, as before. This deception was owing to the want of magnifying power in the telescope used by Galileo. For the first telescope constructed by this astronomer, magnified the diameters of objects only three times ; his second improved telescope magnified only eight times ; and the best telescope which, at that time, he found himself capable of constructing, magnified little more than thirty times ; and with this telescope he made most of his discoveries. But a telescope of this power is not sufficient to show the opening, or dark space, between the ring and Saturn, on each side of the planet ; and, at the time it appeared divested of its two appendages, the thin and dark edge of the ring must have been in a line between his eye and the body of Saturn—which phenomenon happens once every fifteen years. About forty years after this period, the celebrated Huygens greatly improved the art of grinding object-glasses ; and with a telescope of his own construction, twelve feet long, and afterward with another of twenty-three feet, which magnified objects one hundred times, he discovered the true shape of Saturn's ring ; and in 1659, published his ' Systema Saturnium,' in which he describes and delineates all its appearances.

It was suspected by astronomers, more than a century ago, that the ring of Saturn was double, or divided into two concentric rings. Carsini supposed it was probable that this was the case. Mr. Pound, in the account of his observations of Saturn, in 1723, by means of Hadley's new reflecting telescope, states, that with this instrument he could plainly perceive ' the black list in Saturn's ring,' and gives an engraving of the planet and ring, with this dark stripe distinctly marked, as in the modern views of Saturn. It was not, however, till Sir W. Herschel began to make observations on this planet, with his powerful telescopes, that Saturn was recognised as being invested with two concentric rings. The following are the dimensions of the rings, as determined by the observations of this astronomer, which are here expressed in the nearest round numbers. Outside diameter of the exterior ring, 204,800 miles, which is nearly twenty-six times the diameter of the earth. Inside diameter of this ring, 190,200 miles. Breadth of the dark space between the two rings, 2,839 miles, which is seven hundred miles more than the diameter of our moon, so that a body as large as the moon would have room to move between the rings. Outside diameter of the interior ring, 184,300, and the inside diameter, 146,300 miles. Breadth of the exterior ring, 7,200 miles ; breadth of the interior, 20,000 miles, or two-and-a-half times a diameter of the earth ; so that the interior ring is nearly three times broader than the exterior. The thickness of the ring has not yet been accurately determined. Sir John Herschel supposes that it does not exceed one hundred miles. ' So very thin is the ring,' says Sir John, ' that it is quite invisible, when its edge is directly turned to the earth, to any but telescopes of extraordinary power.' The breadth of the two rings, including the dark space between them, is very nearly equal to the dark space which intervenes between the globe of Saturn, and the inside of the interior ring. It appears to have been lately ascertained that this double ring is not exactly circular, but eccentric. This seems to have been first observed by Schwalz, of Dessau, in 1828. He informed Mr. Harding of it, who thought he saw the same thing. Mr. Harding informed Professor Schumacher, who applied to M. Strave, to settle the question by means of the superb micrometer attached to his great telescope. M. Strave measured the distance between the ring and the body of the planet, on five different days, and ascertained that Saturn's ring is really eccentric, and consequently that the centre of the planet does not coincide with the centre of the ring, but that the centre of gravity of the rings oscillates

round that of the body of Saturn, describing a very minute orbit. This is considered as of the utmost importance to the stability of the system of the rings, in preventing them from being shifted from their equilibrium by any external force, such as the attraction of the satellites, which might endanger their falling upon the planet.

This double ring is now found to have a swift rotation around Saturn in its own plane, which it accomplishes in ten hours and a half. This rotation was detected by observing that some portions of the rings were a little less bright than others. Sir W. Herschel when examining the plane of the ring with a powerful telescope, perceived near the extremity of its arms or ansæ, several lucid or protuberant points, which seemed to adhere to the ring. At first he imagined them to be satellites, but afterward found, upon careful examination, that none of the satellites could exhibit such an appearance; and therefore concluded that these points adhered to the ring, and that the variation in their position arose from a rotation of the ring in the period above stated. The circumference of the exterior ring being 643,650 miles, every point of its outer surface moves with a velocity of more than a thousand miles every minute, or seventeen miles during one beat of the clock. It is highly probable that this rapid motion of the ring is one of the principal causes, under the arrangements of the Creator, of sustaining the ring, and preventing it from collapsing, and falling down upon the planet. This double ring is evidently a solid, compact substance, and not a mere cloud, or shining fluid. For it casts a deep shadow upon different regions of the planet, which is plainly perceived by good telescopes. Beside, were it not a solid arch, its centrifugal force, caused by its rapid rotation, would soon dissipate all its parts, and scatter them in the surrounding spaces. It is not yet ascertained whether both the rings have the same period of rotation. This magnificent appendage to the globe of Saturn, is about 30,000 miles distant from the surface of the planet, so that four globes, nearly as large as the earth, could be interposed between them : it keeps always the same position in respect to the planet : is incessantly moving around ; and is carried along with the planet in its revolution around the sun.

DIMENSIONS OF SATURN'S RINGS.

It is difficult for the mind to form an adequate conception of the magnitude, the mechanism, and the magnificence of these wonderful rings, which form one of the most astonishing objects that the universe displays. In order to appreciate, in some measure, the immense size of these rings, it may be proper to attend to the following statements. Suppose a person to travel round the outer edge of the exterior ring, and to continue his journey without intermission, at the rate of twenty-five miles every day, it would require more than seventy years, before he could finish his tour round this immense celestial arch. The interior boundary of the inner ring encloses a space which would be sufficient to contain within it three hundred and forty globes as large as the earth ; and the outer ring could enclose, within its inner circumference, five hundred and seventy-five globes of the same magnitude, supposing every portion of the enclosed area to be filled. This outer ring would likewise enclose a globe containing 2,829,589,622,018,315, or more than two thousand eight hundred billions of cubical miles ; which globe would be equal to more than ten thousand eight hundred globes of the size of the earth. In regard to the quantity of surface contained in these rings, the one side of the outer ring contains an area of 4,529,491,800, or more than four thousand five hundred millions of square miles. The one side of the inner ring contains 9,888,730,318, or nearly ten thousand millions of square miles. The two rings, therefore, contain on one side, above fourteen thousand four hundred millions of square miles ; and as the other sides of the rings contain the same extent of surface, the whole area comprehended in these rings will amount to 28,856,365,236, or more than twenty-eight thousand eight hundred millions of square miles. This quantity of surface is equal to one hundred and forty-six times the number of square miles in the terraqueous globe, and is more than five hundred times the area of all the habitable portions of the earth. Were we to suppose these rings inhabited, (which is not at all improbable,) they would accommodate a population—at the rate of two hundred and eighty inhabitants to a square mile, as in England—of 8,078,102,266,080, or more than eight billions, which is equal to more than ten thousand times the present population of our globe. So that these rings, in reference to the space they contain, may be considered, in one point of view, as equal to ten thousand worlds.

These rings, therefore, exhibit a striking idea of the power of the Creator, and of the grandeur and magnificence of his plans

and operations. They likewise display the depths of his wisdom and intelligence. For they are so adjusted, both in respect to their position around the body of the planet, and to the degree of motion impressed upon them, as to prevent both their falling in on the planet, and their flying off from it through the distant regions of space. We have already stated, that the rings are not exactly concentric with the body of the planet. Now it is demonstrable from physical considerations, that, were they mathematically perfect in their circular form, and exactly concentric with the planet, they would form a system, in a state of unstable equilibrium, which the slightest external power, such as the attraction of the satellites, might completely subvert, by precipitating them unbroken on the surface of the planet. For physical laws must be considered as operating in the system of Saturn, as well as in the earth and moon, and the other planets ; and every minute circumstance must be adjusted so as to correspond with those laws. ' The observed oscillation,' says Sir J. Herschel, ' of the centre of the rings about that of the planet, is in itself the evidence of a perpetual contest between conservative and destructive powers ; both extremely feeble, but so antagonizing one another, as to prevent the latter from ever acquiring an uncontrollable ascendancy, and rushing to a catastrophe.' ' The smallest difference of velocity between the body and rings must infallibly precipitate the latter on the former, never more to be separated ; consequently, either their motion in their common orbit round the sun must have been adjusted to each other by an external power, with the minutest precision, or the rings must have been formed about the planet, while subject to their common orbital motion, and under the full, free influence of all the acting forces.' Here then, we have an evident proof of the consummate wisdom of the Almighty Contriver, in so nicely adjusting every thing in respect to number, weight, position, and motion, so as to preserve in undeviating stability and permanency this wonderful system of Saturn. And we have palpable evidence, that every thing conducive to this end has been accomplished, from the fact, that no sensible deviation has been observed in this system for more than two hundred and twenty years, or since the ring was discovered, nor, in all probability, has there ever been any change or catastrophe in this respect, since the planet was first created, and launched into the depths of space.

APPEARANCE OF THE RINGS FROM THE BODY OF SATURN.

These rings will appear in the firmament of Saturn like large luminous arches, or semicircles of light, stretching across the heavens from the eastern to the western horizon, occupying the one-fourth, or one fifth part of the visible sky. As they appear more brilliant than the body of the planet, it is probable that they are composed of substances fitted for reflecting the solar light with peculiar splendor ; and therefore will present a most magnificent and brilliant aspect in the firmament of Saturn. Their appearance will be different in different regions of the planet. At a little distance from the equator, they will be seen nearly as complete semicircles, stretching along the whole celestial hemisphere, and appearing in their greatest splendor. In the day time, they will present a dim appearance, like a cloud, or like our moon, when the sun is above the horizon. After sunset, their brightness will increase, as our moon increases in brilliancy when the sun disappears, and the shadow of the globe of Saturn will be seen on their eastern boundary, directly opposite to the sun. This shadow will appear to move gradually along the rings till midnight, when they will appear in the zenith, or the highest point of those celestial arches. After midnight, it will appear to decline to the western horizon, where it will be seen near the time of the rising of the sun. After sun-rise, its brightness decays and it appears like a cloudy arch throughout the day. The following circumstances will add to the interest of this astonishing spectacle :

1. The rapid motion of the rings, which will appear to move from the eastern horizon to the zenith in two hours and a half.

2. The diversity of surface which the rings will exhibit. For, if we can trace inequalities on those rings, by the telescope, at the distance of more than eight hundred millions of miles, much more must the inhabitants of Saturn perceive all the varieties with which they are adorned, when they are placed so near them as one-eighth part of the distance of our moon. Every two or three minutes, therefore, a new portion of the scenery of the rings will make its appearance in the horizon with all their diversified objects ; and, if these rings be inhabited, the various scenes and operations connected with their population, might be distinguished from the surface of Saturn with such eyes as ours aided by our most powerful telescopes.