

## What can be the real Nature of Gravitational Force.

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THERE is nothing simpler than the formula which gives the law of the relations of gravity, namely, the "inverse square of the distance." At the same time the question "What is gravity" has hitherto utterly eluded all attempts at solution. We will, however, endeavour to give a rough sketch of the attempts that have been made in this direction. In the first place we note that the laws of gravity are observed to be in all places and all times absolutely the same. They know no variation. They are uninfluenced by the quality or state of the matter upon which they operate. Whether matter be under the influences of magnetic, thermal, electrical or chemical forces, the laws of gravity will operate upon it in precisely the same way. Again, no screen interposed can lessen the effect of the force of gravity. Its power is ideally penetrative. Nothing placed between an object and the Earth can lessen its weight. The interposition of the Moon does not diminish the Sun's attraction upon the Earth. There are no gravitational eclipses. Gravity knows no obstacles. It spreads out uniformly in all directions, diminishing under all conditions exactly inversely to the distance from the attracting body. Again gravity seems to transcend time. Its transmission through space can be mathematically demonstrated to be not less than six million times the velocity of light, which is itself enormous. Indeed the finest observations have failed to detect any delay in the speed of its transmission. What attempts have been made to explain the nature of this wonderful force? The force has been attributed to "ultramundane corpuscles," bombarding the unscreened slightly more than the screened sides of two mutually attracting bodies. But this theory demands a slight opacity in material bodies, whereas gravity acts with ideal penetration. Again, the buffetings of electrons has been appealed to. But the objection to this theory is that such energy could not be propagated at the most at a higher velocity than that of light, and as we have said above, gravity is transmitted at least six million times more swiftly. Again a theory of the impulsive power of the etherial radiations has been put forward to account for gravity. It is true that this force would act as the law of the inverse square demands, and if the impinging rays were absorbed in the proportion of the density of the attracting bodies,

the attraction would increase, as it should do, in the ratio of their masses. But here transmission could not exceed the velocity of light, and moreover there would have to be an impossible wastage of electro-magnetic energy. Again, an "undulatory theory" of gravity has been proposed. But this too hopelessly breaks down under rigorous analysis. Lastly, there is the "electro-dynamical" explanation of the nature of gravity. This is, however, hardly more than a verbal theory, for we do not know what electricity is any more than we know what gravity is. It is an explanation "per ignotiora." All we can safely say is, that the deeper science penetrates into the mystery of things, the more clear it becomes, that the universe is under the government of the forces of electricity, displayed in an infinite variety of operations.

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## Note on the Elements of the Orbit of the IX Satellite of Jupiter.

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THE IXth satellite of Jupiter, which was discovered by Nicholson at the Lick Observatory last year, has like the VIIIth satellite a retrograde motion. It is only of the 19th magnitude, so small that it never could have been detected visually, no matter how large the telescope. Nicholson discovered it on one of his photographs, as a little thin line, betraying its existence and the direction of its stately motion around its mighty primary. The elements of its orbit are as follows:—

Epoch and osculation, 1914, July 27, 8817.	
Mean anomaly of epoch $M^{\circ} 49^{\circ} 28'$	} A.D. 1914.0
Perihelion distance of Node $\omega 71$	
Longitude of Node $\Omega 309^{\circ} 23'$	} J
Inclination $i 157^{\circ} 51'$	
Excentricity $e 0.163$ .	
Mean motion $\mu 0^{\circ} 315$ .	
Period $P 3.125$ years.	

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