

## 'ASTRONOMY OF THE FUTURE.'

[We have received several communications respecting this article (which was in our number for November last)—some treating it as entirely absurd. We give the following.—Ed.]

I read with interest the article in this month's *Fraser* by Mr. Newton Crosland, on the possibility that our atmosphere is an essential factor in the heat and light kindled by the sun. Mr. Ure, in a large work of his, perhaps thirty-five years ago, called the sun a *focus of radiation*, and I think never would apply to sun or star the epithets luminous, burning. He, too, was professedly a chemist. But towards the close I was startled to find Mr. N. C. attribute to Newtonians the belief that there is a centrifugal force at work as a cause of the motion of a planet or satellite round its principal. At Oxford, more than fifty years ago, it was familiarly taught that 'centrifugal motion' was alone correct, and that centrifugal force was a mere fancy to correspond with centripetal force: but the centrifugal motion is a mere result of the PRIMITIVE IMPULSE, not of any centrifugal force. The accelerations along the axes called  $x$  and  $y$  are represented by  $-\frac{d^2x}{dt^2}$  and  $-\frac{d^2y}{dt^2}$  ( $t$  the time), and being proportional to the accelerating forces are for convenience often called the forces. So, the acceleration in a direct line away from the centre of force, being measured by  $\frac{d^2r}{dt^2}$  (where  $r$  is the radius), is familiarly called the centrifugal force. I no longer have Newton at my hand to refer to; but I am persuaded that he regarded a single primitive impulse and a continuous centripetal force to satisfy the conditions of the problem. That it does so is quite clear. The first column of p. 598 seemed to me pure mistake. I must also differ from the writer in thinking that Newtonians do or can exclude what he calls theology from their astronomy. . . . It is the moral side of theology which cannot enter physics. The Greeks, not attributing a moral nature to God, included theology in physics.

I do not suppose gravitation to be philosophically separate from other forces. I have no doubt that repulsion and cohesion are contained in the formula which expresses the true law (as for illustration,  $F = \frac{a}{r^2} \left(1 - \frac{b}{r}\right) \left(1 - \frac{c}{r}\right)$ , where  $b$  is immensely less than  $a$ , and  $c$  than  $b$ ); nor do I suppose any forces to exist in the universe but Divine forces. A mathematical clergyman wrote to me in reference to the Rev. Thomas Pennington Kirkman's book, that he looked on this as the truth, which vindicates for natural philosophy the purely religious character which for a hundred years after Newton was claimed for it. Professor Tyndall says that matter seems to him everywhere alive. I accept this as a dark yet virtual avowal of the doctrine that God is immanent in the universe.

*Mens agitat molem et magno se in corpore miscet.*

F. W. NEWMAN.

The suggestion of replacing the imaginary power called gravitation by the real power of electro-magnetism appeared in a work called *Alastor, or the New Ptolemy*, printed for Saunders and Ottley in 1852, and in the same work the anomaly of Saturn's rings was solved by pointing out that the form is that of satellites gyrating each in its own path with such velocity as to appear to a terrestrial eye a single ring of light, like a burning stick whirled through the air.

N. LEVITT.

