

on the one hand, and Scrope and Lyell on the other, Etna supplied so crucial a test. Nor can we regard the few notes of Mr. Rutley on the microscopic characters of several specimens brought to him by the author, excellent as they are in themselves, as affording anything like an adequate discussion of the nature of the Etnean lavas.

There are not, indeed, wanting indications in the work before us that the author has scarcely succeeded in so far mastering the scientific questions connected with his subject as to qualify himself for giving anything like authoritative opinions concerning them. Thus on page 111 we find him speaking of a crater as "composed of a prehistoric grey labradorite, and of doleritic lava." Again, so far as can be gathered from the work before us, the hypotheses of elevation craters and eruption craters are of about equal value. We are informed simply that "the opinion of geologists is divided as to the manner in which a volcano is formed;" and then follows a statement of the two rival hypotheses. Surely after the convincing reasoning of Scrope, and the patient observations of Lyell on Etna itself, as detailed in the celebrated memoir read before the Royal Society in 1858, it is strange to find such language used upon the subject, more especially when we recollect that no attempt was ever made by Lyell's opponents to discredit his observations or to reply to his deductions. We should almost as soon expect to read in a modern work on astronomy that the opinion of astronomers is divided as to whether the earth moves round the sun or the sun round the earth.

We find so much to praise in this little book, especially in the clear *résumé* of the history of the mountain and its eruptions, and the illustrations so carefully selected and reduced from those of larger works which are not easily accessible to general readers, that we regret we cannot express more unqualified approbation of that portion of the book which calls for especial notice in the pages of this journal. We can only hope that in a second edition the author may find an opportunity, which he will not neglect, of considerably lengthening and very greatly strengthening this scientific portion of his work; and in order to do so, without at the same time impairing its popular character, we can scarcely suggest a better example for him to follow than the work of Prof. Phillips, to which we have alluded at the commencement of this article.

### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### The Trans-Neptunian Planet

THE explanation given by Prof. Peters (*Astr. Nach.*, 2,240) of the observations made at Washington in 1850 of this supposed planet is put beyond doubt by the examination of Mr. Ferguson's observing-book. It is due, however, to Mr. Ferguson to say that his record is full and complete, and that his changes in the reductions were honestly made. The record is in pencil, and no figures were erased or rubbed out. They are crossed out, and the assumed figure is put by the side of the original one, while at the bottom of the page is a note with pen and ink, and

in Mr. Ferguson's handwriting, stating the changes that were made. Prof. Peters's ingenious discovery of the truth was made without knowledge of the observing-book.

Such criticisms are instructive, showing how unsafe it is to build theories before we are sure of the facts. They may also be a means of avoiding a waste of labour. It is known to me that at least two American astronomers, armed with powerful telescopes, have been searching quite recently for a trans-Neptunian planet. These searches have been caused by the fact that Prof. Newcomb's tables of Uranus and Neptune already begin to differ from observation. In this connection the note of Mr. Dunkin on the errors of Leverrier's tables of Saturn is interesting. But are we to infer from these errors of the planetary tables the existence of a trans-Neptunian planet? It is possible that such a planet may exist, but the probability is, I think, that the differences are caused by errors in the theories of these planets. My observations of the satellites of Saturn are not yet discussed, but they indicate that Bessel's mass of Saturn is nearly correct. Now Leverrier has diminished this mass by about  $\frac{1}{25}$ th, and it seems probable that this diminution was caused by some error in his theories of Jupiter and Saturn.

A few years ago the remark was frequently made that the labours of astronomers on the solar system were finished, and that henceforth they could turn their whole attention to sidereal astronomy. To-day we have the lunar theory in a very discouraging condition, and the theories of Mercury, Jupiter, Saturn, Uranus, and Neptune, all in need of revision; unless, indeed, Leverrier's theories of the last two planets shall stand the test of observation. But after all, such a condition of things is only the natural result of long and accurate series of observations which make evident the small inequalities in the motions, and bring to light the errors of theory.

Washington, March 7

ASAPH HALL

#### Rats and Water-Casks

MR. NICOLS says, in *NATURE*, vol. xix. p. 433:—

"A ship's carpenter told me that, in the old days, before the use of iron tanks on board ship became general, the rats used to attack the water-casks, cutting the stave so thin that they could suck the water through the wood without actually making a hole in it. If any one could substantiate this it would have an important bearing on the question under consideration."

Capt. Wickham, when First Lieutenant on board H.M.S. *Beagle*, told me that when he was a midshipman it was his duty, on one of the king's ships to see that certain vessels on deck were always kept full of water, in order to prevent the rats gnawing holes through the water casks, and that through such holes nearly all the water in a cask would leak away.

CHARLES DARWIN

#### Tides at Chepstow

I OBSERVE two letters in *NATURE* lately upon this subject. Many years ago I took some pains to ascertain the greatest known rise of tide at Chepstow, for I doubted the accuracy of the common statement that it was seventy feet and upwards. At the time I made the inquiry the large railway bridge at Chepstow to carry the South Wales Railway across the River Wye was being constructed. I was acquainted with Mr. Oakden, one of the engineers on the work, and he, with great care, took levels of the marks which had been made from time to time recording the very high tides, some of them going back many years. He found the highest of them to be some decimal (of which I have no record) above fifty feet above ordnance datum. I think this may be relied upon. It is corroborated in a paper by the present Astronomer-Royal, on "Tides and Waves," in the "Encyclopædia Metropolitana," vol. v. p. 242, paragraph 7, first edition. He says: "Thus, at the entrance of the Bristol Channel the whole rise at spring-tides is about eighteen feet, at Swansea about thirty feet, and at Chepstow about fifty feet."

W. B. CLEGHAM

Saul Lodge, Gloucestershire, March 18

#### Migration of Birds

PROF. NEWTON in his article on Migration of Birds (*NATURE*, vol. xix. p. 433) has omitted one, and a very important limit to the height at which birds of passage can perform their journeys. This is *temperature*. The following table of Daniell's will show