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 intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Origin of the Aurora Spectrum.

PROF. RAMSAY gives the wave-length of the principal line in his new gas as 5566. It will no doubt also occur to others that this is very near the wave-length of the aurora line, which Vogel has measured as 5569. It should be mentioned in connection with this line that Profs. Liveing and Dewar have observed one very near it at 557 in sparks taken in liquid oxygen. The second green line given by Prof. Ramsay as 5557, seems also to have been seen by these observers (*Phil. Mag.*, xxxviii. p. 237, 1894). ARTHUR SCHUSTER.

Manchester, June 10.

The Action of Electric Discharges on Photographic Plates.

REFERRING to the paper on this subject, read on May 16, by Mr. J. A. McClelland, at the Cambridge Philosophical Society, and reported in your issue of June 9 (p. 142), perhaps I may be allowed to mention that very similar experiments, with the deduction that the effect is chiefly due to light, and not to electrolytic or other action, were described by myself in a paper to Section A of the British Association, at its Edinburgh meeting in 1892, and will be found fully reported in the *Electrical Review* for August 26 of that year.

I do not know whether others have observed the fact that when strong sparks from an induction coil or influence machine are allowed to traverse the sensitive surface of an ordinary photographic dry plate, that a dark line, delineating the path of the spark, is immediately produced, and can clearly be seen without any necessity for photographic development. Further, that such lines, though faint to commence with, darken appreciably after a few minutes lapse of time, and still more so in the course of a few hours. This appears to indicate that whatever the precise action of the spark on the film, this action continues after it has once been started. Further, it is a curious fact that these lines, if examined with a magnifying glass, are always found to consist of two dark lines with a light space between them. This is specially noticeable immediately after the spark has passed, the space apparently filling up with lapse of time. A. A. C. SWINTON.

66 Victoria Street, London, S.W., June 10.

A High Rainbow.

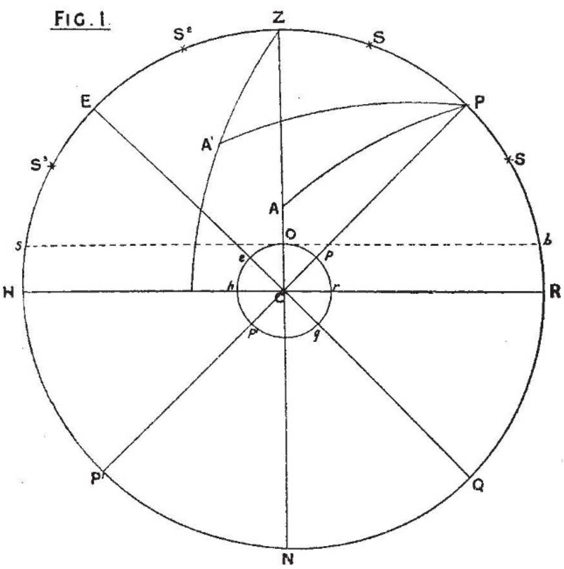
ON Sunday afternoon, May 29, while sitting in my yard, my twelve-year-old son called my attention to a rainbow which he had discovered while lying on his back looking up at the sky. The local time here was 5.40 p.m., and the sun, therefore, about an hour and a half high. The bow was in the west, and about 70 degrees from the horizon, with its convex side to the sun. The colours were fairly well brought out, the red being on the convex side of the arc, and the violet on the concave side. The figure on p. 132 of Tait's "Light" shows a short arc near the zenith, which is a fair representation of what was seen here. I have not read an account of what was seen by Helvetius further than is contained in Prof. Tait's book, and do not know whether the arc seen by him near the zenith showed the rainbow colours. In this case I do not see any of the other halos seen by Helvetius. There were but few very thin clouds, and no rain at all. SIDNEY T. MORELAND.

Lexington, Virginia, U.S.A., June 2.

NAUTICAL ASTRONOMY.

IF the compass is the navigator's sheet-anchor, the sextant is certainly his best bower; and just as the former was known, if not generally used in Europe, about a century before Flavio Gioia got the credit of discovering it, so the latter was invented by the transcendent genius of Sir Isaac Newton, more than half a century before it was re-invented by Hadley in 1731. Newton does not seem to have suggested its adaptability for navigational purposes, or if so, it was not sufficiently known or taken up, and I am not aware of any reason to suspect that Hadley knew of Newton's discovery.

The principal use the navigator puts the sextant to is that of measuring the altitudes of heavenly bodies—that is, the angle at his eye subtended between the object and the visible horizon. Now the *rational* horizon may be defined as the plane perpendicular to the plumb-line through the earth's centre, or the circle traced by the meeting of this plane with the celestial concave. The *sensible* horizon is generally defined as a plane parallel to the former through the eye of the observer; but this can only coincide with the *visible* horizon if the eye of the observer is at the surface of the earth—as if he were immersed in the sea, till a horizontal line from his eye would be a tangent to the sphere at that point. But the eye of the observer is always above the surface of the sea; and the more it is raised, the more the visible horizon is depressed, and a correction called "dip" has to be applied to an altitude measured to it, to reduce it to what it would have been had the eye been at the sea-level. Again, before this *apparent* altitude can be used for position-finding, it has to be still further corrected for



refraction, due to the bending of the rays of light, in passing through the earth's atmosphere, and in the case of sun, moon, or planet for parallax, to reduce it to the angle at *the centre of the earth and to the rational horizon.* Both these corrections are zero when the body is in the zenith, and a maximum at the horizon. Parallax is the angle at the observed body, subtended by the semi-diameter of the earth under the feet of the observer, which will be reduced to a point when the body is in the zenith. If the body has an appreciable semi-diameter, it has to be applied to the altitude of the limb to get that of the centre.

In the diagram (Fig. 1), let H E Z P R Q N P′ represent a meridian of the celestial concave, and the inner circle the corresponding meridian of the earth; let Z be the zenith, N the nadir, P and P′ the poles of the heavens, being the points in the celestial concave, which would be perforated by the earth's axis if indefinitely produced: then H R will represent the rational horizon, the plane of which, passing through C, is normal to the plumb-line Z O N, *s O b* will represent the sensible horizon (O being the position of the observer), E Q, the plane of which is normal to P P′, will be the equinoctial, whose plane coincides with that of the terrestrial equator. On a meridian