

primitive plant formation is desecrated by a single foreign invader." The concluding chapters deal with the division of the islands into botanical districts, and the affinities, origin, and history of the flora. As regards the latter, Dr. Cockayne admits the necessity of great land extension in the Antarctic direction.

*Annual Reports on the Progress of Chemistry for 1919.* Issued by the Chemical Society. Vol. xvi. Pp. ix+234. (London: Gurney and Jackson, 1920.) Price 4s. 6d. net.

ONE of the most useful of the publications issued by the Chemical Society is the annual volume summarising the progress made each year in the various main branches of chemistry. With this bird's-eye view of the year's achievements at command, a worker is readily able to survey, in something like proper perspective, the advances made in other divisions of the science as well as in his own.

The period covered by the present volume synchronises with the return of many scientific workers from occupations connected more or less directly with the conduct of war to conditions which, in due time, will no doubt lead to a full resumption of scientific investigation for its own sake. Meanwhile it is too early to expect accounts of many such researches. For the moment, the aftermath of war work is being shown in papers dealing with technical problems on which chemists have worked during the last few years. There is, nevertheless, a fair amount of purely scientific research work recorded. Rutherford's investigations on atomic disintegration are of fundamental importance if the results are eventually confirmed; and other notable pieces of work are the studies on the "poisoning" of palladium as a catalyst by hydrogen sulphide, on the origin of alkaloids from amino-acids, and on fermentation. In the "crystallography" section, it may be noted, a good description is given, with figures, of the principles underlying X-ray methods of exploring crystal structure.

*The Ascent of Man: A Handbook to the Cases illustrating the Structure of Man and the Great Apes.* (London County Council.) Pp. 74. (London: The Horniman Museum and Library, n.d.) Price 6d.

THIS little handbook, by Dr. H. S. Harrison, curator of the Horniman Museum, is written in simple language, and admirably suited to stimulate interest in the recent remarkable progress in our knowledge of the ancestry of man. The bibliography with which it concludes will also be helpful to those who wish to pursue the subject further. Dr. Harrison emphasises the fact that man must be traced back to small arboreal mammals, and well observes: "It is scarcely too much to say that if the earth had borne no trees, there would have been no men." His anatomical descriptions are made readable and interesting by his frequent references to habits and modes of life.

A. S. W.

NO. 2649, VOL. 105]

## 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.)

### Relativity and Reality.

No one would wish to strain at a gnat. If the relativist finds it convenient to make the time-axes of his four-dimensional medium the pure imaginary direction by writing  $t = \tau\sqrt{-1}$ , that would appear to be a matter of indifference, so long as for each co-ordinate a single line or axis still suffices to indicate the values that  $x$ ,  $y$ ,  $z$ , and  $\tau$  can bear. But the matter becomes complicated as soon as we project in oblique directions. Thus take the equations of the "restricted" relativity theory,

$$x = \beta(x' - ut'), \quad t = \beta(t' - ux'), \quad \beta = (1 - u^2)^{-\frac{1}{2}},$$

which upon substitution become

$$x = \beta(x' - iu\tau'), \quad \tau = \beta(\tau' + iux'),$$

and these can be written

$$x = x' \cos \theta - \tau' \sin \theta, \quad \tau = x' \sin \theta + \tau' \cos \theta,$$

if  $\tan \theta = iu$ .

Thus  $(x, \tau)$  ( $x', \tau'$ ) are co-ordinates of the same point projected upon different axes, but not in any real direction. According to this system, A can grasp B's scheme of space-time only when he generalises his own  $x, y, z, \tau$ , so that each of them stands for an unrestricted complex variable. But such a removal of restriction cannot be pictured without allotting a whole plane to each variable, and that means doubling our whole apparatus of representation and a description of events in terms of not fewer than eight real dimensions. Surely no physicist can be expected to take the system seriously.

The mathematician does not seem to be aware that he is asking one to swallow a camel. Thus in Prof. Eddington's recent book, "Space, Time, and Gravitation," we read (p. 48): "The observer's separation of this continuum into space and time consists in slicing it in some direction... clearly the slice may be taken in any direction; there is no question of a true separation and a fictitious separation." But there is the qualification, which surely deserves mention, that every real direction must be excluded, since the angle  $\theta$  is necessarily imaginary, because  $\beta$ , which is greater than unity, is its cosine. The original passage from  $(x, t)$  to  $(x', t')$  is real, and we get back to reality by slicing in an imaginary direction with respect to an imaginary axis. The device should be classed with the focoids, those two imaginary points at infinity where any two concentric circles touch. They recall to the mathematician's mind certain algebraic forms, but have no other actuality whatever. The point I would make however, is this: If this analogy is dropped, the idea of time as a fourth dimension is not in any way advanced by the interpretation of the equations above from the position it has occupied since the days of Lagrange.

R. A. SAMPSON.

Royal Observatory, Edinburgh, July 26.

### An Attempt to Detect the Fizeau Effect in an Electron Stream.

WITHOUT in any way touching the theoretical aspect of the case, it seems worth while to put on record the null result of an experiment to see whether the Fizeau effect was present in the case of a beam of light passing along a rapidly moving stream of electrons.

A pair of Jamin plates giving a separation of the