

with sodium sulphate, because it is cheaper." There is no reference to the consequent modification of the entire scheme in terms of the main product (cellulose) and of the offensively malodorous volatile by-products. To the main report is appended one by Mr. D. C. Winterbottom on "Supplies and Cost of Raising 'Marine Fibre,'" the remarkable product of *Posidonia australis*. For the industrial utilisation of this product more than one "promotion" has been attempted; according to the author, two of these survive, of which the *Posidonia Fibres Syndicate* is producing six to seven tons per week at Port Broughton. On his estimate of the costs of dredging, etc. (4l. 10s. 6d.), and subsequent handling, the clean, air-dry fibre cannot be produced to sell at less than 17l. per ton. A second appendix, by Mr. J. C. Earl, on the paper-making value of various South Australian raw materials, deals with six indigenous products of little promise.

WAR problems and after-the-war problems are discussed by writers of every varying shade of opinion in *Scientia*, the Italian equivalent of our own *Science Progress*, but which exhibits a more international tendency by publishing French translations of English and Italian articles. Thus Prof. Sayce (xix., 5) considers that the history of the Assyrian empire under Tiglath Pileser and his successors affords a lesson as to what may be expected from a military nation imbued with the spirit of world-conquest. In the same number Prof. Roberto Michels, of Turin and Bâle, deals with the demolition of the international labour movement. Prof. Knut Wicksell (Lund, Sweden) discusses the influence of over-population in stimulating wars, and expresses the somewhat sanguine prophecy that with the present decline of the birth-rate in European countries peace conditions may become more possible (xix., 6). Prof. A. Pillet, of Paris (xx., 12), considers that the problem of the war from the Allies' point of view involves the entire crushing of the German Empire. Peace conditions and what is to happen after the war form the subject of speculations at the hands of Prof. E. Catellani, Padua (xx., 8), and E. Cecotti, Messina (xx., 6). Sir Alfred Hopkinson (xx., 12), while emphasising the strict adherence to the principles of international law in the operations of the Allies, blames the neutral countries for not taking action in enforcing the observance of similar principles on the enemy. But an attempt is made to apply the methods of exact science to the problem of when and what offers of peace should be made by a victorious belligerent, in a paper on "The Economic Dynamics of War," by Prof. John Bates Clark, of Columbia University. In his opinion the time for making the offer is when the gain to be derived from continuing the war is more than outbalanced by the sacrifice required for its continuance. And the terms to be exacted from the vanquished side should consist of all that the prospective victor could gain by pushing his conquest to the bitter end *minus* the cost of so pushing it. If these terms are offered and can be secured there is no advantage for either side to continue the struggle.

THE Open Court Company will publish very shortly a translation, from the first edition, of "The Geometrical Lectures of Isaac Barrow." The work will contain a portrait of Barrow, and an introduction and notes by J. M. Child.

OUR ASTRONOMICAL COLUMN.

AURORA BOREALIS.—Mr. Denning writes that though the moon was nearly full on the evening of January 4 there was a brilliant occurrence of aurora observed from widely distant stations. The Rev. W. F. A. Ellison observed it from Fethard-on-Sea, near Water-

ford, and describes it as a particularly magnificent display. From Edinburgh, at about 10 p.m., there was also a fine exhibition, extending along a considerable range of the northern horizon. Rapid variations were apparent in the details, the light alternately appearing and disappearing. Clouds were very prevalent at low altitudes in the northern region, and the glow spread upwards from behind these with striking effect. At Bristol there was an auroral glow between about 8 and 9 p.m., and at 8.30 a bright streamer shot upwards to about 15° W. of the Pole star. But the appearance was rendered somewhat inconspicuous by the unusual brilliancy of the moon, due to the very clear atmosphere.

Dr. A. A. Rambaut, Radcliffe Observatory, Oxford, sends us the following notes of observations of this aurora made by Mr. W. H. Robinson at that observatory, and also of the bright meteor of the same date, referred to in last week's NATURE (p. 379):—A bright haze in the northern sky attracted considerable attention at Oxford soon after 8 p.m. on January 4. A long segment of an auroral arch lay along the horizon, with its apex at a small altitude in the N.N.W. Isolated streamers appeared, but generally for a few seconds only. The finest display occurred at 10.15 p.m. (or perhaps a minute or so later), when streamers suddenly developed all along the arch, lasting for a very brief interval, a white haze taking its place. At about 10.15 p.m. a brilliant fireball attracted notice, which ran rapidly downwards from the direction of the moon, passed 2° or 3° east of Jupiter, and burst, with a blue colour, 10° or 15° below the planet, its trail swiftly disappearing. The light of the meteor was distinctly more intense than that of the moon. An approximate estimate places the track from 3h. om., +18° (first seen), to oh. 45m., +5°.

CLOUDS ON MARS.—In the course of a report on the planet Mars, in which observations made by members of an international organisation are summarised and compared, Prof. W. H. Pickering makes several interesting references to clouds which appeared on the planet during the opposition of last year (*Popular Astronomy*, vol. xxiv., p. 639). Clouds were seen frequently by all the observers, and Prof. Pickering points out that the clouds always lie over the so-called desert regions of the planet, apparently being precipitated so soon as the fertile regions are reached. Dissolution is sometimes very rapid. Only a few years ago it was claimed by some observers that clouds were rarely or never to be seen on Mars, but during the last opposition the planet was scarcely ever seen without them. The existence of clouds in the atmosphere of Mars appears to have been first established by Sir Norman Lockyer in his observations during the opposition of 1862.

THE CEPHEID VARIABLES.—The results of some further investigations of the relations between the orbital elements of Cepheid stars have been given by Dr. Ludendorff (*Astronomische Nachrichten*, No. 4869). He finds that for several stars resembling δ Cephei, the elements are closely related, as shown in the formula

$$100e \cos \omega = -21.8 + 0.963(1 - e^2)^{\frac{1}{2}} K^3 P. 10^{-3},$$

where e , ω , P are respectively the eccentricity, angle from periastron to node, and the period in days, while K is half the total amplitude of the radial velocity.

A similar formula is applicable to stars resembling ζ Geminorum, the two numbers on the right-hand side of the equation then becoming +2.4 and +0.73. Further confirmation has been obtained of the relation previously given by Dr. Ludendorff, $2K = 47.3 A$, where A is the range of variation in brightness expressed in magnitudes; this, however, appears to be valid only for stars of types F to G.