Galileo and Scientific History

A LETTER has been received from Prof. Lane Cooper with reference to the article by Prof. A. S. Eve which appeared in NATURE of January 4 (p. 8). Prof. Lane Cooper suggests that physicists should find much to interest them in Aristotle's "Dynamics" (pp. 26–33) and in Aristotle's "Physics", edited by W. D. Ross (Oxford, 1936). There is a further suggestion that Salviati may have referred to the Tower of Pisa (178 ft.), while Sagredi might have considered the Campanile of Venice (323 ft.). Prof. Lane Cooper directs attention to the curious mistake of Galileo, namely, that "in free fall, wood starts off faster than lead". Moreover, Galileo, about 1590, claims that he had "often tested this". It must be remembered that Prof. Lane Cooper's main interest is in language and literature, and that his personal interest lay in the growth of a myth. He further questions whether those who suppose that a theatrical Galileo ascended the Tower, after due advertisement, to perform modern experiments with free fall before the mob, are really honouring that great and good man. "If Stokes and Rayleigh had lived in Galileo's day, would either of them have lent himself to a display of the sort ?"

Control of Power Networks

THE problem of nation-wide electricity supply has undergone considerable changes in recent years. Electric power has been applied to many services, with the result that continuity of supply has now become almost essential to the life of the community. Economy in capital costs entails the reduction of spare plant to a minimum by creating a common pool. Economy in running costs necessitates the placing of the generating stations in such positions that fuel and water costs are reduced to a minimum. This has led to the linking up of distributing networks and power stations, and it is essential that the controlling engineer should be immediately informed of any appreciable change in the load on the networks. This subject was discussed in a paper read to the Institution of Electrical Engineers on February 7 by G. A. Burns and T. R. Rayner. They describe the automatic methods by means of which the engineer is at once informed of the state of the load at a distribution substation, and the methods by means of which the apparatus is started and circuits opened and closed without using any manual labour. There are already in service on various sections of the British grid 150 installations of the apparatus the authors described. It embodies automatic telephone apparatus spread over very wide areas. The components employed are the same as those incorporated in about eleven million lines of automatic telephones spread over practically every country in the world. This proves the robustness of construction and the stability of the apparatus components used in the system described in the paper. It is interesting to notice that the problems arising in connexion with the control, distribution and protection of power networks have been practically solved by the adaptation of methods and apparatus used in automatic telephony.

Mathematics in Engineering

THE scholastic method of dividing mathematics into various branches called geometry, algebra, trigonometry, calculus, etc., has advantages from the point of view of the teacher, but according to Dr. A. Russell, in the *Faraday House Journal* for the Lent term 1936, there is no need for the engineering student to handicap himself by solving a problem by some particular method. This custom was fostered in Great Britain some fifty years ago by the old-fashioned syllabus for the Cambridge Mathematical Tripos. In the old days, the Tripos used to last for nine days, and was divided into two periods of four and five days each, separated by an interval of ten days. Four of the papers were marked in the syllabus 'easy problems'; but few of them were easy. The problem papers sometimes had between twenty and thirty questions, and so the time of most of the candidates was largely expended on reading them. The candidates were also harassed by hearing quill pens scratching and squeaking all round them, as fountain pens were not then used. During the first three days of the examination, the use of the calculus was taboo. In the Euclid paper, the use of algebra or trigonometry was not permitted. In another paper the candidates were examined on the first three sections of Newton's "Principia". This was not difficult, but the riders were, as it was imperative to prove them by Newton's methods. These were the days in which there was a 'senior wrangler', and the mathematical coaches coveted the honour of having trained one almost as much as the owner of a racing colt covets winning the Derby. Dr. Russell illustrates the 'all-in' methods by applying them to geometrical problems.

Bathymetry of the Oceans

THE nomenclature of ocean deeps is still in some confusion, and this is largely due to the use of fathoms in Great Britain and metres in most other countries in the record of depths. In the *Challenger* reports, Sir John Murray named the areas over 3,000 fathoms as 'deeps'. This figure was arbitrary and when converted into metres (5,486 metres) has even less significance as a criterion of depth, although the Prince of Monaco in his "Carte générale bathymétrique" of 1912 adopted the near equivalent of 6,000 metres and many of the *Challenger* names. In *Petermann's Mitteilungen* of February, Dr. G. Wüst proposes a new system of nomenclature for the ocean features of the world which incorporates a good deal already in use by G. Schott. He chooses 4,000 metres (2,187 fathoms) as his standard. In depths of less the bottom figures as ridges : in depths of more as basins. The 'deeps' in the older sense of the term disappear from Dr. Wüst's map. Each feature receives a geographical name derived from its location, and the personal names commemorating oceanographers are not used. The figure of 4,000 metres is of course arbitrary except in so far as it approximates to the depths at which the average ocean floor lies. The map shows both Atlantic and Indian Oceans divided into east and west troughs,

each in turn divided into basins, and the Pacific Ocean divided into a wide central trough and narrow western and (south) eastern troughs. A second map divides the surface waters on the same basis and gives a name to the sea overlying each basin. This is of more doubtful value, and some of the names are unlikely to gain general acceptance.

Bathymetric Charts of the Oceans

AT the Seventh International Oceanographical Congress held in Berlin in 1899 it was decided to draw up a general bathymetric chart of the oceans. Through the generosity of H.S.H. Prince Albert I of Monaco, it was possible to produce the first edition in 1904 and a second edition which was begun in 1912 but not completed until 1930. After the death of the Prince of Monaco, it was decided that a new edition should be prepared by the International Hydrographic Bureau at Monte Carlo. The first sheet of this third edition, Sheet *A*.1 (North Atlantic from Equator to lat. 47° N.), is now on sale at a price of 35 French francs. Since the publication of the last edition, echo-sounding has come into general practice, and in the construction of Sheet *A*.1 some 70,000 soundings were examined. As a result, the many inequalities of the bottom of the sea are now being disclosed in areas previously thought to be more or less smooth. The sheet (1 ft. 11 in. by 3 ft. 3 in., chart dimensions) is coloured to show the depth contours of the ocean and the principal mountain ranges of the continents.

Forty-Six Years of Phenology

MR. J. EDMUND CLARK's important paper on "The History of British Phenology" (*Quart. J. Roy. Meteorol. Soc.*, **62**, January 1936) comes at a time when the six hundred or so phenological observers organised in Britain by the Royal Meteorological Society are beginning their annual observations on the dates of flowering of plants, song of birds, appearance of migrants, butterflies, etc. In Great Britain organised phenology dates from Gilbert White's classic eighteenth century observations. The Royal Meteorological Society's phenological reports were begun in 1875 by the Rev. Thomas A. Preston, of Marlborough School, who made about 20,000,000 calculations. From 1889 until 1910 Edward Mawley organised them with 22–23 observing stations watching 50 plants, 14 birds, 6 insects and frog spawn. From 1911 until 1913, Messrs. J. E. Clark and R. H. Hooker were responsible, in 1914 Mr. Clark, and from 1915 until 1920 (during which year 5,000 reports were tabulated) by Messrs. J. E. Clark and H. B. Adames. For the last five years, Messrs. J. E. Clark, I. D. Margary and C. J. P. Cave have been responsible for them, and in 1930 as many as 18,000 records were tabulated. Critics of the exhaustive series of statistics and maps published annually in the Phenological Report will probably, after the half century of work is reached, appreciate their value in that the deductions are already proving useful for farm and garden crops.

Central Agricultural and Scientific Bibliography

MODERN mass-production of scientific and technical literature led first to the growth of comprehensive abstract services, which, as literary proliferation increased, have tended to bury the references to articles on specific subjects in the mass of abstracts on all subjects. Thus has developed the present-day demand for specialised bibliographies—lists of references classified according to the titles of the articles noticed, and informing about the quantity rather than the quality of scientific literature. A comprehensive bibliography on all branches of agriculture and allied subjects is now being organised at the Science Library, South Kensington, London, S.W.7. As the Library takes most of the four thousand or so agricultural journals published throughout the world, it offers unusually good facilities for the preparation of such a bibliography. Subscribers, paying 10*s*. per annum as individuals, or £5 5*s*. as institutions, will have full access to the bibliography and special facilities for reference to books in the Library. Translations and abstracts will also be made. The service commenced on March 1.

The Applications of Fluorescence

IN a paper read to the Illuminating Engineering Society on January 14, Mr. F. E. Lamplough pointed out some useful applications of fluorescence. The work is carried out both by visual and photographic methods, and as the fluorescence colours as a rule bear little relation to the natural colours of substances, it often happens that colourless materials and those of identical natural colours can readily be distinguished by their fluorescence. This method is used by detectives, experts and collectors. It has been used for deciphering ancient manuscripts from which the writing had been erased, for detecting alterations in pictures, for distinguishing between old and new marble, cut ivory or bone. Repairs to pottery, glass and woodwork are at once evident. It is of equal value in the examination of foodstuffs, textiles and paper. It has been used to yield pictures of fossils otherwise almost invisible. Some use of it has been made in display and advertising as well as in stage and film work. Extensive use was made of fluorescence in the film production of H. G. Wells's "Invisible Man". If the skin of the actor is made non-fluorescent and his suit strongly fluorescent, then in ultra-violet light the suit appears to walk about in the most amazing manner without visible means of support. The use of fluorescence to vary the colour of a source of light was demonstrated by means of a series of discharge tubes, in which the light given by the discharge was changed by coating the interior of the tube with different fluorescent powders.

Biochemical Research in India

THE annual report of the Indian Society of Biological Chemists gives as usual a comprehensive summary of the work carried out during the past year (Society of Biological Chemists, India. Biochemical and Allied Research in India in 1934.