

APHELIA OF PLANETS AND COMETS.—Mr. C. D. Perrine examines the grouping of these aphelia in Proc. Nat. Acad. Sci., U.S.A., September, 1919. The grouping of aphelia of the minor planets about a strongly marked maximum in longitude 195° has been pointed out before. It is shown that the aphelia of the forty-five short-period comets are grouped in the same manner. It is further remarked as a coincidence (it can scarcely be more) that the aphelia of the eight major planets are all situated in the same half of the ecliptic, their centre of mean position being in the longitude of the apex of solar motion. The aphelia of the long-period comets appear to be grouped about two maxima, the most strongly marked being near longitude 90° , the other near longitude 270° . Mr. Perrine notes that these are respectively the longitudes of the antapex and apex, and deduces a theory that the comets are captured from interstellar space. The obvious difficulty presents itself that the great majority of such objects would enter the sun's domain with independent velocities of the order of several miles per second, and their orbits would, in consequence, be strongly hyperbolic. Mr. Perrine escapes from this difficulty by suggesting that practically all these hyperbolic comets would pass too far from the sun for us to see them; we should only see those the independent velocity of which was practically zero. These last would, however, be only a very small fraction (perhaps one in ten thousand) of the comets entering the sun's domain, so the number of these would have to be immensely large to supply the number of parabolic comets that we see. The latter number is two or three a year, so the former number would need to be reckoned by millions every century.

THE BRITISH SCIENCE EXHIBITION, GLASGOW.

AN exhibition on similar lines to those of the British Science Guild's Exhibition of last summer is now being held by the Corporation of Glasgow, with the assistance of a scientific advisory committee. The Kelvin Hall, in which the exhibition is held, was erected for the purpose of holding a series of industrial exhibitions, and the Corporation has a special department for their organisation. The exhibits are housed in a single building and on one level, so that there is ample space for their display, and power is available for setting machinery in motion and allowing demonstrations of high-temperature operations. The exhibits are, therefore, seen under very favourable conditions, and the response to the invitation to exhibit has been very gratifying. Owing to an unfortunate combination of circumstances, several firms which were represented in London have been unable to appear, and the absence of some of the leading instrument firms is noticeable; but many of the London exhibits reappear, in some cases in an enlarged form, whilst there have been many additions, especially in regard to engineering and shipbuilding.

A very large area is covered, and an inspection of the exhibition convinces a visitor that the objects shown were well worth bringing together. The enormous progress made during the war and since the armistice in the manufacture of products for which we were entirely dependent on importation is evident, as is the ingenuity displayed in the design of new instruments and machines, both for warlike and for peaceful use. The relaxation of restrictions in regard to secrecy has made it possible to show many improvements which had been kept secret for military reasons, so that there is a most interesting series of instruments illustrating recent developments in wire-

less telegraphy and telephony, and a very extensive display of modern improvements in aircraft, as shown by the work of firms in the Clyde area.

Steam turbines and oil engines are well represented, as well as such interesting inventions in marine engineering as variable-speed gearing and hydraulic transmitters. Many systems of high-temperature welding, especially with the electric arc, are shown in operation, and examples of varied uses of this process are shown, including the junction of the vertical framing and the roof principals in a steel-frame building. The coal industry is represented by a full-sized model of a coal seam with electric coal-cutters at work, and there are also exhibits illustrating the utilisation of the iron ores and oil-fuel supplies of this country.

The chemical exhibits are, in the main, the same as those which were shown in London, whilst the metallurgical industries naturally receive special attention. The Health Department of the city shows a large and instructive collection of preparations illustrating the relation between micro-organisms and disease, as well as diagrams relating to the smoke nuisance. Several Government Departments and universities are represented by stands, at some of which demonstrations are carried on. A kinematograph hall is used for showing films of scientific interest in connection with engineering, shipbuilding, and metallurgy, as well as with bacteriology. The educational value of the exhibition is very great, and a most remarkable picture is presented of the capacity of British manufacturers to accomplish good work when advantage of scientific guidance is taken.

The opening ceremony was performed on Monday, November 17, by Sir Charles Parsons, the Lord Provost of Glasgow presiding, and testimony was then given as to the importance of science to industrial progress. The exhibition has the advantage of following closely on a most successful housing exhibition, also held by the Corporation, and visited by enormous numbers of people, so that there is every reason to expect results which will be beneficial to science and to industry alike by bringing the two into closer contact, and in educating the public as to the necessity for a close co-operation between them. The exhibition remains open until December 6.

A NEW ASTRONOMICAL MODEL.

THE illustrious scholar Gerbert (A.D. 940-1003), afterwards Pope under the name of Sylvester II., was apparently the first of the schoolmen who illustrated his theoretical lessons on astronomy by the use of globes, which he constructed with his own hands. About the year A.D. 1700 George Graham invented a machine to show the movements of the earth and planets about the sun, a copy of which was made for Charles Boyle, the Earl of Orrery. Hence the name of an apparatus very useful for illustrating lessons in astronomy, although Sir John Herschel did call orreries "very childish toys." But surely the difficulty in teaching astronomy is to make the young pupil think in three dimensions. What are we going to do when the relativists would have us imagine phenomena in four dimensions?

Some forty years ago the prospectuses of schools generally advertised among the subjects taught "the use of the globes and department." Presumably the orderly arrangement of the solar system was to be reflected in the conduct of the pupils. The "use of the globes" seems to have disappeared from the apparatus of pedagogy, although the teaching of geography and the elementary notions of astronomy are very much facilitated by their employment. But