light intensity. Many workers resort to the sub-stage iris diaphragm for this purpose, with the result that definition and resolution suffer. Where colourless or lightly stained preparations are under examination the advantage of light regulation is considerable, while for dark-ground illumination it is absolutely essential for accurate observation. It is possible that there would be a limited demand for objectives corrected for some small region of the visible spectrum, but whether the advantages to be derived are sufficient to induce any manufacturer in this country to take the matter up I do not know. J. E. BARNARD.

National Institute for Medical Research,
Hampstead, London, N.W.3, December 20.

Prismatic Structure in Optical Glass.

THE specimens of columnar structure illustrated in the accompanying reproductions of photographs (Figs. 1 and 2) were obtained during the manufacture of optical crown glass.

The dimensions of the pot were 24-in. diameter and 24-in. height. After the final stirring, during which the temperature fell to about 1000° C., the pot of glass was withdrawn from the furnace and quenched overall externally with cold water. The pot was then regularly cooled during about eighty hours. Fracturing occurred radially from the centre to the sides and base of the pot. Without further consideration it might be assumed that the columnar fracture commenced at the pot surface, which had been severely chilled, and spread radially towards a central nodule the diameter of which was about 6 in., but such a conclusion is scarcely justified.

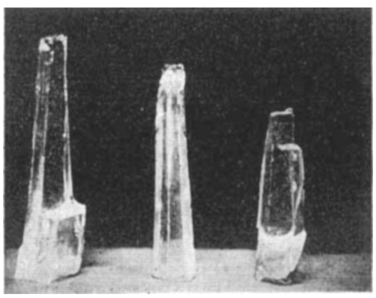

FIG. 1.

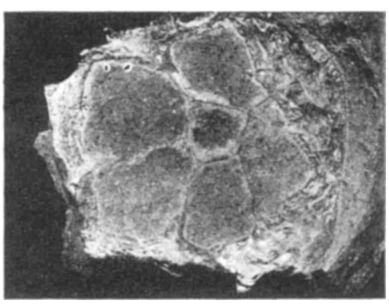

FIG. 2.

It is the central nodule that is of most interest, as it gives a clue to the history of the specimen. The prisms of glass (Fig. 1), which are about 6 in. long, ended abruptly at the nodule surface, which was uniform. To break the nodule was difficult; it behaved like toughened glass. There can be little doubt that its surface-layers were held in compression by the tension of the interior, and, therefore, any surface cracks were held closed, thus preventing fracture. As the prismatic structure ended abruptly at the surface, there being no sign of its continuation within the nodule, it is evident that the surface of the nodule constituting the terminal joints of the prisms was not of later date than the surfaces of the prisms.

At the moment of separation of the nodule its material would tend to move towards its centre. Its surface would move to a place of smaller area, and, being thereby compressed, the formation of normal fractures would be prevented. But the material external to the nodule would withdraw towards the outside. The surface adjacent to the nodule would move to a position of greater area and would crack polygonally. These cracks would instantly spread outwards. That the action started from the centre and not the outside is indicated by the close adhesion of the prisms at their base, as compared with their inner ends. Indeed, it is difficult to trace any passage of the cracks as far as the pot surface.

This sequence of events may throw some light upon the time-relationship of joints and prism surfaces in natural columnar basalt dykes.

To explain the specimen which is reproduced in Fig. 2, about one-sixth full size, is not so easy. In this case the diameter and height of the fireclay pot were each 12 in. It contained a small experimental melt of optical crown glass. At a temperature of about 1300° C. the whole pot of glass was plunged into cold water for about five minutes. It was then cooled regularly during twelve hours. In the glass itself there was no sign of prismatic structure, which was confined to the fireclay base of the pot as illustrated. Most probably the whole action took place during the drastic cooling of the fireclay, the bottom thickness of which was only about 1 in.

The glass itself within a short distance of the surface must have been still quite plastic after five minutes' quenching. Any trace of structure that might exist in the intermediate chilled layer would be lost in the inevitable shattering of this layer that usually occurs. JAMES WEIR FRENCH.

Anniesland, Glasgow.

The Calendar of Scientific Pioneers.

WITH this issue of NATURE the series of short biographical notes on the leading men of science of the past, which it has been my privilege to contribute week by week, comes to an end. It has, however, been considered that it may be of interest to supplement these notes by another series referring to the great pioneers of industry, and the Editor has again entrusted the preparation of this new Calendar to me.

In bringing the Calendar of Scientific Pioneers to a close, I should like to express my thanks to Prof. J. Arthur Thomson, Prof. G. B. Matthews, and others who kindly scrutinised the list of names to be included, and to various correspondents who have supplied me with information. My thanks are especially due to Mr. E. T. Warner, of the Royal Naval College, Dartmouth, who has carefully checked all the notes and has assisted me in other ways.

Great care has been taken to give the correct dates, and where authorities differ, as they often do, inquiries have been made in order to try to trace the source of error. In the case of Joseph Black, for instance, who died on December 6, 1799, but whose death is often stated to have taken place on Novem-