ledge of an equal number of separate subjects to a uniform level of mediocrity, should be in the hands of a succession of form masters, who, knowing their boys well, may exercise a profound influence upon their characters and carry to a high level their studies in a more coherent curriculum.

8. That the conditions for admission to universities should be reconsidered and rendered more uniform as between different universities and less uniform as between different faculties and different honours schools in the same university; and that, in the interest of candidates of mature age and of other candidates approaching the university otherwise than through the normal avenue of the secondary school, university entrance tests should be distinguished from secondary school examinations.

9. The reform of university teaching in certain important respects, notably by a reduction in the number of lectures.

10. That the completion of a three years' university course in engineering should entitle students to no more than the B.A. degree; and that, until candidates have added works experience to academic training, they should not receive technical degrees (such as Bachelor of Engineering or Bachelor of Technical Science) which might then serve as professional qualifications.

11. That any time spent in works between school and college should not be unduly prolonged.

12. That university teachers be encouraged to undertake research on behalf of, and in co-operation with, manufacturing firms; and that additional Government grants be paid to universities and colleges with this end in view.

13. That, by the establishment of such an association of manufacturing engineers as we have advocated and by other means, the volume of research work carried out in connection with the British engineering industry be greatly increased; and that provision be made for this increase in the volume of research by fully utilising and extending the facilities already available in universities and colleges, as well as in the works of private firms, and also by establishing a central research laboratory for investigations that cannot be undertaken elsewhere.

The report was accompanied by a diagram illustrating the scholarship system recommended by the committee. This diagram differs but slightly from one reproduced in NATURE of October 21, 1915 (vol. xcvi., p. 214).

J. C. M. G.

THE OPTICAL INDUSTRY IN FRANCE.

A SERIES of articles by various authors has recently been appearing in the *Revue générale des Sciences* on the methods to be adopted for the development of French trade after the war. Amongst these have appeared two articles (May 30 and June 13) by M. A. Boutaric on the French optical industry and its future.

He points out that before the Napoleonic wars France had been dependent on England for its optical glass, and it was as a result of the British blockade that its manufacture was commenced in France.

At the present time the house of Parra-Mantois manufactures practically all the special optical glasses made by Schott and Co., and the French makers undoubtedly are more successful than their competitors in the manufacture of the glass discs required for very large astronomical mirrors and objectives. In every branch of optical science French physicists have invented instruments and methods for testing their qualities, but the French manufacturers have not done themselves justice by an efficient catalogue propaganda. M. Boutaric, when referring to the firm of Zeiss, mentions especially that it "has surrounded its products with a scientific propaganda." He shows how severe the German competition in microscopes was before the war, although there are two good French makers—Nachet and Stiassnie. The metallurgical microscope of Le Chatelier has been developed by Pellin with considerable success. The polarimeter in its present commercial form was developed by the French makers Soliel and Laurent, and is essentially a French instrument, yet the German houses have almost obtained a monopoly in the sale of the instrument outside France.

The manufacture of binoculars is the most successful of all the French optical industries, several large firms (Balbreck, Baille-Lemaire, Société française d'Optique, Société des Lunetiers, etc.) being employed in their manufacture. As showing the large quantity of optical glass used in these glasses, it is stated that the Société des Lunetiers alone use about 200,000 kilos of glass annually.

Although French makers showed several prism binoculars of the Porro type at the 1867 Exhibition, yet the manufacture of these glasses passed almost entirely to Germany. Now, however, glasses equal to the best German models are being made in France in large numbers for her Army and those of her Allies. The original supremacy of the French photographic lens has passed away, because, in the opinion of M. Boutaric, the French makers did not use the new glasses and modern grinding methods, nor sufficiently avail themselves of skilled technical knowledge. M. J. Richard has developed with great skill and success a stereoscopic camera, the "Verascope," and also a very rapid camera shutter, but the majority of the cameras used in France have been imported. The kinematograph, the invention of a Frenchman, Prof. Marey, has been carried to a high state of perfection by the firms of Lemaire, Pathé, and Gaumont. To a certain extent France is dependent on outside sources for kinematograph film, but, on the other hand, she exports finished printed film to the annual value of 600,000*l*. The lighthouse industry, built on the theoretical work of Fresnel, is a successful one, although it has had to face keen competition from English and German makers.

M. Boutaric points out that although in nearly all optical matters French savants are the pioneers, yet the French optical industry is very small as compared with the German. In an interesting paragraph he endeavours to analyse the reasons for this success. "Here, as in everything else, the Germans have been saved by their deep sense of business. The German industry demonstrates by

a wise publicity the worth of its goods, sometimes excellent, but sometimes also copies of our models and inferior to ours; their catalogues, well edited and illustrated, are published in many languages, and give full details of the instruments they describe, their travellers, men of parts, knowing intimately their instruments . . . and trying to satisfy the wishes of their customers."

M. Boutaric points out that the collaboration between the man of science and the manufacturer is far more close in Germany than in France. In the former the man of science is in intimate touch with the works, and is well paid for his services. The foreman and apprentices are trained in the theoretical side of their subject in classes they are obliged to attend. In the firm of Zeiss half the time spent by the workers in the technical classes is counted as time spent in the works. No steps are neglected to perfect the organisation as a whole; everything is done to make the machine independent of a single individual. In France the success and reputation of a firm have too frequently depended on one individual. That some steps are being taken to strengthen the optical industry in France is shown by the fact that a large factory has been built by La Société française d'Optique, formed in conjunction with the firm of Lacour-Berthiot, for meeting the competition of the best German firms. M. Boutaric urges that if the future of the industry is to be assured, new blood must be introduced, young mechanics trained, and a school of optics founded. This school, for which M. Violle has pleaded, should be divided into at least two sections: optics proper and photography. In it practical classes on glass grinding, etc., should be given in conjunction with theoretical work.

After an appeal for mutual co-operation between the various firms and individuals interested, M. Boutaric urges that the Government should take steps to protect French patents and trade marks against unfair competition. Anyone with experience of the laxity of the French patent specification and patent laws will appreciate the force of this appeal.

ARCTIC OCEANOGRAPHY.

IMPORTANT contributions to Arctic oceanography are contained in the report of Dr. F. Nansen's work in Spitsbergen seas in 1912 ("Spitsbergen Waters." By F. Nansen. Christiania, 1915). Dr. Nansen spent July and August of that year in his yacht, the *Veslemöy*, on the west and north of Spitsbergen. His main object was to push far to the north to get deep-water samples from the polar basin in order to make more accurate determinations of specific gravity than were possible during the voyage of the *Fram*. But this aspect of the expedition was only partially successful on account of the pack ice being unusually far south. However, a great deal of valuable work was done, both in the open seas and in the fjords. Only one or two of many interesting results can be noticed here.

It has been maintained that the melting of glacier ice has a considerable cooling effect on the water strata of Spitsbergen fjords. Dr. Nansen confutes this idea. He took a vertical series of temperatures at the entrance to Ice Fjord in July, when it was clear of ice, and again in August, when ice almost blocked the way. The water at 50 metres and the intermediate cold layer were much warmer in August than in July. Again, in Cross Bay, at both 100 and 200 metres from the face of Lillehook Glacier, the cold intermediate layer was both thinner and warmer than further out in the fjord. The bottom temperatures near the glacier were also higher than further out in the fjord. But as the surface salinity was greater near the glacier than further away it would appear that the glacier ice does not melt rapidly at the upper end of the fjord. The high salinities of the inner end of the fjord may be in part due to the more extensive formation of ice in winter there than further out, which would increase the salinity.

Another important matter raised in this paper is the extension and shape of the north polar basin. In this matter Dr. Nansen has modified his views since the days of his *Fram* expedition. The result of that expedition led to the belief that the water of the north polar basin differed from that of the Norwegian Sea. The work of the *Veslemöy* contradicts this, and shows that the salinities of the two are identical. The deep water of the north polar basin is probably derived from the Norwegian Sea. This discovery does away with the necessity for postulating a high submarine ridge between Greenland and Spitsbergen, yet one at a depth of about 1200–1500 metres is still necessary to account for the difference in temperature of the deep water in the two basins. In any case, if the deep water of the polar basin is derived from the Norwegian Sea and not formed in the basin itself, there is no need to believe in such an extensive polar basin as formerly was considered necessary. The discovery, a few years ago, by Vilkitski, of islands north of Cape Chelyuskin does something to confirm this belief in a less extensive deep basin. It is true that the Stefansson expedition found no new land, and that Peary's Crocker Land has apparently no existence, but these facts do not disprove the possibility of a wide continental shelf, and Nansen goes at considerable length into questions of the drift of the *Fram* and of the ice to substantiate the probability of this being the case. We have followed Nansen in using the form Norwegian Sea, but there seems to be no reason why this should replace the older and generally accepted name, Greenland Sea.

NOTES.

DR. J. O. BACKLUND, M. B. Baillaud, Sir F. W. Dyson, Dr. P. Lowell, Prof. F. Schlesinger, and Prof. H. H. Turner have been elected honorary fellows of the Royal Astronomical Society of Canada.

THE provisions of the "Summer Time" Act will cease to operate at the end of September. In a