great herring fisheries of the North Sea. As an example of the extent of this variation the following figures from Dr. Johnstone's paper may be quoted (p. 31):—

Manx Summer Herrings: Fisheries of 1916 and 1917.—Composition of the Flesh of the Fish: Monthly Means.

	May, 1916	May, 1917	Aug., 1916	Aug., 1917
Condition	Virgin	Virgin	½-Full	Full
Water	75·0	68·5	48·4	43·5
Oil	2·5	5·4	31·5	36·6
Proteid	21·1	19·7	16·5	15·7
Ash	2·3	3·3	2·3	2·9
Total	100·9	96·9	98·7	98·7
Energy values (calories)	1100	1330	3608	3943

The most striking variation is in the fat, which rises from about 2½ per cent. at the beginning of the season to more than 36 per cent. in August, when the fish are not far from the spawning phase. After spawning has taken place a great reduction in the percentage of fat occurs, spent fish obtained in September, 1914, showing a reduction to about 9 per cent.

In addition to many analyses of fresh herrings the paper contains similar figures for cured fish of various kinds, pickled herrings, kippers, bloaters, and red herrings. A few samples of sprats were also analysed.

It must be clearly stated that the figures given apply only to the "flesh" of the herrings, including the skin (*minus* scales). The author makes the curious statement that "from the point of view of dietetics it is only the flesh that matters," But surely the roes and milts of "full" herrings are about the best and most nutritious parts of the fish, and the value of the fish as food will not have been adequately dealt with until we have figures in which these are included in their due proportions.

Amongst other aspects of the question discussed by Dr. Johnstone are the effects of cooking and the chemical effects of salting herrings, as well as a number of physiological matters, such as the locus of the fat, the nature of the fat, and the seasonal metabolic phases. The paper is one of great interest, and it is to be hoped that the subject will be followed up.

E. J. A.

THE METALLIFEROUS ORES OF THE IRON AND STEEL INDUSTRY.[1]

IN June, 1917, the Department of Scientific and Industrial Research published a report dealing with the metalliferous raw materials of the iron and steel industry of the United Kingdom, the Allies, and the neutrals. Its object was to collect and summarise in a form which can easily be consulted as much information as possible from the principal literature pertaining to the sources of iron ores, and other metalliferous ores accessory to the metallurgy of iron and steel; to describe their composition and character, giving analyses where possible, together with indications as to the geographical position and the accessibility of the minerals. The report did not claim to give the results of independent researches, but merely to provide for the inquirer information for which he would otherwise have to search through a great variety of publications and monographs issued by technical and scientific societies and geological surveys. How useful this publication has been to the iron and steel industry is shown by the fact that the stock of copies was almost exhausted three months after publication.

It soon became apparent that the value and the scientific completeness of the report would be greatly enhanced if an account were given of the supplies of the ores in enemy countries also, and the issue of a new edition has provided the opportunity of adding this information. Some later statistics are also given, and various errors and omissions have been corrected. The second edition accordingly consists of three parts: (1) Notes on the iron ores of the United Kingdom and British dominions; (2) notes on iron-ore deposits in foreign countries; (3) notes on the ores of the principal metals, other than iron, used in the iron and steel industries. The last-named part describes the occurrence and composition of the ores of chromium, cobalt, manganese, molybdenum, nickel, titanium, tungsten, vanadium, and zirconium, and the principal uses of the special steels or ferro-alloys made from them.

The German steel industry is based upon, and was rendered possible only by, a discovery of two Englishmen, Sidney Gilchrist Thomas and Percy Carlyle Gilchrist. This discovery, which in their hands became also an invention, brought within the scope of economic development the vast supplies of phosphoric ores (Minette) of Lorraine and Luxemburg, and of the Salzgitter and Ilsede districts, which were thus made available for the manufacture of commercial steel on a great scale. As the industry grew its requirements were supplemented by imports from the Briey orefield in France, which is the main part of the same ore body which extends to annexed Lorraine and Luxemburg. These ores were all treated by the "basic" process. For the raw materials of acid steel and steel of special quality, Germany had to depend on imports derived mainly from Sweden, Spain, and Russia.

In May, 1915, a secret memorial, drawn up by six great industrial and agricultural associations in Germany, was presented to the Chancellor. A translation of this was published by the Comité des Forges de France in August, 1915, and from it the following quotation is taken: "Concerning France . . . besides the iron-ore region of Briey, it would also be necessary to acquire the coal region in the Departments of Nord and the Pas de Calais; the security of the German Empire imperatively requires the possession of all the Minette mines, including the fortresses of

[1] "Report on the Sources and Production of Iron and other Metalliferous Ores used in the Iron and Steel Industry." (H.M. Stationery Office.) Price 2s. net.

Longwy and Verdun, which are necessary for their defence; the possession of the vast quantities of coal, and specially of the bituminous coal, which abounds in the North of France is no less important than the acquisition of the iron-ore mines."

Not long after the outbreak of war the German steel industry was beset by serious difficulties owing to the fact that the imports of manganese ore, one of the essential accessories, were cut off, and it was predicted by more than one authority in this country that the shortage of this ore would cause a crisis in, and the eventual stoppage of, the German steel industry. Confident predictions were made as to the date beyond which, for this reason, the war could not be continued by Germany. These predictions entirely failed to take into account the very considerable deposits of manganiferous iron ore contained in the German Empire. In 1911 $2\frac{3}{4}$ million tons of such ore containing less than 12 per cent. of manganese, and 288,000 tons containing between 12 and 30 per cent., were mined. These constituted, therefore, important sources of production when the pinch came. There is good reason for thinking that about ten months' stocks of high-grade ore were present in the country at the outbreak of war, and these were greatly augmented by the confiscation of supplies found in Belgium and North-east France. The mines producing high-grade ore were stimulated to the utmost activity; means are said to have been devised for recovering the slag produced at the ferro-manganese blast furnaces, and also from basic-steel slag. By the desulphurisation of blast-furnace coke certain economies in manganese are considered to have been effected. There is to-day no evidence that Germany is in serious difficulties with regard to steel production owing to the cutting off of external sources of manganese ore.

In pre-war times Russia produced more manganese ore than any other country. In 1913 the output was 1,175,000 tons; most of this was exported and went through the Dardanelles. How heavily this industry was hit by the war is shown by the fact that in 1915 the production is stated to have been only 9750 tons. India, much the largest source of supply within the Empire, was a close competitor of Russia, and, apart from a drop of output in 1915, production has been well maintained. Much of the Russian export went to the United States of America, and the iron and steel industry in that country has been placed in considerable difficulties in consequence. For a time the deficiency was made good by imports of the high-grade ores mined in Brazil. With the acute shortage of ship tonnage which now exists, however, a most urgent appeal has been made to the iron and steel manufacturers in the United States to utilise home sources of ferruginous manganese and manganiferous iron ores.

The Department of Scientific and Industrial Research is to be warmly congratulated on the publication of a report which gives in a well-arranged and lucid form just the information it set out to collect and systematise. It is to be hoped that it will become one of its standing publications, and that from time to time new editions with the most up-to-date information will be issued.

H. C. H. CARPENTER.

PROF. BERTRAM HOPKINSON, F.R.S.

THE death, in a flying accident on August 26, of Col. Bertram Hopkinson, C.M.G., F.R.S., professor of mechanism and applied mechanics in the University of Cambridge, is a grievous loss to science and the nation. Born in 1874, the eldest son of Dr. John Hopkinson, F.R.S., he inherited not a little of his father's scientific insight and genius for bringing science to bear on practical matters. This hereditary aptitude was fostered by close contact with his father's mind in early life; he was his father's frequent companion in work as well as in play. Bertram lived at home, attending St. Paul's School until he went to Trinity, where he took the Mathematical Tripos. An unlucky illness compelled him to take an ægrotat degree in the First Part; but he showed his quality in the Second Part, when he was placed in the First Division of the First Class. He then read for the Bar, devilling in a well-known counsel's chambers, and had been "called" when the tragic death of his father, along with a younger brother and two sisters, while climbing near Arolla in 1898, changed the current of his life. He boldly took up his father's business as a consulting electrical engineer, in association with his uncle, Mr. Charles Hopkinson, and Mr. Talbot, a former assistant. With them he carried out various tramway undertakings during the next four or five years.

In 1903 Hopkinson was elected professor of mechanism and applied mechanics at Cambridge, in succession to the present writer. To many the appointment of so young and comparatively unknown a man must have seemed surprising, but those who knew Hopkinson were confident that the electors had made a wise choice. It was entirely justified by the result. In Hopkinson's hands the Cambridge School of Engineering prospered exceedingly, going from strength to strength in numbers, in academic and professional repute, and, above all, in activity as a centre of research. Hopkinson was himself devoted to research, and could inspire his pupils with a like ardour. In some instances a pupil's name appears as joint author of the published paper; in others the pupil was himself left to complete and publish the work.

No one, I think, can read Hopkinson's papers without being reminded of those of his father. There is something of the same freshness of outlook, the same penetration and grasp, the same personal detachment, the same directness in attack, the same unconventionality in method, the same avoidance of side issues and concentration on the essence of the problem. It is impossible to do more here than give the briefest indication of