

same lesson in an article in the March *Fortnightly Review* on "The War and British Industry." Mr. Money comments that "we have been content to leave the development of many old industries and the establishment of many new industries to foreign hands," owing to our "normal" disregard of science.

Let us not deceive ourselves into believing that "science" or "chemistry" affects a limited number of subsidiary industries. There is no industry in the world, from building construction to coke-making, from artillery construction to the making of explosives, from dyeing to leather tanning . . . which has not been in recent years turned inside out by science and invention. We have been content in too many matters to let the world go by us.

Even in the matter of preparation for war Mr. Money, quoting from the address delivered before the Mathematical Association on January 9 by Sir George Greenhill (see *NATURE*, January 21, p. 573), gives a melancholy contrast between the conditions under which German and British artillery officers have been trained in their science at the Military Technical Academy of Berlin and at Woolwich.

The neglect of science in industry and in public affairs, which is characteristic of this country, culminated in the prospectus of British Dyes (Limited), on the board of which science is entirely unrepresented. The opinions of Sir Henry Roscoe and Sir William Ramsay on the scheme, expressed in the columns of the *Times*, have already been given in *NATURE* (March 11, p. 41), whilst Prof. Armstrong, in the *Morning Post* (March 13), considers that "our fate as makers of dyes is sealed." The failure of the scheme to attract sufficient capital from investors to justify the directors of the company in proceeding to allotment was referred to last week (p. 94). A meeting of representatives of the textile and dyeing trades was held at Manchester on March 24 to consider the position, and a resolution was adopted in favour of proceeding with the company if certain modifications were made in the business part of the programme. There is no doubt as to the national necessity for such work as the Government scheme is intended to promote, but to expect that a company without a single industrial chemist upon its board of directors will be able to compete with the highly organised coal-tar colour industry of Germany is to show complete want of understanding of the scientific problems which must be faced if permanent success is to be assured.

How little Germany fears competition in this field in the future from English manufacturers, even though aided by the resources of the State, can be gathered from an admirable article by Prof. O. N. Witt in the *Chemiker Zeitung* for February 13. In this article are given the real reasons why Germany has been able to outstrip all competition and to secure practically a monopoly, and why the foundations of the industry are so solidly based that the prospects of the British scheme having

anything like a permanent success seem altogether illusory. It must be remembered that the German chemical industry (with one or two exceptions) has never received any protection whatever from tariffs. How futile such protection as that afforded by patent laws can be in comparison with the results obtained by the organisation of science in the service of industry is emphasised by a report to Congress, which is reprinted in the *Chemical News* of March 5. In the United States a 30 per cent. duty on some coal-tar dyes for more than thirty years has not produced a real coal-tar dye industry. Germany, on the other hand, has succeeded because she has placed science on a sound business footing, of which the fair remuneration of the scientific worker has been a striking feature. The part played by the German banks, often with men of considerable scientific attainments on their boards, in developing German industry is emphasised by Mr. W. P. Dreaper in an article on Industrial Research in the *Financier* of March 12.

Germany, in short, has succeeded in the past because she deserved to succeed. Not only has she organised scientific effort on the manufacturing side, but she has organised equally effectively her commercial relations with foreign countries. This side of the question, which has played no small part in attaining the final result, is dealt with in the current *Bulletin* of the Société d'Encouragement (vol. cxxii., p. 33), by M. Lindet, who gives as an example an account of the methods adopted by Germany in Rumania.

The Germans present to the Rumanians objects specially manufactured to satisfy the local requirements, sold at a price which is lower than ours because they are manufactured more cheaply and because they bear lower charges for transport. The German and Austrian merchants and manufacturers interested in Rumanian business have formed a syndicate with its representative at Bucharest. They obtain in this way facilities for transport in common which we do not possess. They have at Bucharest banks which allow long-date credits, and they have representatives and travellers who without intermission pursue their clients. They advertise widely, and have inaugurated at Bucharest a museum of their goods.

It is an organisation of this kind, highly developed on both the manufacturing and commercial sides that we have to prepare to face in the future, after the war has ended and Germany is left free to resume her usual activities.

DR. A. S. LEA, F.R.S.

THE ranks of those who took part in founding the Cambridge Physiology School grows thin. But a few months ago we recorded the death of Dr. Gaskell. We have now to record the death, on March 23, of Dr. Arthur Sheridan Lea at sixty-one years of age.

Lea entered Trinity College, Cambridge, in 1872, he became Foundation Scholar of the College, and in 1875 he took a First Class in the

Natural Sciences Tripos. His bias was to the chemical side of physiological problems, and, in consequence, on Foster's advice, he began research with Kühne at Heidelberg. Kühne combined in a rather unusual manner the study of physiological chemistry with that of histology, and Lea's work with him developed, as it chanced, mainly on histological lines. Kühne and Lea were the first to observe satisfactorily with the microscope the changes taking place in a living gland—the pancreas—with intact circulation, and to note the special vascular supply of the Islets of Langerhans. One of the figures illustrating their paper is given to this day in most text-books of histology and physiology.

Lea, after his return to Cambridge, specialised in physiological chemistry though he gave instruction to pupils in the whole range of physiology, and to him was due the development in the Cambridge laboratory of advanced teaching in this subject. In the successive editions of Foster's "Text-book of Physiology," Lea wrote the part dealing with physiological chemistry, and in the fifth edition (1892) this part, revised and enlarged, appeared as a separate volume entitled "The Chemical Basis of the Animal Body." His research work was chiefly on the chemical changes in food during digestion, and on the action of rennet and fibrin ferments.

Lea's first post was that of demonstrator of physiology for Dr. Foster. In 1881 he became director of medical studies and assistant lecturer at Gonville and Caius College. In 1885 he was elected fellow of the college, and soon after became bursar. He was appointed university lecturer in 1884. His career in the university and in science was cut short by the development of a spinal disease—signs of which had long been present—making walking at first difficult and later impossible. None of his friends can forget the astonishing fortitude with which Lea met this shattering of his chief interests. He had always led an active outdoor life; he had cruised about the coasts in a yacht whenever opportunity offered; he was Captain in the Cambridge Volunteers, had taken special courses of instruction at Aldershot, and was a good rifle shot. Since he could no longer carry on these pursuits, nor continue his research in the laboratory, he decided after a time to break entirely with the old life. He left Cambridge and settled at Sidcup in Kent.

Rarely then or later did Lea rail at fate. He put on a cheerful countenance, and made the best of what was left him. He kept in touch with his old friends, revised the proofs of their books as occasion offered, and occasionally made small pieces of apparatus for them with the mechanically-driven lathe which served to keep up the cunning of his hands. Before leaving Cambridge he had married, and had one son. In a letter written shortly before he died, Lea expressed pleasure that his son had volunteered for the Army and was serving in the trenches. In this as in other matters he kept his private anxieties to himself.

J. N. L.

PROF. A. A. W. HUBRECHT.

THE death of Prof. Hubrecht at his residence in Utrecht on March 21, in his sixty-fifth year, removes another link between the zoology of the present day and the zoology of what may be called the great epoch of Huxley and Balfour. His earlier work dates back to 1874, and was of an anatomical character; it was only in the later part of his career that he devoted himself to embryology, and advocated views which led to lively controversy, and were provocative of good work, both on his own part and on the part of those who opposed him.

Speaking broadly, Hubrecht's name will survive as associated with thoroughly sound work and with the elucidation of a large number of most important new facts, even if the deductions which he drew from them no longer find favour with zoologists. So far, indeed, as theories are concerned, Hubrecht's mind continued to reflect the mental attitude of the zoological world in which his youth was passed; it was, indeed, a time of the "faith that moves mountains." Ardent naturalists were applying the Darwinian doctrine of evolution to every part of the animal kingdom; with the enthusiasm of pioneers they were tackling the most obscure and difficult problems of the natural relationships of animals; the deep abysses which separate different phyla of the animal kingdom were traversed by their soaring imagination, for were not the powers of variation limitless? and did not the principle of "change of function" enunciated by Dohrn authorise one to homologise any organ of any animal with any organ of any other animal to which it bore the slightest resemblance? So Hubrecht, to whom we owe the first thoroughly satisfactory account of the anatomy of the Nemertine worms, was convinced that Vertebrata were descended from a Nemertine worm, and that the Nemertine proboscis represented the Vertebrate notochord.

In his later years Hubrecht devoted himself principally to mammalian embryology, and made a series of most valuable observations on the relations between placenta and young in the eutherian mammals. He was led by these observations to a theory of the origin of mammalia, which has not been borne out by the work of other embryologists or by palæontologists. He supposed that the higher mammalia were directly descended from amphibia, and that the monotremata, the anatomy and embryology of which betrays in an unmistakable manner their reptilian affinities, were secondarily modified forms. Here, again, Hubrecht's firm faith carried him over all difficulties. These remarks are not intended as any disparagement of the methods of comparative anatomy or embryology, but are merely designed to emphasise the fact that in these, as in all other sciences, sound inductions are only possible on the basis of an immense accumulation of facts. Modern zoologists addicted to Mendelism would do well to remember that "of making many factors there is no end, and formulæ are a weariness to the flesh."