

faults and disturbances observed in the coal-field near Swansea ; and important suggestions are made regarding the subdivisions recognised in the Upper Coal-measures of North Staffordshire and their extent westwards across the Cheshire plain, and south-westwards into the Birmingham area.

The discovery of Rhætic, Liassic and Cretaceous fossils in rocks, preserved within an old volcanic vent in the Isle of Arran, is of especial interest as indicating the former extent of these Secondary strata. The Cretaceous rocks of the south of England have received attention, more especially as regards the Lower Greensand of parts of Sussex and the Isle of Wight, the subdivisions in which are compared.

Students of Tertiary strata will find interesting references to the successive overlaps of the London Clay and Bagshot beds on the western side of the Hampshire Basin. The volcanic series of Arran and of Skye come into notice also in the portions of the Summary which deal with Tertiary times.

In various parts of the country observations have been made on Pleistocene deposits, the most important being the full account of the glacial phenomena in the Macclesfield district.

The petrographical work includes a particular account of the marbles of Assynt, which have resulted from contact metamorphism produced by igneous rocks on surrounding dolomites. The palæontological work includes important catalogues of type-specimens of Pleistocene, Pliocene and Devonian fossils preserved in the Museum of Practical Geology ; and there are special notes on Carboniferous plants from Berwickshire and on the fossil fishes from the Silurian rocks of the Lesmahagow district. In this brief abstract of some of the results of a year's work on the Geological Survey we have refrained from mentioning individuals, but the work of each has been carefully indicated in the memoir. It is satisfactory, moreover, to note the assistance that has been rendered by Mr. R. Kidston, Dr. R. H. Traquair and Dr. G. J. Hinde in the identification of particular groups of organic remains.

SIR J. HENRY GILBERT, LL.D., F.R.S.

THE names of Lawes and Gilbert have been "household words" in the mouths of English students of agriculture during the past half century. Sir John Lawes departed from amongst us last year, at the age of eighty-five. His colleague, Sir J. H. Gilbert, has also now finished his labours ; he died at Harpenden on December 23, at the age of eighty-four.

Joseph Henry Gilbert was the second son of the Rev. Joseph Gilbert, a nonconformist minister at Hull. He was born at Hull in 1817. His mother, Ann Gilbert, was a daughter of the Rev. Isaac Taylor, of Ongar, and thus belonged to a well-known literary family ; she was herself the authoress of numerous poems for children. While at school young Gilbert met with a serious accident, and practically lost the sight of one eye. His great pluck enabled him to accomplish his life's work with little apparent hindrance, but the disadvantage of weak sight was very real, and much of his subsequent literary work had to be dictated. He went from school to Glasgow University and studied chemistry under Dr. Thomas Thomson. From thence he went to University College, London, and commenced working in the laboratory of Dr. Antony Todd Thomson. Here apparently he first made the acquaintance of Mr. John Lawes, who was a frequent visitor to the laboratory. He next proceeded to Giessen, where Liebig was then professor of chemistry, and took the degree of Ph.D. in 1840. Dr. Gilbert then acted for a short time as assistant to Dr. Antony Todd Thomson, and afterwards left to take up

calico printing and dyeing in the neighbourhood of Manchester.

It was in 1843 that Dr. Gilbert's services were engaged by Mr. Lawes for the agricultural investigations then commencing at Rothamsted. We have already noted in these pages (*NATURE*, September 13, 1900, p. 467) the foundation of the Rothamsted agricultural investigations by Mr. J. B. Lawes, their rapid development at his sole expense, and their subsequent liberal endowment by him ; we have now to mention the important part taken in the work by his collaborator, Dr. Gilbert.

The two investigators were, to a considerable extent, well matched, each supplying some deficiency in the other. Sir John Lawes brought to the work a very original mind, an enterprising spirit, and a thorough knowledge of the facts of practical agriculture ; and this practical knowledge served to inform his judgment and enabled him to test the truth of many of the scientific theories which came before him. Sir J. H. Gilbert, on whom the details of the work devolved, brought to his task a more exact knowledge of science and of methods of investigation, an acquaintance with foreign chemists and foreign literature, and, above all, methodical habits of work, which proved of immense value in planning and carrying on through fifty-eight years the field experiments which became such a striking feature in the Rothamsted investigations. He was an indefatigable worker, and loved to accumulate an immense mass of results, frequently of a similar kind ; and a reader of Rothamsted papers is sometimes so overwhelmed by numerical statements that, to use a familiar simile, "he finds it difficult to see the wood for the trees."

The Rothamsted investigators soon found themselves engaged in controversy with German men of science, and Sir J. H. Gilbert at once proved himself to be a warm and untiring antagonist. The first subject of dispute was the so-called "mineral theory" of Baron Liebig. Liebig held that the atmosphere supplied in sufficient quantity both the carbon and nitrogen required by crops, and that the proper function of manure was to supply the ash constituents of the crop it was intended to grow. On the other hand, the Rothamsted field experiments with wheat and barley proved unmistakably that ammonium salts and other nitrogenous manures had a far greater effect in increasing the produce than any application of phosphates, potassium salts, or other ash constituents. So long as the question was confined to the cereal crops, Rothamsted was triumphant ; but when leguminous crops became the subject of experiment the answer was doubtful, and in many cases the manures supplying ash constituents proved the most effective. It has taken many years, and tasked many investigators, to elucidate this part of the subject. We now know that the roots of leguminous plants become the habitation of certain bacteria, and that by means of these the plants are fed in a special manner with nitrogen from the atmosphere.

The subject of the assimilation of nitrogen by plants led to one of the most highly prized of the Rothamsted investigations, in which plants were grown from seed in soils destitute of nitrogen, but supplied with ash constituents, and in an atmosphere free from ammonia, the object being to ascertain in a rigorous manner if an assimilation of the free nitrogen of the air took place. The work lasted three years, and was made the subject of a communication to the Royal Society by Lawes, Gilbert and Pugh. The chief honour of the work belongs, in this case, to the last-named author. Pugh was an American studying in Germany, and when the controversy on nitrogen assimilation between Boussingault and Ville was at its height he offered to come to Rothamsted and help to solve the question. His offer was accepted. The whole of the experimental work was conducted by Pugh with an ingenuity and accuracy which were justly admired.

In later years another controversy arose as to the part taken by carbohydrates in the formation of animal fat. Lawes and Gilbert had satisfied themselves by their experiments on pigs that fat was undoubtedly produced from carbohydrates. The German physiologists doubted this, and at one time Rothamsted and its followers stood almost alone in their opinion. Now the tide has turned; the experimental evidence for the formation of fat from carbohydrates has become overwhelming, and it is even believed by some that no fat is formed from the albuminoids of the food, but that all the fat stored up by the animal is derived either from carbohydrates or from the fat originally present in the food. The question is one of very great practical importance, the German school formerly insisting that nitrogenous foods must be selected for economic fattening, while the English teaching gave the farmer a much wider choice.

The scope, development and results of the Rothamsted experiments, and the numerous honours jointly conferred on Lawes and Gilbert, have been so recently noticed when speaking of the work accomplished by Sir John Lawes that a repetition of them here seems hardly necessary. Sir J. H. Gilbert was at his death the oldest surviving Fellow of the Chemical Society, having been elected in 1841. He became president of the Society in 1882-3. He was elected a Fellow of the Royal Society in 1860, he served on the Council, and was a regular attendant at the meetings of the Society. With Sir John Lawes he received a Royal medal in 1867. He became a Fellow of the Linnean Society in 1875. He was president of the Chemical Section of the British Association in 1880. He was elected professor of rural economy at Oxford in 1884 and held the office till 1890; the subjects chosen for his lectures were the results of the Rothamsted investigations. He received honorary degrees from several Universities, and was a member of various foreign academies and societies. On the occasion of the jubilee of the Rothamsted experiments in 1893 he was presented with a piece of plate, and afterwards received the honour of knighthood.

Sir J. H. Gilbert carefully maintained through life a connection with foreign workers. His holidays were frequently occupied by visits to scientific meetings and institutions in Germany and France. He made three visits to the United States and Canada, and delivered several lectures there. He enjoyed a very vigorous constitution, and continued actively at work up to the last year of his life. Unfortunately, his disposition forbade his co-operation with any younger colleague, and the institution at Rothamsted is now left without any apparent successor to its historic labours.

The funeral of Sir J. H. Gilbert took place at Harpenden on December 27; deputations from various scientific bodies attended. The Lawes Agricultural Trust was represented by Sir Chas. B. Lawes, Sir John Evans, F.R.S., Mr. W. Carruthers, F.R.S., Prof. H. E. Armstrong, F.R.S., Dr. J. A. Voelcker and Mr. H. Rix; the Board of Agriculture by Mr. T. H. Elliot; the Royal Society by Mr. A. B. Kempe, F.R.S.; the Chemical Society by Prof. W. A. Tilden, F.R.S., and Prof. W. R. Dunstan, F.R.S.; the Linnean Society by Prof. G. B. Howes, F.R.S.; the Meteorological Society by Mr. F. C. Bayard; the Society of Chemical Industry by Mr. A. Smetham.

NOTES.

PROF. W. A. HERDMAN, F.R.S., sailed for Ceylon on December 26, 1901, to undertake for the Government an investigation of the pearl oyster fisheries of the Gulf of Manaar. He is accompanied by a first-rate assistant, and in Ceylon the inspector of the fisheries and his staff will cooperate and provide

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boats and divers. A suitable steamer for dredging and trawling will be placed at Prof. Herdman's disposal by the Government of Ceylon; and the necessary gear and apparatus for collecting and observational work, and for biological experiments, have been sent out in advance. We understand that Prof. Herdman has arranged to take samples of the plankton throughout the voyage to Ceylon, and to launch current-floats at particular parts of the course.

A PUBLIC meeting was held on Friday last at Cromarty, the birthplace of Hugh Miller, for the purpose of discussing what steps should be taken to celebrate next year the centenary of his birth. Sir Archibald Geikie wrote stating that he heartily sympathised with the object of the meeting and wished all success to the movement which it would initiate. After discussion, a committee was appointed to further a scheme for the erection in Cromarty of a Miller Institute, comprising a library and museum.

It is proposed to commemorate, on June 15 next, the two hundredth anniversary of the death of G. E. Rumphius, the celebrated naturalist who spent his life in investigation at Amboina, one of the Molucca Islands. The authorities of the Colonial Museum at Haarlem have made arrangements for the preparation of a Rumphius medal, copies of which can be obtained in silver or bronze. Subscribers for the commemorative medals who send their names to the president or secretary of the Haarlem Museum before March 1 will receive a copy of a memorial volume to be published in honour of Rumphius.

THE death is announced of Mr. H. G. Madan, senior Fellow of Queen's College, Oxford, and for twenty years head of the science department at Eton College.

WE learn from *Science* that Mr. Alexander Agassiz, accompanied by Mr. W. McM. Woodworth, has undertaken an expedition to the Maldiv Islands in the Indian Ocean, in order to study the coral formations. A steamboat for this purpose has been chartered at Ceylon.

DR. SVEN HEDIN, the Swedish explorer, who recently arrived at Ladakh from Central Asia, has sent a telegram to King Oscar announcing that he has made an extremely important journey through all Tibet, disguised as a pilgrim, with two followers. On approaching Lhasa they were recognised and captured, but were well treated by order of the Dalai Lama. A second attempt was opposed by 500 Tibetan soldiers. Dr. Hedin's collections were lost, with almost the whole caravan, but his notes were saved.

THE Board of Agriculture has appointed a committee to investigate the two diseases of sheep known as "braxy" and "louping-ill." The members of the committee are Prof. Hamilton, of Aberdeen University, Mr. J. McI. McCall, assistant veterinary officer to the Board, Mr. E. J. Wheler, agent to the Duke of Northumberland, with Mr. R. B. Greig, lecturer on agriculture, &c., to the Durham College of Science at Newcastle-on-Tyne, as secretary and demonstrator. The mortality from the diseases in question is a cause of very great loss to the sheep-farming industry in Scotland, probably amounting to between a quarter and half a million of money annually, or even more.

DR. HANS REUSCH, Director of the Geological Survey of Norway, directs attention, in a recent issue of *Naturen*, to the fact that the rock at Moskogaissa mine, 750 m. above the sea, in Lyngen, Arctic Norway, is covered with a frozen moraine from 18 to 20 metres thick. On a previous occasion Dr.