of the present century. In a vacuum an atom of gas will go in a perfectly straight line until it hits the wall. If a source of atoms is in line with two fine slits, they will all hit the opposite wall in a narrow line. The atoms were obtained by boiling silver in a small furnace. Those which get through the slits strike the wall and stick there. Even after four hours nothing is visible on the glass, but there exist chemical methods of development whereby the invisible trace of silver attracts more silver from the developer and becomes visible. Now suppose that in their path the atoms encounter a non-uniform magnetic field. In the gaseous form the atoms of silver have a magnetic moment, and so they will experience a deflecting force. If the atoms were pointing arbitrarily in all directions, the character of the field shows that the fine line of the image should be spread out into a lens-shaped figure. What is in fact observed is quite different; the lens is there but it is hollow. The atoms are all pointing straight towards or straight away from the magnetic field.

This result would have been astonishing twenty years ago, but as a matter of fact the experiment was tried with a fairly strong expectation that it would turn out as it did. The quantum theory has illuminated many branches of physics, but none more than spectroscopy, and in particular it describes with complete success the influence of magnetic fields on spectra. According to this theory the atom is a very definite structure, and the definiteness extends not merely to size and shape, but also to its direction in space. The theory goes further and indicates that an atom ought to have a definite magnetic moment, which is called the "Bohr magneton," or in some cases a simple multiple or fraction of this. In silver the deflexion corresponds exactly to one magneton. Several other substances have since been measured, and most of the effects explain themselves on the same principles. Modern physical theory has to face a great many difficulties, and one of the severest is to explain how it is that half the atoms can point away from the field. Each atom evaporates in the furnace right outside the magnetic field and pointing in an arbitrary direction. As it enters the field, if it is to point away, it must gain energy, and there is nowhere from which the energy can come. This would have been a severe difficulty a few years ago, but dynamical toleration has grown recently, and it is becoming recognised as a probability that energy is only conserved on the average and not exactly.

The older calculations of para- and dia-magnetism depend essentially on assuming that the atoms can point in any direction, and they go wrong if this ceases to be true. We know it to be untrue in Gerlach's experiments, and the question arises as to whether it is true in other cases. This is the subject of some very remarkable recent experiments by Glaser. The susceptibility of gases is very small and hard to measure unless the gases are compressed. Glaser has perfected the arrangements of one method of experiment to such a high degree that he could measure the effect for very low pressures. The principle of his experiment can be described by analogy with the question of buoyancy. If a body is weighed in air and in water, the difference of the weights measures the weight of the displaced water. If a different liquid is used, a similar weighing will give its density in terms of water. Glaser takes a light rod of some substance, actually a slightly paramagnetic glass, and suspends it in a non-uniform field. In a vacuum the field twists the rod round by a definite amount. If it is surrounded by a gas which is also paramagnetic, it will not experience so great a twist, because it will, so to speak, be partly floated by the gas. Similarly, if the gas is diamagnetic, it will be more twisted than in a vacuum. The effect is very small and by no means easy to obtain, but by measuring the amount of twist a value can be found for the susceptibility. The diamagnetism stays constant down to a fairly low pressure, and then changes over to a larger value—actually three times as great. The work is very recent, and the theory is still more or less unknown. Superficially the phenomenon is rather like that of Gerlach, but a little deeper consideration shows that no very close analogy can be drawn between the two cases.

It is natural to suppose that the collisions between the molecules are somehow responsible for reducing the susceptibility at high pressures; but there is great difficulty in seeing how it comes about, for it must be remembered that even at high pressures a molecule is in collision for only a small fraction of the time it spends between collisions. Moreover, though it might be possible to explain in this way a change of susceptibility, there seems no chance of getting a factor so great as three to one. No doubt there will soon be more experiments to help us. For example, much could be deduced if we knew how the curves varied for different temperatures; and it would also be most interesting to know how other gases behave, in particular the strongly paramagnetic oxygen. Unlike the work of Stern and Gerlach, Glaser's experiments do not seem to fit in with the general scheme of things, and so we may perhaps hope that they will lead to some surprising new developments in physical theory.

Obituary.

MR. W. E. CUTLER.

WE regret to have to record the death, on August 30, of Mr. W. E. Cutler, the field palæontologist who was working in Tanganyika Territory for the British Museum on the Dinosaur-bearing beds near Lindi. Those who lead sheltered lives in Europe are sometimes apt to overlook the arduous character of the work on expeditions in tropical or arctic lands, where either endemic disease or extremes of temperature endanger human life, and we may venture to refer to an article in these columns on April 18, p. 573, of this year, in which it was pointed out that the region in which these wonderful relics of an ancient fauna exist is pest-ridden to an unusual degree.

Mr. Cutler was a Londoner by birth, but emigrated to Canada with his parents at an early age. As a young man he became attracted by fossil collecting, and for some time it is believed worked in that wonderful natural museum which exists in Wyoming; later on he made some fine collections from the Cretaceous beds of Alberta and elsewhere. He served with the Canadian forces during the War, and then returned to

his adopted land to make collections for the University of Manitoba from the Ordovician beds of western Canada. He was about fifty years of age at the time of his death. He lived solely for his work, and had in the intervals of his collecting learnt a great deal about the anatomy of the creatures he sought for.

Brought up in a hard school, Cutler prided himself on going anywhere with a minimum of kit and the simplest of food, and it came as somewhat of a shock to him when he was equipped for the East African Expedition to find that his impedimenta contained tents, camp beds, mosquito nets and the like. He was impatient of such things, and inclined to look upon them as unnecessary luxuries which would need attention and therefore hinder his work. Maybe if he had more fully recognised the danger of the insidious Anopheles, he would have been spared to carry on his work.

Cutler's labours have been productive of fruitful results, and it is said that more than 600 bones have been collected, some of which have arrived, others being ready for despatch, and it will give some idea of the magnitude of the task when we learn that they will fill at least 120 cases. All these have been personally excavated and prepared for despatch by Mr. Cutler with the help of a few untutored natives—no mean task! They have, of course, not yet been worked out systematically, but it has been determined that bones of both armoured and probably carnivorous dinosaurs as well as herbivorous species are among the specimens. Such an enthusiastic worker will be hard to replace, but the work must go on, for what has been achieved only demonstrates the magnitude of the task and its importance. May this sad loss in the front line stimulate the public to support the expedition and enable it to continue with a staff much strengthened and supplied with every safeguard which the science of tropical hygiene can provide. C. W. H.

WE regret to announce the following deaths:

Dr. Hans Bunte, emeritus professor of the Technical Highschool in Karlsruhe, well known for his work in connexion with the German gas industry, on August 17, aged seventy-seven years.

Prof. Ernst Erdmann, director since 1922 of the Institute for Applied Chemistry at Halle, on August 19, at Rättvik, Sweden, aged sixty-eight years.

Prof. Georg Klien, director for more than forty years of the East Prussian Agricultural Institute, in Königsberg, on June 23, aged seventy-six years.

Prof. Otto Lummer, director of the Physical Institute of the University of Breslau, whose investigations dealt with interference phenomena and with the estimation of the sun's temperature, on July 7, aged sixty-five years.

Dr. Rudolf Martin, professor of anthropology in the University of Munich and an honorary fellow of the Royal Anthropological Institute, on July 11, aged sixty-one years.

Dr. Mansfield Merriman, professor of civil engineering at Lehigh University from 1878 until 1907, who was a pioneer in the development of technical education in the United States and also was distinguished for his work on mechanics and strength of materials, on June 6, aged seventy-seven years.

Current Topics and Events.

SIR DANIEL HALL, in the course of his presidential address to the Conference of Delegates of Corresponding Societies at the Southampton Meeting of the British Association, appealed for their help in studying the antiquities of the land and of farming. He pointed out that the opportunities in local societies for the study of natural history and archæology are rapidly becoming smaller, and even in such fields as botany and zoology the development of science is rapidly decreasing the sphere of activity available to the non-professional man. He therefore suggested that such individuals can profitably turn their attention towards recovering, before it is too late, the detailed agricultural history of the country. The Corresponding Societies can give invaluable help in discovering the original settlement of the land, the manors, the system of cultivation adopted before enclosure, and the date and method of enclosure. The need for this work has been made all the more urgent by the Law of Property (Amendment) Act of 1924, which practically does away with the manor as a legal entity, and by the recent sales and breaking up of many of the great estates. Title deeds and estate records in the hands of manor stewards, family solicitors and the like, may therefore become distributed and increasingly difficult to trace. In this connexion a request from a Society to be allowed to examine these records will carry far more weight than one from a private person. In addition, much useful information could be obtained in some districts by a close study of vestigial physical traces of the old farming, and by the examination of field names referring, for example, to crops that have now disappeared. Again, the preservation for local museums of old farming implements would be a valuable activity of a local society. Apart from the intrinsic interest of this work, it would find a useful and highly desirable application in country schools. A series of parish maps showing the change in agricultural customs, distribution of land, vegetation, and so on, would provide excellent material for showing how, in response to physical and changing economic environments, the present farming system has slowly grown up from its simple beginning far back in the past.

AMONG the interesting exhibits shown in Section B (Chemistry) during the session devoted to the ignition of gases at the recent meeting of the British Association at Southampton were the photographs taken at Sheffield by Prof. Wheeler and Mr. O. Ellis on behalf of the Safety in Mines Research Board. By arranging a camera to open at regular short intervals, they have been able to photograph the successive positions occupied by flames produced by the firing of explosive mixtures of methane and air in closed spherical and cylindrical vessels. When the gas was fired by a spark in the centre of a glass sphere, the successive