curves of variable stars of the Algol type. S. Antliæ has usually been regarded as belonging to this class, and is specially interesting on account of its short period of 7h. 46·8m., and because it is said to retain its full brightness for *less* than half its period, this last peculiarity being opposed to the probability of the variation being due to a dark eclipsing body. On constructing a curve from a series of 177 measures, the conclusion is that S. Antliæ is not a star of the Algol type, but its light is *constantly* changing, and that it should rather be classed among the variables of the δ Cephei or η Aquilæ type. An interesting feature of the light curve for this star is that the increase of light is slower than the diminution. As this ratio (0·62) in most other short-period variables is from 0·20 to 0·33, there seems reason for dividing the two classes.

The star β Lyræ is commonly regarded as a variable of short period of the same class as the above. "Observations of its spectrum, however, show that two or more bodies, revolving round each other, are present. The light curve found by Argelander may be closely represented by assuming that the primary minimum is caused by the eclipse of the brighter body by the fainter, and the secondary minimum by a similar eclipse of the fainter body by the brighter. This star should therefore be taken from the class of ordinary short-period variables and included among the stars of the Algol type." Lockyer finds, however, that there is evidence of greater complication in the system; and the theory of eclipses alone fails to account satisfactorily for the velocities in the line of sight which are obtained from the measurements of photographs of the spectrum of the star.

AWARD AND PRESENTATION OF THE RUMFORD PREMIUM.

IN conformity with the terms of the gift of Benjamin, Count Rumford, granting a certain fund to the American Academy of Arts and Sciences, the Academy is empowered to make, at any annual meeting, an award of a gold and silver medal, being together of the intrinsic value of three hundred dollars, as a premium to the author of any important discovery or useful improvement in light or in heat, which shall have been made and published by printing, or in any way made known to the public in any part of the continent of America, or any of the American islands; preference being always given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind.

At the annual meeting of 1885, the Academy awarded the Rumford premium to Thomas Alva Edison for his investigations in electric lighting, and the presentation of the medals took place at the meeting of May 13, 1896.

Vice-President Goodale, in presenting the medals, made the following remarks:—

"It would be highly presumptuous for one whose knowledge of physics is of the most elementary character to occupy the time of the Academy by any statement of his own in conveying these medals. Happily such a course is unnecessary. The Chairman of the Rumford Committee has placed at our command a brief statement which makes clear the ground of the award.

"'The Rumford Committee voted, June 22, 1893, that it is desirable to award the Rumford medal to Thomas Alva Edison in recognition of his investigations in the field of electric lighting, and they confirmed this vote on October 9, 1893, in the following words: "Voted for the second time to recommend to the Academy that the Rumford medal be awarded to Thomas Alva Edison for his investigations in electric lighting."

"The Committee reached the conclusion expressed by these votes after long deliberation and after careful sifting of all the evidence which was at their disposal in regard to Mr. Edison's claim for priority in the construction of the incandescent lamp, the conception of the central lighting station together with the multitude of devices, such as the three-wire circuit, the disposition of the electric current feeders, and the necessary methods for maintaining the electric potential constant.

"The Committee felt that they could not decide upon Mr. Edison's claim for priority in any particular invention in this new industry. Indeed, Courts of Law, after prolonged litigation, have found it difficult to decide how far Mr. Edison was in advance of contemporary workers. The task given to the Rumford Committee to decide who is most worthy of the Rumford medal, especially in the field of the application of electricity for the production of light and heat, is not an easy one. The number of investigators is now so large that it is no longer possible, in general, for one man to claim to be the first to apply electricity to a new field. The successful application is the result of many minds working on the same problem. Although the Committee did not feel justified in expressing the opinion that Mr. Edison invented the incandescent carbon filament lamp, or that he was the first to arrange such lamp in multiple on the circuit, thus producing what is popularly termed a subdivision of the electric light, or that the Edison dynamo had greater merits than the machine of Gramme and Siemens and others; still, they are convinced that Mr. Edison gave a great impulse to the new industry, and that he was the first to successfully instal a central electric lighting plant with the multitude of practical devices which are necessary. They believe that this impulse was due to his indefatigable application, to his remarkable instinct in whatever relates to the practical application of electric circuits, and to his inventive genius. They, therefore, have unanimously recommended to the Academy to bestow the Rumford medals upon him, feeling that the work of Mr. Edison would especially appeal to the great founder of the medals—Count Rumford—if he were living.

"The Academy has accepted the report of the Rumford Committee, and has voted to confer the gold and the silver medal upon Mr. Edison. The recipient finds it impossible to be present at this meeting of the Academy, and has requested Prof. Trowbridge to act as his proxy and to receive the medals for him.

"In the name of the Academy, I beg you, Prof. Trowbridge, to accept the charge of conveying these medals to Mr. Edison's hands. It would be most ungracious for us who are assembled in this room, which is flooded by this steady and brilliant electric light, to withhold our personal thanks for what Mr. Edison's investigations and practical activities have done for us all. And, hence, I may venture to say that our thanks and all good wishes are to be conveyed with the Rumford medals."

Prof. Trowbridge replied as follows:—

"Mr. President, and gentlemen of the Academy, I accept the medals for Mr. Edison; and at his request I wish to express his deep sense of the great honour the Academy has conferred upon him. His work in the field of electric lighting has been the subject of prolonged litigation, and at times he has had doubts, in reading the opinions of learned experts, whether his work has been original, or whether he had really contributed anything to the world's progress. The recognition of his labours by the American Academy of Arts and Sciences, regarded by Count Rumford in his gifts as the coequal of the Royal Society of London, is, therefore, especially grateful to him. Acting as his proxy, I thank the members of the Academy for the distinction which they have, by their votes, conferred upon him."

CAUSES OF DEATH IN COLLIERY EXPLOSIONS.

A REPORT, by Dr. John Haldane, on the causes of death in colliery explosions, with special reference to the Tylorstown, Brancepeth, and Micklefield explosions, was published in a Blue-book a few days ago. The report contains a vast amount of valuable information on the composition of after-damp, the action on men and lights of the gases present in, or mixed with, after-damp, the action of after-damp, heat and violence, along the track of an explosion, the distribution of after-damp and other gases in a mine after an explosion, the distribution of smoke in underground fires, the positions at which bodies are found after an explosion, and the means of saving life in colliery explosions and fires. To understand the dangers to life after a colliery explosion, and the possibilities of escaping these dangers, it is necessary to have a clear idea of the action, both on men and lamps, of the gases which are likely to be present in the air of the mine. These gases, so far as is known, are carbon dioxide, carbon monoxide, nitrogen, fire-damp, and sulphurous acid. Oxygen may be deficient or absent. Dr. Haldane discusses the effects of these gases *seriatim*, and the information he brings together, as well as his own careful observations, should be valued by colliery managers, while it will certainly interest chemists and physiologists.

In the case of the Tylorstown explosion, which, Dr. Haldane says, was evidently propagated through the three pits by coal-dust, fifty-seven men were killed. Of this number fifty-two, or 91 per cent. of the whole, were killed by after-damp, the remainder being killed instantaneously by violence. In nearly every case of death from after-damp, the parts of the skin or mucous membrane through which the colour of the blood could be observed, had a red or pink colour, instead of being leaden-blue or pale, as is the case in death from any other cause. This reddening, as seen in the face, hands, &c., often gave the bodies an extraordinary appearance of life. There seemed to be only one cause which could account for the carmine red colour of the blood, namely, the presence of carbon monoxide. To make certain, Dr. Haldane examined the blood from two of the bodies on the spot, by means of a spectroscope, and he found that not only was carbon monoxide present, but that the hæmoglobin was nearly saturated with it. A quantitative determination proved that in both bodies the hæmoglobin was 79 per cent. saturated. This result is of special interest, as it shows, for the first time, the percentage saturation of the blood at the moment of death from carbon monoxide poisoning.

The recognition of carbon monoxide in the air of mines is, as Dr. Haldane points out, a matter of much practical importance, and many lives have been lost through ignorance of the fact that the lamps, to which miners trust for the recognition of other gases, give no *direct* indication of carbon monoxide. A simple test, which there is every reason to think might be successfully introduced, is suggested: it is to observe the symptoms of a mouse or other equally small warm-blooded animal, when exposed to the doubtful atmosphere. In small animals the rate at which the blood becomes saturated with carbon monoxide is far more rapid than in man; hence a small animal, such as a mouse, shows the effects of the gas far more rapidly than a man. Practically speaking, the condition of a mouse which has been for a very short time in a poisonous percentage of carbon monoxide, indicates what will be the condition of a man carrying it after a much more prolonged stay in the same atmosphere. With a man at rest it takes about twenty times as long for the man as for the mouse to be distinctly affected by the gas. Dr. Haldane's experiments show distinctly how valuable the indications given by a mouse, or other small animal, would be to men exposed to danger from after-damp. It is therefore suggested that a few white mice might easily be kept for this purpose in the engine-room at the top of the downcast shaft, and be taken down in small cages by the rescue party.

Another point to which attention may briefly be directed is the colour-test described by Dr. Haldane for use in post-mortem examinations as a criterion for carbon monoxide poisoning. A drop of the blood of the subject is diluted with about 100 times its volume of water, and is compared with a solution of normal blood, and with a similar solution saturated with coal-gas. According to the percentage saturation of the sample of blood under examination, the tint of the first solution will approach to that of the normal blood, or of the blood saturated with coal-gas (that is, with carbon monoxide), and a rough estimate may be made of the percentage saturations. The test is said to be more delicate than that with the spectroscope.

INDIVIDUALITY IN THE MINERAL KINGDOM.[1]

IT might be expected of a new Professor that in his inaugural address he should avail himself of the possibly unique opportunity of an audience, and should give some account of his science and of the manner in which he proposes to teach it. In that case he would doubtless claim for his own subject that it is the most fascinating and the most important of all branches of human knowledge; he would doubtless, also, proceed to prove, to his own satisfaction, that it should be a necessary feature in any system of education.

It is well known that every specialist has an exaggerated view of the importance of his own subject; a view which is no doubt largely due to his ignorance of all others. I am deeply conscious of sharing this failing, and therefore do not propose to give any laboured account of mineralogical science; instead of stating exactly what in my opinion should be taught in this university, I will rather state presently what I think should not be taught; instead of attempting to *prove* that mineralogy possesses a true educational value, I will assume that this may be accepted without further argument from the very fact that it is recognised by the University.

[1] An inaugural lecture delivered at the University Museum, Oxford, by Henry A. Miers, F.R.S., Waynflete Professor of Mineralogy.

Perhaps none of the sciences is more of a special subject than mineralogy, in this sense—that it is familiar to few besides those who have made it their particular study; for this reason I may be pardoned if I assume total ignorance on the part of my hearers, and begin by removing a confusion which may possibly exist in the minds of many.

Mineralogy is not crystallography. Mineralogy is the study of minerals in all their relations, and from every point of view; it is a branch of natural history; the study of one class of natural objects, namely, all the inorganic parts of the earth, which we are accustomed to class together as the Mineral Kingdom. Crystallography, on the other hand, is a distinct science, and is the study of matter in the crystalline state, not being by any means confined to minerals; it is, like physics, or chemistry, or geology, one of the sciences whose aid is invoked in the study of minerals.

Since, however, the finest and most interesting examples of crystals have been found in the mineral kingdom, this study has been, by common consent, annexed by the mineralogist, and instruction in crystallography has been left entirely to him. The result has been in some ways disastrous; crystallography is in reality as essential to the student of chemistry or of physics as it is to the mineralogist, and yet remains in general a sealed book to them. They have been reluctant to go to the mineralogist for information, and consequently they have failed to make the acquaintance of crystallography. In this connection I may quote the forcible words of Mr. Lazarus Fletcher: "It seems obvious," he says in an address delivered a few years ago, "that in a satisfactory system of education every chemist should be taught how to measure and describe the crystalline characters of the products which it is his fate to call into existence. A knowledge of the elements of crystallography, including the mechanics of crystal-measurement, ought to be made a *sine quâ non* for a degree in chemistry at every university."

To this I would add that crystallography is not merely a matter of theoretical interest to the chemist, but is absolutely essential for the practical determination and description of any compound. It will scarcely be believed that there is only one teaching institution in the British Isles where crystallography forms a necessary part of the chemical student's course, namely the Central Technical College in London, where I was invited some years ago by Prof. Armstrong to found a class in the subject, and where excellent work is now being done by Mr. Pope. That it is found necessary to insist upon this study in a technical college of all places in the world is surely a remarkable confession that this, like every pure science, is far from being devoid of practical application.

If we turn now to mineralogy proper, the practical value of this science is obvious without any explanation.

In mining and metallurgy we have subjects of vast commercial importance in which a knowledge of scientific mineralogy is most desirable.

In particular it would be a great advantage to this country if all who are sent out to hold official positions in new or distant lands, could receive some previous instruction in the study of minerals which are of economic importance. We should not then hear of ruby companies formed through sheer ignorance to exploit what subsequently proved to be red garnets, neither would valuable ore deposits be overlooked for years simply because no one among the early settlers was familiar with the aspect of the common metallic minerals. I have no doubt that a course of lectures upon the detection of gold, silver, and precious stones, would prove attractive even in Oxford in these days of mining adventure and speculation, and I would not deny that they might be of some service to those whose future work lies in India or the colonies, or to those who travel in little-known regions. But I feel very strongly that our business here is with general education, and that the later the date in any educational system to which extreme specialisation or technical training can be postponed the better it will be for the student.

For this reason mining and metallurgy, which belong to technical education, have in my opinion no more place in such a university as this than any other branch of industrial or applied science. We do not seek here in the matter of practical engineering to compete with the great engineering workshops, or in the matter of clinical instruction with the great London hospitals; and in the same way, we should no more expect or desire to compete here with mining or metallurgical schools than to teach the jeweller's art.

A university can best serve the cause of technical education