not taught in the school and yet gave life and unity to the class-room work and a common social bond to teachers and to taught.

When Wilson went to Clifton, his experience of teaching science and his enthusiasm for it were invaluable. He did not himself take a big part in the actual class work, but he collected a band of teachers and gave them the right opportunities. Of these they made splendid use. Their teaching owed a great deal of its inspiration to the way in which their headmaster encouraged them to do original work. Scientific knowledge, the Royal Society itself, would have been poorer had it not been for the opportunities that Clifton gave its masters and its boys during the period of his headmastership.

Of Wilson's work at Clifton as a whole there is much to be said. Percival had laid solid and noble foundations; Wilson gave the school just the touch of inspiration, intellectual and spiritual, that carried it through the difficult second chapter of its life. Men of ability still remember him as a teacher who made Plato a living power in their lives. To all, his versatility and enthusiasm meant much. He cared little for the solemn pomposities of life; he cared a great deal for the mortal things that touch the human mind. When sorrow or shame, success or failure, visited the community—and these are from time to time inevitable visitors in any great school—he never failed in the power to show how he longed to sympathise and restore. Now and then, no doubt, he bewildered his subordinates by improvised devices, or by a hurried change of opinion. But bewilderment is good for all men, especially for schoolmasters. He took a simple and disarming pleasure in his own feats, but was ever the first to proclaim the merits of others. Thanks to this generous quality of appreciation, masters of very different and some of very great talents found happy work at Clifton. In his northern parish these same qualities shone out for the encouragement of many clergymen and for the spiritual benefit of those laymen who, living among the dark satanic mills, are tempted to cease from mental strife.

At Worcester, Wilson mastered a new craft: that of deciphering and editing the archives in the Cathedral Library. But he did not confine himself to the Library; he spoke his mind in sermons and in lectures on the urgent social problems that affected the city's life, and he imparted his own new-won love of the ancient Cathedral to countless groups of visitors, who followed him spellbound on his courteous and enthusiastic pilgrimages from end to end of the building.

It is not fanciful to suppose that in his school-days Wilson heard the two voices that speak to men of liberty. At King William's College the ocean bellowed from his rocky shore; at Sedbergh the mountain floods brought him the same message: and all through life he had this music in his ears and rejoiced in it. To these voices others deep and vibrant were added as life brought him happiness and sorrow and quickened his imagination. So it is for a very rich and venturesome nature that all who knew him are grateful and that all the trumpets surely sounded on the other side. W. W. V.

PROF. A. A. MICHELSON, FOR.MEM.R.S.

IT is just fifty years since Michelson made his first attempt to measure the velocity of the earth through the ether. Shortly before his death he was still at work on the same problem. The memorable result was in 1887 when, in conjunction with Morley, he performed the famous experiment that ultimately led to the theory of relativity and changed our whole conception of the physical world. There was a combination of grandeur and delicacy in the apparatus which strikes the imagination—the massive pier floating in mercury and moving almost imperceptibly in slow revolution, the delicate interferometer capable of detecting a lag of one ten-thousand-billionth of a second in the arrival of the light wave; and, as a climax for the theorist, the subtle escape of Nature from the trap that Michelson had set for her.

I am not sure that Michelson himself was ever really convinced that this epoch-making work was not a 'failure'; for he was disinclined to the new theories. But he must have felt the thrill of success when in more recent times his interferometer, now magnified to colossal dimensions, gave the first measurement of the angular diameter of a star. His last work reverted to one of his earliest problems, the determination of the velocity of light; I think it is not yet known whether it has realised his most cherished ambition, to determine this constant to within one kilometre per second. He stands out as a man who could bring big ideas to fruition.

A. S. EDDINGTON.

IN 1899 I chanced to read in the *Journal de Physique* for that year two articles which provided no small part of my interest in life for several years, and the reading of which perhaps determined my career. They contained Pellin and Broca's description of the constant deviation prism, and Michelson's of his echelon diffraction grating. Michelson's first complete description is in the *Astrophysical Journal* for June 1898.

The resolving power of a diffraction grating is proportional to the product of the total number of lines by the order of spectrum observed. Consideration of how to increase resolving power by increase of the order of spectrum led Michelson to the idea of replacing the closely ruled reflecting lines of the ruled grating (with its spectra of the first, second, and other small orders) by the reflecting surfaces presented by the steps of a number of glass plates of equal thickness laid on each other *en echelon*, and yielding a spectrum of, say, the 20,000th order. He dismissed the idea of a reflection echelon at once as impracticable, saying: "The difficulty, even supposing the optical work to be practically perfect, would be the joining of the separate plates in such a way as to have always the same distance between them". But by using the same arrangement for transmission instead of reflection, he avoided these difficulties (though with some sacrifice of resolving power), and the paper describes the use of a transmission instrument to investigate the Zeeman effect.

The Michelson echelon came very opportunely for the study of this (the Zeeman) effect announced by Zeeman in 1897, and was very much used during the next ten years for that and for measurements of fine structure by many observers (Galitzin, Koch, Janiki, Nagaoka, Merton, McLennan, and Zeeman himself). Latterly, the quartz Lummer-Gehrcke plate has to some extent supplanted the echelon, chiefly on account of the fact that the lines of greatest interest lie in the ultra-violet, which is beyond the range of the transmission instrument. Together with the Fabry-Perot interferometer, these instruments have contributed in no small degree to the development of modern physics.

Quite recently, Michelson's original idea of using the grating as a *reflection* instrument has been successfully realised. This is more powerful than the transmission form, and can be used not only for fine structure work in the ultra-violet and Schumann regions, but also for substandard wave-length measurements in these regions, to an accuracy very much greater than that hitherto available. If the study of hyperfine structure, which is now just developing, fulfils the expectation of contributing to our knowledge of nuclear physics, it would seem that it is to Michelson's reflection echelon that we shall have to look for the greater share of the work.

F. T.

WE regret to announce the following deaths:

Dr. Alwin Berger, an authority on succulent plants and cacti, who contributed a monograph on the Crassulaceæ to Engler-Prantl's "Natürliche Pflanzenfamilien", on April 20, aged fifty-nine years.

Prof. J. H. Comstock, emeritus professor of entomology in Cornell University, and an honorary fellow of the Entomological Society of London, on Mar. 20, aged eighty-two years.

Commander Sir Trevor Dawson, Bart., R.N., a past president of the Junior Institution of Engineers and an authority on armaments, on May 19, aged sixty-five years.

Prof. W. D. Halliburton, F.R.S., emeritus professor of physiology at King's College, London, and president of Section I (Physiology) of the British Association at the Belfast meeting in 1902, on May 21, aged seventy years.

Dr. Rudolf Marloth, who was president of the South African Association for the Advancement of Science in 1914 and author of works on the flora of South Africa.

Dr. Frederick Muir, known for his entomological work, especially in the Hawaiian Islands, formerly president of the Hawaiian Entomological Society and vice-president of the Entomological Society of London, on May 13, aged fifty-nine years.

Prof. Louis H. Pammel, professor of botany in the University of Iowa, who was a vice-president (Section G) of the American Association in 1919, on Mar. 23, aged sixty-eight years.

News and Views.

ON May 20, Lord Rutherford, as chairman of the Advisory Council of the Department of Scientific and Industrial Research, delivered an able and informative speech in the House of Lords on the problem and prospects of obtaining liquid fuel from coal. We import, he said, liquid fuel of various kinds to the value of £40,000,000 annually, and failure of this supply would have disastrous consequences to national life. So far as can be foreseen, coal is the only possible source of oil in Great Britain. Two methods are known for obtaining oil from coal, carbonisation at low or high temperatures, and hydrogenation. Lord Rutherford discussed the technical problems associated with low-temperature carbonisation and the steps taken by the Fuel Research Board to encourage the development of new retorting systems and to modify and improve low temperature tars, so as to enable them to replace natural products. Hydrogenation of tars offers promise of giving good yields of serviceable oils for various purposes, and large-scale tests are to be made. Much greater yields of oil per ton of coal can be obtained by direct hydrogenation of the coal, which has been shown to be technically possible. The development of carbonisation and hydrogenation offer great advantages, but the main problems are economic, for natural oils are available to-day in abundance and at very low prices. Progress in carbonisation depends on how far the nation is prepared to pay for a purer atmosphere by using cokes instead of coal. The hydrogenation process is limited by the degree of willingness of the nation to pay for independence in this matter of liquid fuels. Lord Rutherford ended by saying that a full scientific understanding of this problem is more essential to Great Britain than to any other country.

LORD PARMOOR, as a Government spokesman, spoke appreciatively of the importance of having in the House men like Lord Rutherford, who are able to deal authoritatively with scientific matters and expound them clearly and adequately to laymen. In contrast, on the same day, the House of Commons debated the representation of the universities in Parliament. Arguments in favour of ensuring representation of science and scholarship in the House of Commons were resisted in favour of the counting of heads. Unfortunately, the case of the universities has been weakened by their own action in selecting members according to their political complexion rather than for their intellectual stature. The debate in the House of Lords provides a good argument for the presence of scientific members in the legislature.

ON May 24, Prof. Einstein, after having had the degree of D.Sc. conferred upon him by the University of Oxford, delivered at Rhodes House his third and last lecture on the latest developments of the theory of relativity. The general theory of relativity, in its original form, was defective, inasmuch as the electromagnetic field was not expressed by means of the metric of the space-time continuum as was gravitation. A physical basis for such a unified structure was lacking, and one could only be guided by considerations of mathematical simplicity and logical form. Prof. Einstein's new development depends on a modified form of the Riemann geometry, which admitted distant parallelism (integrability of the law of displacement).