$$\exp\left\{-4\pi\int_{r_0}^{r_1}(1/\lambda^*)dr\right\}$$
$$=\exp\left\{\frac{-8\pi e\sqrt{2M(Z-1)}}{h}\,(r_1{}^{1/2}-r_0{}^{1/2})\right\}$$
$$=\exp\left\{-3\cdot33\sqrt{Z-1}\,(7\cdot4Z^{1/4}-0\cdot4\sqrt{A^{1/3}+1})\right\},$$

which is about 10^{-27} for B_5^{11}. This, subject to considerable error, for example, from the uncertainty of r_1, expresses the probability that the proton will penetrate the barrier in one attempt. Multiplying by the number of oscillations before dissociation, we find the probability of penetration before dissociation to be 10^{-21} in this case. This result may well be in error by several powers of 10, but it appears that if the model is at all relevant, the chance of penetration is insignificant for all nuclei beyond the deuteron. The same calculation for the latter, neglecting the inner screening and so writing 1 in place of $\sqrt{Z-1}$, gives a penetration probability of 10^{-9} per vibration, so that penetration may occur in about 10^{-8} sec.

Specific forces of the meson have been disregarded. There is an obvious chance that it will suffer nuclear capture or destruction before the two nuclei can interact, the probability of which is reduced by the fact that the meson is in excited states throughout the period significant for this process. If, on the other hand, the mesonic forces lead to some closer union of proton and meson than we have considered (differing from a neutron), it might well react with any nucleus.

The energy available from proton adhesion is small (1·96 and 0·51 MeV. respectively) for the 'saturated' nuclei C_6^{12} and O_8^{16}. For nearly all other nuclei it is 5 MeV. or more. The next most common nucleus in the gelatine is N_7^{14}, yielding 7·3 MeV., which would account for the observations if the product, O_8^{15}, was formed with an excitation of about 3·5 MeV. Boron was also present in these emulsions, and could yield more than enough energy by proton adhesion, but in this case the most likely reactions liberate α-particles.

This process can in any case be rejected statistically For a total of 380 mesons observed to stop in the emulsion, four secondary mesons have been observed, with at least 500 μ of secondary track in the 50-μ thickness of the emulsion, and mutually consistent in energy yield. Geometrical probability indicates that about thirty times as many events should have occurred, in which the secondary meson passed out of the emulsion earlier: it could then either go undetected or be indistinguishable from a proton. On the other hand, one should not fail to detect a projected length of 50 μ of the end of a meson track. Hence the four observed secondary mesons are representative of about 120 $\pm$ 60 (the limits expressing probable error) whereas the 380 mesons observed to stop should represent not more than about 900 actually stopping. (For randomly directed straight tracks ending at random depths in an infinite layer of thickness H, the statistical proportion of all tracks which end in the layer which have horizontally projected ranges within the layer exceeding R is $(\sqrt{R^2/H^2+1}-R/H)$. For $R/H=1$, this is 0·414. For $R/H>1$, it is well approximated by $H/2R$, but for $R/H \gg 1$, track curvature will reduce the proportion below this estimate.)

Thus it appears probable that the production of a 4 MeV. secondary meson occurs for 13 $\pm$ 7 per cent of the mesons stopping in the emulsion. Presumably only about half the mesons are negative, and only about half of these can form mesonic hydrogen atoms (since H comprises 40 atomic per cent of the whole emulsion): if we suppose the interaction with a second proton is weak, so that the mesonic hydrogen is most likely, and about equally likely, to be attracted to carbon, nitrogen or oxygen (1 in 8 of which nuclei, in the gelatine, is N^{14}), we have an expectation of about 3 per cent if *every* encounter of a mesonic hydrogen atom with an N^{14} nucleus leads to capture of the proton, and on every occasion there is 'internal conversion' of the liberated energy, producing a secondary meson of 4 MeV. Unconsidered factors are mostly unfavourable, so that even on the small number of observations it is statistically improbable that they represent this process.

A further consideration is that the simple theory leads us to expect a larger number of easily observable 2 MeV.—and possibly of ½ MeV.—secondary mesons deriving their energy from proton adhesion to C_6^{12} and O_8^{16}: though it is a simple and plausible addition to the theory to suppose that these reactions are relatively 'forbidden'.

It should be added that such processes may be of importance in other circumstances; if it is correct to suppose that mesons can survive for, say, 10^{-8} sec. in hydrogen-like orbits about protons, then there is a finite chance that a meson can induce a nuclear build-up reaction, causing the attachment of a proton to a deuteron. However, with two or more cosmic ray mesons in the field, the whole of our observational knowledge about mesons requires re-examination.

I am indebted for a number of discussions to Dr. H. Fröhlich and Messrs. Lattes, Occhialini and Powell.

Note added in proof. Later observations enable the 'corrected observed' proportion of mesons producing secondaries to be refined from 13 $\pm$ 7 per cent to 12·8 $\pm$ 2·5 per cent (117 $\pm$ 20 in 917 $\pm$ 70), thus increasing the confidence with which the hypothetical alternative process can be rejected.

OBITUARIES

Prof. T. David Jones, C.B.E.

It is with much regret that we record the tragic death of Prof. Thomas David Jones in a motor accident which occurred outside Amesbury on August 30.

T. David Jones was born of a mining family at Aberyskir, Breconshire, in 1900. He was educated at the Technical College, Swansea, and the University College, Cardiff. After the First World War, during which he served with the 17th Lancers, he resumed his studies at the University of Birmingham. He graduated, and passed the Colliery Managers' Examination in 1922; obtained his M.Sc. in 1923 and the Ph.D. a year later. He was then appointed to the mining research staff directed by the late Prof. J. S. Haldane. In this capacity, he carried out extensive investigations into mining conditions, spontaneous combustion, geothermic gradients and mine lighting.

In 1936, Prof. Jones was appointed to the chair of mining at the University College, Cardiff, and in 1939 he became director of research to the Monmouthshire and South Wales Coal Owners' Association, in which position he was responsible for intensive investigations carried out on the suppression of dust in coal mines. He was invited in 1946 to visit and advise the colliery engineers of Belgium and Holland on various mining problems, and earlier this year had carried out an extensive tour at the request of the Commonwealth Governments of Australia and New Zealand. In April of this year he was appointed to the chair of mining at his old University at Birmingham.

Prof. Jones was a member of many learned societies and institutions, most of which he served on their councils; he was actively interested in all schemes connected with mining education and training, and for many years he had been actively connected with the Order of St. John. He was made a Commander of the British Empire in January 1947; a Commander of the Crown, Belgium, in June 1947, and a Commander of the Order of St. John of Jerusalem in July 1947.

He had high academic qualifications, a broad outlook on life, and an intense interest in his fellow beings. His boyish enthusiasm, together with his great energy, made him an outstanding personality, endeared him to his colleagues, and fired all who came in contact with him with his own enthusiasm.

J. HOWARD GRIFFITHS

WE regret to announce the following deaths:

Mr. John Dower, author of the report on National Parks in England and Wales (1945), prepared for the Ministry of Town and Country Planning, on October 3.

Dr. Stephen Miall, for many years editor of *Chemistry and Industry*, on October 12, aged seventy-five.

NEWS and VIEWS

Education in H.M. Forces

Now that the Royal Navy, the Army and the Royal Air Force are beginning to assume a peace-time footing, education in those Services is being revised. The Services are anxious to continue effective liaison with civilian education authorities in organising and developing educational facilities among serving men and women. An Army Education Advisory Board and a Royal Air Force Education Advisory Committee, both representative of a range of civilian educational interests, have already been formed. All this will affect the Central Advisory Council for Adult Education in H.M. Forces which, under the able secretaryship of Dr. Basil Yeaxlee, and with the help of its regional committees, has worked hard throughout the War and since (in an advisory capacity) in providing the necessary liaison between Service and civilian education authorities and in choosing and supplying lecturers and other educators (in an executive role).

The Council and the three Services have therefore agreed in principle to the following proposals, subject to further consideration of details: (1) The universities should be invited to consider their extra-mural departments taking over the work hitherto carried out by the regional committees of the Council. (2) Advisory functions of the Central Advisory Council should now be discharged by the inclusion of some of its members on the new Army Education Advisory Board and the Royal Air Force Education Advisory Committee. The Admiralty hopes to obtain advice from former members of the Council on an *ad hoc* basis. Meanwhile, until the end of 1948, the Council should continue to function as such.

So far as the Council's executive functions are concerned, it is suggested that these should in due course be assumed by an inter-Services Executive Committee whose members will represent the Services, the Ministry of Education and other civilian educational interests. If the new proposals are eventually put into effect, their success will depend upon the goodwill of the Services and civilian educationists and others concerned. If Service education is to be accepted as an integral part of national education, then it is up to both Service and civilian personnel to work together. In this respect, responsibility will devolve on the universities and other civilian education institutes and authorities to see that whatever facilities, advice and other assistance they can give to all three Services must be given whenever required; on the other hand, the Services must recognize that if their educational work is to attain a high grade and be recognized by the soldier, sailor and airman as a real and effective part of the nation's educational scheme, then the Service educational authorities must collaborate as much as possible with their civilian colleagues and counterparts.

British Dyestuffs: Mr. J. Baddiley

MR. J. BADDILEY, for many years research director of Imperial Chemical Industries, Ltd. (Dyestuffs Division), retired on September 30. He was intimately associated with research in the dyestuffs industry throughout the whole of the period popularly known as the renaissance of British dyestuffs. A pupil of Prof. Green at the University of Leeds, Baddiley was appointed as research chemist in the company of Levinstein, Ltd., at Blackley in 1909, and provided the first example of departure from Mr. Ivan Levinstein's policy of employing only German chemists. At an early date he exhibited a flair for inspiring and leading other research workers, and during his first years of service to industrial chemistry he guided an ever-increasing team of workers who were charged with the task of putting British dyestuffs on the map. During this period he discovered a range of dyes designed to produce level (or even) shades on viscose rayon. When I.C.I. was formed, he was made a delegate director responsible for research in the group of dyestuffs manufacturers in the parent company. Dyestuffs research was concentrated at Blackley and, during Baddiley's tenure of office, grew tremendously, embracing also the fields of rubber chemicals, auxiliary chemicals, organic polymers and synthetic drugs. Dyestuffs, his first love, remained his favourite, however, and perhaps his greatest single achievement was the discovery, in collaboration with the late Mr. A. Shepherdson, of a range of dyestuffs for the colouring of acetate rayon. Baddiley's high reputation in the dyestuffs and dyeing industries was recognized when he was awarded the Perkin Medal by the Society of Dyers and Colourists in 1939.