Fig. 1. Extracted fibre: dependence of tension (shown as percentage of maximum) on concentration of adenosinetriphosphate. Curve A: 70 per cent shortened at 20° C. Curve B: 60 per cent shortened at 2° C.

Fig. 2. Extracted fibre: dependence of rate of splitting of adenosinetriphosphate (shown as percentage of maximum) on its concentration. Curve A: 20° C. Curve B: 2° C.

no longer varies with temperature. If the relationship of tension to temperature had persisted after washing out the adenosinetriphosphate, it would have been an indication that this relationship is not connected with the rate of splitting of adenosinetriphosphate, and thus that the dependence on temperature might rest on a reversible thermodynamic equilibrium.

Assuming the existence of thermodynamic equilibria, the simplest hypothesis (E. Wöhlisch, K. H. Meyer) supposes a statistical coiling up of the fibre molecules. In such a system the function of adenosinetriphosphate would be to weaken reversibly the linkages between neighbouring molecules in the extended state. This hypothesis is attractive because it allows all the known actions of adenosinetriphosphate on actomyosin to be explained as due to a diminution of cohesion forces. A proof of this special mechanism would, at the same time, be a proof of the general assumption that the model contraction rests upon a thermodynamic equilibrium.

If the increase of tension with temperature in an adenosinetriphosphate contraction depends on more and more actomyosin chains becoming freely movable as the temperature rises, we should expect, according to the Second Law of Thermodynamics, that this region of 'melting' would be pushed to higher temperatures for lower concentrations of adenosinetriphosphate. If no irreversible complication occurs at a high enough temperature, a 'melting' would occur without any adenosinetriphosphate—that is, a pure heat contracture. Such a heat contracture, in fact, sets in in the actomyosin threads between 40° and 60° C., the threads shortening by 20–30 per cent. If, however, the thread was previously brought to an adenosinetriphosphate contraction between 0° and 20° C. and then heated, the length remains unaltered between 20° and 40°; but above 40° it decreases just as steeply as previously described without adenosinetriphosphate contracture. The total shortening is then about 75 per cent.

The temperature at which 'melting' occurs must, according to the Wiegand-Snyder equation, be one of high β values, that is to say, by optimum concentra-

tion of adenosinetriphosphate in the region from 0° to 20° C. If the concentration of adenosinetriphosphate is lowered, the β value decreases more between 10° and 20° than between 0° and 10°. The temperature of 'melting' therefore appears to be lower with a lower concentration of adenosinetriphosphate. Temperature and adenosinetriphosphate, therefore, do not behave as they should if the mechanism were similar to that of Wöhlisch-Meyer.

The tension of the models contracting under adenosinetriphosphate increases with increasing concentration of adenosinetriphosphate only until an optimum concentration is reached. This optimum concentration is $10^{-2.2}$ – $10^{-2.3}$ M for shortened fibres at 2° C., and $10^{-1.7}$ – $10^{-1.8}$ M at 20° C. There is also an optimum concentration for the rate of splitting of adenosinetriphosphate by shortened fibres: at 2° C. $\approx 10^{-2.3}$ M and at 20° C. $\approx 10^{-1.8}$ M (see Figs. 1 and 2). If one supposes, following Michaelis and Menten, that these optima relate to the affinity between enzyme and substrate, the binding energy for the bond between adenosinetriphosphate and actomyosin can be calculated as 6–8,000 cal.

For unshortened fibres the optimum concentration of adenosinetriphosphate (for development of tension) is lower than that for shortened fibres at both 2° and 20°. It is not known if the optimum concentration for rate of splitting changes in the same way. The ability of the contractile structure to react with adenosinetriphosphate thus depends on the degree of shortening. This might be related to the shortening heat found by Hill, but it is as yet too early for such a discussion.

OBITUARIES

Dr. H. M. Vernon

DR. H. M. VERNON was born in 1870 and educated at Dulwich College, whence he obtained a science scholarship at Merton College, Oxford. There he studied chemistry for three years, followed by two years of physiology. He combined these subjects with an interest in general biology and at intervals worked at the Marine Zoological Station at Naples. Here his chief study was statistical investigations upon the effects of environment and cross-fertilization on the growth of sea-urchin larvae.

In 1898 Dr. Vernon took his medical degree and was elected a Fellow of Magdalen College, Oxford. His time now was spent chiefly in teaching and research in physiology. The First World War changed the centre of his interests. For a time he worked in Birmingham making munitions. This gave him the opportunity of observing conditions of work and their effects on the workers. He was amazed at the lack of consideration for the workers. He had thus a unique training for the work which was to occupy him for the rest of his life.

When the Health of Munition Workers' Committee was appointed in 1915, Dr. Vernon was one of the first investigators, and his work on "Hours of Labour" has been not only of great practical importance but it also opened a way for future investigation. When the Industrial Fatigue (Health) Research Board was appointed at the end of the War, Dr. Vernon was offered a post as investigator. His researches were concerned with tin-plate workers, blast-furnace workers, and coal-miners, particularly from the point

of view of atmospheric conditions, heating and ventilation, as well as rest pauses and allied subjects.

In 1932 he retired and occupied himself with writing articles and books. Among the latter are "Industrial Fatigue and Efficiency", "The Principles of Heating and Ventilation", "The Shorter Working Week", "Accidents and their Prevention", all excellently documented. He was disappointed that, when the Second World War broke out, those responsible for the work of the factories had not learnt the lessons of 1914-18. However, although it took time, researches dating from 1918 onwards were gradually incorporated into the practice of the factories.

Dr. Vernon was undoubtedly a pioneer, and his careful and accurate observations concerning many facets of the industrial field have played, and will yet play, a great part in research. He was unusually well-qualified by his scientific and medical knowledge for the work he undertook. Those who knew him during his working life admired and appreciated his single-minded enthusiasm for industrial research into a new field. He has had a long working life at work of his own choice.

MAY SMITH

Dr. F. S. Hogg

Dr. F. S. Hogg, director of the David Dunlap Observatory, University of Toronto, died suddenly on January 1. Frank Scott Hogg was born at Preston, Ontario, on July 26, 1904. He was the son of James Hogg, a well-known physician, and Ida Mary Barber, graduate of the University of Toronto. He attended the local high school and also the Galt Collegiate Institute, which was a famous institution a generation ago. From the University of Toronto he graduated in 1926, being awarded the gold medal offered by the Royal Astronomical Society of Canada for first place in astronomy. He then went to Harvard University, where he obtained the A.M. degree in 1928 and Ph.D. in 1929.

Upon receiving the Parker Travelling Fellowship, Dr. Hogg spent a year at the University of Cambridge and in visiting European observatories. On his return he was research associate at Amherst College, Mass., during 1930-31. After this, Dr. Hogg was on the staff of the Dominion Astrophysical Observatory at Victoria, B.C., during 1931-34, and when the David Dunlap Observatory of the University of Toronto was nearing completion, he was first appointed lecturer in the Department of Astronomy in the University, later assistant professor. He was associate professor from 1942 until 1946 when, on the retirement of Dr. R. K. Young, he became professor of astronomy and director of the Observatory.

Dr. Hogg was president of the Royal Astronomical Society of Canada in 1941 and 1942; and from 1937 he was assistant editor of the Society's *Journal* and *Observer's Handbook*.

At the David Dunlap Observatory, Dr. Hogg's chief work was on the determination of radial velocity, for which the 74-in. reflector is specially efficient. He was noted for the loyalty of his staff and for the interest he aroused in the young men who wished to carry on researches at the Observatory.

Dr. Hogg was a member of the American Astronomical Society and of the International Astronomical Union, and also of the committee on navigation of the National Research Council of Canada. He was also interested in astro-navigation, and devised and constructed a practicable bubble-sextant. Further, he was a good citizen of his community.

Dr. Hogg married in 1930 Helen B. Sawyer, a Ph.D. of Radcliffe and well known for her researches into globular star clusters. Mrs. Hogg has been for some time research associate in the Department of Astronomy and has now been made an assistant professor. There are three children, a daughter at the University and two sons still at school.

C. A. CHANT

NEWS and VIEWS

Geography at Leeds: Mr. R. F. Peel, M.B.E.

THE newly established additional chair of geography in the University of Leeds has recently been filled by Mr. R. F. Peel. Mr. Peel was educated at Northampton School and at St. Catharine's College, Cambridge, where he graduated in 1934, and obtained a diploma in anthropology with distinction the following year. During 1935-39 he was lecturer in geography at King's College, Newcastle upon Tyne, and returned there after the War as senior lecturer. In 1946 he went back to Cambridge, and in 1949 was elected University lecturer in geography and Fellow and director of studies in geography of St. Catharine's College. Although Mr. Peel's interests have turned increasingly towards human and social geography, his research work has embraced several fields. An expedition to the interior of Libya in 1938 resulted in six or seven published papers. Parts of a lengthy physiographical study of the Tyne drainage area have been published and other parts are expected to be ready this year. For his work in Libya and northern England he was awarded last year the Cuthbert Peake Grant by the Royal Geographical Society. Since 1946, he has completed a book on physical geography and has collaborated in a volume

of advanced cartography. During the Second World War Mr. Peel was in the Survey Branch of the Royal Engineers, and towards the end of the War was in charge of the map production branch of the Survey Directorate in Italy, for which he was awarded the M.B.E.

International Commission for Plant Slide Exchanges

AN International Commission for Plant Slide Exchanges, to which materials might be sent for processing and from which participants could receive in exchange any available slides that they might desire, has been established under the auspices of the Botanical Section of the International Union of Biological Sciences in co-operation with the California Botanical Materials Co., in the laboratories of which the materials will be processed. The aim of the Commission is to enable co-operating institutions and individuals to build up reference slide collections by exchanging plant materials sent in by them for slides processed from either these materials or from those forwarded by others. Any individual botanist, department of botany or botanical institution may become a member of the Commission upon payment in advance of an annual fee of ten dollars. Members