not secured in the proposed Atlas. The contention that the map can show nothing that the column of figures does not already reveal is easily refuted, although it may readily be admitted that the measure of interpretation and interpolation involved in drawing a map results in a loss of rigid mathematical accuracy. The subjective element is, however, being steadily reduced as cartographic technique advances, and all scientific workers who make customary use of distribution maps are aware that these can prove richly suggestive of new lines of investigation. Among such workers the economic historians appear as recent recruits, and the maps compiled from the statistical records of Domesday Book will provide not the least striking plate in the National Atlas.

It will be a very real gain and a very real economy to find within the pages of a single folio or pair of folio volumes the results of work in widely different fields, geological, meteorological, ecological, economic, and so on, uniformly displayed in such a way as to assist comparative study. Facts that must be sought in a score of publications, maps that, if they exist at all, are drawn on every possible projection and scale, will here be made immediately accessible, and such an Atlas, besides providing an instrument of research, will also serve as an indispensable work of reference, affording material information to the industrialist, to the social worker, to the administrator, to the regional planning authority, to the man of affairs.

The usefulness of the National Atlas will not, indeed, be called in question. Doubts may arise as to whether the material is available for so comprehensive and so complex a publication. In fact a very great body of material, very diverse in character, already exists in map form, and only awaits transference to uniform base maps. A further great body exists in statistical shape, and its actual mapping demands no more than the services of a trained cartographer. There remain, however, a number of desirable maps which must be the subject of research: a lithological map, for example, a water supply map, a smoke pollution map, maps of accessibility of individual towns by road and rail. Yet others depend upon data that are only very slowly accumulating: a map of the distribution of soils, for example, or, in quite another field, a map of the distribution of place names, which throw so clear a light on early settlement. Many such maps, if they can be drawn at all, must be partial and tentative, and in an Atlas intended for general as well as for specialist use, they will demand very careful cartographical treatment if they are to be free from *suggestio falsi*.

Of quite another character is the difficulty arising from the territorial division of the island of Ireland into two separate political units of which only one is part of the national territory of Britain. The unit of area for topographical, climatological, and many biological maps is obviously the British Isles, but official statistics, and certain official maps (those of the Ordnance Survey, for example), stop short at the boundary of Northern Ireland. It is too early to say whether some form of co-operation with Eire may not eventually be achieved.

In very many cases, of course, separate maps of England and Wales as one unit, and of Scotland and Northern Ireland as another, will be appropriate, and the basic scale of one to a million ($1/M$), involving a page size of approximately 21 in. × 14 in., has been chosen with this point in view. The use of an identical base map, suitably enlarged or reduced in scale, for every map in the Atlas, intended to facilitate rapid and exact comparisons between one distribution and another, is a cardinal feature of the plan.

It will be abundantly clear that only by willing co-operation among scientific workers whose material lends itself to cartographic exposition can a worthy National Atlas be eventually achieved. Pending the reorganization of the Atlas Committee, which it is hoped will not be long delayed, the present writer will be happy to act as a clearing house for suggestions and ideas.

OBITUARIES

Prof. R. A. Sampson, F.R.S.

WE regret to record the death of Prof. Ralph Allen Sampson, Astronomer Royal for Scotland and professor of astronomy in the University of Edinburgh during 1910–37, which took place at Bath on November 7.

Sampson was born in County Cork in 1866. From the Liverpool Institute he entered St. John's College, Cambridge, graduating in 1888 as third wrangler. Two years later he was awarded a Smith's Prize, and a fellowship of his College followed immediately. Between 1889 and 1891 he was a lecturer in mathematics at King's College, London, returning in the latter year to Cambridge as the first holder of the newly-endowed Isaac Newton studentship. In 1893 he went to Newcastle-on-Tyne as professor of mathematics in the Durham College of Science, and two years later he succeeded to the chair of mathematics in the University of Durham, which became in 1908—a restoration after some years of abeyance

—the chair of mathematics and astronomy. In 1910 Sampson migrated still farther north, succeeding Sir Frank Dyson, on the latter's transference to Greenwich, as Astronomer Royal for Scotland and professor of astronomy in the University of Edinburgh.

Sampson's greatest work was his theory of the four great satellites of Jupiter. This immense undertaking, which involved the discussion of thousands of eclipses of the satellites and demanded qualities of perseverance and patience in addition to mathematical powers of the highest order, engrossed his attention for more than a quarter of a century. The observational material he used fell into two categories: (1) old observations made visually, and (2) the photometric observations of the gradual disappearances of the satellites in eclipse, made at Harvard between 1878 and 1903. Although the general mathematical theory did not appear until 1921 (*Mem. Roy. Astr. Soc.*, 63) the University of Durham undertook in 1910 the publication of the "Tables of the Four Great Satellites of Jupiter", and in the previous year Sampson's discussion of the photometric observations appeared in vol. 52 of the *Harvard Annals*. For these researches he was awarded in 1928 the Gold Medal of the Royal Astronomical Society.

Sampson's first research (1894) was on the "Rotation and Mechanical State of the Sun". At an early stage he became convinced that a satisfactory theory of the distribution of temperature in the interior of the sun was essential to his purpose. He discarded the principles of convective equilibrium and attempted a discussion of temperature conditions by means of simple hypotheses governing radiation and absorption—twenty years before the foundations of atomic physics were laid. In this work Sampson was a true pioneer. In 1900, he edited J. C. Adams's "Lectures on the Lunar Theory" and, later, the Adams manuscripts relating to the discovery of Neptune.

Sampson's most valuable contribution to astronomy during his directorship of the Royal Observatory in Edinburgh was his work on measuring the effective temperatures of the stars. During this period, too, he was greatly interested in the performance of clocks and he contributed many papers on this subject to the Royal Society of Edinburgh.

Sampson was elected to the Royal Society in 1903. From 1915 until 1917 he was president of the Royal Astronomical Society and for many years he acted as secretary of the Royal Society of Edinburgh. He held the honorary degrees of Sc.D. and LL.D. of Durham and Glasgow respectively, and in 1921 he was elected a corresponding member of the Bureau des Longitudes (Paris). He is survived by his wife, one son and four daughters. W. M. SMART.

Prof. R. V. Wheeler

RICHARD VERNON WHEELER, director of the Safety in Mines Research Stations, professor of fuel technology in the University of Sheffield and editor of *Fuel in Science and Practice*, died at his home in Sheffield on October 28 at the age of fifty-six years. He graduated in the University of Manchester in 1903, where as an undergraduate he had already joined the band of research workers who laid the foundations of our present knowledge of flame and combustion, the famous Manchester school which will always be associated with the names of H. B. Dixon, W. A. Bone and R. V. Wheeler.

Wheeler became one of the leading authorities on safety in mines both in Great Britain and abroad, being awarded the Gold Medal of the Institution of Mining Engineers in 1937, and also one of the leading fuel technologists, receiving the Melchett Medal of the Institute of Fuel in 1938, but he always remained at heart a research worker. Having little use for the *ad hoc* and empirical type of research, he was fortunate in having the ability to convince those responsible for the organization and financing of the researches over which he had control of the importance and value of long-range and fundamental research. This ability was largely due to the clarity with which he explained complex problems to the non-scientific or non-technical man. As a result he was enabled to build up teams of research workers who have carried out extensive investigations in each of the fields of work in which he was interested.

In dealing with some of the most important problems involved in the winning and utilization of coal, namely, dust explosions, spontaneous combustion, carbonization and industrial burning, Prof. Wheeler regarded a knowledge of the constitution of coal as being of prime importance. This was emphasized in the "Monograph on the Constitution of Coal" written by him and Dr. M. C. Stopes and published by the Department of Scientific and Industrial Research in 1918. In this publication, which greatly stimulated research in this field, they summarized critically the work already done, and surveyed the ground to be covered by future workers. Wheeler took a prominent part in the development of this work with the assistance of many collaborators, and the main results are to be found in a series of twenty-five papers in the *Journal of the Chemical Society* under the general heading of "Studies in the Composition of Coal". The application of these researches to the more technical problems was well brought out in a series of papers published in the technical press. In his work on the prevention of gaseous explosions he emphasized similarly the importance of a fundamental knowledge of the mode of ignition and combustion of gaseous mixtures. The outstanding work in this direction was published in papers in the *Journal of the Chemical Society* dealing with the ignition of gases and with the uniform movement during the propagation of flame. The justification of his long-sighted policy is again shown by the important series of papers in the technical press showing how this knowledge could be applied.

Despite the wide range of the subjects of these researches, Prof. Wheeler always took keen interest in every piece of research under his direction, large or small, and was a continual source of suggestions and advice. He was an extremely hard worker, his enthusiasm for his work was infectious and he earned the esteem and respect of all those fortunate enough to work under him.