layer of radioactivity by meteoritic accretion. This may have been completed very early in the earth's history, and the present unevenness may have been brought about by subsequent agencies such as erosion. Dr. Bullard replied that the variability of heat-flow measurements on land was small, most observations being within fifty per cent of the mean value. It seemed to him unlikely that any serious sampling error had been incurred by making only a few measurements at sea. Dr. Stoneley asked if determinations of heat-flow had ever been made at several places in a very small area, or across a batholith of varying radioactive content. Dr. Bullard replied that in Persia about twenty wells in an area about 20 miles by 10 miles all yielded consistent results, after allowance had been made for structural variations in conductivity. No one has been able to investigate the heat-flow in a batholith in detail.

Mr. Browne suggested that the apparatus used in the Pacific should be used in a pool at the bottom of a mine shaft in order to eliminate any possible objection on the grounds that different techniques have been used for land and sea. In reply to a question from Prof. Tilley, Dr. Bullard said that no seismic measurements had been made of the thickness of the sediments on the ocean floor in the areas where the heat-flow has been measured.

In connexion with the validity of inferring average radioactive contents from hand specimens, Dr. Davidson said that he did not think it likely that most specimens had been collected from the border zones of batholiths: it is more usual to find them collected from quarries, which are, as a rule, in the centres of batholiths. In inferring radioactive contents from an ionization survey, allowance can be made for the effects due to potassium by estimating the potash in the rocks. Surveys can be conducted in aircraft and from 'jeeps', or in boreholes. In the aircraft survey, background fluctuations are always the limiting factor to what can be detected: for example, at 500 ft. altitude the performance factor, or ratio of the increase of ionization, due to the presence of a radioactive anomaly, to the background variation, is about 6 for an area of 15,000 sq. yd. covered by a low-grade ore with 0·01 per cent U_3O_8. He thought this method gave by far the best sample. In reply to Dr. Bullard's query, he said that he thought that there was no difficulty in accounting for all the radioactivity 'lost' from the continents: some sediments with radioactive contents as high as 150 gm./ton are known.

The representativeness of the meteorites which have been examined was also discussed by several speakers. Prof. Paneth said that no meteorites had been found with a radioactive content greater than that supposed to be the average for the earth. It is a mistake to suppose that all meteorites found in a particular area have come from the same place at the same time, since detailed examination often shows that the individual meteorites in a supposed 'shower' have different helium contents. Where it is certain that a shower or large single meteorite has fallen, such as in the case of the Arizona meteorite, the variation in helium and radioactive content is much smaller.

Prof. Tilley asked if anything was known about the way in which phosphate ores hold their uranium. Dr. Davidson replied that petrographical and chemical studies seemed to indicate that the uranium atoms are an integral part of the apatite structure. On the other hand, analysis shows that only about one molecule of uranium is associated with 4,000 of apatite, whereas the ores contain usually between 1 and 4 per cent of rare earths, which have an ionic radius similar to that of uranium.

Dr. R. I. B. Cooper pointed out that no significant difference in radioactive content had been found between Hawaiian basalts and those erupted near the centres of the continents. He thought, therefore, that it was unlikely that a different process has gone on in depth beneath the continents from that beneath the oceans to account for the apparent upward concentration of radioactivity beneath the former. It seemed worth while, however, in view of Prof. Paneth's disclosures, to re-examine the data. Prof. Paneth said that he thought it more likely that the original distribution of radioactivity was determined by the solubility of radioactive elements in the various layers, as suggested by Goldschmidt. Dr. Bullard said that, as there are no acid rocks under the oceans, this process would give different heat-flows. Dr. Gold pointed out, however, that the accretion suggested by Mr. Browne might have begun after the separation of the acid rocks.

R. I. B. Cooper

[1] Davidson, C. F., *Mining Mag.* (December, 1951).

OBITUARY

Sir Reginald Stradling, C.B., F.R.S.

Reginald Edward Stradling died at Shrivenham on January 26, at the age of sixty. Born in Bristol, the son of E. J. Stradling, he was educated at Bristol Grammar School and then studied engineering at the University of Bristol, where he graduated in 1912, proceeding later in his life to the degree of D.Sc. He served throughout the First World War, with a commission in the Royal Engineers, and gained the M.C. Later he became lecturer in civil engineering at the University of Birmingham and, in 1922, head of the Civil Engineering, Architecture and Building Department of Bradford Technical College. There began the special interest in building research which was to become his main work.

In 1924 Stradling was appointed director of the then young Building Research Station of the Department of Scientific and Industrial Research. Under his guidance the Station grew steadily until in 1939 it covered a wide range of activities in building and allied branches of civil engineering. The task of the growing Station was a difficult one. Scientific method had to be applied to building problems, and a traditionally minded industry had then to be persuaded to use the results. Stradling's enthusiasm and energy in the work and his high standing with engineers, architects and builders had much to do with the success achieved. In addition to his work at the Building Research Station he was also, during 1933–39, director of the Road Research Laboratory.

In 1938, when war threatened, Stradling was asked to prepare for the Home Office a report on the scientific aspects of civil defence, and, resulting from this, a Research and Experiments Branch of the Air Raid Precautions Department of the Home Office was set up in February 1939, with Stradling in charge as chief adviser. He saw at once the importance of enlisting the help of scientific workers outside the government service, and a number of eminent men were brought together to form a Civil Defence Research Committee. Some of these later served with Stradling in a full-time capacity during the War.

All aspects of civil defence were studied by Stradling's team; but particular attention was given to the collection and analysis of information on the results of air attack. Many trials were organized to determine the effects of explosions on structures of various kinds, and, when the real attack started, the results of the enemy bombing were closely studied. The information gained was of great value to the Ministry of Home Security (as the Air Raid Precautions Department had then become) in developing the necessary protective and precautionary measures. In the later stages of the War it was also widely used in the planning of the Allied offensives. At this phase a considerable group of Americans was successfully integrated into the British research team.

In 1944 Stradling moved to the Ministry of Works as chief scientific adviser, with the principal object of bringing to bear on the post-war building problems the scientific methods of attack which had been so successful in civil defence. Naturally he looked to the Building Research Station for much of the scientific support which he needed. At that time, however, the study of costs and economics and of certain sociological aspects of building was not included in the Station's research programme. To fill this gap, Stradling organized a research team within the Ministry. Considerable progress was made, particularly in the development of machines suitable for operation on the smaller building-sites and in the study of houses of non-traditional types. Later, in April 1950, these research functions, and the staffs involved, were transferred to the Department of Scientific and Industrial Research and became an additional part of the Building Research Station.

Unfortunately, in 1949, Stradling's health deteriorated and he relinquished his post at the Ministry of Works. On his recovery he was appointed dean of the Military College of Science at Shrivenham. He was carrying out his new duties with his characteristic enthusiasm when death came to him suddenly.

Stradling was made a C.B. in 1934 and, for his services to the Ministry of Home Security, was knighted in 1945. In 1943 he was elected to the Royal Society. He was prominent in the affairs of the Institution of Civil Engineers and served on the Council and as vice-president. In 1942 he was awarded the James Alfred Ewing Medal by the Institution. He was also awarded the United States Medal for Merit for his war-time work.

Stradling remained throughout his life a friendly and approachable man, with an enthusiasm for his work that infected those around him. He married Inda, daughter of Alfred W. Pippard, of Yeovil, in 1918, and there was one son and one daughter of the marriage.

F. M. Lea

NEWS and VIEWS

Theory of Chemical Structure in Organic Chemistry: A. M. Butlerov

In *Nature* of January 19, p. 92, a translation was published of resolutions passed at a conference held in Moscow last June on the theory of chemical structure in organic chemistry. It was stated there that "The Conference has clearly demonstrated the soundness of the theory of the structure of organic compounds due to the great Russian scientist, A. M. Butlerov; this theory lies at the basis of the whole of modern organic chemistry". The theory of resonance or mesomerism was said to be "directly opposed to the basic thesis of Butlerov's theory", and it was condemned as physically untenable and sterile. Such sweeping claims require examination. A. Butlerow (he published his scientific work in German under that style) did distinguished work on the reactions of addition and isomerization of olefins, mainly in the 1870's. Probably his best-known paper (*Annalen*, 189, 44; 1877) is that of 1877 on the isomerization and hydration of the di*iso*butylenes. He interpreted the double-bond shift as arising from the addition and elimination of water. He pointed out that the ready occurrence of such a reversible isomeric change would confer on a substance the power to undergo chemical reactions in accordance sometimes with one and sometimes the other structure. The correctness of these ideas was established by subsequent events. In 1883 Baeyer, having just previously made a study of the chemistry of isatin, suggested that a facile interconversion of structures might cause a substance such as isatin to exhibit the reactions of more than one structure. During 1885–86 Conrad Laar advanced the very different view that such structures did not represent distinct and potentially separable species, but only end-phases of an intramolecular oscillatory situation in a single species. However, in 1896 and afterwards, Claisen, Hantzsch, Knorr and Wilhelm Wislicenus achieved the isolation of many of the isomeric substances which Laar's theory treated as incapable of separate existence. They were able to observe the controlled interconversion of the isolated tautomers. This led to the firm establishment of tautomerism as a mode of chemical reaction, along the lines of Butlerow's and Baeyer's ideas. Thus the way was prepared for a study of the mechanism of interconversion of tautomers, which has been the special contribution of the present century. Butlerow's and Baeyer's ideas about tautomerism have nothing to do with the theory of mesomerism, which does not describe atomic arrangements, but only the electron distribution in a single and fixed bonded structure of atoms.

William Davidson of Aberdeen

The tercentenary memorial lecture on William Davidson of Aberdeen (*c.* 1593–*c.* 1669), delivered in Marischal College, Aberdeen, by Prof. John Read, on November 26, 1948, to mark the three-hundredth anniversary of Davidson's assumption of his duties as professor of chemistry in the Jardin du Roi, Paris, has now been published as No. 129 of "Aberdeen University Studies" (pp. 32+4 plates; Aberdeen University Press, 1951; n.p.) and forms a notable addition to this scholarly series. Davidson is remembered in the history of chemistry for many reasons: he was the first professor of chemistry to be appointed in France and the third in Europe; he was the first Scotsman and the first native of the British Isles to occupy a chair of chemistry; and he wrote one of the early text-books of chemistry, "Philosophia Pyrotechnica" (Paris, 1633–35), of the contents of