therefore, that we are obtaining a better understanding of gas mixtures, and solutions other than those for which the regular assembly is a satisfactory model.

At the third session Prof. I. Prigogine (Brussels) described some recent work extending the Lennard-Jones and Devonshire model of liquids to binary mixtures at temperatures far from the critical point. In such systems it is possible to study the way in which the effective vibration frequency of a molecule in its 'cell' changes with concentration, and also how the mean size of the cells changes with concentration. It is found that both these effects have an influence on the thermodynamic functions, and give important corrections to the usual approximation of regular solutions. The magnitude of these effects has been calculated for the system carbon tetrachloride–carbon tetramethyl, and preliminary measurements give results in good agreement with the theory. Prof. Prigogine also reported some theoretical calculations in which account is taken of the presence in a liquid of Lennard-Jones cells containing 0 or 2 molecules. Such calculations lead to a much better value for the critical volume of a liquid; but, as yet, the work has not been extended to systems of more than one component. Other topics which arose in the succeeding discussion included the surface tensions of solutions composed of molecules of unequal size or shape; the variation of surface tension with composition gives a sensitive indication of the way in which molecules are oriented in a surface and supplements the information that can be obtained from the bulk thermodynamic properties.

The last session of the conference was devoted principally to the present experimental position. In his introductory paper Prof. D. H. Everett (Dundee) mentioned the scarcity of accurate data on the thermodynamic properties of solutions, and stressed the importance of choosing suitable experimental systems for the testing of particular statistical theories. Older work was concerned primarily with solutions departing little from ideality, but more recently both experimental and theoretical work has been concerned with departures from ideality due to flexibility and differences in shape. Prof. Everett discussed in some detail the system benzene–diphenyl, recently studied with concordant results by several different workers. As he pointed out, the results cannot be quantitatively interpreted in terms of a quasi-crystalline model with benzene occupying one site and diphenyl two; it seems that in dilute solution diphenyl must disorient the benzene structure, and perhaps for this reason the system is not a satisfactory one against which to test the theory. Prof. Everett directed attention to the useful supplementary information that may be derived from measuring non-thermodynamic properties such as viscosity, dielectric constant and absorption spectra. In the critical region very few reliable thermodynamic data are available; and here a few well-chosen measurements should greatly increase our understanding of such phenomena as the solubility of solids in vapours.

In the discussion, Mr. J. H. Baxendale gave a careful analysis of the experimental errors in his investigation with Dr. B. V. Enustin of the benzene–diphenyl system, and showed that the discrepancies with the simple theory are well outside the experimental errors. Dr. V. Mathot (Brussels) described a method of calculating the thermodynamic properties of a solution in which the solute consists of monomers and associated complexes. The activity coefficient of carbon tetrachloride in mixtures of this liquid with alcohols is found to fall between the value calculated from the Flory–Huggins model and the value appropriate to an 'ideal infinitely associated' solution. Further, it can be shown by the principle of detailed balancing that the ratio of activity coefficients of solute and solvent is equal to the fraction of solute molecules in the monomeric state; and this relationship is verified with great accuracy by spectroscopic measurements on the hydroxyl vibrational absorption band in its first and second overtones. This shows clearly that deviations from ideality are, indeed, due to the formation of complexes in these systems. Another observation which aroused great interest was the fact, reported by Dr. J. H. van der Waals (London), that the heats of mixing of hydrocarbons sometimes vary considerably with temperature; no satisfactory explanation has yet been found for this phenomenon.

Among the visitors who also took part in the conference were Dr. F. Booth (King's College, London), Mr. J. L. Copp and Mr. G. Duff (Dundee), Dr. M. J. S. Dewar and Dr. H. Tompa (Maidenhead), Dr. R. Freeman and Dr. W. Moffitt (Welwyn), Dr. E. L. Mackor (Oxford), Dr. P. Meares (Aberdeen), Dr. G. J. Szasz (American Embassy, London), Mr. Trappeniers (Brussels) and Dr. L. R. G. Treloar (Royal Institution, London).

H. C. Longuet-Higgins

OBITUARIES

Dr. L. J. Comrie, F.R.S.

Dr. Leslie John Comrie died on December 11 at his home in London at the age of fifty-seven. His health had been failing after a stroke two years ago, which left him with an active mind, but with much reduced capacity for work. He worked right up to the last, almost completing a project of long standing—a guide to errors in published mathematical tables.

Comrie was born at Pukekohe, New Zealand. He took a degree in chemistry at Auckland University College, before joining the New Zealand Expeditionary Force and serving in the First World War, during which he lost a leg. After the War he gave up chemistry for astronomy and computation, which were to be the great interests of his life. He was elected an Isaac Newton Student at Cambridge, and took his Ph.D. in 1923. He then spent three years in the United States, teaching astronomy and introducing computation into the student courses, first at Swarthmore College, then at North-Western University, Evanston, Illinois.

Returning to England, which he made his home, he served the Nautical Almanac Office first as deputy superintendent, then, during 1930–36, as superintendent. During this period he revolutionized the "Nautical Almanac" and its computation. By mechanizing calculation he greatly increased its range, accuracy and cheapness. This was reflected in great changes in the content of the "Nautical Almanac" itself—the major ones came first in that for 1931—which much increased its value as an astronomical tool.

In 1937 Comrie left the Nautical Almanac Office to found the Scientific Computing Service, Ltd., the first independent professional organization (and still the only one) to provide large-scale computation with high mathematical content. This organization, under his directorship, has performed major computational work in many fields—for industry, for government departments and for universities. Emphasis was on accuracy, and on the lack both of dislike and of fear of computation—no job was ever turned down as being too large. When the Second World War broke out, one of Comrie's most valuable contributions consisted of two volumes of 200 pages of double-entry ballistic tables for the War Office, which were designed, computed, proof-read, printed and bound under his direction within the first twelve days of the War.

Comrie's main work was in the application of commercial machines to computational problems and in the construction of mathematical tables. He was opposed to the building of special calculating machines, but advocated always an examination of existing machines, available in considerable numbers, to see which was best adapted to the problem in hand. He was adept in devising special methods by which such machines could best be used, and in modifying the computational formulæ to fit the machines. He was never reluctant to tell a client that he was asking for unnecessary accuracy or results, or to point out that proposed methods were wrong or unduly lengthy.

One of his most constant objectives was the complete replacement of logarithmic computation by machine computation; he was always advocating the widespread adoption of calculating machines in all business and research establishments, and was always ready to advise on the choice of machine for each job to be tackled. It was his belief that, eventually, everyone who had need to compute should and would have a calculating machine. His experiences and judgment in this respect were acknowledged by the leading manufacturers and distributors of calculating machines, who could always be sure of advice based strictly on the merits of the machine and problem under discussion.

Comrie's work in preparing mathematical tables will probably form his most lasting memorial. At the Nautical Almanac Office and in collaboration with Prof. J. Peters of Berlin, he was interested in preparing tables of trigonometrical functions in exactly the form needed to help the computer most, and prepared several tables giving natural values to meet the needs of mechanical computation, for which logarithmic values are useless.

As secretary of the British Association Mathematical Tables Committee, he played a leading part in the preparation of most of the B.A. Mathematical Tables—achieving standards of typography and accuracy not previously considered attainable.

The "Standard Four-figure Mathematical Tables", prepared with Prof. L. M. Milne-Thomson, and his two revisions of Barlow's Tables are well known. So also are his last works to appear during his life-time, namely, his revision of "Chambers's Mathematical Tables"; the four-figure tables contain more useful tables, formulæ and ideas about tables and computing than have ever before been collected into 64 pages, while in the two volumes of "Chambers's Six-figure Mathematical Tables" he has prepared a set of tables replacing the old seven-figure tables, which should meet nearly all needs in the elementary field for many decades to come. In the introductions to these two volumes he has compressed an account of a very large proportion of his computational experience—they may almost be used as a text-book on general computational techniques. He was the first to believe that the maker of tables not only should, but also could, provide tables that were free from error. He believed, too, that it was his duty to give the user every possible aid and convenience. Comrie had an almost professional knowledge of typography, and the careful and expert attention which he always paid to this art, as well as to the logical austerities of the English language, set its mark on all his work.

Besides a great interest in the preparation of mathematical tables, Comrie had an equally powerful interest in other tables, and he conducted systematic and thorough searches for errors over very many years. His experience in these matters was very great, and it is fortunate that he had almost completed a record of this experience. This is to appear as part of a new edition of "An Index of Mathematical Tables", prepared by Fletcher, Miller and Rosenhead. The first edition of this "Index" was actively sponsored by Comrie, who financed publication through the Scientific Computing Service.

Comrie's outstanding contributions to the field he had done so much to extend and transform were acknowledged by election to the fellowship of the Royal Society last March. He was the first in this field to receive such recognition.

His experience and enthusiasm in computation and table-making will be very greatly missed. He will also be missed by his many astronomical and New Zealand friends, who could always be sure of interest, encouragement and help. J. C. P. Miller

Prof. J. W. Cobb, C.B.E.

On Saturday, November 25, John William Cobb died in Leeds at the age of seventy-seven. Educated at the Leeds Modern School, he entered the Yorkshire College (now the University of Leeds) in 1889. After graduating in the University of London at the age of nineteen, he went straight into industry with the Farnley Iron Co., Ltd., of Leeds. This firm manufactured certain high-grade local products—wrought iron and clay ware. John Cobb found himself in a works peopled with skilled craftsmen but without a scientific atmosphere. He was commissioned to learn by his own observation and experiment, but without a laboratory. His employers were in advance of the times and not lacking in encouragement. Thus he was able to advance the technique of the works, especially in the efficient use of fuel. In this way he acquired a reputation for knowledge of industrial gas heating. Endowed with curiosity and initiative, and thanks to the support of his employers, Cobb was able to carry out a considerable amount of investigation of works processes, notably on the solid reactions of silicates. In this, he showed himself ahead of his contemporaries.

In 1904 the Yorkshire College attained university rank and one of its first acts was to embark on the study of, and research on, fuels. This enterprise was the first of its kind in a British university. In 1906, a Department of Fuel and Metallurgy was established under the responsibility of Prof. W. A. Bone. He retained this position until 1912, when he took office in the new Department of Fuel at the Imperial College of Science and Technology.

In the meantime, the Fuel Department at Leeds had become associated with the science and technology of towns' gas. In 1910, when, by death, the British gas industry had lost one of its leading members, Sir George Livesey, it chose to use its resources to endow the chair of the new Department in Leeds. The departure of Prof. Bone to London