

## CALORIMETRY

THE seventeenth annual Calorimetry Conference was held during August 22–24 at the University of California, Berkeley. Hosts for the occasion were the Inorganic Materials Research Division of the Lawrence Radiation Laboratory and the College of Chemistry. Local arrangements were made by a committee comprised of Prof. N. E. Phillips (chairman), Prof. R. Hultgren, Dr. D. N. Lyon and Mr. I. Pratt.

In keeping with the traditions of previous conferences, a wide variety of topics pertaining to calorimetry was discussed, including experimental techniques, results and their interpretation. Thirty-seven papers were presented, the principal one of which was that given as the Huffman Memorial Lecture by Prof. E. F. Westrum, jun. (University of Michigan). Prof. Westrum discussed the "Thermodynamics of Globular Molecules" and set out lucidly the problems of understanding the behaviour of the so-called plastic crystals. Thermodynamic measurements on these substances can yield valuable information about transitions, and about rotation of molecules and molecular groups in the solid. Much of the available experimental information has been obtained by Prof. Westrum and his students.

Invited papers were given by M. L. McGlashan (University of Reading), D. Patterson (University of Montreal), A. M. Karo and A. W. Searcy (University of California). Each of these papers served to emphasize a particular part of the programme. For example, McGlashan's discussion of the calorimetric determination of the change of enthalpy of vapours with pressure and Patterson's application of the Prigogine theory to the explanation of heats of mixing of polymer solutions introduced a series of contributions on measurements of heats of mixing, solution and dilution.

Karo described the information about lattice vibrations which is obtainable from thermodynamic properties of crystalline solids and illustrated his

theme by taking examples of alkali halide crystals. In particular, he showed how accurate experimental heat capacities are sufficient to distinguish between several possible ionic models. Papers contributed in related fields dealt with thermodynamic properties of solid yttrium hydrides, transition metal and technetium hexafluorides, palladium hydride, lithium metal, helium and methanes.

High-temperature thermodynamic properties were introduced by Searcy's contribution on the interpretation of the properties of inorganic solid solutions (uranium-oxygen and cerium-oxygen systems), which was coupled with a plea for more experimental measurements. The particular kinds desired were not represented at the Conference; high-temperature studies which were reported had more to do with the measurement of stored energy.

Many other specific topics were touched on, for example, precision bomb calorimetry, which provides accurate and fundamental information on heats of formation and is the very basis of thermo-chemistry; techniques of micro-calorimetry for measuring very small energy changes; improvement of standards of measuring energy and temperature.

Again, in keeping with the practices of previous conferences, no proceedings will be published. The work discussed will in due course appear in regular journals. A report on the Conference would not be complete, however, without mentioning the annual dinner held at Spenger's Fish Grotto in Berkeley. Dr. Nicholas Kurti of the Clarendon Laboratory, Oxford, was the after-dinner speaker and chose as his topic "What's Cooking", a deceptively calorimetric title. Although he did not, as advertised, prove his text, which was the aphorism, "The discovery of a new dish contributes more to the happiness of mankind than the discovery of a star", he kept his audience thoroughly entertained and no one worried unduly.

## GAS CHROMATOGRAPHY

AN informal symposium of members of the Gas Chromatography Discussion Group of the Institute of Petroleum was held on September 7 at the Royal College of Advanced Technology, Salford, with Mr. C. S. G. Phillips in the chair. Dr. Ramage, head of the Chemistry Department, welcomed the Group at the College. The first paper was a repeat by Dr. A. J. P. Martin (Abbotsbury Laboratories, Elstree) of his opening address\* to the fourth International Symposium on Gas Chromatography (Hamburg, June 1962) entitled "Future Possibilities in Microanalysis". Dr. Martin stated that much could be gained, particularly in the sciences where the amounts of available materials are severely restricted, if the scale of analytical operations were reduced by a factor of  $10^6$  or greater. It should be possible to design apparatus to weigh  $10^{-9}$  g at room temperature and  $10^{-11}$  g at a few degrees absolute. In gas chromatography he envisaged the possibility of the column effluent being passed over a directly weighed leaf of adsorbent to give a mass integral chromatogram and

\* To be published in full in the *Proceedings of the Hamburg Symposium*.

a system of multiple leaves providing fraction collecting facilities. Time-of-flight mass spectrometry and X-ray crystallography could provide the means of identification. As far back as 1946, Engström (*Acta Radiologica*, Stockholm, Suppl. 63; 1946) had used the characteristic absorption of very long X-rays to carry out an analysis on samples of the order  $10^{-9}$ – $10^{-12}$  g. The main difficulty in the type of picocchemistry envisaged by Dr. Martin lay in the limitation imposed by the size of our hands. This was exemplified in the 'stone-age' character of the instruments available for handling sizes observable under a simple microscope. Essentially then, smaller hands would be required and ideally these should have similar translatory and sensory facilities as the hands made by nature. Some form of mechanical-pneumatic system used in conjunction with the human hand was the approach suggested. Although at first sight a reduction of about ten to one might not seem difficult to achieve, it should be borne in mind that the aim would be to design a system capable of reproducing itself by the same reduction factor