ment concentration. Finally, Dr. N. Kelso King (Division of Physical Chemistry, Commonwealth Scientific and Industrial Research Organization) discussed the significance of isosbestic points in studying reaction mechanisms.

The session on atomic absorption spectroscopy, which was held on the final morning, proved to be one of the most successful sessions of the conference. It was very gratifying to witness the obvious intense interest in this subject, which was pioneered in Australia and New Zealand. Mr. J. E. Allan (Rukuhia Soil Research Station, New Zealand) opened this session by reviewing recent developments in the technique. The progress made since the second Australian Spectroscopy Conference in 1959 was amply illustrated by the increase in published research papers from 5 to 50 at present. Dr. B. G. Davey (School of Agriculture, University of Sydney) described the application of atomic absorption spectroscopy to the analysis of agricultural materials. It is now possible to determine rapidly many elements in soil and plant material; up to 170 samples an hour can be analysed for one element with a coefficient of variation less than $\pm$ 5 per cent using very simple equipment. Mr. D. J. David (Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization) discussed the determination of molybdenum by atomic absorption. Molybdenum is believed to be present in a flame as the oxide under normal conditions, but in an acetylene–air flame operated under reducing conditions the molybdenum trioxide dissociates to atomic molybdenum which can be detected by absorption. Mr. David suggested that compound formation under flame conditions may account for many of the interferences that can occur in analysis by atomic absorption. The research in atomic absorption being carried out at present at the Rukuhia Soil Research Station was surveyed by Mr. J. E. Allan. Extension of the range of elements accessible to the technique by the use of nitrous oxide–acetylene flames is being investigated. The determination of cobalt and nickel in agricultural materials has been studied in detail, and procedures established for the analysis of fertilizers. Dr. J. B. Willis (Division of Chemical Physics, Commonwealth Scientific and Industrial Research Organization) showed how atomic absorption was being used to determine traces of heavy metals such as lead, mercury, bismuth, nickel, cadmium and zinc in biological materials. The sample preparation procedures are much simpler than those involved in most existing methods; cadmium and zinc can be determined directly in urine and preliminary experiments suggest that zinc may be determined in blood serum and whole blood by spraying the diluted material directly into the flame. Cathodic sputtering appears to be an attractive method for atomizing those elements (for example, aluminium, strontium and titanium) which form refractory compounds under flame conditions, and Drs. B. M. Gatehouse, J. V. Sullivan and A. Walsh (Division of Chemical Physics, Commonwealth Scientific and Industrial Research Organization) discussed the factors affecting the cathodic sputtering of various metals. In some instances it has been possible to establish sputtering conditions which permit analytical determinations, but the method is still unsatisfactory for aluminium.

The final session of the conference was devoted to resonance spectroscopy. Dr. G. S. Bogle (Division of Physics, Commonwealth Scientific and Industrial Research Organization) reviewed the development of the theory of electron paramagnetic resonance. Mr. A. J. Harle, Dr. L. E. Lyons and Mr. B. K. Selinger (Department of Physical Chemistry, University of Sydney) summarized the results of a preliminary survey of the electron-spin resonance spectra of some charge-transfer complexes between chloranil and aluminium oxide, hexamethyl benzene and tetracyanoethylene, dibenzacridine and tetracyanoethylene or chloranil. Dr. G. S. Bogle (Division of Physics, Commonwealth Scientific and Industrial Research Organization), Drs. W. F. Forbes and W. E. Savige (Division of Protein Chemistry, Commonwealth Scientific and Industrial Research Organization) reported some investigations of the electron paramagnetic resonance properties of cystine and related compounds after irradiation with mercury 2537 Å. radiation and a sun-lamp (peak ~ 3100 Å.). Similar spectra are obtained for all the compounds examined, indicating that the same trapped free radical $RS\cdot$ ($R = CH_3\cdot\underset{\underset{|}{}}{CH}\cdot(NH)_2\cdot COOH$) is formed in each case on irradiation. Mr. T. J. Seed (Department of Physics, University of Canterbury) discussed the paramagnetic spectra of manganous ions in undiluted crystals of the solid-solution ammonium chloride–manganous chloride–water.

In the final paper of the conference Dr. C. K. Coogan (Division of Chemical Physics) and Prof. H. S. Gutowsky (Chemistry Department, University of Illinois) reported on nuclear magnetic resonance in sodium hydrosulphide. Observations on the hydrogen-1 and sodium-23 resonances in polycrystalline samples of sodium hydrosulphide tend to confirm Pauling's hypothesis that the hydrosulphide ion is tumbling very rapidly in the crystal lattice and thus presents an outward spherical form to the surrounding ions. This occurs above 80° C., and it was also observed that SH^- ions can diffuse through the lattice.

R. A. DURIE

COLLOIDAL SYSTEMS

AN informal discussion on colloids, under the auspices of the Faraday Society, was held in the Royal College of Science and Technology, Glasgow, on June 27. The meeting was held to mark the centenary of the appearance of Thomas Graham's paper, "Liquid Diffusion applied to Analysis", in which a clear definition of colloids and crystalloids was first given. An attempt was made to cover as many colloidal topics as possible; in the event, this did not prove feasible and the subjects tended to be somewhat biased towards association colloids. About seventy people attended the meeting, including several from Holland.

The chairman, for the morning session, was Prof. P. L. Pauson, who welcomed the visitors to the Royal College and indicated the reasons for holding the discussion at this time and place. (Graham held his first chair at the College.) The first speaker was Dr. A. J. Hyde (Glasgow), who gave a brief biography of Graham with rather greater emphasis on the private

and non-scientific side of his life than on his scientific achievements, which are reasonably well known.

Sir Eric Rideal (London) then gave an address on "Colloid Science: a Century of Progress". Sir Eric reviewed the development of colloid chemistry since 1861, commencing with Graham's work on peptization, gels and sols. He then discussed work on coagulation, flocculation and peptization of sols, drawing on the work of Von Weimarn, Hardy and Perrin for examples. A review of optical investigations on colloidal solutions was then given, reference being made to the work of Faraday and Tyndall, and finally to the ultramicroscope of Zsigmondy and Siedentopf. Gels and adsorption were dealt with rather more briefly, mention being made of the work of Freundlich and the swelling experiments of van Bemmelen.

The final speaker in the morning session was Dr. A. S. C. Lawrence (Sheffield), who gave a talk describing the work of his group at Sheffield on soap–water–amphipile systems. Graham did not carry out any investigations on soap solutions, but they come within his classification of colloids. Dr. Lawrence commenced with a general description of the colloidal and other phenomena encountered, and of the phase diagrams of the systems. He continued with a more detailed account of the liquid crystalline forms and myelinic figures which are obtained on adding soap solutions to crystals of a polar additive, or solutions of additive to a soap crystal. These were interpreted in terms of adsorption of soap and additive at the solid-liquid interface. In conclusion, mention was made of the effect of organic and inorganic salts on the systems.

For the afternoon session, the chairman was Sir Eric Rideal and the first speaker, Dr. A. P. Prosser (London). Dr. Prosser gave a talk on the forces which, in conjunction with electrostatic forces, stabilize all colloidal systems. Beginning with a general account of van der Waals forces and London dispersion forces he then went on to deal with their origin and the differences which exist when bodies are very close together (< 250 Å. apart, the unretarded case) or relatively far apart (> 2000 Å., the retarded case). He then gave a brief outline of the theory of the forces and the problem of evaluating them from the theory in the retarded and unretarded cases. The experimental determinations of attractive forces by the groups led by Bradley, Derjaguin, Overbeek and Kitchener were then discussed, along with some recent experiments on flocculation in colloidal systems.

The second paper in the afternoon, entitled "Polyelectrolytes", was by Prof. J. A. V. Butler and Dr. D. J. R. Laurence (London) and was read by Dr. Laurence. The subject-matter is directly connected with Graham's work on caramel and gelatin. Dr. Laurence mentioned the general properties of polyelectrolyte solutions such as high viscosity and gel formation. He then went on to discuss more specialized properties such as titration curves, conductivity curves and transport properties which give rise to the picture of a polyelectrolyte molecule in solution as a charged random coil with small gegenions, some of which are 'free' and some 'trapped' inside the coil. The last point is particularly well illustrated by measurements of transport number. The spatial configuration of the coils was then discussed in terms of the information obtainable from sedimentation, viscosity and light-scattering measurements. Finally, deoxyribonucleic acid was treated in rather more detail, followed by a mention of proteins, including ribonuclease.

The final speaker, Prof. J. T. G. Overbeek (Utrecht), spoke on the drainage of soap films. He began with a few general remarks on the structure of soap films, their thickness and colours. Then followed a description of the stretching of films, with the formation of new film, and the drainage of films. Finally, the nature of the black film was discussed, with reference to the discontinuity in thickness at the edge of the black area, the forces giving rise to the black film and the ultimate breaking stability of the film when electrostatic and van der Waals forces are opposed to one another. Prof. Overbeek then presented a colour ciné film of the drainage of soap films illustrative of all the points he had mentioned, and containing, in addition, several beautiful illustrations of moving colour effects obtainable in soap films.

A. J. HYDE

THE LIBRARY ASSOCIATION

ANNUAL CONFERENCE

THE papers presented at the annual conference of the Library Association at Hastings during September 19–22 were of general rather than specific interest to the scientist. Mr. Leslie Wilson and Viscount Caldecote made some reference to the National Reference Library of Science and Invention and the National Lending Library for Science and Technology and to the proposals for the re-organization of the Library Association, particularly as they seek to establish the Association as the professional association of librarians, and their papers are of direct consequence to scientists and technologists. Sir Charles Snow's lively presidential address, with its plea for a wide view of the functions of the public library in the Welfare State, should also commend itself to them. Sir Charles believes that the public libraries must in future assume some of the functions of the great private lending libraries and that, in particular, they have a real responsibility to contemporary literature which some of them have yet to recognize. Mr. K. J. Lea, county librarian of Essex, on the other hand, while not discounting this amenity aspect, to which the smaller library authorities are virtually limited, urged that more attention should be given to the educational and specialized services, if necessary by the development of a two-tier system based on co-operation between boroughs and counties, the possibility of which is already being demonstrated by the county libraries of Britain.

Mr. Leslie Wilson's paper, on "Libraries and Information Services: the Challenge of the Future", was equally concerned with co-operation, alike between such bodies as the Library Association and the Association of Special Libraries and Information Bureaux and between these and institutions concerned with the use of information. He stressed first