ethylenediammine[8]; and trivalent gallium, indium and thallium, but not aluminium, will give insoluble 1 : 3 complexes with 2-methyl-8-hydroxyquinoline and similar reagents[9]. We shall present elsewhere our observations with sterically hindered ligands such as α-methyl- and α : α′-dimethyl-*o*-phenanthroline.

The stability of complexes formed by any one ligand, for example, ammonia, with a series of metals may be expected to increase with the electronegativity of the metal concerned. Though reliable values for the transition elements are not yet available, it is of interest to record that a plot of instability constants (log k_n) against the second ionization potential (corresponding to the change $M \rightarrow M^{++} + 2e$ for the metal concerned) is approximately linear from manganese to copper, points for zinc lying somewhat off the curves. Thence, or less readily from the accompanying graph, it can be seen that the successive increments in stability in passing from manganese to copper complexes are of much the same order whether water is replaced by two molecules of ammonia, or one of salicylaldehyde or a diammine. When any one metal is considered, the gain in configurational entropy consequent upon ring formation is strikingly demonstrated by the high relative stability of the latter complexes.

Whereas it seems reasonably certain that the most stable complexes are always formed by elements terminating the transition series, and probable that the same 'natural' order of stability is preserved throughout each series, the acceptance of a unique order of stability operating throughout the Periodic Table must wait upon more extensive quantitative measurements with more varied types of ligands and upon a wider range of metals. Quantitative studies on chromous complexes should prove of particular interest.

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FIRST INTERNATIONAL CONGRESS ON RHEOLOGY

SOON after the end of the War, the Committee of the British Rheologists' Club approached rheologists in the Netherlands about the possibility of holding an International Rheological Congress in Holland. Dutch rheologists welcomed the suggestion and set up a Committee to organise the Congress (see *Nature* of January 17, 1948, p. 104).

Shortly afterwards, the International Council of Scientific Unions appointed a Joint Committee on Rheology which held its first meeting in London in September 1947. The honorary secretary, Prof. J. M. Burgers, was taking a leading part in the organisation of the Congress, and it was agreed that the plans for the Congress should be made in close co-operation with the Joint Committee, the second annual meeting of which would also be held at the same date and place as the Congress itself. The Congress was held at Scheveningen during September 20–25.

The technical business of the Congress was divided into two parts: (1) general lectures given by invitation of the Committee; (2) shorter communications submitted by members. The latter part was arranged to run in three concurrent programmes, though the subject-matter was grouped in four categories: (*a*) theoretical problems; (*b*) experimental methods; (*c*) rheological properties of various systems; (*d*) biological systems.

The official languages of the Conference were English and French, the Dutch members showing a remarkable proficiency in the English language.

There was also a general discussion on nomenclature introduced in a general lecture by Prof. J. M. Burgers, who also presented a communication from the International Joint Committee. The Joint Committee had instructed two of its members, Prof. J. M. Burgers and Dr. G. W. Scott Blair, to draw up a report on nomenclature based on the various wartime publications of the British Rheologists' Club and of Dutch rheological organisations. Although developed entirely independently of one another, these reports had been found to have very much in common.

Prof. Burgers also summarized in his address the general scope of the work which the Congress was about to undertake.

The general lectures covered a wide field of rheology. Prof. F. Eirich, of the Polytechnic Institute of Brooklyn, N.Y., dealt with experimental methods in rheology, discussing the relative merits of different types of viscometers and rheometers for industrial and academic problems. Prof. C. Sadron, of the University of Strasbourg, spoke on the viscosity of dilute solutions of macromolecules, with special reference to molecular shape and orientation. This lecture was particularly valuable in drawing together information from Dutch, American, British and French sources, and in presenting a composite picture of the complex problems of viscosity-concentration relations.

Dr. M. Reiner, of the Technical College, Haifa, spoke on rheological relations in complex systems, outlining first the applications of the classical theories of elasticity and hydrodynamics, and then proceeding to discuss how the classical rheological coefficients vary with structural changes in the material and how various groupings of elastic and viscous elements are linked together to account for the behaviour of complex systems. Dr. K. Weissenberg, of the British Rayon Research Association, Manchester, also spoke on rheology of abnormal systems, developing a comprehensive scheme by which all macroscopic aspects of rheological behaviour can be dealt with whether previously regarded as 'normal' (that is, conforming to some established theory or convention) or as 'abnormal'. The scheme is based on a general theory of transformation for defining invariant rheological parameters. The lecture was ably illustrated by experiments.

Dr. G. W. Scott Blair (University of Reading) discussed psychophysical aspects of rheology, and the relationship between physical measurements and subjective judgments of rheological conditions as made by craftsmen in industry, and explored the possibilities of applying multiple factorial analysis to data from batteries of empirical rheological tests. Prof. A. L. Copley (New York University) spoke on biological problems in rheology, dealing especially with rheological problems of protoplasm, of cellular coats and intercellular substances, and on the rheology of body fluids ('humoral rheology'). Dr. R. Houwink, of the Rubber-Stichting, Delft, who was also chief secretary of the Congress, spoke on rheology in industry, outlining the main rheological properties important for industry, with special reference to glass, asphaltic bitumen, thermoplastics, thermosetting plastics and paints.

In a short account of the Congress it is impossible to deal with all the contributions to the sectional meetings, numbering between thirty and forty papers; but it can be said that the ground covered was very wide.

There were a number of papers on thixotropy, including one by Sir Charles Goodeve, in which a novel model was described to represent thixotropic and plastic flow. Dr. H. Nitschmann, from the Harvard Medical School, Boston, described interesting experiments on thread-forming liquids, showing the relationship between this property and changes in viscosity with driving pressure. Dr. C. N. Davies, of the London School of Hygiene and Tropical Medicine, also discussed thread formation of liquids. It was somewhat unfortunate that, in an otherwise admirably arranged programme, Drs. Davies' and Nitschmann's papers were read in different sections almost simultaneously. M. M. Louis (Reuil, France) described a new type of viscometer for industrial use which should have a wide appeal on account of its simplicity of design; and a number of new rheometers were also described for the study of rubber, plastics, printing inks and other materials. Drs. H. de Bruijn and P. G. Meerman, of the Netherlands State Mines, discussed the use of a Stormer viscometer for settling suspensions, and Mr. W. Lethersich, of the Electrical Research Association, the relative merits of compression and rotation instruments for work on dielectrics.

On the theoretical side, turbulence phenomena received considerable attention; Dr. R. Schnurmann, of the Manchester Oil Refining Co., dealt with Reynolds' numbers in solutions of large molecules, and Dr. J. C. Oldroyd (Courtaulds, Ltd., Maidenhead) discussed wall-effects in turbulent flow through pipes. Prof. J. J. Hermans (University of Groningen) gave a summary of his well-known work and that of Prof. P. H. Hermans on swelling of gels, and Prof. W. T. Astbury (Leeds) gave an account of X-ray and electron microscope studies on myosin and actin.

Of the thirty-eight sectional papers, apart from general lectures, circulated in preprint form before the meeting, no less than twenty were from British rheologists, and, indeed, Great Britain was very well represented at the Congress.

An exhibition of rheological apparatus included instruments from Holland, Great Britain and France. The apparatus was classified in accordance with the way in which the stresses are applied, for example, direct, alternating, etc., whether the stress is distributed homogeneously throughout the material, or inhomogeneously, and whether the rates of shear are constant or variable. There were some sixty instruments grouped in this way. The exhibition was open during most of the Congress, and Dr. R. N. J. Saal gave a short informal address describing the exhibits and their classification.

On the evening of September 23 an informal dinner was held, Prof. H. R. Kruyt presiding. Prof. Kruyt proposed the health of the delegates, and replies were made on behalf of Great Britain by Dr. G. W. Scott Blair, of the Continental countries by Prof. C. Sadron and of the United States by Dr. A. Voet.

Following the Congress, many delegates took part in a three-day trip by touring car to Arnhem and the State Mines in the Province of Limburg. On September 25 visits were paid to the General Rayon Union, to the Staple Fibre Factory of the A.K.U., to the Netherlands Shipbuilding Experimental Station at Wageningen and to the Central Food Products Research Station. On September 26 there was a visit to the Arnhem Battlefield and on September 27 to the Central Experimental Station of State Mines at Treebeck.

The Congress was very well organised, although, in spite of the quite remarkable recovery already made, conditions in Holland are at least as difficult as they are in Britain. The Dutch organising committee must have worked extremely hard in preparing the Congress, and the unfailing kindness and help which we received from all our Netherlands colleagues, and especially from Prof. J. M. Burgers (chairman), Dr. R. Houwink (first secretary) and Dr. G. E. Rotgans (organising secretary), will long be remembered. (As Dr. Houwink said at the dinner, Dr. Rotgans turned out to be "not a bad goose, but a very good goose indeed!")

Although in existing circumstances it was felt to be unwise to fix a date and place for the Second Congress, it was the general feeling both in the Congress itself and within the International Joint Committee that congresses of this kind should be held about every four years, and the hope was expressed that the Joint Committee should recommend the calling of a Second Congress in due course.

The *Proceedings* of the First Congress will be published shortly and will be available at an approximate cost of £2 8*s*. G. W. SCOTT BLAIR

NATIONAL RESEARCH COUNCIL OF CANADA

ANNUAL REPORT

THE thirty-first annual report of the National Research Council of Canada (Ottawa) covers the year ended March 31, 1948, and includes the report of the president, Dr. C. J. Mackenzie, together with the financial statement. The total expenditure during the year amounted to just over 6·9 million dollars; almost a further quarter of a million dollars was expended on work carried out at the request of Government Departments and provided for by them, apart from the 7·646 million dollars received in other ways, including parliamentary appropriations of 6·351 million dollars. To cope with the expanding programme, facilities have been extended and the staff now total more than 2,300, of whom a thousand, half of them scientific workers, are working at the atomic energy project at Chalk River. The operating branch for the production and extraction of isotopes was organised during 1947, and branches of the project are concerned with the problems of operating the low-energy ZEEP and the higher-powered experimental NRX piles and handling their highly radioactive products safely and effectively. Attempts are being made to spread the new techniques and knowledge to the universities and other research institutions in Canada, and thus to foster research in these fields.