

THE BRITISH SOCIETY OF RHEOLOGY

BULLETIN — No. 2, 1961

HISTORY
NOT TO BE REMOVED
FROM
FILE.

Hon. Secretary :

DR. M. F. CULPIN,
8 The Broadway,
Pontypool,
Monmouthshire.

Hon. Editor (Bulletin) :

MR. J. F. HUTTON,
"Shell" Research Ltd.,
P.O. Box No. 1,
Chester.



THE BRITISH SOCIETY OF RHEOLOGY

New Members

Elected 19th April, 1961.

NAME AND ADDRESS	INTERESTS
S. D. Carlill, Dept. of Physiology, R.F.H. School of Medicine, 8 Hunter Street, London, W.C. 1.	Anomalous flow properties of blood. Horizontal rotating viscometer. Blood flow <i>in vivo</i> .
Dr. I. Ll. Thomas, Welsh School of Pharmacy, Welsh College of Advanced Technology, Cathays Park, Cardiff.	Viscometers for use with non-Newtonian fluids. Materials:—phosphatides, bentonite, gelatin, agar, acacia, tragacanth, etc.
Dr. H. Markovitz, Mellon Institute, Pittsburgh 13, Pa., U.S.A.	Polymers and their solutions, linear visco-elasticity, non linear phenomena.
Dr. G. B. Thurston, Department of Physics, Oklahoma State University, Stillwater, Oklahoma, U.S.A.	Wave propagation and oscillatory flow.
J. A. Blackburn, 135 Eton Hill Road, Radcliffe, Nr. Manchester, Lancs.	Rotational viscometry; pigment dispersions in non-aqueous media, elastomers; rheolo- gical properties of nitro-cellulose and ethyl cellulose emulsions; relationships of rheo- logical properties of printing inks to printability.
M. C. Nally, 18 Rutherford Sq., East Kilbride, Glasgow.	Flow of visco-elastic liquids.
Dr. A. de Vries, Centre de Recherches—St. Gobain, 182, Avenue Aristide Briand, Antony (Seine), France	Polymers, glass, suspensions.
J. Tochon, Centre de Recherches—St. Gobain, 52 Boulevard de Villette, Paris, 19 ^e , France.	Polymers, glass.
G. Pezzin, Universita di Padova, Istituto di Chimica Fisica, Via Loredan, 4, Padova, Italy.	
Dr. J. Meissner, Ludwigshafen/Rhein, Wittelsbachots 58, Germany.	Polymer melts, rheometric measurements and processing methods.

Victoria (Australia) Branch

NAME AND ADDRESS	INTERESTS
R. E. Price, c/o Central Research Laboratories, I.C.I. A.N.Z. Ltd., Newson Street, Ascot Vale, Victoria, Australia.	Melt properties of polymers. Weissenberg effect, visco-elasticity.
I. C. McDowall, c/o School of Architecture, University of Melbourne, Parkville N.2, Victoria, Australia.	
A. J. Gaskin, c/o Chemical Research Laboratories, C.S. I.R.O., Box 4331 G.P.O., Melbourne, C.1., Victoria, Australia.	Suspensions and pastes, cements, concretes, clays, sands, rotational viscometry, yield, dilatant systems.

Changes of Address.

- CAMERON, K. M., MR.
12 Mayfield Drive, Woods Close, Stapenhill, Burton on Trent, Staffs.
- CLAASSENS, J. W., PROF.
Dept. of Dairy Science & Technology, Faculty of Agriculture, University of the O.F.S., Private Bag, Bloemfontein, O.F.S., South Africa.
- FREEMAN, P. R., MR.
Defence Research Staff, British Embassy, 3100 Massachusetts Avenue, N.W., Washington D.C., U.S.A.

News of Members

We regret to announce the death of Dr. J. Brooks on 2nd October, 1960. Dr. Brooks joined the Society in 1951 and worked at the Low Temperature Research Station, Cambridge.

Mr. N. Wookey has been appointed a Director of Scribbans-Kemp (Research & Development) Ltd.

Dr. L. Grunberg has been appointed Superintendent of Fluids Group of the National Engineering Laboratory, East Kilbride, with the rank of Deputy Chief Scientific Officer.

Dr. J. Lamb of the Department of Electrical Engineering, Imperial College, has been appointed Professor of Electrical Engineering, at the University of Glasgow. He will take up his new duties on 1st September, 1961.

At the Inaugural Meeting of the Victoria (Australia) Branch the following officers were elected:

Branch President: Mr. R. S. T. Kingston, Division of Forest Products, C.S.I.R.O., P.O. Box 310, South Melbourne, SC5.

Branch Hon. Secretary: Dr. P. U. A. Grossman, Division of Forest Products, C.S.I.R.O., P.O. Box 310, South Melbourne, SC5.

Branch Hon. Treasurer: Mr. E.R. Ballantyne, 23 Hartlands Road, East Ivanhoe, N21.

Ordinary Members: Dr. H. A. J. Battaerd, Mr. B. D. Craven, and Mr. K. R. Hall.

In the New South Wales (Australia) Branch, Dr. A. A. Palmer Kanematsu Institute of Pathology, Sydney Hospital, has succeeded Dr. N. W. Tschoegl as Branch Hon. Treasurer. Professor R. C. L. Bosworth (Branch President) will deliver a series of six lectures on "Viscoelasticity" in June and July at the University of New South Wales.

Mr. H. G. Muller, Spillers Ltd., Station Road, Cambridge, has written to tell us that on April 24th, 1961 a "Cambridge Rheology Club" was formed. Fourteen Cambridge rheologists were present. The aim of the club is to hold informal discussions among members trained in different disciplines and to try to help each other in solving problems. At a meeting in May Dr. D'A. Kok a haematologist and Dr. P. A. G. Munro an anatomist led a discussion on the rheology of body fluids.

Recent Meetings.

The British Society of Rheology held a very successful meeting, attended by some 60 members, at the National Institute for Research in Dairying, Shinfield, Reading, on the 20th and 21st April 1961. The general heading for the Conference was "Theoretical Rheology" with particular emphasis on non-Newtonian behaviour. Pre-prints of the papers were available.

Dr. J. R. A. Pearson (Cambridge University), on the subject of "Non-Newtonian Flow and Die-Design," explained in terms of simplified non-Newtonian fluid models the persistence of flow defects caused by obstructions in a flowing polymer stream. These obstructions arise from the need to give mechanical support to the die. Dr. F. C. Roesler (I.C.I., Billingham Division) considered the rolling compaction process in which a powder is transformed into a compact solid by feeding it continuously from a hopper into a system of counter-rotating rollers: the mathematical description of the field of pressure and flow between the rollers was condensed into a single differential equation for which suitably chosen families of solutions were considered. These papers were notable contributions to the understanding of important technological processes. Their particular significance lay in

the ability of the respective authors to reduce a complex practical system to its essential components and then to set up the fundamental equations on which further mathematical analysis was based.

Two excellent accounts by recognised authorities on the basic ideas underlying complex mathematical analyses were given, one by Professor A. E. Green (King's College, Newcastle-upon-Tyne) under the heading "Some Topics in Non-Linear Continuum Mechanics"; and the other by Professor J. G. Oldroyd (University College, Swansea) on "Finite-strain Viscoelasticity." Both speakers examined critically the fundamental origins of their theories and the validity or otherwise of the models which are used. The clarity with which these concepts were explained was greatly appreciated and very useful.

Dr. J. R. Jones (University College, Swansea) gave a detailed analysis of the flow of non-Newtonian liquids in pipes both straight and curved with a central core present, and attention was given to the problem of eccentricity of this core.

Problems of stress wave propagation in anisotropic media illustrated in terms of media of hexagonal symmetry were outlined by Mr. M. J. P. Musgrave (National Physical Laboratory) who showed to first order the velocity and slowness surfaces are unchanged in the presence of small absorption.

A creep law for strain-hardening materials and its consequences under conditions of primary flow was considered by Dr. G. Capriz (English Electric Company Ltd.) Cases both of simple tension and complex stress were considered and new suggestions put forward to explain primary creep under complex stress.

Dr. P. Feltham (Leeds University) presented the results of experiments on observation of the logarithmic law of stress relaxation under constant strain in the range 77 to 358°K, in copper, iron and brasses. The relaxation strength increased sharply with temperature, and the behaviour was explained in terms of a theoretical model in which small local shears take place in constant stress gradients, the rate of shearing being controlled by a strongly stress-dependent activation energy.

A detailed analysis was given by Dr. T. Ll. Richards (College of Advanced Technology, Birmingham) of the significance of the strain ellipsoid in large plastic strain: a new definition was put forward of the plasticity of solids to cover the full range from brittle to ideally plastic solid. Various implications and applications of the strain ellipsoid were considered, including the derivation of the shear systems in cubic metal crystals and the deformation textures.

The meeting concluded with an afternoon visit to the laboratories of the Physics Department of the National Institute for Research in Dairying.

Papers read to the Victoria (Australia) Branch include "Characterisation of linear viscoelastic behaviour" by Dr. N. W. Tschoegl

(Bread Research Institute, North Ryde) on 1st March, 1961, and "The Rheological properties of surface films and their molecular interpretation" by Prof. A. E. Alexander (University of Sydney) on 7th June, 1961. Activities of the New South Wales (Australia) Branch have included "Non-linear viscoelasticity, hydrogen bonding and physical properties of wool fibres" by Mr. N. Feughelman (Division of Textile Physics, C.S.I.R.O.) and "Dynamics of thixotropic recovery" by L. Dintenfass (Branch Secretary).

Among the papers presented at the April Meeting, at Sheffield, of the Society of Glass Technology were two on the use of glass as a lubricant: "Lubrication in metal forming" by Dr. J. F. Wallace (University of Sheffield) and "The use of glass in the hot forming of metals" by M. J. Sejournet (Compagnie du Filage des Métaux et des Joints Curty, Paris 8).

The programme of the joint meeting of the Deutsche Rheologen Vereinigung and the Deutsche Rheologische Gesellschaft held at Bad Oeynhausen on the 10th and 11th April, 1961 was as follows:

"Liquids with singular flow behaviour in the rest state (quasi plastic liquids)" by Dr. H. Giesekus, (Farbenfabriken Bayer A.G., Leverkusen).

"Measuring techniques for characterising the consistency of oleogels", by Prof. Dr. H. Dunken (Universität, Jena).

"On the measurement of thixotropy: an attempt at a phenomenological theory of this measurement and a practical application", by Prof. Dr. M. Matschinski (Soc. Française de Géochimie, Paris).

"On the viscometry of structure viscous liquids at high values of rate of shear", by Dr. K. Kirschke (Bundesanstalt f. Materialprüfung, Berlin-Dahlem).

"On the viscosity dependence of frictional losses in an internal combustion engine", by E. von Eberhorst (B.P., Hauptverwaltung, Hamburg).

"On the measurement of the complex E and G. moduli during plastic deformation", by W. Pechold (T.H., Stuttgart).

"Investigation with models of the flow processes in deep drawing presses", by Prof. Dr. H. Hertel (Technische Universität, Berlin).

"Operational peculiarities of a Höppler viscometer having a very small gap width, observed in the determination of the pressure dependence of the viscosity of water near 500 atmospheres and at 160°C", by Dr. W. Weber (Physikal. Techn. Bundesanstalt, Braunschweig).

"Measurement of the viscosity of high polymer melts at pressures of 1 to 2000 kp/cm²", by V. Semjonow (Deutsche Kunststoff-Inst., Darmstadt).

"The temperature control of a high pressure viscometer", by Dr. J. Schurz (Universität, Graz).

"The temperature change of viscosity of silicic acid, germanium dioxide and boric acid in the molten state" by R. Brückner (Max Planck Inst. f. Silikatforschung, Würzburg).

"On an apparatus for the determination of the shear modulus and Poisson's ratio at one frequency", by C. J. Nederveen (T.N.O., Delft).

"Damping of oscillations in Li-Ba-silicate glasses", by Dr. M. Coenen (Max Planck Inst. f. Silikatforschung, Würzburg).

"The measurement of rheological properties of foils in the audio-frequency range", by Dr. W. Hoffmann (Farbenfabriken Bayer A.G., Leverkusen).

"The permanent viscometer, Leib system" by Dr. H. Kühlewein (Bad Wiessee).

On the 8th May, 1961, the Nederlandse Reologische Vereniging held a meeting on "Mechanical and Dielectric Relaxation Phenomena". The following papers were read:

"High resolution nuclear resonance spectra of high polymers" by Dr. U. Johnsen (Kunststoffinstitut, Darmstadt).

"Dielectric relaxation in crystalline polymers" by Dr. C. A. F. Tuijnman (Centraal Lab. Staatsmijnen, Geleen).

"The influence of fillers on the mechanical properties of rubber vulcanizates" by Dr. B. I. C. F. van Pul (Rubberinstituut, T.N.O., Delft).

On the 30th May, 1961, in Stockholm, the following papers were read at a conference of the Swedish Society:

"Creep and stress relaxation in crystalline solids at low temperatures Parts I and II", by P. Feltham (University of Leeds).

"Thixotropic flow processes", by B. Järse (Henken-Helios A.B., Stockholm).

"The study of non-Newtonian flow of macromolecular solutions using capillary viscometers", by U. Lohmander (Uppsala Universitet).

Future Meetings

The joint meeting of the British Society of Rheology and the Non-Destructive Testing Group of the Institute of Physics and Physical Society on "*Rheological Techniques*", will be held at the Imperial Hotel Llandudno on 21st and 22nd September, 1961.

The present plan for the Spring, 1962, meeting of the B.S.R. is a conference on "*Soil Mechanics*" to be held in London. Further details will be published when they become available. However, any Members

who may have suitable papers for this conference should write to Mr. G. K. Jones, The Copyhold, Nutfield Road, Redhill, Surrey.

Two subjects for future meetings have been suggested by Members. One is the rheology of emulsions: the other is the temperature dependence of viscosity, particularly of Newtonian materials. The Secretary would be pleased to receive comments on these proposals.

The Annual General Meeting of the Victoria (Australia) Branch will be held on 6th September, 1961, and will be followed by the paper "*Extrusion and flow of polymers*" by Mr. R. E. Price (I.C.I.A.N.Z.) Mr. O. G. Ingles (C.S.I.R.O.) will read a paper, "*Molecular forces and rheology in clay soils*" on 6th December, 1961.

The New South Wales (Australia) Branch plans to hold a three-day symposium on "*Theoretical and Applied Rheology*" in August 1962. Intending contributors and participants should write to Mr. L. Dintenfass, School of Chemical Technology, P.O. Box No. 1, Kensington, N.S.W., Australia.

The 32nd Annual Meeting of the U.S. Society of Rheology will be held at the University of Wisconsin, Madison, Wisconsin on 30th October to 1st November, 1961. Local arrangements are in the hands of Prof. J. D. Ferry of the University of Wisconsin and the technical programme is in the charge of Dr. E. A. Collins (B. F. Goodrich Chemical Co., P.O. Box No. 122, Avon Lake, Ohio). Titles of proposed papers should reach Dr. Collins as soon as possible and abstracts by 15th August. A special symposium on "*The rheology of paper coatings*" is being considered.

The Fourth International Congress on Rheology will be held at Brown University, Providence, R.I., from 26th to 30th August, 1963. Dr. R. S. Marvin of the National Bureau of Standards and Prof. R. S. Rivlin of Brown University have been appointed Co-Chairmen. Communications and enquiries should be addressed to Prof. Rivlin.

A technical meeting of the Society of Glass Technology will be held at Stratford on Avon on 18th to 21st October, 1961. Further details may be obtained from the Assistant Secretary, Thornton. Hallam Gate Road, Sheffield, 10. The 6th International Congress on Glass will take place in Washington, D.C., U.S.A., on 8th—14th July, 1962. Prof. R. W. Douglas, at the above address, is the British representative for the organisers of the Congress.

The 6th Congress of the International Society for Fat Research will be held in London from 9th to 13th April, 1962. The Congress Secretariat is at the headquarters of the Society of Chemical Industry, 14 Belgrave Square, London, S.W.1.

In previous issues of the *Bulletin* we have published the titles of symposia to be held during the Third Congress of the European Federation of Chemical Engineering in 1962. The Society of Chemical Industry in

announcing a fourth title, "The physics and chemistry of high pressures", have declared the programme completed. It is as follows:

20th June, 1962, "Process optimisation".

21st to 23rd June, 1962, "Interaction between fluids and particles".

25th June, 1962, "The handling of solids".

26th to 28th June, 1962, "The physics and chemistry of high pressures".

"Biorheology"—A New Journal

Pergamon Press Ltd., Headington Hill Hall, Oxford, have announced a new international journal entitled "*Biorheology*". It is hoped that the first number will be issued in January, 1962. Initially, the journal will be published quarterly but, if the demand justifies it, the rate will be increased to monthly in due course. The Editors-in-Chief are two distinguished Members of the British Society of Rheology, Prof. A. L. Copley of the New York Medical College and Dr. G. W. Scott Blair of the National Institute for Research in Dairying, University of Reading.

The general scope of the journal will be evident to rheologists. It will be concerned with processes in the living organism and with materials originating from the organism. However, studies on substances of biological origin which belong exclusively to technology will not be included. Subjects of interest will include the flow of blood, protoplasmic streaming, flow of lymph, synovial fluid, cerebrospinal and intraocular fluids, properties of cervical mucus and semen, bronchial mucus, strength of bone and cartilage, rheology of muscle, coagulation of blood or milk, flow properties of mucopolysaccharides and desoxyribonucleic acid.