

HISTORY
NOT TO BE REMOVED
FROM
FILE.

THE
BRITISH SOCIETY
OF RHEOLOGY

BULLETIN — No. 4, 1959

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 approved 15th September, 1959.

NAME AND ADDRESS.	INTERESTS.
Dr. J. O. Cutter, c/o Goodlass, Wall & Co., Ltd., Goodlass Road, Speke, Liverpool, 24.	Suspensions of powders in liquids.
Dr. B. K. Drake, Olof Skötkonungsgatan 66, Gothenburg S, Sweden.	Subjective and objective methods of measuring consistency (viscosity, elas- ticity, etc.) of various foods.
B. S. E. Farrow, 82 Woodford Road, Bramhall, Stockport, Cheshire.	Textile fibres, extensometry.
C. P. Jeffreson, Courtaulds (Australia) Ltd., Tomago, New South Wales, Australia.	Fibres.
L. V. Judd, Courtaulds (Australia) Ltd., Tomago, New South Wales, Australia.	Polymers, visco-elastic materials, liquids. General.
W. A. Kalenich, I.B.M. Research Library, Box 218, Yorktown Heights, New York, U.S.A.	General.
C. S. Landau, Aero Research Laboratories, Box 4331, G.P.O., Melbourne, Australia.	Metals and Alloys.
Dr. N. S. Parker, Products Research Department, Rowntree & Co. Ltd., The Cocoa Works, York.	Viscosity of concentrated suspension. Rotational viscometry.

New members approved 15th October, 1959.

Dr. J. R. A. Pearson, 3 Graysfield, Welwyn Garden City, Herts.	Theoretical treatment of flow of Newton- ian and non-Newtonian fluids.
Miss G. Raumann, Flat 3, 105 Cheadle Road, Cheadle Hulme, Cheshire.	Mechanical properties of anisotropic polymers.
Prof. F. Reimann, Istanbul-Capa Institute for Medical Research, Turkey.	Blood.
Dr. J. Scudder, 547 Riverside Drive, New York 27, New York, U.S.A.	Bio-rheology.

B. Warburton,
The Distillers Co. Ltd.,
Research & Development Dept.,
Great Burgh,
Epsom, Surrey.

Mechanical dynamic and creep properties
of solid polymers.

N. E. Waters,
43 Digswell Rise,
Welwyn Garden City, Herts.

Visco-elastic phenomena of high poly-
meric materials.

News of Members.

Events are moving rapidly in Australia. In Bulletins 2 and 3 1959, we reported the progress made by Dr. P. U. A. Grossman in forming an Australian Branch of the British Society of Rheology. The programme of the first scientific meeting, given elsewhere in this Bulletin, is evidence of the great interest in rheology shown in Australia. Now we hear of the proposed formation of a second Australian Branch. The Acting Secretary of the new Branch is Mr. L. Dintenfass (School of Chemical Engineering, University of New South Wales, P.O. Box No. 1, Kensington, N.S.W.). Mr. Dintenfass informs us that he has received help and advice in his new venture from Dr. Grossman. Problems of nomenclature have always beset rheology; for the time being we shall refer to the new groups as the Australian (Victoria) Branch and the Australian (N.S.W.) Branch. The Australian (N.S.W.) Branch had its first informal meeting on 26th October, 1959, which was attended by twenty people. An interim Committee was formed with Prof. R. C. L. Bosworth as Chairman. A second meeting will be held on 2nd February 1960 when it is hoped that the views of the committee of the British Society of Rheology will be known.

Recent Meetings.

The Annual General Meeting of the British Society of Rheology was held on 14th September 1959, during the Autumn conference at Imperial College. Professor Richardson was in the Chair.

The reports presented by Mr. N. Wookey (Hon. Secretary) and Mr. D. W. Jopling (Hon. Treasurer) were the last by these gentlemen for according to the rules they were not eligible for re-election to their respective offices. It should not go unnoticed that on motions from the Chair special thanks were recorded for Mr. Wookey and Mr. Jopling for their considerable good work for the Society during the past four years.

Also according to rule Professor Richardson retired from office as President after a fruitful two years. Dr. H. Kolsky was elected President.

Other items of note: Officers and Committee for 1959-60; Accounts for year ending 30th June, 1959, and a statement on Income Tax Relief for annual subscriptions are presented at the end of this Bulletin.

The Autumn meeting of the British Society of Rheology was held at Imperial College, London, jointly with the Acoustics Group of the

Physical Society. Our President, Prof. E. G. Richardson, who is also a leading figure in the Acoustics Group gave his Presidential address entitled "Aspects of the Rheology of Liquids." The aspects considered by Prof. Richardson were those with which he has been specially concerned in his own researches. For example, the rheological properties that influence the propagation of sound waves in liquids. Thanks largely to the efforts of Dr. R. W. B. Stephens and the Acoustics Group a high proportion of authors of the remaining papers were from overseas. These authors were Prof. P. Westervelt (Brown University), Dr. H. G. Flynn (Harvard University), Dr. T. A. Litowitz (Catholic University of America), Ir. J. Heijboer (T.N.O. Delft) and Dr. W. P. Mason (Bell Telephone, New Jersey).

A joint meeting of the Faraday Society (Colloid and Biophysics Committee) and the British Society of Rheology was held in Oxford on September 23rd and 24th 1959. The subject was "Flow Properties of Blood and Other Biological Systems."

The meeting was opened by Prof. P. A. Allison, F.R.C.S. Then followed an introductory lecture by Dr. A. S. Lodge who outlined the principles of rheology.

Several papers were read on the properties of the uterine cervix and its mucus. Drs. M. L. R. and D. R. Harkness discussed the remarkable properties of connective tissue at the time of parturition; Dr. F. K. Beller (Tübingen) spoke of the influence of hormonal factors on mucus consistency; and Dr. R. A. Gibbons and Mr. F. A. Glover described measurements of flow-birefringence of cervical mucoids. Bronchial mucus was discussed by Drs. J. C. White and P. Elmes.

Other systems dealt with were hyaluronic acid and hyaluronidase (Dr. H. J. Rogers), skeletal muscle (Dr. J. R. Bendall), fish products (Dr. J. J. Connell), D.N.A. solutions (Prof. J. A. V. Butler and Dr. A. B. Robins) and protoplasm (Prof. L. V. Heilbrunn, Univ. of Pennsylvania). Dr. G. W. Scott Blair described coagulation processes in milk which he compared, on the following day, with those in blood.

A general lecture on rheology of blood was given by Dr. L. E. Bayliss. Differential flow velocities in living bodies were discussed by Dr. R. L. Whitmore and velocity profiles in pulsatile flow by Dr. D. A. McDonald. Prof. A. L. Copley (New York) spoke on apparent viscosity and wall adherence, especially as affected by coating glass capillary walls with fibrin. Prof. S. Baez (New York) read a paper on pressure effects in living vessels and Dr. W. E. Stehbins discussed turbulence in the human vascular system.

In the afternoon session, Prof. H. H. Pfeiffer (Bremen) described measurements of dichroism and Prof. A. Katchalsky (Rehovot, Israel) discussed the rheology of individual erythrocyte membranes. Dr. H. Hartert (Heidelberg) spoke on the rheological significance of his "Thrombelastograph" which follows the process of blood clotting and Prof. K. Weissenberg demonstrated many applications of rheology to the study of biological systems.

Many of the techniques described in these papers (as well as a number of others) were illustrated in an Exhibition of apparatus shown in the laboratory. On the first evening, there was a dinner at St. John's College and on the last evening, a programme of scientific films. These illustrated and further developed the themes already described by Dr. D. A. McDonald and his colleagues, by Prof. S. Baez and by Prof. A. L. Copley, Dr. G. W. Scott Blair and their colleagues. Finally, Prof. M. H. Knisely (Charleston, U.S.A.) showed a film to illustrate his work on "sludged blood."

Other distinguished foreign visitors also presided at some of the sessions, including Prof. M. Reiner (Israel) and Prof. J. Scudder (New York).

Much of the success of the meeting was due to the excellent local organisation, in the hands of Dr. R. G. Macfarlane, F.R.S., who also acted as Hon. Treasurer.

The proceedings of the Conference will be published in book form early in the New Year under the joint editorship of Prof. A. L. Copley and Dr. G. Stainsby.

G.W.S.B.

The Thirtieth Anniversary Meeting of the Society of Rheology (U.S.A.) was held at Lehigh University on 4-6th November 1959. A total of 36 papers were on the programme and two Symposia (on Adhesion and on Mechanics of Continua) were included. During the meeting the 1959 Bingham Medal was presented to Dr. E. Orowan, Westinghouse Professor of Mechanical Engineering in the Massachusetts Institute of Technology. It will be recalled that from 1939-50, Prof. Orowan was Reader in the Physics of Metals at Cambridge University and during this period gave papers at meetings of the British Society of Rheology.

The programme of the Lehigh meeting was as follows:

"Rheological Measurements with the Brabender Plastograph," C. C. McCabe.

"The Influence of Viscometer Design on non-Newtonian Measurements," R. McKennell.

"Flow Down an Inclined Plane," Ray D. Hoffman and Raymond R. Myers.

"Remarks on Rheology in Europe," J. D. Ferry.

"The Rheology of Asphalt: II Flow Characteristics III. Dynamic Mechanical Properties," F. H. Gaskins, J. G. Brodnyan, W. Philippoff, and E. Thelen.

"Stress-Optical Properties of Silicones," W. Philippoff.

"Flow Properties of Lithium Stearate-Oil Dispersions," W. H. Bauer, D. O. Shuster and S. E. Wiberly.

"Rheology and Dental Materials," R. H. Roydhouse.

"On Anomalies in the Measurement of the Complex Modulus," S. H. Bodner.

- "Dynamic Compressibility of Natural Rubber Sulfur as a Function of Pressure, Temperature and Frequency," J. E. McKinney.
- "Concentration Dependence of the Stress-Optical Coefficient in Dilute Solution," W. Philippoff.
- "Thermodynamics of Stretching of Nylon Fibers," M. L. Williams.
- "Rupture of Rubber," L. Mullins.
- "Dynamics of Frictional Compressible Fluids-Application to Plastico-Dynamics," C. Torre.
- "Thermodynamics' Relationship to Rheology," H. Hull.
- "Modern Theories of Materials," C. Truesdell.
- "Stress Analysis for Viscoelastic Bodies Subject to Temperature Variation," L. W. Morland and E. H. Lee.
- "Hypo-Elasticity and Elasticity," B. Bernstein.
- "Theory of Anisotropic Fluids," J. L. Ericksen.
- "On the Concepts of Equilibrium in Continua. Parts I and II," B. D. Coleman and W. Noll.
- "Rheological Properties of Molecules in Fibers," F. H. Ree, S. Chang, T. Ree and H. Eyring.
- "The Significance of Rheology in the Making and Using of Paper," A. H. Nissan, H. G. Higgins and A. Lagani, Jr.
- "A Re-Interpretation of the Rouse-Bueche Theory of Viscoelastic Behaviour," R. S. Marvin.
- "Rheology in Search of Structures, Part II," A. Voet and W. N. Whitten, Jr.
- "The Behaviour of Particles in Laminar Shear," S. G. Mason.
- "Heat Transfer to non-Newtonian Fluids Under Laminar Flow Conditions," A. B. Metzner and D. F. Gluck.
- "Mechanism of Peeling," Y. Inoue and Y. Kobatake.
- "Theory and Analysis of Peel Adhesion: Bond Stresses and Distribution," D. H. Kaelble.
- "Experiments on Peeling," J. J. Bikerman.
- "The Peeling Force of Adhesive Joints," F. S. Chang.
- "The Tensile Strength and Tacky Behaviour of Polymeric Liquids," R. A. Erb and R. S. Hanson.
- "Fluid Mixing in Agitated Vessels," A. B. Metzner, K. W. Norwood and J. S. Taylor.

On the 18th November, 1959, the Nederlandse Reologische Vereniging jointly with the Nederlandse Natuurkundige Vereniging (Physical Society) held a meeting in Delft. It took the form of a symposium on the mechanical behaviour of viscoelastic materials. The following papers were presented.

"General introduction," Prof. Dr. A. J. Staveman (Rijksuniversiteit, Leiden).

"Survey of the theory of mechanical relaxation phenomena," Dr. F. Schwarzl (Centraal Laboratorium T.N.O., Delft).

"Thermodynamic treatment of relaxation phenomena," Prof. Dr. H. Meixner (Technische Hochschule, Aachen).

"Mechanical spectroscopy and molecular movements," Ir. J. Heijboer (Centraal Laboratorium T.N.O., Delft).

"The use of viscoelastic spectra in practice," Ir. C. van der Poel (Kon./Shell Laboratorium, Amsterdam).

"The physical properties of invert glasses and conventional glasses," Dr. J. M. Stevels (Philips, Eindhoven).

FUTURE MEETINGS.

Spring Meeting 1960.

The British Society of Rheology will hold a meeting in Manchester on April 7th and 8th 1960. Accommodation has been arranged at Ashburne Hall: part of the meeting will be held in the Reynolds Hall of the College of Technology. The meeting will include sessions on lubrication, disperse systems and the methods and concepts of rheology. Visits will be arranged to Jodrell Bank, the Fluid Motion Laboratory of the University, the Shirley Institute, or the British Rayon Research Association. Full details can be obtained from the Hon. Secretary.

It is proposed to hold a meeting on the rheology of polymers later in the year. Dr. D. W. Saunders, British Rayon Research Association, Heald Green Laboratories, Wythenshawe, Manchester 22, is organising this, and would welcome offers of contributions. A meeting on theoretical rheology has also been proposed. It is some years since a meeting of this kind was held. Contributors will be asked to present papers in such a way that they may be appreciated by those members without advanced mathematical training. The Hon. Secretary would be pleased to hear from possible speakers.

The date of the Australian (Victoria) Group symposium on Viscoelastic Systems has been changed to 16-18th February 1960. The Secretary, Dr. P. U. A. Grossman (Division of Forest Products, C.S.I.R.O., South Melbourne) reminds us that the proceedings will not be published. Contributions so far received are as follows:

"The influence of moisture changes on creep in wood. Experimental results," L. D. ARMSTRONG.

"High temperature behaviour of certain metals," D. L. AXELROD.

"Properties of oil-based and rubber-based glazing compounds," R. BALLANTINE.

"The long term behaviour of gypsum plaster," F. A. BLAKEY (or colleague).

"A review of creep studies on concrete," F. A. BLAKEY.

"Visco-elasticity, compression and incipient bonding in a draining fibre pad," J. DE YONG and H. C. HIGGINS.

"Thixotropy, dilatancy and elastacity in fluid colloidal systems," L. DINTENFASS.

"Hygro-plasticity of wool," M. FEUGHELMAN.

"Weissenberg's equation of rheological state—An interpretation of the assumptions made and their application to laminar shear of elastic liquids," P. U. A. GROSSMAN.

"The rheological behaviour of hydrogen-bonded materials," H. G. HIGGINS.

"Collapse and set in wood cells," W. G. KAUMAN.

"Rheological behaviour of wood at high stress levels—Including an interpretation in terms of reaction rate theory," R. S. T. KINGSTON.

"A micro-viscometer for the measurement of the properties of bitumen," K. MARTIN.

"The relationship between paper structure and fracture patterns," A. MCKENZIE.

"Evidence for variable diffusion coefficients in wool from sorption and torsion measurements," P. NORDON.

"Some theories of visco-elasticity from the point of view of rate processes," B. J. RIGBY.

"Rheological studies on cereal and protein monolayers," N. W. TSCHOEGL.

The following meetings of the Institution of Mechanical Engineers will all be held at the Institution Headquarters, 1 Birdcage Walk, S.W.1. A symposium on "Recent mechanical engineering developments in automatic control" on 5-7th January, 1960. A number of speakers will be from overseas and an exhibition will be staged. An ordinary meeting on "The strength of rails with particular reference to rail joints" by S. Wise, D. Lindsay, and I. G. T. Duncan on 13th January, 1960, at 6.00 p.m. A Lubrication Group discussion on "Water lubrication" on 23rd February, 1960 at 6.00 p.m. An Applied Mechanics Group discussion on "A replica technique for measuring static strains" introduced by V. M. Hickson on 24th March, 1960, at 6.00 p.m.

Meetings of the Plastics Institute will include: a Young People's Lecture on "Sticky Plastics," by N. A. de Bruyne (Ciba (A.R.L.) Ltd.), to be held on 1st January, 1960, at the Institution of Electrical Engineers, W.C.2, at 2.30 p.m.; a conference on "Polymeric Progress" in the William Beveridge Hall, Senate House, W.C.1 on 30th-31st March, 1960.

The Textile Institute will hold the "Second Quinquennial Wool Textile Research Conference" at Harrogate on 18-27th May, 1960,

and the Institute's "Annual Conference" in London on 30th May-3rd June, 1960.

The Institution of Chemical Engineers will hold a meeting in the rooms of the Geological Society, Burlington House, W.1. on 22nd March, 1960, at 5.30 p.m. to hear a paper on "The flow of granules through apertures," by R. L. Brown.

Two papers of possible interest to members will be read to the Surface Activity Group of the Society of Chemical Industry at 14 Belgrave Square, S.W.1. The first, "Emulsions in theory and practice," will be given by Dr. C. G. Sumner on 11th January, 1960, at 5.30 p.m. and the second "The colloidal stability of natural rubber latex," by Dr. E. G. Cockbain on 29th February 1960, also at 5.30 p.m.

International meetings in 1960 will include: "The 7th International Congress of Soil Science" at Madison, Wisconsin on 15-20th August, "The 10th International Congress of Applied Mechanics" at Stresa, Italy on 31st August-7th September, and "The 3rd International Congress of Surface Activity" at Cologne, Germany on 12-17th September.

New Journals.

The Society of Glass Technology, whose Honorary Secretary is Prof. R. W. Douglas of the University of Sheffield, have recently announced a change in their publication policy. The Journal of the Society of Glass Technology will be replaced by two new journals. Glass Technology and Physics and Chemistry of Glasses. Both will be published bi-monthly from February 1960. Glass Technology will contain reports of applied science on such matters as product manufacture, control and testing. Physics and Chemistry of Glasses will contain reports of original studies both theoretical and experimental on, for example, thermodynamics, relaxation processes and viscosity.

Book Review.

"Physics as a Career"

Messrs. Chapman and Hall have just published for the Institute of Physics the 2nd Edition of Mr. Norman Clarke's book, "Physics as a Career." In the course of eighty pages, Mr. Clarke gives an excellent account of the kinds of post which a professional physicist may expect to find open to him. Not only are the relative prospects of the physicist in industry, government service, hospital, university, etc., summarised, but the atmosphere surrounding each type of employment is described. It is hard to imagine a more impartial discussion: the physicist himself must decide where to go. That is not to say that any VIth form or university student who takes physics and reads this book will be assured of a happy career. The important thing is for every teacher of physics to be quite sure that he is familiar with the subject of this book, so that he can advise when necessary. He will probably be able to give useful information to students of disciplines other than physics.

M.F.C.

Accounts for Year Ending 30th June, 1959

		INCOME.					EXPENDITURE.				
			£	s.	d.				£	s.	d.
1957-8						1957-8					
548	Balance on 1st July	...	647	14	6	165	Printing and distributing Bulletin and Nature reprints	...	194	17	10
243	Subscriptions, members	...	261	19	11	48	Committee and administrative expenses	...	51	13	5
29	„ subscribers	...	2	12	0	—	Subsidy of Meetings	...	6	10	0
12	Interest on P.O.S.B. a/c.	...	11	15	0						
8	From advertising appointments vacant	...	10	10	0						
1	Excess Income from Meetings	...	—	—	—						
17	Casual Sales of Bulletins	...	—	—	—						
3	From Internat. Cong. Trust Fund	...	—	—	—	648	Balance on 30th June	...	681	10	2
861			£934	11	5	861			£934	11	5

DOUGLAS W. JOPLING,
Hon. Treasurer.

ALAN G. WARD,
Hon. Auditor.

5th August, 1959.

LIST OF NATIONAL SOCIETIES OF RHEOLOGY.

Britain: Dr. M. F. Culpin, Hon. Sec., British Society of Rheology, 8 The Broadway, Pontypool, Monmouthshire, U.K.

France: Prof. H. Weiss, Office National des Universities et Ecoles Francaises, 96 Boulevard Raspail, Paris VIe, France.

Germany: Dipl. Ing. K. Kirschke, Der Rheologische Gesellschaft DRG EV, Berlin Dahlem, Unter den Eichen 87, Germany.
Dr. Meskat, Deutsche Rheologen-Vereinigung e.v., Geschäftsstelle, Dormagen, Bahnhofstrasse 9, Germany.

Japan: Dr. B. Tamamushi, 1321 Shimo-Ochiai 3, Shinjuku-Ku, Tokyo, Japan.

Netherlands: Nederlandse Reologische Vereniging, Kring Reologie, Bond voor Materialenkennis, 's-Gravenhage, Parkstraat 69b, Holland.
Secretary, Dr. P. G. Meerman, Wienenweg 28, Brunssum (L), Holland.

U.S.A.: Mr. W. R. Willets, Titanium Pigment Corp., 99 Hudson Street, New York, N.Y., U.S.A.

Sweden: Dr. J. Kubat, Svenska Traforskningsinstitutet, Drottning Kristinas Vag 61, Stockholm (O), Sweden.

List of Representatives from Countries having a Group of Rheologists.

Australia: Dr. P. U. A. Grossman, 19 Mountain View Road, Nunawading, Victoria, Australia.

Mr. L. Dintenfass, School of Chemical Engineering, Univeristy of New South Wales, P.O. Box 1, Kensington, N.S.W., Australia.

Brazil: Prof. B. Gross, Instituto Nacional de Tecnologia, Avenida Venezuela 82, Rio de Janeiro, Brazil.

Israel: Prof. M. Reiner, 21 Kiriat Sefer, Ahnza, Haifa, Israel.

India: Dr. B. R. Seth, Indian Institute of Technology, Kharagpur, India.

B.S.R. Officers and Committee for 1959-60.

President: Dr. H. Kolsky, Armament Research and Development Establishment, Fort Halstead, SEVENOAKS, Kent.

Hon. Secretary: Dr. M. F. Culpin, 8 The Broadway, PONTYPOOL, Monmouthshire.

Hon. Treasurer: Mr. C. C. Mill, 19 Cray Avenue, ASHTEAD, Surrey.

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Hon. Editor (Abstracts): Dr. J. C. Vernon, 106 Monkswood Avenue, WALTHAM ABBEY, Essex.

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Mr. D. Jopling, 17 Kenton Park Crescent, Kenton, HARROW,
Middx.

Dr. R. Roscoe, King's College, NEWCASTLE-UPON-TYNE.

Dr. D. W. Saunders, B.R.R.A., Heald Green Laboratories,
Wythenshawe, MANCHESTER 22.

Mr. G. H. Tattershall, 32 High Storrs Drive, SHEFFIELD, 11.

Mr. R. W. Whorlow, Physics Department, Battersea College of
Technology, Battersea Park Road, LONDON, S.W.11.

Mr. N. Wookey, 52 Tavistock Road, EDGWARE, Middx.

Income Tax Relief for Annual Subscriptions.

The Society has been approved by the Commissioners of Inland Revenue for the purposes of Section 16 of the Finance Act, 1958, and members who qualify for relief under that Section will, in future, be able to claim the whole of their annual subscription as a deduction from their emoluments assessable to income tax under Schedule E.

In order to qualify for relief a member must be able to show that:

- (a) the subscription is defrayed out of the emoluments of his office or employment, and,
 - (b) the activities of the Society so far as they are directed to all or any of the following objects:
 - (i) the advancement or spreading of knowledge (whether generally or among persons belonging to the same or similar professions or occupying the same or similar positions);
 - (ii) the maintenance or improvement of standards of conduct and competence among the members of the profession;
- are relevant to the office or employment, that is to say, the performance of the duties of the office or employment is directly affected by the knowledge concerned or involves the exercise of the profession.

The first subscription for which relief may be claimed is that payable on 1 October, 1959. Members who are eligible for relief should apply to their tax offices as soon as possible for form P358 on which to make a claim for adjustment of their P.A.Y.E. coding. It is understood that members will not be required to produce a receipt for the payment of the subscription.