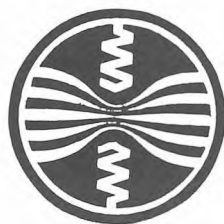


THE BRITISH SOCIETY OF RHEOLOGY

BULLETIN



1983, VOL. 26, NO. 2

CONTENTS

OFFICERS AND MEMBERS OF COUNCIL	I
EDITORIAL	II
'FADING MEMORY'	20
NEWS: OF MEMBERS	21
OF MEETINGS	25
ADVERTISEMENTS	28
DIARY	31

Hon Editor
Dr H A Barnes
Unilever Research
Port Sunlight Laboratory
Bebington, Wirral
Merseyside, L63 3JW

ISSN - 0045 - 3145



OFFICERS AND MEMBERS OF COUNCIL

President: MR. J. F. HUTTON, Thornton Research Centre, P.O. Box No. 1, Chester, CH1 3SH.

Secretary: DR. J. J. BENBOW, Department of Chemical Engineering, University of Birmingham, P.O. Box 363, Birmingham B15 2TT. (Telephone: 021-472-1301, ext. 3548)

Treasurer: MR. T. A. STRIVENS, Physics Section, Research and Development Department, ICI (Paints Division) Ltd., Wexham Road, Slough, Berkshire SL2 5DS.

Membership Secretary: DR. D. C-H. CHENG, Warren Spring Laboratory, Stevenage, Hertfordshire SG1 2BX.

Abstracts Editor: DR. D. R. OLIVER, Department of Chemical Engineering, University of Birmingham, P.O. Box 363, Birmingham B15 2TT.

Bulletin Editor: DR. H. A. BARNES, Unilever Research, Port Sunlight Laboratory, Bebington, Wirral, Merseyside, L63 3JW.

Ordinary Members:

DR. S. T. E. ALDHOUSE, B.P. Chemicals, Research and Development Department, Sully, South Glamorgan CF6 2YU.

DR. P. C. ANDERSON, B.P. Research Centre, Chertsey Road, Sunbury-on-Thames, Middlesex TW16 7LN.

DR. A. EVANS, Department of Surgery, Royal Victoria Infirmary, Newcastle upon Tyne. NE1 4LP

DR. T. E. R. JONES, School of Mathematical Sciences, Plymouth Polytechnic, Plymouth. PL4 8AA

DR. M. R. MACKLEY, Department of Chemical Engineering, University of Cambridge, Pembroke Street, Cambridge. CB2 3RA

DR. C. J. S. PETRIE, Department of Engineering Mathematics, University of Newcastle upon Tyne, Newcastle upon Tyne NE1 7RU.

EDITORIAL

One of the privileges of being the Honorary Editor of the Bulletin is becoming the custodian of a full set of bound back copies. On examining these, it became clear that in it's present form, the Bulletin contains much more information for and about Members than the first editions in the early 1940s.

It was originally incorporated with "Rheology Abstracts" and then only contained, on average, two and a half pages. When the Bulletin got its own Editor in 1958, it began to grow. By 1961 the average number of pages had doubled and by 1965 had doubled again. The present level of around 25 pages came about in the late 1960s. Since then, the size has varied from 12 to 32 pages with some "bumper numbers" in the early 1970s - the Information Retrieval Special Edition ran to 76 pages!

Obviously, these 40+ years have seen great changes, not least the price to Non-Members. In the 1940s it was 25p! Any comments Hon. Treasurer?

Apologies - to Chris Petrie and Jim Ferguson, whose names were missing in the last issue as the Contributors of Conference reports.

Help please! Articles for the Bulletin are still needed. The present form of printing makes line drawings easy to produce, thus lavish illustrations are welcome! We hope that in the near future we can run a series of articles on the new generation of "constant stress rheometers" - any contributions along these lines would be most welcome.

FADING MEMORY - AN OCCASIONAL SERIES

NO. 1 - MR. CLERK MAXWELL ON THE DYNAMICAL THEORY OF GASES.

The phenomena of viscosity in all bodies may be described, independently of hypothesis, as follows:—

A distortion or strain of some kind, which we may call S , is produced in the body by displacement. A state of stress or elastic force which we may call F is thus excited. The relation between the stress and the strain may be written $F=ES$, where E is the coefficient of elasticity for that particular kind of strain. In a solid body free from viscosity, F will remain $=ES$, and

$$\frac{dF}{dt} = E \frac{dS}{dt}.$$

If, however, the body is viscous, F will not remain constant, but will tend to disappear at a rate depending on the value of F , and on the nature of the body. If we suppose this rate proportional to F , the equation may be written

$$\frac{dF}{dt} = E \frac{dS}{dt} - \frac{F}{T},$$

which will indicate the actual phenomena in an empirical manner. For if S be constant,

$$F = ES e^{-\frac{t}{T}},$$

showing that F gradually disappears, so that if the body is left to itself it gradually loses any internal stress, and the pressures are finally distributed as in a fluid at rest.

If $\frac{dS}{dt}$ is constant, that is, if there is a steady motion of the body which continually

increases the displacement,

$$F = ET \frac{dS}{dt} + Ce^{-\frac{t}{T}},$$

showing that F tends to a constant value depending on the rate of displacement. The quantity ET , by which the rate of displacement must be multiplied to get the force, may be called the coefficient of viscosity. It is the product of a coefficient of elasticity, E , and a time T , which may be called the "time of relaxation" of the elastic force. In mobile fluids T is a very small fraction of a second, and E is not easily determined experimentally. In viscous solids T may be several hours or days, and then E is easily measured. It is possible that in some bodies T may be a function of F , and this would account for the gradual untwisting of wires after being twisted beyond the limit of perfect elasticity. For if T diminishes as F increases, the parts of the wire furthest from the axis will yield more rapidly than the parts near the axis during the twisting process, and when the twisting force is removed, the wire will at first untwist till there is equilibrium between the stresses in the inner and outer portions. These stresses will then undergo a gradual relaxation; but since the actual value of the stress is greater in the outer layers, it will have a more rapid rate of relaxation, so that the wire will go on gradually untwisting for some hours or days, owing to the stress on the interior portions maintaining itself longer than that of the outer parts. This phenomenon was observed by WEBER in silk fibres, by KOHLRATSCH in glass fibres, and by myself in steel wires.¹

MEMBERSHIP NEWS

The following applications for membership were approved at the April Council Meeting:

S J ARMOUR BSc, PhD fesa FG	Defence Research Establishment Suffield Ralston Alberta T0J 2N0 Canada
Dr C G de KRUIF ets FG	Van 't Hoff Laboratorium Rijksuniversiteit Utrecht Padualaan 8 3584 CH Utrecht The Netherlands
Peter A TOWERS BSc fesa CDL	Cadbury Schweppes Ltd Group Research Lord Zuckerman Research Centre University of Reading Whiteknights Reading Berks RG6 2LA
Barry James John WEBSTER petsa FGL	Standardised Food Products Ltd Whitehouse Industrial Estate Runcorn Cheshire WA7 3BJ
Alan BUCKLEY BSc, PhD petsa BCD	Celanese Research Company 86 Morris Avenue Box 1000 Summit New Jersey 07901 USA
Gerard PRILUTSKI BScH, MS et CD	Dept of Chemical Engineering University of Delaware Newark Delaware 19711 USA
Dr Jose Dolz RIPOLLES fetsa FGKM	Universitat Politecnica de Barcelona ETS Ing Camins, Canals i Ports Jordi Girona Salgado 31 Barcelona 34 Spain
Mark Scott BEHRENS BScH petsa DFGLN	University of Delaware Dept of Chemical Engineering Newark Delaware 19711 USA
Daniel F RYAN BE fetsa DN	University of Delaware Dept of Chemical Engineering Newark Delaware 19711 USA

Kenneth Gordon POWELL	University of Delaware Dept of Chemical Engineering Newark Delaware 19711 USA
BSChE petsa DO	
Ivan BROWNING	E R Squibb & Son Ltd Pharmaceutical Formulation Dept, I.D.L. Reeds Lane Moreton Wirral Merseyside
BPharm, MSc	
Brian HOULIHAN	Loctite (Ireland) Ltd Whitestown Industrial Estate Tallaght Co.Dublin Eire
TechDipl(ApplSc), GRSC feta CDFGH	
Prof Danièle SIGLI	École Nationale Supérieure des Industries Textiles de Mulhouse Laboratoire de Mécanique et Rhéologie 11 rue Alfred Werner 68093 Mulhouse cedex France
DSc fetsa DEGJKN	
Dominique DUPUIS	École Nationale Supérieure des Industries Textiles de Mulhouse Laboratoire de Mécanique et Rhéologie 11 rue Alfred Werner 68093 Mulhouse cedex France
Doctorat 3ème cycle petsa DEKN	
James FOXALL	British Gas London Research Station Michael Road Fulham London SW6
BSc, PhD feta IO	

RESIGNATIONS

Dr G J Addis, University of Glasgow, Dept of Materia Medica.

Dr T R B Lavin, Institute for Industrial Research and Standards,
Dublin, Ireland.

Dr J C Williams, Univeristy of Bradford, Postgraduate School
of Studies in Powder Technology.

R W Smith, Matthey Printed Products Ltd, Burslem, Stoke-on-Trent.

S.Bilgin, UMIST, Dept of Mechanical Engineering, Manchester.

DEATH

We regret to record the death of L W Turner of Surbiton, Surrey, in June 1982.

MEMBERSHIP CEASED BY RULE 4(d)

A Mellor, Hornsea Pottery Co Ltd, Hornsea, Yorks.

W L Wrieden, E R Squibb & Son Ltd, Moreton, Wirral, Merseyside.

A J Farnley, Cassio Photographic Paper Co Ltd, Watford, Herts.

Dr J C Reed, University of Tulsa, Oklahoma, USA.

S L Citroen, UCW, Dept of Applied Mathematics, Aberystwyth.

Dr M Bayliss, Fosco International Ltd, Nechells, Birmingham.

Dr N E Hudson, University of Strathclyde, Dept of Fibre Science, Glasgow.

Oldroyd Prize

A fund is being set up by Liverpool University to establish an Oldroyd Prize. Anyone wishing to give a donation should contact the Finance Officer, The University of Liverpool, P.O. Box 147, Liverpool. L69 3BX. Individual donations are limited to a maximum of £5. The society is donating £30 .

Travelling Grants

Applications for travelling grants are invited from student members who wish to attend conferences approved by the B.S.R. in the U.K. and abroad. The grants will be limited to the following ceilings: £50 in U.K. and £100 abroad. Applications accompanied by a reference from an academic supervisor should be sent in the first instance to the treasurer for later approval by the Council.

GOLD MEDAL AWARD

The 1983 Gold Medal Award has been made to Professor A S Lodge of the University of Wisconsin, USA, (previously of UMIST, UK). He expects to be able to receive the award at the BSR September Meeting in London. A full report of the presentation and citation will appear in Issue No. 4.

PROFESSOR H KOLSKY

Herbert Kolsky, Professor of Applied Mathematics and Engineering, Division of Applied Mathematics, Brown University, Providence, Rhode Island since 1960, is the 1982 recipient of the American Society of Mechanical Engineers' Worcester Reed Warner Medal. He will receive this award "for his pioneering contributions to the experimental and theoretical study of stress waves in elastic and inelastic solids", which, together with his book on this subject, have had a profound influence on successive generations of researchers.

From 1958 to 1960 he was President of the British Society of Rheology.

PROFESSOR G V VINOGRADOV

The 1982 Tribology Gold Medal has been awarded to Professor Georgi Vladimirovich Vinogradov, of the Institute of Petrochemical Synthesis at the Academy of Sciences of the USSR, in Moscow, for his outstanding service to the science and technology of friction and wear, particularly in the field of the physical chemistry of lubrication and the rheology of lubrication greases.



British Society of Rheology
and
Deutsche Rheologische Gesellschaft
in association with
EFCE Working Party on
Non-Newtonian Fluid Processing



Conference on
Engineering Rheology

**IMPERIAL COLLEGE
LONDON**

19 — 23 September 1983

This Conference is the third in the series on Chemical Engineering Rheology, following on from those held in Salford (1974) and Aachen (1979). Its aim is to bring together research workers and industrial engineers concerned with the flow, transportation, handling and processing of rheologically complex materials, including the characterisation of flow properties for engineering applications. Some sixty papers are to be presented; amongst the areas covered are complex fluid flow, rheology of homogeneous and multi-phase systems, rheological instrumentation, polymer processing, minerals handling and rheology of reacting systems.

Full details and registration forms may be obtained from:

Dr. G.C. Maitland,
Department of Chemical Engineering,
Imperial College,
London, SW7 2BY,
U.K.

THE INSTITUTION OF CHEMICAL ENGINEERS
(NORTH WESTERN BRANCH)



CALL FOR PAPERS

**Wet Solids Handling
Manchester, February 1984 –
call for papers**

Papers are invited for a one day symposium to be organised by the N W Branch and held in Manchester in February 1984 on the topic of *Wet Solids Handling*. The symposium will investigate aspects of handling a range of materials with significant moisture content such as damp powders, filter cakes, pastes and very high solids-content slurries which are normally difficult to handle or barely pumpable. Papers are welcomed which cover theoretical or practical aspects of handling these materials for a wide range of scales of operation and industrial applications. Summaries should be sent to Dr Bruce Duckham, Department of Chemical Engineering, University of Salford, The Crescent, Salford M54WT (tel: 061-736 5843 ext. 287).

Other new meetings

Polymer science

The Polymer Physics Group of The Institute of Physics and the Royal Society of Chemistry is holding its biennial conference on 14–16 September 1983. Entitled 'Physical aspects of polymer science', the conference will be held at the University of Reading.

Further details are available from Dr J V Champion, Honorary Secretary, Polymer Physics Group, Department of Physics, City of London Polytechnic, 31 Jewry Street, London EC3N 2EY.

Elasto-plasticity and creep

A one-day meeting of the Stress Analysis Group of The Institute of Physics will be held on the subject of recent developments in computational procedures for solving stress problems involving elasto-plastic and creep analysis. It is intended to hold the meeting on 13 October 1983 at a venue in London. Participants wishing to submit papers for presentation should send titles and summaries not exceeding 250 words to the programme organiser, Dr T K Hellen, Berkeley Nuclear Laboratories, Berkeley, Glos GL13 9PB, by 31 March 1983. Further details will be issued on request.

Materials under strain

The 3rd international conference on mechanical properties of materials at high rates of strain is to be held at the Department of Engineering Science, University of Oxford, on 9–12 April 1984. It is being co-sponsored by the Materials and Testing Group of The Institute of Physics, the Institution of Mechanical Engineers (Engineering Sciences Division) and the Department of Engineering Science at the University of Oxford.

The conference will be concerned with both experimental and theoretical approaches to the study of all aspects of mechanical behaviour involving high rates of strain.

Further information may be obtained from Dr J Harding at the Department of Engineering Science, Parks Road, Oxford OX1 3PJ.

A TECHNICIANS TRAINING COURSE IN VISCOMETRY

at

WARREN SPRING LABORATORY
STEVENAGE

28-29 JUNE 1983

The aim of this new 2 day **Training Course in Viscometry** is to introduce laboratory technicians and experimental workers to the latest developments in the operation and recommended practice for viscosity/non-Newtonian flow curve measurements on the instruments he/she routinely uses. Participants will be introduced to other viscometers, and made aware of the latest models on the market.

The numbers of those attending the course will be restricted to allow individual tuition.

Lectures

Practical Periods

Discussion Periods

Course Manual

Fees at £190 + VAT (£218.50 total at current VAT rate)
per participant.

Warren Spring Laboratory — Attention Mrs C A Moules
PO Box 20
Gunnels Wood Road
Stevenage
Herts SG1 2BX Telephone: Stevenage (0438) 3388.

Over the past decade the Applied Rheology section at the Laboratory has organised 1 week Training Courses in Fluid Rheology and 1-day Seminars on Suspension Rheology as part of its service to industry. These events have been aimed at rheologists, physicists, chemists or engineers who have responsibility for product formulation, quality and process control, process plant design, selection and operation. These events will continue to be held. The next 1-week course is from November 14 to 18, 1983.

WARREN SPRING LABORATORY



A Status Report PROCESS CONTROL VISCOMETRY CURRENT APPLICATIONS AND FUTURE NEEDS

A report to be made available to current and potential users or manufacturers of process control viscometers by Warren Spring Laboratory to aid more effective viscometer application in industry, to identify new applications and markets, and to define the need for new instruments for use on the more "difficult" materials.

What are the Advantages of Process Control Viscometers?

Properly applied, process control viscometers can give improved product quality, less product variability, less wastage and are essential aids to automation in many processes dealing with liquids, non-Newtonian fluids, suspensions or emulsions. Typical industrial applications are in oil blending, paper and board production, polymer production, food processing including chocolate blending, control of viscosity of paint or other coating fluids and printing ink.

Why are the Benefits of Process Control Viscometers so Little Exploited in Industry up to Now?

Despite the general acknowledgement that process control viscometers could provide significant economic advantages, there are real doubts as to the performance, effectiveness and reliability of the many available commercial instruments in typical industrial environments, especially for "difficult" products that are paste like, viscoelastic or thixotropic. Justification of the use of process control viscometers is often not easy, even though the economic case is likely to be strong and significant wider benefits can accrue in the production process.

How will the WSL Report Help?

The report will provide a reference document giving the best current practice in the use of process control viscometers in different industrial sectors, together with possibilities for wider application. The associated methods of control, and guidelines for the setting up and use of a process control viscometer will be given, with modern low cost microprocessor techniques being emphasised.

Further information

Dr Peter Bransby
Head, Materials Handling Division
Warren Spring Laboratory, DoI
Gunnels Wood Road
Stevenage
Herts
SG1 2BX

Telephone: Stevenage (0438) 3388



UNIVERSITY OF SURREY

Guildford Surrey GU2 5XH Guildford (0483) 71281

SERC CASE STUDENTSHIP

RHEOLOGY OF OIL WELL CEMENTS

Applications are invited for a CASE Studentship commencing in October, 1983. The project, which is expected to lead to a Ph.D degree, will be in collaboration with British Petroleum Co. Ltd. It will involve studies of the flow and thixotropic properties of materials used in oil well cementing. Applicants should hold, or expect to obtain, First or Upper Second Class Honours degrees in Materials Science, Physics, Civil or Mechanical Engineering. The work will be carried out in the Civil Engineering Department.

Applications, including the names of two Academic Referees and a Curriculum Vitae should be sent as soon as possible to Dr D J Hannant, Civil Engineering Department, University of Surrey, Guildford, GU2 5XH.

DIARY

- June 13-16 Capri, Italy:
European meeting on polymer processing and properties.
 (Societa Italiana di Reologia)
 Contact:
 Dr. Paolo Masi
 Istituto di Principi di Ingegneria Chimica
 Piazzale Tecchio
 80125 Napoli
 Italy
- Aug. 20-24 Baden-Baden, West Germany:
Fifth International Congress on Biorheology.
 Contact:
 Prof. Dr. K. Messmer
 Department of Experimental Surgery
 Zm Neuenheimer
 Feld, 347
 D6900
 Heidelberg 1
- Sept. 6-10 Bucharest, Rumania:
Viscoplasticity and applications.
 (Euromech 175)
 Contact:
 Professor N. Cristescu
 Faculty of Mathematics
 University of Bucharest
 Str. Academiei 14
 Bucharest 70109
 Rumania
- Sept. 19-23 London, England: *Engineering Rheology.*
 (B.S.R. and Deutsche Rheologische Gesellschaft)
 Contact:
 Dr. D. C-H. Cheng
 Warren Spring Laboratory
 (Ref: 116/43)
 P.O. Box 20
 Gunnels Wood Road
 Stevenage
 Hertfordshire
 SG1 2BX
- Dec. 8- 9 Cambridge, England:
Molecular and Microstructural Basis of Viscoelasticity.
 Contact:
 Dr. M. Lal
 Unilever Research
 Port Sunlight Laboratory
 Bebington
 Wirral
 L63 3JW

