

BULLETIN



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Hon. Editor:

M. CAMINA,

Paint Research Association,

Waldegrave Road,

Teddington,

Middlesex.



FOREWORD

One of the interesting facts about our Society is that its members come from many scientific disciplines. As a subject grows from the introduction of new knowledge, new techniques and new ideas, there appears a pressure for its separation into more specialised parts. This is a historical progression and often results in a lack of communication between the protagonists of each part. One aim of the Society, therefore, should be to promote dialogue between the chemists, engineers, mathematicians, physicists and technologists who are the Society.

Too many technologists and business men consider the theoretical approach to be irrelevant. They have good reasons, after all Jenner's answer to smallpox was to introduce smallpox to the body: a procedure inexplicable to contemporary theory but a truly technological answer. Yet Harvey's findings on the circulation of the blood put paid to leeches, albeit a hundred years later: a scientific answer. These examples, corroborate what somebody once said, "that science solves the possible and technology the impossible". But in reality all the parts go hand-in-hand and separation would make for a poorer Society.

OFFICERS AND MEMBERS OF COUNCIL 1977-1978

President: DR. J. J. BENBOW, I.C.I. Ltd., Agricultural Division, Billingham, Teesside.

Secretary: MR. F. N. COGSWELL, I.C.I. Ltd., Plastic Division, Welwyn Garden City.

Treasurer: MR. A. EVANS, Department of Surgery, Royal Victoria Infirmary, Newcastle upon Tyne.

Membership Secretary: DR. F. E. R. JONES, School of Mathematical Sciences, Plymouth Polytechnic, Plymouth.

Abstracts Editor: MR. J. ASTIN, Department of Applied Mathematics, U.C.W., Penglais, Aberystwyth.

Bulletin Editor: MR. M. CAMINA, Paint Research Association, Teddington, Middlesex.

Ordinary Members:

DR. D. C-H. CHENG, Warren Spring Laboratory, Stevenage.

MR. T. C. DAVENPORT, B.P. Research Centre, Sunbury-on-Thames, Middlesex.

DR. J. FERGUSON, Department of Fibre Science, University of Strathclyde, Glasgow.

DR. D. MARSHALL, Institute of Polymer Science, Loughborough University of Technology, Loughborough.

DR. D. R. OLIVER, Department of Chemical Engineering, University of Birmingham, Birmingham.

DR. C. J. PETRIE, Department of Engineering Mathematics, University of Newcastle upon Tyne, Newcastle upon Tyne.

Co-opted Member:

DR. M. SHERRIFF, The School of Pharmacy, London.

PERSONAL NOTE

Mr. J. Astin

Jack Astin graduated from the University of Nottingham in 1961 with a B.Sc. in Mathematics. For two years he was a research student in the mining engineering department where at the same university he obtained his M.Sc. in 1963 for work on subsidence. From 1963-65 he was a lecturer in mathematics at the Medway College of Technology in Kent. In 1965 he joined the staff of the Applied Mathematics Department at the University College of Wales, Aberystwyth. He has been a member of the society for 13 years and has helped organise meetings for the Society in Aberystwyth and Cambridge. He has a wife, two children and a farm house in the Welsh countryside. He enjoys chess, walking, gardening, camping and maintaining his wife, his children and his farm house.

FOURTH INTERNATIONAL CONFERENCE ON FRACTURE (ICF⁴)

International Conferences on Fracture are being organised quadrennially under the auspices of the International Congress on Fracture (ICF). This Congress, meant to promote international co-operation among scientists and engineers in the wide field of strength and fracture of materials, was founded by Professor Takeo Yokobori in 1965 during the first of the series of the Conferences held at Sendai (Japan). The second and the third Conferences were held respectively at Brighton (England) in 1969 and Munich (West Germany) in 1973. The ICF⁴ was held during June 19th-24th, 1977, at Waterloo (Ontario) on the beautiful campus of the University of Waterloo set amidst sylvan surrounding of the Canadian countryside. The meeting was a mammoth event attended by over 500 delegates drawn from 38 countries. The proceeding of the Conference were preprinted and these ran into over 3,500 pages containing more than 350 contributions.

The five Plenary sessions dealt with the following titles, with about eight papers presented under each by authors whose names are given within brackets below:

I. MECHANICS AND MECHANISMS OF FRACTURE

(M. F. Ashby; J. D. Embury and G. H. Le Roy; A. P. Kfoury and J. R. Rice; J. F. Knott; G. R. Irwin and P. C. Paris; W. Hutchinson and H. Obrecht; J. L. Swedlow and M. E. Karabin, Jr.; F. A. McClintock).

II. FRACTURE OF LARGE SCALE STRUCTURES

(A. S. Tetelman and P. M. Besuner; J. Nemec, J. Drexler and M. Klesnil; D. J. Burns, R. J. Pick and T. Brown; G. T. Hahn and M. F. Kanninen; B. L. Averbach; E. Smith, T. S. Cook and C. A. Rau; H. T. Corten; A. J. McEvily; R. W. Nichols; C. J. Beevers).

III. FRACTURE AT HIGH TEMPERATURES AND IN SENSITIVE ENVIRONMENTS

(L. F. Coffin, Jr.; R. W. Armstrong; H. A. Kuhn and G. E. Dieter; D. McLean, B. F. Dyson and D. M. R. Taplin; C. J. McMahon, Jr., C. L. Briant, S. K. Banerji; M. H. Kamdar; J. C. Scully).

IV. FRACTURE OF NON-METALLIC MATERIALS

(A. S. Argon, J. G. Hannoosh and M. M. Salama; A. Peterlin; H. H. Kausch; J. G. Williams and M. W. Birch, A. G. Evans, A. H. Heuer and D. L. Porter; G. A. Cooper and M. R. Piggott; K. R. Piekarski; M. L. Williams and G. P. Anderson).

V. RECENT DEVELOPMENTS AND NEW CONCEPTS IN THE APPLICATION OF FRACTURE MECHANICS

(T. Yokobori, S. Konosu and A. T. Yokobori, Jr.; A. J. Carlsson and K. M. Markstrom; H. Liebowitz, J. Eftis and D. L. Jones; A. Kochendörfer; N. F. Eaton, A. G. Glover and J. T. McGrath; W. Soete; D. Francois).

THE PLASTICS AND RUBBER INSTITUTE PRINCE PHILIP AWARD

Dr. Brian Mercer, Inventor of Netlon, Honoured

The second Prince Philip Award of the Plastics and Rubber Institute has gone to Frank Brian Mercer, D.Tech., F.T.I., inventor of Netlon, for the originality of his invention (the ingenuity of which was described by Mr. Justice Whitford, when granting a patent extension in 1972, as "exceptional") and for its remarkable development and application within the theme of the award, "plastics in the service of man".

Netlon is now manufactured in a very wide range of constructions and from a variety of polymer materials. Uses are chiefly in agriculture, horticulture, fish farming, food production, packaging, land reclamation and a growing number of medical applications, e.g. dialysing filters for kidney machines. This product

range indicates a significant use of plastics in the beneficial service of mankind.

Netlon is now manufactured in 22 countries and the global sales of extruded plastics mesh is approaching £100,000,000 annually.

The first Prince Philip gold medal was awarded in 1976 to Professor John Charnley, C.B.E., F.R.S., F.R.C.S., for his pioneering work with plastics materials in the development of an artificial hip joint.

CALLS FOR PAPERS

Measurement and Control of Rheological Processes

The first joint meeting between the British Society of Rheology and the Cybernetics Society will be held at The School of Pharmacy, London, on Friday, January 5th, 1979, to discuss aspects of the measurement and control of rheological processes in physical and biological systems. The object of this meeting is to bring together the expertise of both societies in a common topic.

Those people wishing to contribute at the meeting should send a title followed by an abstract to:

Dr. B. Warburton,
Department of Pharmaceutics,
The School of Pharmacy,
The University of London,
29/31 Brunswick Square,
London WC1N 1AX.

First Announcement

The Rheology of Associating, Structured and Biological Systems

Joint meeting of the British, Italian and Netherlands Societies of Rheology, supported by the Polymer Physics Group of the Institute of Physics.

Amsterdam, April 18th-20th, 1979

Deadline for submission: October 31st, 1978

Submission of papers (title and one-page abstract only) is open to members and non-members of the three Societies and the Polymer Physics Group. Papers providing a link between rheological behaviour and structure of a wide class of systems, including, e.g., gels, liquid crystals and associating suspensions, will be welcome.

English is recommended as the language of the meeting. The abstracts should be sent to the secretaries of the respective Societies:

United Kingdom:

F. N. Cogswell, 67 Daniells, WELWYN GARDEN CITY, Herts. AL7 1QT.

Italy:

A. Pavan, Istituto di Chimica Industriale del Politecnico, Piazza Leonardo da Vinci 32, 20133 MILANO.

The Netherlands:

U. Daum, Industrial Organisation TNO, Division of Technology for Society, P.O. Box 217, 2600 AE DELFT.

The host organisation is the Netherlands Society of Rheology, whose President, Dr. H. C. Booij, Central Laboratory DSM, P.O. Box 18, 6160 MD GELEEN, will be the chairman of the Organising Committee.

FUTURE MEETINGS

International Conference

The Toughening of Plastics

July 4th-6th, 1978, at The Regent Centre Hotel, London

The Plastics and Rubber Institute Conference on "Toughening of Plastics", to be held on July 4th-6th in London, features many of the world's leading experts on polymer toughening. The meeting will be truly international, with ten papers from the U.S.A., eight from the U.K., four from Germany, and contributions from Belgium, France, Holland and Italy. Speakers from B.A.S.F., Bayer, B.F. Goodrich, Borg-Warner, Dow, DuPont, General Electric, Montedison and Shell will take part in the programme which covers the chemistry, physical properties, rheology, and economic outlook for toughened plastics. Fracture properties, including impact, stress cracking and fatigue, feature prominently.

Predictably the main emphasis is on A.B.S. and H.I.P.S., but there are also papers on toughening of polypropylene, nylon 66, epoxy resins and resin composites.

The Rheology and Rheometry of Multiphase Systems

Provisional Programme for the Conference to be held at the College of St. Mark and St. John, Plymouth, Devon, from September 6th-8th, 1978.

Tuesday, September 5th

Evening: Buffet Supper available at College of St. Mark and St. John.

Wednesday, September 6th

Morning: Opening address by the President, Dr. J. J. Benbow: "Exploitable Similarities in the flow behaviour of two phase materials".

FLUID SYSTEMS 1: R. I. Tanner: "A Langevin approach to suspension rheology"; J. Astin: "Flow of a two phase liquid in a curved channel".

Coffee.

FLUID SYSTEMS 2: D. C-H. Cheng: "A review of methods for measuring the viscosity of settling suspensions"; D. Eagland, G. M. Wardlaw and A. P. Allen: "A differential pressure viscometer with low shear capability: its use in studies of a polystyrene latex at low volume fractions in alcohol water mixtures"; P. A. Arundel: "The influence of red cells on blood rheology".

Lunch.

Afternoon: PASTE LIKE SYSTEMS 1: D. V. Boger, G. Sarmiento, C. Tiu, P. H. T. Uhlherr: "The rheology of red mud"; M. Thompson and S. N. Bhattacharya: "Rheological study of primary sewage sludge"; C. R. Diamond.

Tea.

PASTE LIKE SYSTEMS 2: G. H. Tattersall: W. M. Berg: "On the flow behaviour of cement paste: influences of the granulometric composition of the cement and of the concentration of solids"; T. E. R. Jones and S. Taylor: "Flow properties of concrete materials".

Thursday, September 7th

Morning: FIBRE FILLED POLYMERS: D. H. Thomas: "The relevance of a parallel plate type rheometer to the characterisation of a class of discontinuous materials"; R. J. Crowson, M. J. Folkes and D. W. Saunders: "The rheology of short glass fibre filled thermoplastics at very high shear rates"; J. Militky and J. Jansa: "Model for mechanical behaviour of semicrystalline PAD-fibres".

Coffee.

RUBBERY SYSTEMS: L. F. Nielsen: "Elastic properties of two-phase composites"; J. F. V. Vincent: "The rheology of soft locust cuticle: a filled polymer water system"; A. R. Ramos and R. E. Cohen: "The influence of diblock copolymers on the structure and properties of polybutadiene-polyisoprene blends".

Lunch.

Afternoon: POSTER SESSION ON GENERAL RHEOLOGY: M. M. Cross: "Relation between viscoelasticity and shear thinning behaviour in liquids"; J. M. Davies: "The behaviour of non-Newtonian liquids in a pulsatile flow apparatus"; C. Klason and J. Kubat: "Noise phenomena associated with flow in certain polymeric systems"; T. E. R. Jones; ADDITIONAL CONTRIBUTIONS.

Evening: ANNUAL GENERAL MEETING; CONFERENCE DINNER.

Friday, September 8th

Morning: STRETCHING FLOWS 1: D. R. Oliver and R. C. Ashton: "Extensional flow of polymer thickened oil at a temperature of 80°C"; F. R. Young: "Cavitation in a liquid between rotating rollers"; A. Evans: "Stretching liquids".

Coffee.

STRETCHING FLOWS 2: J. Harris: "Converging flow viscometry: viscosity measurement of awkward materials and application to concentrated suspension rheology in food research"; D. V. Boger and H. Nguyen "on the use of die entry flows for extensional viscosity measurement"; M. Moan, S. Ghonien and G. Chauveteau: "Laminar flow of dilute polymer solutions into and through a capillary".

Lunch.

CONFERENCE DISPERSES.

THREE-DAY CONFERENCE ON RHEOMETRY

Date: October 25th, 26th and 27th, 1978

Place: University of Leuven, Heverlee

Instituut voor Chemie-Ingenierstechniek

The main subject of this conference is the rheometry of non-newtonian liquids, including polymer melts, rubber compounds, polymer solutions, suspensions, etc.

Each of these three days will be devoted to a particular aspect of rheometry, that is:

- rotary devices (cup, cone-plate, plates, . . .)
- oscillating devices (excentric plates, balance rheometer, . . .)
- extrusion devices (capillary, slit, meltindexer . . .)

An exhibition of rheological equipment will be held during the Conference, and most manufacturers are expected to be represented.

A main conference will introduce each day, describing basic aspects of the technique, followed by technical presentations from companies, and scientific communications by users of rheological equipment.

This three-day Conference will give you the opportunity to receive information on commercial rheometrical apparatuses, to discuss with users and to present your own experimental data.

If you wish to present a paper on topics described above, please send an abstract (title and 300 words maximum) to the Secretary, Dr. Jean L. LEBLANC, MONSANTO Technical Centre, rue Laid Burniat, 1348 LOUVAIN-la-NEUVE.

COURSE

Warren Spring Laboratory, Stevenage, Herts.

FIFTH COURSE IN FLUID RHEOLOGY

November 20th-24th, 1978

The Course is primarily aimed at the practising rheologist, physicist, chemist, technologist and engineer who has responsibility for product formulation, quality and process control, process plant design and selection.

Further details from: Dr. D. Cheng.

TECHNICAL ENQUIRY

Wanted!

A Bingham material with a yield value of about 500 Pa and a plastic viscosity of 40 Pas. Must not include particles of size greater than 0.1mm.

Question!

Does anybody know of any material which has truly Bingham flow?

LETTER TO EDITOR

Dear Sir,

I refer to the letter of Messrs. Deer and Warburton to you, published in the Bulletin Vol. 21, No. 1, concerning the Rheological Instrument Project of the Non-Newtonian Flow Panel. As the

Panel is a Science Research Council working party, the matter does not strictly concern the Laboratory. But as Warren Spring is referred to by name in the letter, I think a response from the Laboratory is necessary to put the record straight.

Messrs. Deer and Warburton mentioned "the Warren Spring symposium". What they probably meant is the Training Courses in Fluids Rheology that we held in November 1976 and November 1977 (which incidentally we will be repeating in the same month later this year). Their offers to loan a demonstration model came verbally but we had to decline because, as we explained over the 'phone, our courses were tightly scheduled, with practical laboratory work carefully chosen to illustrate and complement the lectures. They were not platforms for exhibition of equipment and we had also to decline similar offers from other instrument manufacturers.

We are of course familiar with the Deer Rheometer since the date (1968) when it was described in the literature and patent application made. We have followed its progress in the many commercial hands, from when it was placed on the market by Polymer Consultants Ltd. (1974), through Deer Instruments and Baird & Tatlock (Process Control Section), to the present Rheometer Marketing Ltd. We understand that the instrument has now been placed in a large number of academic and industrial organisations. No doubt it is being given the intensive on-the-job assessment that any new equipment has to go through to prove itself.

At Warren Spring Laboratory we had considered making an evaluation of the Deer Rheometer in our in-house rheology programme. However, the Laboratory has suffered a substantial cut in staff as a result of the Government reduction in Civil Service manpower over the past two years and we have therefore been forced to make choices between competing research programme needs. In this situation, we are unable to devote public funds to this evaluation which would be in addition to our existing commitments in rheology, even though the results would have been of value to users in the British industry at large. We then considered carrying out the assessment in the Rheological Research Service, which is jointly funded by industrial participants and the Department of Industry. But the Project Committee, on which the member companies are represented and which decides on the work to be done, did not place very high priority on this task. The various companies handling the Deer Rheometer were invited to join the Rheological Research Service, but they did not accept.

A third way in which Warren Spring Laboratory would be able to carry out an evaluation on the Deer Rheometer would be for the work to be sponsored under a repayment contract, in the way that quite a lot of the work in the Laboratory is done. An informal

offer to do this was made to a representative of Rheometer Marketing Ltd. at the recent (January 1978) meeting at Cranfield. We have yet to receive a response from the company.

Yours faithfully,

D. C-H CHENG

Materials Handling Division
Warren Spring Laboratory
Stevenage
Herts

APPLICATIONS FOR MEMBERSHIP

February 1978

Rosanna Falabella, B.Sc., M.Sc.
f,et,sa,C,N.

Polymer Science Eng. Dept.,
Univ. Mass,
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MA 01003,
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Professor Irvin Mitchell Krieger,
B.Sc., M.Sc., Ph.D.
f,et,sa,D,G.

Dept. of Chemistry,
Case Western Reserve University,
Cleveland,
Ohio, U.S.A. 44112.

Dr. E. W. Williams, B.Sc., Ph.D.
f,t,s.

D.A.M.T.P.,
The University,
P.O. Box 147,
Liverpool.

Professor M. J. Crochet.
f,et,sa,C,D,I.

Unite De Mecanique Appliquee,
Universite Catholique de Louvain,
Batiment Stevin,
Place Du Levant,
B 1348,
Louvain-La-Neuve,
Belgium.

RESIGNATION

Professor J. Ulbrecht.

The British Society of Rheology Australian Branch

The following have been accepted by the Committee as new members of the British Society of Rheology (Australian Branch):

Mr. V. M. Markus
Mr. P. H. Dawe
Dr. D. R. G. Williams
Mr. D. T. Hornsby
Mr. J. V. Parekh
Mrs. Hang Nguyen
Mr. G. Sarmiento
Mr. R. P. Chhabra
Mr. L. Barro

DIARY

1978

July 4-6. "The Toughening of Plastics", London.

August 28-September 1. "Non-Newtonian Fluid Mechanics", Louvain-la-Neuve, Belgium.

September 6-8. "The Rheology and Rheometry of Multiphase Systems", Plymouth.

October 25-27. "Rheometry Conference", Heverlee, Belgium.

1979

January 5. "Measurement and Control of Rheological Processes", London.