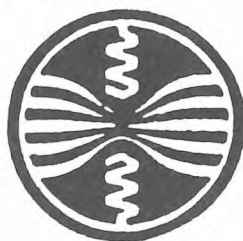


- 9 MAY 1988

THE BRITISH SOCIETY OF RHEOLOGY

BULLETIN



1988, Vol. 31 No. 1

Contents

Officers and Members of Council	i
Editorial	ii
Dr J.P.Berry	1
The Scott Blair Scholarship	2
The Chamonix conference	3
Membership news	8
Rheology Abstracts	10
Duplicate journals	11
Conference Diary	13
Forthcoming conferences	15
Advertisements	

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Professor P. Townsend,
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ISSN-0045-3145

- i -

THE BRITISH SOCIETY OF RHEOLOGY
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1987/88

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Fax: 021-471-4691

EDITORIAL

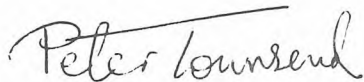
This issue concentrates on conference matters with a long report of the Chamonix meeting. Apart from 'conventional matters' the study of the flow of water crystals when compressed by two (hopefully parallel) long narrow metal boundaries seems to be a problem to which several Rheologists have devoted considerable attention.

Programmes for future conferences include the Brunel meeting in May and the G.W. Scott Blair Memorial Conference in September.

It is with great sadness that we record the death last August of yet another major contributor to the field of Rheology, Dr. Jim Berry, former director and chief executive of Rapra Technology Ltd.

The Council are anxious to encourage applicants for the Scott Blair scholarship. This is open to PhD students who have completed the first year of research. Full details are given later in this Bulletin.

Finally, the council at its last meeting asked me to offer our congratulations to Jim Ferguson on his appointment as Stocker Visiting Professor at the College of Engineering and Technology, Ohio University, Athens, Ohio, U.S.A. Congratulations are also due to the rheological instrumentation company, Carri-Med Ltd., who have been awarded their third exporting award from the Federation of Sussex Industries.



Peter Townsend

DR. J.P. BERRY

Dr. J.P. (Jim) Berry, who died in August of last year, was a physical chemist who made a major contribution to the understanding of the rheology of polymers before becoming a professional manager in mid-career. It was as the Director and Chief Executive of the Rubber and Plastics Research Association of Great Britain (re-formed under his direction into Rapra Technology Limited) that he was best known.



Jim Berry graduated in Chemistry at London University and then joined the British Rubber Producers Research Association. While there he undertook studies on stress relaxation phenomena for which he was awarded his PhD. Following this, he moved to the U.S.A. where he worked for General Electric and carried out pioneering research on the fracture of rigid plastics, and where he was, for a time, an Assistant Professor at the University of Akron.

He began his twenty-two years of service at Rapra in 1963, when he returned to the UK to undertake fundamental work on the rheology of polymers. He was made Assistant Director in 1969, Deputy Director in 1973, and Director and Chief Executive in 1976.

His time as Director saw substantial changes at Shawbury. Turnover almost trebled, from just over £1 million in 1976 to around £3 million in 1985. At the same time, the balance of the business changed with the proportion of income from contract work rising from around one third to two thirds of the total.

In recognition of these changes, a major review of Rapra's organisational structure was carried out to allow the company to

operate in the commercial mode which its activities had taken. The consequences were the redesignation as Rapra Technology Limited and the setting up of a Board of Directors.

Among the many honours given Dr. Berry during this time were two of the Plastics and Rubber Institute's most prestigious awards. In 1983, he was selected to present the Institute's Foundation Lecture, while in 1985 he received the Hancock Medal in recognition of his leadership at Shawbury and his commitment to the work of the Institute.

He retired at Easter 1986, having reached his normal retiring age, looking forward to pursuing his interests in music, cinema, walking and caravanning. Within a matter of weeks after retirement he sadly contracted the cancer against which he struggled unsuccessfully for the remainder of his life.

THE SCOTT BLAIR SCHOLARSHIP 1988

In memory of the work and example of Dr. G.W. Scott Blair, the Society will institute a series of scholarships to encourage excellence in research in rheology, and to enable the scholar to undertake research activities which would not normally be possible without such a grant, such as a period of work at an overseas University.

PhD students, or equivalent, who are completing their first year of research, and are members of the British Society of Rheology, may apply to become a Scott Blair Scholar.

The scholarship will have a value of £500 per annum (or such value as shall from time to time be decided by Council) to be used at the absolute discretion of the scholar. Subject to a satisfactory report from his supervisors, the scholarship will be renewable for a maximum of one more year. Thus it will usually be available during the second and third years of a normal PhD project.

In addition to the annual payment, Council will consider applications for additional funding to attend conferences. The scholars will be expected to present the results of their research at meetings of the Society, and to make occasional contributions to the Bulletin.

The award of the scholarship will be decided by Council, who cannot enter into correspondence with unsuccessful applicants, and who reserve the right not to award a scholarship in any particular year.

Applications for the 1988 Scott Blair Scholarship should reach the President no later than 1 August 1988. The application should be on no more than two sides of A4 paper and contain: personal details of the applicant, a description of the research, notes on any special uses envisaged for a proportion of the scholarship, and an endorsement from a person with supervisory responsibility for the research.

INTERNATIONAL CONFERENCE ON EXTENSIONAL FLOW,

CHAMONIX, FRANCE, JAN. 18-22ND, 1988

Was it good news or bad? A conference in Chamonix - what an inspired idea. This would be a golden opportunity to try out probably long lost skiing skills. If only there was going to be any snow. Eagerly scanned newspaper and teletext pages didn't seem to hold out much hope. On the other hand the organisers had put together such an excellent programme that there was going to be no giving way to any temptation to slip off to the slopes. The good news was that there was snow, although only above 1800 metres. Fortunately that was where all the pistes were and there were no queues for lifts due to the bad snow reports. Each day the conference programme had a four hour break between morning and afternoon sessions; time enough to make brief visits to view and even to sample a number of pistes and the breathtaking views over the Alps from the top cable station at 3500m on the Aiguille du Midi, overlooked only by nearby Mont Blanc.

This International Conference on the rheology of polymers and polymer solutions under extensional flow was extremely well organised by Prof. Ken Walters (Wales), Dr. Jim Ferguson (Scotland), Prof. J-M. Piau and Prof. Claude Wolff (France). It was attended by some 70 participants from at least fifteen countries worldwide, the greater proportion being from academic institutions. The papers were of a very high average standard, many of them by the recognised world leaders in their topics. It is the organisers intention that the conference proceedings will be published as a special issue of the Journal of non-Newtonian Fluid Mechanics.

The conference contained 45 papers divided into the four topic areas of polymer melts, polymer solutions, theory and applications.

Polymer Melts

The polymer melts sessions consisted of 10 papers which actually covered polymer melts, rubbers, liquid crystals and bitumen with papers in both practical and theoretical areas. One of the main messages which emerged from a number of the papers is that a flow regime which includes elongation in addition to shear will cause orientation of the polymer molecules modifying the subsequent properties of the product. This orientation may induce some crystallisation (Klaas te Nijenhuis, Delft, Holland). The presence of two phases in a material undergoing elongational flow can alter the effect of the flow. Fibrils dispersed in polymer introduce a secondary shearing motion which reduces the extent of molecular orientation caused by elongational flow (Isabel Miles, ICI, Cleveland, UK). Dependant on conditions of temperature and flow, elongation can cause either the mixing or demixing of a polymer blend. i.e. The position of the phase boundaries in a phase diagram can be dependant on the shear history of a blend (Henning Winter, Massachusetts, USA). Pierre Attané (Grenoble, France) reported on the behaviour of blends of polymers in

bitumen. He showed how the empirical test values of ring and ball softening temperatures and penetration indices could be derived from rheological measurements.

Theory

The theory sessions contained nine papers. These are never easy to follow by those who are not aficionados of pages of differential equations. It was apparent that there is still little consensus among the modellers as to the best model to use to represent polymer molecules in solutions or melts. There were also some present who would now prefer that their earlier models were no longer named after themselves, having moved on to new models. A number of the papers dealt with proposed improvements to models. For instance Guiseppe Marrucci (Naples, Italy) emphasised the need to include the relaxation times of both the polymer molecules and the tubes within which they are contained in a reptation model.

Some of the most interesting observations to come out of this section were about the nature and dimensions of the recirculation zones found at a contraction in a flow. Marcel Crochet (Louvain la Neuve, Belgium) compared calculated streamlines for viscoelastic fluids in elongational flow, both for sharp contractions and for opposed flows entering a T-junction, with observed streamlines as earlier reported by Ken Walters and Howard Barnes and obtained good agreement with their results. He showed that larger vortices were obtained with fluids exhibiting larger elongational viscosities. There is an indication here that measuring the size of the recirculating vortex at a sharp contraction, using a flow visualisation technique, could be used to measure the elongational viscosity.

John Hinch (Cambridge, UK) showed the results of computer simulations of how polymer molecule conformations are deformed by strong strains. There was nothing in his results from which it would be predicted that polymer molecules should undergo the mid-point scission in elongational flows which has been found in the experimental studies of other researchers.

Polymer Solutions

This was the largest section containing seventeen papers, although the topics covered both theoretical and practical aspects. The device most commonly used to measure elongational viscosities was the instrument designed by Jim Ferguson (Strathclyde) and now marketed by Carri-Med Ltd. A number of users, including Ferguson, now also use the option of a suction tube, first reported by Gupta, in place of the rotating drum, to take up the spun filament. This extends the instruments capability to lower viscosity fluids.

A number of papers described alternative methods for determining elongational viscosities of solutions. In addition to Gupta's use of a suction tube with the Ferguson spinline rheometer, Moan (Brest, France) reported the use of a tubeless syphon in which the suction tube is designed to measure the stress in the same way as in the spinline rheometer. Gerry Fuller (Stanford, USA) used an opposed jet principle, similar to that used at Bristol by Keller et al, but in which one of the jets is able to pivot

enabling the stresses to be measured. David Binding (Aberystwyth, UK) reported the analysis of the shape of the flow into a contraction, deriving an expression for the extensional rate. The stresses are measured using flush mounted pressure transducers either side of the contraction. David James (Toronto, Canada) has designed an instrument also using a contraction in the flow path, but with the shape of this funnel matching the fluid non-Newtonian properties to produce a core in which the fluid velocity is proportional to axial distance hence giving a constant extensional rate.

Merwyn Jones (Aberystwyth, UK) used measurements on a thread at the point at which it broke on falling from a capillary. Howard Barnes (Unilever, Port Sunlight, UK) presented a very simple design for the routine ranking of the elongational viscosity of materials. He used a measurement of the flow rate from a sharp edged orifice in the bottom of a sample container rather like a Ford cup.

An interesting observation noted by Keller and Odell (Bristol, UK) relates to the relaxation rates of deformed polymer molecules in solution. These rates can be separated into two regimes. Whilst the molecule is free draining it relaxes slowly, retarded by the viscous medium of the solvent, but once it has contracted to the point where it is no longer free draining (i.e. the solvent is excluded from within the polymer coil), it snaps back much more quickly to its equilibrium conformation. Conversely when being extended, the extension rate accelerates with the extension of the molecule.

Nguyen (Lausanne, Switzerland) reported a critical strain rate for scission of polymer molecules in dilute solutions undergoing transient elongational flows. He predicted that transient flows result in greater degradation than do stagnant flows.

A number of the papers referred to the role of preshear history and of molecular entanglements in elongational viscosity. In the theory section the papers by Mewis, Leblans, Denn and Marucci had all incorporated the effects of history into the models that they presented, usually in the way in which they treated the relaxation spectra. In the solutions and applications sections, Ferguson, Wolff, Odell and Bewersdorff among others referred to the effects of preshear on the extent of either molecular alignments or entanglements. Jeff Odell referred particularly to the role played by these entanglements in the scission of molecules at high elongational rates where they see 'flare' in their birefringence observations due to unstable flow.

It seemed to be the opinion of a number of presenters that the excess pressure drops, found when polymer solutions flow through geometries involving extensional flows, are not necessarily simply attributable to an 'extensional viscosity'. Thus this excess pressure drop was not just due to the elongation of the polymer molecules in solution, but also to the changed flow properties of the solution in which the molecules have become entangled as a result of the flow. These effects may only be seen in fast transients where the characteristic times exceed the relaxation times for disentanglement. They can also be encountered at dilutions well below those at which entanglements would be expected. The calculation of whether the molecules overlap must not be based on their relaxed end-to-end dimensions but on an extended dimension resulting from the flow field.

This role of preshear was particularly important in the results presented in three papers. Brunn and Holweg of Erlangen reported large increases in friction factor (resistance coefficient) at a critical Reynolds number in the flow of surfactant or polymer solutions through porous media. They attributed this behaviour to a 'phase transition' from individual molecules or micelles to entangled networks or 'super' micelles. Polymer networks were reported to be formed only in elongational flows but shear induced structures were also seen in surfactant solutions in simple shear. Jim Ferguson and Nick Hudson (Strathclyde, UK) studied the strain hardening due to polymer complexation effects in extensional flows of polymer solutions. They showed how the deformation in shear or elongation could cause the 'zipping up' of polymer molecules in mixtures such as of polyacrylic acid with polyvinylpyrrolidone.

Hans-Werner Bewersdorff (Dortmund, Germany) discussed the importance of molecular extension in shear as a necessary precursor for a polymer to be able to act as a turbulent drag reducer. He showed that above some critical shear rate, a sheared dilute polymer solution displayed an increased apparent elongational viscosity and claimed that this critical shear rate had to be exceeded in pipeflow for drag reduction to be obtained. It was not reported whether this molecular extension in preshear was in any way related to the transition between free-draining and non free-draining conformations discussed by Keller.

A number of participants discussed the differences seen between solutions of stiff and flexible polymer molecules. In shear flow, solutions of both rigid and flexible molecules can exhibit significant shear thinning (psuedoplasticity). A number of exhibitors showed that the extensional viscosity of solutions of rigid polymer molecules, such as Xanthans, did not increase with extensional rate, whilst that of the flexible polymers, such as polyacrylamides, polyethylene oxides or polystyrenes could show significant increases in extensional viscosity as the extension rate increased. Ken Walters showed a particularly interesting example of this behaviour using model tortuous geometries. He compared the flow of Newtonian, inelastic and elastic fluids in a geometry with parallel narrow and broader channels. The Newtonian fluid flow rates were proportional to the channel dimensions. The inelastic (shear thinning, e.g. Xanthan) fluid had a relatively higher flow rate in the narrower channel, whilst conversely, the elastic (elongationally thickening, e.g. PAM) fluid flowed faster in the broader channel, the flow being almost stagnant in the narrow channel.

Applications

This section contained nine papers many of which have already been mentioned. Piau (Grenoble, France) showed a very good film using flow visualisation upstream of a die to illustrate how flow instabilities affected the extrusion of polymers. Adjacent streamlines in the flow could be seen to alternately accelerate and decelerate (even reverse their direction briefly) resulting in a very unstable flow through the die.

Ralph Oliver (Birmingham, UK) reported that the addition of a polymeric additive to a lubricating oil resulted in enhanced load bearing in a journal bearing, particularly when the rotor was eccentrically rotated.

All in all this was an extremely interesting and valuable conference and was at times also controversial. One of the few disappointments was that often just as discussions

were getting really interesting, they had to be curtailed to keep the programme on schedule. This is no criticism of the organisers as none of us seem yet to have a model to predict the time required for the discussion on individual papers when planning a conference.

Mention should also be made of the extremely witty after dinner speech given by Jim Ferguson at the Conference dinner. If only I could remember the punch line - was it the Swiss one wanted as the cooks and the Italians as the organisers, or was it the English as the development engineers and the Germans in charge of the entertainments? Which ever it was the organisers of this conference got it all right and are due our thanks for having done so.

P.C. Anderson,
BP Research Centre, Sunbury

MEMBERSHIP NEWS

The following applications for Membership of the British Society of Rheology have been received and were approved at the Council Meeting on the 4th March 1988.

Mr. S.D. BURTON,
23 Sentance Crescent,
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Near Boston,
Lincs. PE20 1XF
(Royal Ordnance) fetsa

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Baker-Perkins Chem Mc Ltd.,
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Hanley,
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ST1 4DW fea

Mr. J.C. HARRISON,
Sheffield City Polytechnic,
Pond St.,
Sheffield,
South Yorks. fesa

Mr. D.E. HARRY,
3M UK Plc,
Gorseinon Road,
Penllergaer,
Swansea,
Glam. feta

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Glasgow.

Dr. P. BENTZ, pea
Dow Corning S.A.,
Parc Industriel,
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Belgium.

Dr. J. MELLEMA, fetsa
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Holland.

Prof. D.V. BOGER, fetsa
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Parkville, Victoria 3052,
Australia.

Prof. J.R. COLLIER, fetsa
Chemical Engineering Dept.,
Ohio University,
Athens, Ohio 75701,
U.S.A.

Kari D. WRIGHT, feta
4444 Quillen Circle,
Waldorf,
Maryland MD20601,
U.S.A.

RHEOLOGY ABSTRACTS

Contributors needed!

To maintain Rheology Abstracts as a useful source of information and as a journal reflecting the standing of the British Society of Rheology, we need more contributions. The work involved in collecting photocopies of author's abstracts of relevant articles from one or two journals is not onerous, and will be greatly appreciated.

The following journals are scanned regularly -

American Ceramic Soc. Bull	J. Petroleum Technology
Chem. Eng. Sci	J. Pharmaceutical Science
Cement and Concrete Research	J. Pharmacy and Pharmacology
Colloid and Polymer Science	J. Polymer Engineering
Colloids and Surfaces	J. Polymer Sci. B, Polym. Phys.
European Polymer Journal	J. Rheology
Ind. Eng. Chem. Fundam.	J. Texture Studies
Ind. Eng. Chem. Res.	Materiaux et Constructions
Int. J. Multiphase Flow	Molecular Physics
Int. J. Pharmaceutics	Physica
J. American Ceram. Soc.	Physical Review
J. Chem. Eng. Data	Physics Letters
J. Chemical Physics	Polymer
J. Chem. Soc., Faraday Trans. 2	Polymer Communications
J. Colloid and Interface Science	Polymer Science USSR
J. Dispersion Science and Tech.	Progr. in Colloid and Polym. Sci.
J. Experimental Biology	Rheologica Acta
J. Non-Newtonian Fluid Mechanics	SPE Journal
J. Oil and Colour Chemists Ass.	Tech. Ass. Pulp and Paper Ind.

We need abstractors to cover the following journals -

Biorheology	J. Coating Technol.
J. Appl. Polym. Sci.	J. Macromolecular Sci.
Plast. and Rubber Process. & Appl.	Macromolecules
Rubber Chem. and Technol.	Polym. Eng. Sci.

If you are prepared to help with these, or any other journal you believe should be abstracted on a regular basis, *please contact* -

**S.T.E. Aldhouse,
Research and Development Department,
BP Chemicals International Ltd.,
P.O. Box 21,
Grangemouth, Stirlingshire,
FK3 9XH**

Tel. 0324-493466

who would also welcome occasional abstracts from any other journal that any member may feel should be brought to the notice of his fellow rheologists.

Journals available free to members.

A number of journals and other papers which are the property of the Society and which have been in my custody have been added to the Scott Blair collection at the Hugh Owen Library, Aberystwyth. The items listed below are duplicates of those in the collection and Council has decided that they should be offered to members on the understanding that the recipient pays postal charges.

Would any member interested please write to me at

"Highwayman's Retreat",
The Frith,
CHALFORD,
Glos. GL6 8AD

R.W. Whorlow

B.S.R. Bulletin

1964	Nos.2, 3
1965	" 2,
1973	2, 3, 4
1974	" 1, 2

Rheology Abstracts

1960 (3) - 1965(8)	Most issues
1973 (16)	Nos. 3, 4
1974 (17)	" 1, 2, 3

Berichte der Deutschen Rheologischen Gesellschaft e. V.

1961 (20, 21)
1962 (22 only)
1963 (24, 25)
1964 (27 only)
1965 (28, 29)
1966 (30)
1967 (31, 32)
1968 (33)
1969 (34, 35)
1970 (36)

Rheology Bulletin (of the U.S. Society of Rheology)

1964 (33) No. 1
1965 (34) Nos. 1, 3
1966 (35) No. 1

Transactions of the (U.S.) Society of Rheology

1961 (5)
1963 (7)
1964 (8)

Cahiers du Groupe Francais d'Etudes de Rheologie

1957 (2) except Pt.1
1958 (3)
1959 (4)
1960 (5)
1961 (6)

New Series. Cahiers du Groupe Francais de Rheologie

1965 (1) Pt. 1 only

CONFERENCE DIARY

Date	Place	Details
16-18/5/88	Uxbridge, Middlesex, U.K.	'Flow processes in composite materials' British Society of Rheology - contact F.N. Cogswell, ICI plc, The Materials Centre, P.O. Box 90, Wilton Centre, Middlesborough, Cleveland TS6 8JE, U.K.
8-9/6/88	Bordeaux, France	'European Scientific Colloquium on the Mechanical Behaviour of Wood' - contact Professor P. Morlier, I.U.T. "A" de Bordeaux, 33405 Talence Cedex, France.
Summer 1988	U.S.A.	Various courses operated by the Polymer Processing Institute. 'Polymers in Electronics' (Princeton, June 13-14) 'Mixing and Dispersion of Rubber and Plastics' (Princeton, August 1-3) 'Polymer Blends and Alloys' (Princeton, September 26-30) 'Reactive Extrusion' (Williamsburg, October 24-26) - contact Polymer Processing Institute, Castle Point, Hoboken, NJ 07030, U.S.A.
14-20/8/88	Sydney, Australia.	'Xth International Congress on Rheology' contact Professor R.I. Tanner, Dept. of Mechanical Engineering, University of Sydney, Sydney, N.S.W. 2006, Australia.
21-27/8/88	Grenoble, France	'17th International Congress of Theoretical and Applied Mechanics' IUTAM: contact Professor D. Caillerie, Secretary ICTAM 1988, Institut de Mecanique de Grenoble, Domaine Universitaire - B.P.68, 38402 Saint-Martin-d'Herès, CEDEX, France.
7-9/9/88	Egham, Surrey U.K.	'Conundra Rheologica' British Society of Rheology contact - P.C. Anderson, BP Research Centre, Chertsey Road, Sunbury-on-Thames, Middlesex, TW16 7LN, U.K.
29/9/88 - 1/10/88	Drouzhba- Varna. Bulgaria.	'Mechanics and Technology of Composite Materials' Bulgarian Academy of Sciences: contact Professor Y. Simeonov, Central Laboratory of Physico-Chemical Mechanics, Acad G. Bontchev Street, IV km, B1.I, Sofia 1113, Bulgaria.

Date	Place	Details
3-5/10/88	Compiègne, France.	'Thermorheology of Complex Fluids' - contact Professor G. Antonini, Université de Technologie de Compiègne, BP 649, 60206 Compiègne Cédex, France.
19-21/10/88	Talence, France	'23 ^{ème} Colloque Annuel du Groupe Français de Rheologie' - contact Conference Secrétariat, Laboratoire de Mécanique Physique CERMUB, 351 cours de la Libération, 33405 Talence Cedex, France.
26-30/6/89	Fort Collins, Colorado, U.S.A.	'Numerical Methods in Industrial Forming Processes' - contact Professor E.G. Thompson, Colorado State University, Fort Collins, Colorado, U.S.A.
10-12/7/89	Vienna, Austria	'Structural Failure, Product Liability and Technical Insurance', - contact Dr. H.P. Rossmannith, Institute of Mechanics, Technical University Vienna, Wiedner Hauptstrasse 8-10/325, A-1040 Vienna, Austria.
12-15/9/89	Warwick U.K.	'Rheology of Food, Pharmaceutical and Biological Materials' - contact Roy Carter, Royal Ordnance plc., Research and Development Centre, Sewardstone Road, Waltham Abbey, Essex, EN9 1AY
3-7/9/90	Edinburgh,	'The Third Conference of European Rheologists and Golder Jubilee Meeting of the British Society of Rheology' - contact Dr. C.J.S. Petrie, Dept. of Engineering Mathematics, University of Newcastle-upon-Tyne, Newcastle-upon-Tyne, NE1 7RU

FLOW PROCESSES IN COMPOSITE MATERIALS

**A Conference organised by the British Society of
Rheology in association with the British Composites
Society**

**17th-18th MAY 1988
BRUNEL UNIVERSITY, UXBRIDGE**

PURPOSE

During the last twenty five years, the field of composite materials has evolved rapidly, both in respect of composition and in terms of the diversity of their application. Definition of composition and identification of an area in which that composition can be of service require a third partner in order to be fully utilised: that third partner is the ability to process the composition into the required artefact. In composite materials, such shaping processes are frequently severely constrained by reinforcing fibres whose organisation may be seriously modified by the processing stage. In this conference we seek to identify the various elements of such flow processes, present the latest scientific research, both theoretical and empirical, on their characterisation, and identify those areas where further research will be of most value.

LOCATION

Brunel University is in West London close to the M40, M4 and M25 motorways. The nearest mainline railway station is two miles away at West Drayton, and Uxbridge is served by the London Underground system (Metropolitan and Piccadilly Lines) about one mile from the campus. The University is four miles from Heathrow Airport.

P R O G R A M M E

Monday, 16th May

1800-2100 On arrival please go to the Reception Office of Chepstow Hall if you have booked accommodation. From 1900 to 2030 a Buffet supper is available in the Senior Common Room in the Refectory Building.

Tuesday, 17th May: CONTINUOUS FIBRE SYSTEMS

- 0800 Breakfast in Cafeteria
- 0830 Registration in Room R005 of the Lecture Centre
- 0855 Conference opens, Lecture Theatre E on the top floor

PERMEABILITY

- 0900 D. Short and L.J.S. Bradbury (Plymouth) "Some Observations on the Manufacture of Fibre Composite Components using Vacuum Impregnation"
- 0930 C. E. Morrison (Surrey) "Computer Modelling of Resin Flow During Prepreg Manufacture"
- 1000 H. M. M. Killesreiter (Clausthal-Zellerfeld) "Surface Tension Hindered Flow in an Irregular Network of JAMIN Tubes Represented by Porous Rock"
- 1030 Coffee

RHEOLOGICAL CHARACTERISATION

- 1100 T. Rogers (Nottingham) "Rheological Characterisation of Anisotropic Materials"
- 1130 D. Groves (ICI) "A Characterisation of Shear Flow in Continuous Fibre-Thermoplastic Laminates"
- 1200 Lunch in Cafeteria

SHAPING PROCESSES

- 1330 R. Balasubramanyam, R.S. Jones and A.B. Wheeler (Aberystwyth) "Modelling Transverse Flows of Reinforced Thermoplastic Materials"
- 1400 J. A. Barnes and F.N. Cogswell (ICL) "Compaction and Transverse Flow Processes in Continuous Fibre Reinforced Thermoplastics"
- 1430 P. J. Mallon (Galway) "Polymeric Diaphragm Forming of Continuous Fibre Reinforced Thermoplastic Matrix Composites"

- 1500 Tea
- 1530 J. M. O'Neill (Nottingham) "Analysis of Fibre Reorientation
During the Deformation of Laminated Plates"
- 1600 N. Zahlan (ICI) and J.M. O'Neill (Nottingham) "Analysis of the
Spring-Forward Phenomenon During Moulding of Composites"
- 1630 **Session reserved for short contributions on current
research activities and perceived research needs**
- 1900 Sherry Reception
- 1930 Conference Dinner

Wednesday, 18th May: DISCONTINUOUS FIBRE SYSTEMS

- 0800 Breakfast in Cafeteria

RHEOLOGICAL STUDIES

- 0900 R. Balasubramanyam (Aberystwyth) "Numerical Simulation of
the Shape of a Fibre in Flowing Concentrated Suspension"
- 0930 M. J. Folkes and H. A. Potts (Brunel) "Injection Rheometry of
Filled and Unfilled Thermoplastics"
- 1000 A.G. Gibson (Liverpool) "Convergent Die Flow of Polymer
Melts Containing Suspended Fibres"
- 1030 Coffee

EXTRUSION AND MOULDING PROCESSES

- 1100 F. S. Baker (Royal Ordnance) "Extrusion of Highly Filled
Energetic Composite Materials"
- 1130 B. Franzen, C. Klason and J. Kubat (Gothenburg) and T. Kitano
(Tsukuba) "Fibre Length Degradation During Processing of
Short Fibre Reinforced Thermoplastics"
- 1200 H. Henry de Frahan and M. Crochet (Louvain-la-Neuve)
"Calculation of Fibre Orientation in Injection Moulded Parts"
- 1230 Close of Conference and Lunch in Cafeteria

The cost of registration for the Conference, including all meals, will be £70 with accommodation, and £50 without accommodation for registration received before 1 May 1988 and £80 and £60 respectively after that date. Students are eligible for a reduction of £10 on these rates. College accommodation is limited, and early registration is advised. Overseas participants wishing to pay by other than Sterling cheque are requested to add 5% to cover bank charges for exchange.

To: F.N. Cogswell
The British Society of Rheology
ICI Materials Research Centre
P.O. Box 90
Wilton Centre
Middlesbrough
Cleveland
TS6 8JE

Please register me for the Conference **Flow Processes in Composite Materials**

Please delete as applicable:

	<u>Registration Fee</u>	
	<u>Before 1st May</u>	<u>After 1st May</u>
I shall not require accommodation	£50	£60
I shall require accommodation	£70	£80
I am a student (deduction of £10)		
I am an author (deduction of £10)		
I am a member of the British Society of Rheology		
I am a member of the British Composites Society		
My cheque made payable to the British Society of Rheology is enclosed for		

Name

Address

.....

.....

.....

DISCUSSION MEETING

The Polymer Properties Group of the PRI hold occasional informal discussion meetings on polymer topics. The next meeting in the series is to be on rheology.

- Date: 5th October, 1988
- Time: 2.00 p.m.
- Venue: 11 Hobart Place, London SW1 0HL
- Cost: Free
- Speakers/topics: P. Freakley - Rubber mixing
- K. Allsford - Heavily filled
suspensions
- J.Pitman - Prediction of normal
stresses in dies

*Anyone wishing to attend should contact Diane Varley,
PRI, 11 Hobart Place, London SW1W 0HL.
Telephone 01-245-9555.*

ANNOUNCEMENT

CONUNDRA RHEOLOGICA

Dr. G. W. Scott Blair Memorial Conference

The Annual Meeting of the **British Society of Rheology** is to be held at the

Royal Holloway and New Bedford College
Egham Hill, Egham, Surrey

7-9th September 1988

A provisional programme for this conference on 'The Unsolved Problems in Rheology' is published in this Bulletin. The final version will be published in the next issue in the summer.

Conference Fee

The fee of £120 (£130 for non-members of the BSR) includes three nights accommodation in single study bedrooms with private facilities in Reid Hall on the campus and all meals from dinner on the evening of Tuesday, 6th September to lunch on the afternoon of Friday, 9th September, in addition to registration for the conference. The meeting will be held in the Earth Sciences lecture theatre in the Queens Building adjacent to the students' accommodation in Reid Hall. For participants who arrive on the morning of Wednesday, 7th September and who do not need the first night's accommodation, the fee will be reduced by £25.

The meeting will include a Scott Blair Memorial Lecture and the presentation of the first Scott Blair Scholarship (if awarded). A Gold Medal Address by Prof. J.R.A. Pearson will also be included. The Annual General Meeting of the Society followed by a sherry reception and a Conference dinner will be held on the evening of Wednesday, 7th September.

Any enquiries or offers of additional short papers should be addressed to the organiser as soon as possible. If you are intending to participate, whether presenting a paper or not please complete the attached registration form and send it with the appropriate fee to: -

Mr. P.C. Anderson,
Petroleum Engineering Branch (B180/106),
BP Research Centre,
Chertsey Road,
Sunbury-on-Thames,
Middlesex,
TW16 7LN
England

CONUNDR RHEOLOGICA

Dr. G.W. Scott Blair Memorial Conference

Royal Holloway and Bedford New College, Egham,
September 7-9th, 1988

PROVISIONAL PROGRAMME

Tuesday, 6th September 1988

From 4.00 p.m. *Registration*
Entrance lobby, Earth Sciences Block

This lobby will also be used for serving coffees and teas during the conference and will house any displays of rheometer manufacturers' equipment or literature.

5.00 p.m. *Council Meeting*

7.30 p.m. *Dinner*

Wednesday, 7th September 1988

From 9.00 a.m. *Registration*

Will We Ever Know the Truth About Polymer Melts?

Mr. S.T.E. Aldhouse

B.P. Chemicals, R&DD., Grangemouth

Prediction of Dilute Polymer Solutions: Using a Two Phase Media Approach

Mr. W.F. Schierholz

Lehrstuhl für Strömungsmechanik, Universität
Erlangen-Nürnberg, West Germany

Coffee

The Rheology of Concentrated Suspensions

Dr. T. Tadros

ICI Plant Protection Div., Jealott's Hill

The Non-linear Behaviour of Structured Polysaccharide Systems

Dr. G. Brownsey, Food Research Institute, Norwich

The Scott Blair Memorial Lecture

Prof. P. Sherman

Dept. of Food and Nutritional Sciences, King's College London

Lunch (with Mrs. Scott Blair as Guest)
Presentation of Scott Blair Scholarship

The Application of Surface Rheological Techniques to Biological Problems: A General Review

Dr. B. Warburton

The School of Pharmacy, University of London

Does Extensional Viscosity Exist?

Mr. F.N. Cogswell

ICI New Science Group, Middlesbrough, Cleveland

Some Unsolved Problems in Liquid Crystal Theory

Prof. F.M. Leslie

Dept. of Maths, University of Strathclyde, Glasgow

Tea

The Difficulties of Getting a Rheological Test Accepted as a British Standard

Dr. G.H. Tattersall

Dept. of Civil and Structural Eng., University of Sheffield

The Art of Coarse Rheology

Dr. D. C-H. Cheng

Warren Spring Laboratory, Stevenage, Hertfordshire

17.15 pm.

AGM

19.30 p.m.

Reception

20.00 p.m.

Conference Dinner

Presentation of BSR Annual Medal Award

Thursday, 8th September 1988

Deformation of Droplets Suspended in a Stretching Flow

Mr. I.P.T. Moore

Dept. of Chem.Eng., University of Birmingham

Viscoelastic Properties of Clay Suspensions

Dr. G. Maitland

Schlumberger Cambridge Research Ltd., Cambridge

What is the Rheology of Foam in Porous Media?

A Micromodel Study

Mr. P. Armitage and Dr. R. Dawe

Dept. of Mineral Resources Engineering, Imperial College,
London

Coffee

An Experimental Study of Drilled Cuttings Transport in Deviated Wellbores

Dr. P.A. Bern

BP Research Centre, Sunbury-on-Thames, Middlesex

Rheological Properties of Surfactant Solutions

Prof. Dr. P.O. Brunn, A. Wunderlich & J. Holweg

Lehrstuhl für Strömungsmechanik, Universität

Erlangen-Nürnberg, West Germany

Simple Rheology and the Concrete Industry

Dr. G.H. Tattersall

Dept. of Civil & Structural Eng., University of Sheffield

Lunch

Title?

Dr. H. Barnes

Unilever Research Ltd., Port Sunlight Laboratory

What is the "Viscosity" of a Suspension?

Dr. L.V. Woodcock

Schools of Chemical Engineering, University of Bradford

Highly Filled Systems. A Rheological Problem.

Dr. F. Baker & Dr. R. Mortimer,

Royal Ordnance Explosives Ltd.,

Tea

Viscoelastic Properties of Concentrated Ludox-sols

Dr. E.P. Honig

Philips Research Laboratories, Eindhoven, The Netherlands

Sedimentation of Colloidal Suspensions

Dr. R. Buscall

ICI Corporate Colloid Science Group, Runcorn, Cheshire

The Gold Medal Address,

Prof J.R.A. Pearson

Rheology and Transport Phenomena

Slumberger Cambridge Research Ltd., Cambridge

Close

Dinner

Friday, 9th September 1988

Approximate Methods and Simulations for Models with Hydrodynamic Interactions

Dr. H.C. Ottinger

Albert-Ludwigs-Universität Freiburg, West Germany

Pure Liquids (Molecular-, Molten Metals and Molten Salts) Rheologically Described as Concentrated Cluster-Dispersions in a Low-density, Low-viscosity, Low-surface Tension Medium

Mr. J. Kunnen

Mgr. Westerwoudlaan 13, Noordwijkerhout, The Netherlands

Title?

Dr. A. Franck

Rheometrics Europe GmbH, Frankfurt, West Germany

Coffee

A Novel Design of On-line Process Control Rheometer

Dr. J. Ferguson & Xu Zhenmiao

Dept. of Pure and App.Chem, University of Strathclyde, Glasgow

Measurements of Rheological Properties with a Modern Computerized Rotating and Oscillating Viscosimeter

Mr. B. Zoeller

Brabender OHG, Duisberg, West Germany

Capillary Rheometer Data Analysis: Optimisation by Shear Heating and Non-Newtonian Behaviour Corrections

Dr. M.D.H. Thomas

RAPRA Technology Ltd., Shawbury, Shrewsbury, Shropshire

Lunch

The Influence of Stress on the Rate of Cosmic Nucleation in Dilated Liquids

Dr. A. Evans

Decompression Sickness Research Laboratory, R.V.I., Newcastle-upon-Tyne

Title?

Dr. G. Rennie,

Unilever Port Sunlight Laboratory

Tea

Close

Registration Form

CONUNDRA RHEOLOGICA

Royal Holloway and New Bedford College
7-9th September 1988

NAME: _____ Date: _____

ADDRESS: _____
(For correspondence)

Affiliation (e.g. University or Company)

FEE - Member of the British Society of Rheology (£120.00) _____

Ditto but two nights only (£95.00) _____

Non member - 3 nights (£130.00) _____

Non member - 2 nights (£105.00) _____

An accompanying person may register at the same cost
as the participant _____

To assist in room allocation, please indicate whether male or female

Please also indicate whether you have any special dietary requirements.

Please send your completed registration form and your cheque, made payable to the British Society of Rheology, to the address below. Overseas participants, paying in a currency other than Sterling, are requested to add 5% to cover bank charges for exchange.

**Mr. P.C. Anderson,
Petroleum Engineering Branch (B180/106),
BP Research Centre,
Chertsey Road,
Sunbury-on-Thames, Middlesex,
TW16 7LN England**

Prices include VAT, but as a charitable trust, the Society does not have a VAT registered number.

CALL FOR PAPERS

'RHEOLOGY OF FOOD, PHARMACEUTICAL AND BIOLOGICAL MATERIALS'

12th - 15th September 1989

Probable Venue: University of Warwick

The Society's Annual Meeting for 1989 will be on the topic above. Papers will be considered for a session on 'General Rheology'. The aim of the conference will be especially to encourage workers in different fields to compare notes to their mutual benefit.

Titles and abstracts should be sent to:

Roy Carter
Royal Ordnance plc.,
Research and Development Centre,
Sewardstone Road,
Waltham Abbey,
Essex EN9 1AY

Telephone and Fax: 0992 - 713030

Telex: 267455 ROC G

Telecom Gold (Home): 72: MAG31999

LECTURE BY DR. TH. TADROS, ICI PLANT PROTECTION,

AUTHOR OF THE PTG SPECIALIST REVIEW ON EMULSION TECHNOLOGY

The Process Technology Group have commissioned Dr. Th. Tadros of ICI Plant Protection to write an authoritative state-of-the-art review on the formation, properties and breaking of emulsions. This review, which is seen as a more appropriate way of addressing this topic than holding a symposium, has been sponsored by several leading industrial companies.

Dr. Tadros is extremely well known in the colloid science area and is an accomplished public speaker. He has agreed to deliver a lecture on emulsions (formation, physical properties and breaking) at the Royal Society of Chemistry, Burlington House on Wednesday, 1st June 1988 to coincide with publication of this specialist review. The event will commence with a buffet luncheon at 12.30 hr.

Admission to the lecture will be by ticket only at a cost of £18 per person (inclusive of the buffet luncheon and a copy of the specialist review) on application to the Honorary Secretary of the Process Technology Group.

To: Dr. T.H. Page, BP Research Centre, Chertsey Road, Sunbury-on-Thames,
Middlesex, TW16 7LN

From: (Name)

(Address)

(Telephone)

Please send (.....) tickets for admission to the buffet luncheon and lecture by Dr. Th. Tadros on Emulsion Technology to be held in Burlington House, Piccadilly, London, W1V 0BN, on Wednesday, 1st June 1988 commencing at 12.30 hr.

I enclose my remittance for (£18 per head, inclusive of the buffet luncheon and a copy of the PTG specialist review on Emulsion Technology).

Please make cheques payable to "RSC Process Technology Group Trust".

The Group is not registered for VAT, and therefore VAT invoices cannot be issued.

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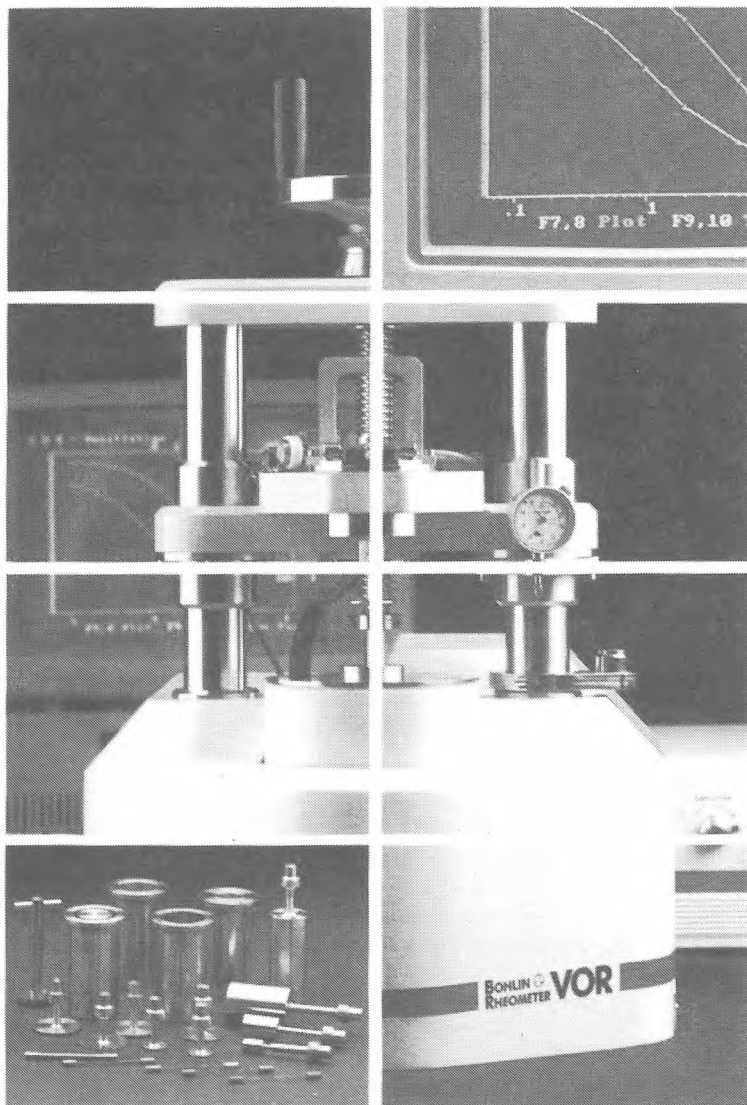
CHEMISTS -

BE IN AT THE START!

Coates Brothers Plc, an international ink and chemical group with a turnover of £200m, have recently established a Group Research Department at St. Mary Cray, Kent. They now invite applications from candidates who have completed an MSc or PhD in Colloid Science and/or Rheology.

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