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THE BRITISH SOCIETY OF RHEOLOGY

BULLETIN



1987, Vol. 30 No. 4

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THE BRITISH SOCIETY OF RHEOLOGY
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1987/88

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EDITORIAL

The news of the death of Dr G W Scott Blair brought great sadness to the society. In this issue of the Bulletin there are tributes from the President and from Professor Sherman.

The council at a recent meeting decided that there should be some lasting memorial to Dr Scott Blair - something that would promote rheology in the way that he would have wished - something that would form a fitting tribute to the memory of the founder member of this society. It was decided that the society should sponsor a postgraduate scholarship to be known as the Scott Blair scholarship. The exact details are yet to be fixed and more information will be available in the next Bulletin.

The Oldroyd Memorial Lectures have been held very successfully at Liverpool, Cambridge and Swansea. It is a mark of the respect to Professor Oldroyd's work that over one hundred people attended the lecture in each of the three locations.

Peter Townsend

GEORGE WILLIAM SCOTT BLAIR

M.A., Ph.D., D.Sc., FRSC, FINSTP

23rd July 1902 to 30th September 1987

With the death of G.W. Scott Blair rheology, the science of deformation and flow of materials, (has lost its doyen and) has suffered a grievous loss. To students and researchers alike his was a household name for more than a half century.

He was educated at Winchester and Oxford University and then worked at the Rothamsted Experimental Station from 1926 until 1937. Although the main emphasis of his studies there was in soil science he was able, nevertheless, to investigate the rheological properties of baker's dough and co-authored a series of research papers which remain classics to this day.

In 1937 he accepted an invitation to become Head of the Chemistry Department at the National Institute for Research in Dairying at Shinfield, Reading, and later he assumed direction of the Physics Department. The 30 years until his retirement in 1967 were the most important and productive of his professional life. The Physics Department, in particular, rapidly acquired an international reputation and attracted a large number of overseas scientists who wished to study and collaborate with Scott Blair. This was largely due to his active participation in the bench work, a phenomenon quite uncharacteristic of modern day laboratory managers, with equipment much less sophisticated than that which is available now.

Of necessity, much of the work carried out at Shinfield related to the physical and textural properties of dairy products. Nevertheless, Scott Blair still found time to make contributions to theoretical rheology and to initiate and promote interest in two new branches of rheology. These were haemorheology, the application of rheology to biological materials, and especially to blood, and psychorheology, the study of psychological phenomena which are associated with the consumer's evaluation of food texture. Both of these sub-branches of rheology are actively studied and developing subjects today due to the pioneering work and stimulus provided by Scott Blair.

His output of research publications was extremely large. In addition, he wrote several books, some of which were translated into other languages.

The many honours bestowed on Scott Blair in recognition of his work included the award of the gold medal of the British Society of Rheology, of which he was President for several years, the Poiseuille medal of the International Society of Biorheology and the Herbert Freundlich medal of the German Society of Rheology. He also received many invitations to visit and lecture overseas, and he was actively involved in the planning and organisation of the first and second international conferences in rheology in 1948 and 1963, respectively. In 1968 he was the guest of honour at the third conference in Bad Oeynhausen, West Germany.

Scott Blair was the founder co-editor of the Journal of Biorheology and an editorial board member of the Journal of Texture Studies. He was invited to become founder editor of the latter journal in 1969 but felt that he had to decline because of the amount of time he had to devote to Biorheology. Nevertheless, he remained a member of the editorial board of the Journal of Texture Studies until his untimely death.

Following his retirement he continued for many years as co-editor of the Journal of Biorheology until failing eyesight compelled him to relinquish the position. For a limited period he was engaged also in research on the flow and coagulation of blood at the Oxford Haemophilia Centre. A continuous stream of distinguished scientists from home and overseas visited him at his retirement home on the river at Iffley, Oxford, and this helped him to retain an awareness of new developments in rheology.

Apart from rheology Scott Blair had many other interests including languages, in many of which he was proficient, philosophy and music. For many years he was a keen choral singer in oratorios, along with his wife.

He is survived by his devoted wife, Rita, with whom he would have celebrated their diamond wedding anniversary later this month.

Professor P. Sherman
Professor of Food Rheology
Kings College London (KQC)

Dr. G.W. SCOTT BLAIR

As founder of this Society and most recently, through the donation of his library, as its benefactor Dr. G.W. Scott Blair will always be remembered by our membership, for many of us, his work and example have been of profound significance in shaping our own careers. Some twenty seven years ago it was my privilege to attend a one day Rheology School organised by the Society to introduce the subject in its full breadth to those who were just entering the field. For one who was still struggling to define the differences between stress and strain it was a very long day. One contribution stood out that day in my mind; not because of its relevance to my own field - for, to my untutored eye, butter and plastics were as similar as chalk and cheese; nor for the rigour of the science - which I have only latterly become able to appreciate; it was the sheer joy with which Dr. Scott Blair delivered his paper which convinced me that rheology was the field to which I would seek to make a contribution. It is through sharing his joy for the subject that I shall remember him.

F.N. Cogswell

Oldroyd Memorial Lectures

Professor Ken Walters of the University of Wales, Aberystwyth presented the Oldroyd Memorial Lecture entitled "The Rheology of Fluids: A Modern View" at the Universities of Liverpool, Cambridge and Swansea. The lecture, sponsored jointly by the Universities and the British Society of Rheology, was attended in each location by over one hundred people including Mrs Katryn Oldroyd, her three sons and many family friends but mainly by former students and colleagues of Professor Oldroyd.

It was fitting that the lecture should be presented by Professor Ken Walters, a former graduate student of Professor Oldroyd and one of the world's foremost Rheologists.

His enjoyable and expertly presented lecture covered all the major developments in the subject and illustrated the importance of Professor Oldroyd's work. "There is no doubt" he said "that during the years between the end of the second world war and his death in 1982 James Gardner Oldroyd had an enormous influence on the field of Rheology. His written work will be a legacy to several more generations of Rheologists and an inspiration to us all".

The audience were able to meet Mrs. Oldroyd and Professor Walters at receptions either before or after the lecture.

Editor



THE OLDROYD MEMORIAL LECTURE AT LIVERPOOL UNIVERSITY
(Left to right): Dr Neville Waters, Mrs. Katryn Oldroyd, Professor Ken Walters,



THE OLDROYD MEMORIAL LECTURE AT SWANSEA UNIVERSITY

MEMBERSHIP NEWS

The following applications for Membership of the British Society of Rheology were approved at the Council Meeting held on the 1st of September 1987.

Dr Denis CLEAVER,
Wolstenholme Bronze Powders Ltd.,
Eccleshill Works,
Lower Eccleshill Road, Darwen,
Lancashire, BB3 0RP

B.Sc.(Hons), Ph.D.

fetsa AGHJ

Mr Martin GOUGH,
Royal Ordnance PLC,
Research and Development Centre,
Sewardstone Road, Waltham Abbey,
Essex, EN9 1AY

B.Sc.

fea BCE

Mr Norman GRIFFITH,
P.E.L. 3M UK PLC,
Gorseinon Road,
Gorseinon,
Swansea, SA4 1GD

B.Sc., M.Inst.M.C.

feta DGH

Mrs Uma ELIE,
United Biscuits (UK) Ltd.,
R & D Centre,
St. Peters Road,
Furze Platt, Maidenhead,
Berkshire, SL6 7QU

B.Sc. (Hons)

fesa L

Dr Colin B. McKENDRICK,
Shell Research Ltd.,
Thornton Research Centre,
P.O. Box 1,
Chester, CH1 3SH

B.Sc. (Hons), Ph.D.

pesa FG

Dr Julian M. O'NEILL,
Dept of Theoretical Mechanics,
University of Nottingham,
Nottingham.

B.Sc., M.Sc., Ph.D.

fitsa ABEN

Mr Henry SCRIVENS,
Diversey Technology Ltd.,
Axis 1 Rhodes Way,
Watford, WD2 4FD

B.Sc., GRSC

fetsa DFG

Mr Gerald SPOORS,
Steetley Quarry Products Ltd.,
P.O. Box 8,
Hartlepool, Cleveland

C.Chem., FRSC.

pea GHI

Miss Catherine TURNER,
Royal Ordnance PLC,
Research and Development Centre,
Sewardstone Road, Waltham Abbey,
Essex, EN9 1AY

fetsa DE

Mr Peter G. VANDOR,
Dept. of Chemical Engineering,
University of Birmingham,
P.O. Box 363, Edgbaston,
Birmingham, B15 2HB

B.Sc.

fea ABHI

MEMBERSHIP MOVEMENTS

Mr S.B. SOLBAI has moved from the University of Cambridge to the University of Technology, Kuala Lumpur, Malaysia.

RESIGNATIONS

Prof J.F. RAFFLE recently retired from the University of Technology, Loughborough. He joined the BSR in 1960.

Prof J.J. Ulbrecht, National Bureau of Standards, Maryland, USA, due to a change in interests. He joined the BSR in 1981.

Membership Classification Scheme

The symbols which follow membership entries indicate the interests of the members according to the following classification:

<i>f</i>	member's main interest is rheology
<i>p</i>	rheology is a secondary interest
<i>e</i>	approach is experimental
<i>t</i>	approach is theoretical
<i>s</i>	area of work is pure science
<i>a</i>	area of work is technology
<i>A</i>	metals
<i>B</i>	composites
<i>C</i>	solid polymers
<i>D</i>	molten or dissolved polymers
<i>E</i>	natural fibres
<i>F</i>	liquid—liquid systems
<i>G</i>	liquid—solid systems
<i>H</i>	particulate solids
<i>I</i>	glasses, ceramics
<i>J</i>	oils, greases
<i>K</i>	building and road materials
<i>L</i>	foodstuffs
<i>M</i>	biological materials
<i>N</i>	theoretical models
<i>O</i>	other systems

THE EUROPEAN RESEARCH MEETING ON ENTRANCE AND EXIT EFFECTS

The European Research meeting on entrance and exit effects held at the University of Kent at Canterbury was jointly organised by the British and the Belgian Societies of Rheology. The chief organisers were Dr. C.J.S. Petrie and Mr. H. Schimanski for the British Society, and Professor M. Crochet and Dr. J. Leblanc for the Belgian Society. The conference was very well attended by members from several societies, and altogether a total of ten countries were represented. Although inevitable changes were made to the original schedule due to cancellation of some papers, the sessions were well organised, and timed very well. The general standard of presentation was excellent and thanks are due to all those involved with the organisation.

The first session was opened with a review of work by Professor D. Boger entitled "Viscoelastic Flows Through Contractions". His paper was both interesting and informative despite his somewhat twisted view of the world with Australia on top! The paper gave a review of problems and solutions within the field from the 1860's until the present day. The second paper was given by Professor K. Walters, and showed the effect of vortex enhancement of both the salient vortex and also the lip vortex due to changes of the Reynolds number of the material, the type of contraction, the sharpness of re-entrant corners, and the contraction ratio. Professor J. Collier explained the flow of non-Newtonian and viscoelastic polymeric fluids through streamlined dies, designed on a CAD/CAM system using a program which maintained equal flow rates to each differential section. A system was investigated to produce high strength extrudates for co-extrusion, used birefringence methods for flow visualisation and analysed the flow using a non-linear finite element scheme. Mme. H. Maders investigated the problem of die swell in Newtonian and viscoelastic (Maxwell) fluids for zero Reynolds number, using the finite element method to achieve a numerical solution. Following this, Professor Crochet, M. B. Debbaut and M. J.-M. Marchal gave papers on "Numerical Simulation Of Entrance And Exit Effects". This method used a new finite element code for calculating viscoelastic flow to simulate flow through contractions at Deborah numbers up to 60 and for different types of fluids. The lecture included predictions of vortex size and intensity, velocity overshoot, stress relaxation, swell ratio, exit velocity profile and how they were dependent on each other. The work received great praise from all delegates and invoked healthy discussion.

Co-flow through an expansion was the subject of Professor M. Denn's lecture. Using both experimental and numerical solutions, the co-flow of two immiscible fluids through an abrupt expansion was investigated. The technique of speckle photography was used to great effect to enhance flow visualisation. Professor D. Baird showed how planar entry and exit flows could be studied using flow

birefringence techniques. The various rheological properties of two different types of fluids were compared, showing how the vortex attachment length, elasticity, Weissenberg number, shear rate and temperature were dependent upon each other. The stresses produced in the corner regions were also investigated for both fluids.

Laser-Doppler techniques were used by Mr. H. Kramer to investigate melt flow through a slit die. He described the various conclusions of his experiments, considering the development of the velocity field within the slit die, the velocity near the wall, the velocity profile and the deformation rate and history of the melt in the entrance region. Mr. N. Cogswell gave a brief description of how the balance between processability and serviceability of a fluid may be improved by using liquid crystal polymers or long fibre reinforced polymers producing polymer coated glass fibres. He compared similarities in behaviour of the two materials with that of conventional polymer melts.

A numerical simulation was made by Dr. J. Leblanc and M. J. Villemaire for converging flow for rubber compounds to show that slippage did occur at the wall during extrusion. The results were verified by experiments carried out using rubber compounds with various external lubricants. It was shown that the lubricant used affected the rheology and the tendency to slippage.

Dr. J. Benbow discussed how flow irregularities are caused during extrusion, and the influence that die shape and extrudate velocity have on the extent of surface fracture. This was illustrated with a variety of materials, ranging from ceramic pastes to boiled eggs. Flow behaviour of polyacrylamide solutions through a single constriction and also through several constrictions of the same shape was considered by Dr. W. van der Bruggen. It was found that a transition occurred from flow thinning to flow thickening above a critical rate. The tube model of polymer melts which explains several aspects of the dynamics of linear and star shaped molecules was altered by Mr. T. McLeish for use with branched systems. Reptation theory was discussed and the case of the H-polymer was worked through in detail. Mr. K. Thomas showed how the Cogswell model has been updated to take into account 'background' pressure, and how it could be improved further by several additions to the mathematical model. A new theory for the approximation of extensional viscosity was proposed by Dr. D. Binding, and the results compared with existing analyses. He then showed how it was used to interpret results for polymeric systems.

The final day of the conference allowed for diversity, with a section on General Rheology. The session was opened by Dr. D. Cheng who spoke about the importance of wall effect in viscometry. His experiments suggested that results obtained from varying viscometers did not give concurrent results. This was not due to end or edge effects, but could be traced to particle migration. This migration was shown to be geometry dependent and thus a dispersion exhibited different behaviour in different viscometer geometries and dimensions. Dr. Cheng offered a solution to the problem simply by using laboratory scale equipment and then scaling up to pilot plant size. Professor Boger's lecture, on "The Exploitation Of The Rheology Of Brown-coal Slurries" offered an interesting look at the way changing surface chemistry of the suspension drastically altered its rheological properties. It was possible to transform the slurry to such an extent that it became attractive as a

liquid fuel. Professor and Dr. Collier described their process for producing internally reinforced fibres, by coating a nylon core fibre with a rayon skin, which gave a textile fibre with permanent strength and modulus, dyability and solubility. The final properties of the fibre could be controlled by the rheological characteristics of the coating solution and the system used to produce the fibres.

A lecture on "Instabilities And Wall Slip" (A last minute addition to the programme), was given by Professor M. Denn. He explained effects that were produced in an extrudate due to the extrusion rate, showing how a stable flow goes into sharkskin, to slip-stick and finally to wavy flow. It was concluded that stress singularity seems to require slip; it is possible to deduce slip velocity using flow curves; a change in boundary condition can be directly observed via heat transfer and melt fracture can be controlled by changing the material of construction of the die. Dr. D. Oliver compared the performance of aqueous Newtonian and highly elastic liquids in thin bearings as the extruder rotor eccentricity was increased, in each case measuring the mean load and frictional force. The lubricant around the bearings was also examined, a polymer-thickened oil and Newtonian oil were compared in the same way as the liquids. Reasons for the results produced were discussed in the lecture.

The University of Kent at Canterbury proved an excellent setting for the conference. All the rooms were arranged to be within a short distance from all the necessary amenities, including the lecture theatre, the canteen, the major banks, and the bar. The food available everyday was varied and suited to all tastes. Many thanks are due to Dr. Petrie for organising the extremely enjoyable and fascinating evening tour of Canterbury Cathedral. The conference dinner was eagerly anticipated, and the highlight of the week for many people was the presentation of the 1987 Annual Award of the British Society to Dr. David Cheng, as recognition for the many years of service he has given to both the British Society, and to everyone who works in the field of rheology.

On a less serious note, a number of delegates found that Canterbury had an attractive selection of public houses, restaurants and nightclubs, several of which gained extra trade during the conference. Finally, a word of thanks should go to the exhibitors of rheological equipment and literature and to the sponsors of the sherry reception which took place before the conference dinner:-

**Baird and Tatlock Ltd.,
Bohlin Reologi UK Ltd.,
Carri-Med Ltd.,
Contraves Industrial Products Ltd.,
Elsevier,
M.S.E.,
Ravenfield Designs Ltd.,
Rheometrics,
Rheo-Tech International Ltd.**

**Kate Turner & Paul Weaver,
Royal Ordnance Plc.
R & D Centre,
Waltham Abbey.**

CONFERENCE ANNOUNCEMENT

FLOW PROCESSES IN COMPOSITE MATERIALS

at Brunel University, Uxbridge

17th and 18th May 1988

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.

PROVISIONAL PROGRAMME

17 MAY - CONTINUOUS FIBRE SYSTEMS

Permeability

- 1 D Short (Plymouth) "Flow of Resins Through Fibrous Assemblies"
- 2 C E Morrison (Surrey) "Computer Modelling of Resin Flow During Prepreg Manufacture"
- 3 H M M Killesreiter (Clausthal-Zellerfeld) "An Industrial Example for Surface Tension Hindered Flow in JAMIN Tubes"

Rheological Characterisation

- 4 T Rogers (Nottingham) "Rheological Characterisation of Anisotropic Materials"
- 5 D Groves (ICI) "A Characterisation of Shear Flow in Continuous Fibre Thermoplastic Laminates"

- 6 R Balasubramanyam, R S Jones and A B Wheeler (Aberystwyth) "Modelling Transverse Flows of Reinforced Thermoplastic Materials"
- 7 J A Barnes and F N Cogswell (ICI) "Compaction and Transverse Flow Processes in Continuous Fibre Reinforced Thermoplastics"

Shaping Processes

- 8 P J Mallon (Galway) "Polymeric Diaphragm Forming of Continuous Fibre Reinforced Thermoplastic Matrix Composites"
- 9 J M O'Neill (Nottingham) "Analysis of Fibre Reorientation During the Deformation of Laminated Plates"
- 10 N Zahlan (ICI) and J M O'Neil (Nottingham) "Analysis of the Spring-Forward Phenomenon During Moulding of Composites"

Session reserved for short contributions on current research activities and perceived research needs

18 MAY - DISCONTINUOUS FIBRE SYSTEMS

- 11 R Balasubramanyam (Aberystwyth) "Numerical Simulation of the Shape of a Fibre in Flowing Concentrated Suspension"
- 12 F S Baker (Royal Ordnance) "Extrusion of Highly Filled Energetic Composite Materials"
- 13 M J Folkes (Brunel) and H A Potts "Injection Rheometry of Filled and Unfilled Thermoplastics"
- 14 A G Gibson (Liverpool) "Convergent Die Flow of Polymer Melts Containing Suspended Fibres"
- 15 B Franzen, C Klason and J Kubat (Gothenburg) "Fibre Length Degradation During Processing of Short Fibre Reinforced Thermoplastics"
- 16 M Crochet (Louvain-la-Neuve) "Fibre Orientation in Injection Moulding Processes"

The Conference will begin at 0900 on Tuesday, 17 May and finish after lunch on Wednesday, 18 May. Accommodation is available on the nights of Monday, 16 and Tuesday, 17 May at the College. The University is close to Heathrow International Airport.

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. Further details and full programme are available on request to:

**F N Cogswell
The British Society of Rheology
ICI Advanced Materials
P O Box No 90
Wilton
Middlesbrough
Cleveland
TS6 8JE**

THE GOLD MEDAL AWARD

Council makes an occasional Gold Medal Award for outstanding contributions to the Science of Rheology. Nominations for such an award should be sent to the President.

THE ANNUAL AWARD OF THE SOCIETY

Council makes an Annual Award for furtherance of the Science of Rheology. This award is designed to reflect either contributions made over a prolonged period or it can be used in appreciation of a particular contribution to the field including a single published paper. Council is always pleased to receive nominations for such an award particularly from the peers or supervisors of younger members of the Society whose contributions are judged to be of especial merit or promise. Nominations should be sent to the President.

Second Call for Papers

The Scott Blair Memorial Conference

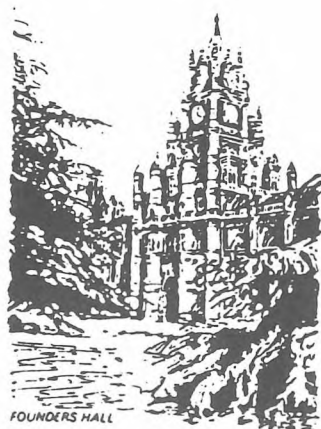
CONUNDRA RHEOLOGICA

The **BRITISH SOCIETY OF RHEOLOGY** is now organising its 1988 annual Autumn Conference, which will be held at the

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

*on September
7th to 9th 1988*

This meeting will include a series of invited review papers, both objective and some light-hearted, which explore the status of some rheological problems which have so far defied a rigorous solution.



Offers of papers and suggestions for topics, titles and speakers will be most welcomed and should be sent to the conference organiser:

**Mr. P.C. Anderson,
BP Research Centre,
Chertsey Road,
Sunbury-on-Thames,
Middlesex TW16 7LN.
Tel. 09327-63351**

or to any other member of the BSR Council.

Those wishing to attend this meeting are also welcome to contact us at this stage and further notification will be sent in due course.

In the tradition of the BSR, the costs of this 3 day meeting will be kept low, probably of the order of £80, including accommodation with private facilities and the Conference dinner.

ONE DAY SYMPOSIUM

STICKY LIQUIDS

at the Victoria Hotel, Bridge Street, Bradford

on 9th March 1988

A one day Symposium on highly viscous and non Newtonian fluid handling

09.00 a.m. *Registration*

09.30 a.m. Chairman - Professor M.F. Edwards,
Unilever Limited/University of Bradford

09.40 a.m. "Measuring the Flow Properties of non-Newtonian Fluids"
Dr J.C. Godfrey, University of Bradford

10.30 a.m. "Chocolate Manufacture and its Associated Problems"
Dr. A.D. Darley, Rowntree Mackintosh Plc

11.15 a.m. *Coffee*

11.30 a.m. "Agitator Design for Highly Viscous Fluids"
Mr. P. Nicholson, Lightnin Mixers Limited

12.15 p.m. "Heat Transfer Design Correlations for Mixing Vessels"
Dr. E.A. Foumeny and Mr. P.J. Bentley, University of Leeds

01.00 p.m. *Carvery Lunch*

02.15 p.m. "Pumps for Handling Viscous and non-Newtonian Fluids"
Mr. D.J. Lambert, Mono Pumps Limited

03.00 p.m. "Dispersion of Powders in Viscous Fluids"
Mr. A. Staib and Dr. J.C. Godfrey, University of Bradford

03.45 pm. *Tea*

04.00 p.m. "Handling Viscous Fluids in Plate Heat Exchangers"
Mr. A. Boothroyd, Alfa Laval Limited

04.45 p.m. Closing remarks

05.00 p.m. *Close*

Fees (including preprints, refreshments and carvery lunch)		
Members of the Institution of Chemical Engineers		£60.00 + VAT
Non members		£70.00 + VAT

Registration Form: STICKY LIQUIDS

Name:	I. Chem. Member	£69.00
	Non Member	£80.50

Company:

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Cheques made payable to I.Chem.E. - East Pennine Centre

Conference Diary

	Date	Place	Details
	18-22/1/88	Chamonix, France.	'International Conference on Extensional Flow' Sponsored by the European Economic Community: contact Professor K. Walters, Dept of Mathematics, University College of Wales, Penglais, Aberystwyth, Dyfed, SY23 3BZ, U.K.
	11-14/4/88	Cambridge, U.K.	'Deformation, Yield and Fracture of Polymers' (Seventh international conference) Plastics and Rubber Institute and other organisations - contact Conference Office, P.R.I., 11 Hobart Place, London SW1W 0HL, U.K.
	Spring/88	Canada.	'Rheology and Processing of Polymers' planned by the Canadian Rheology Group - contact C.R.G. secretary.
	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, PO Box 90, Wilton Centre, Middlesbrough, Cleveland TS6 8JE, U.K.
	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, Bl.I, Sofia 1113, Bulgaria.

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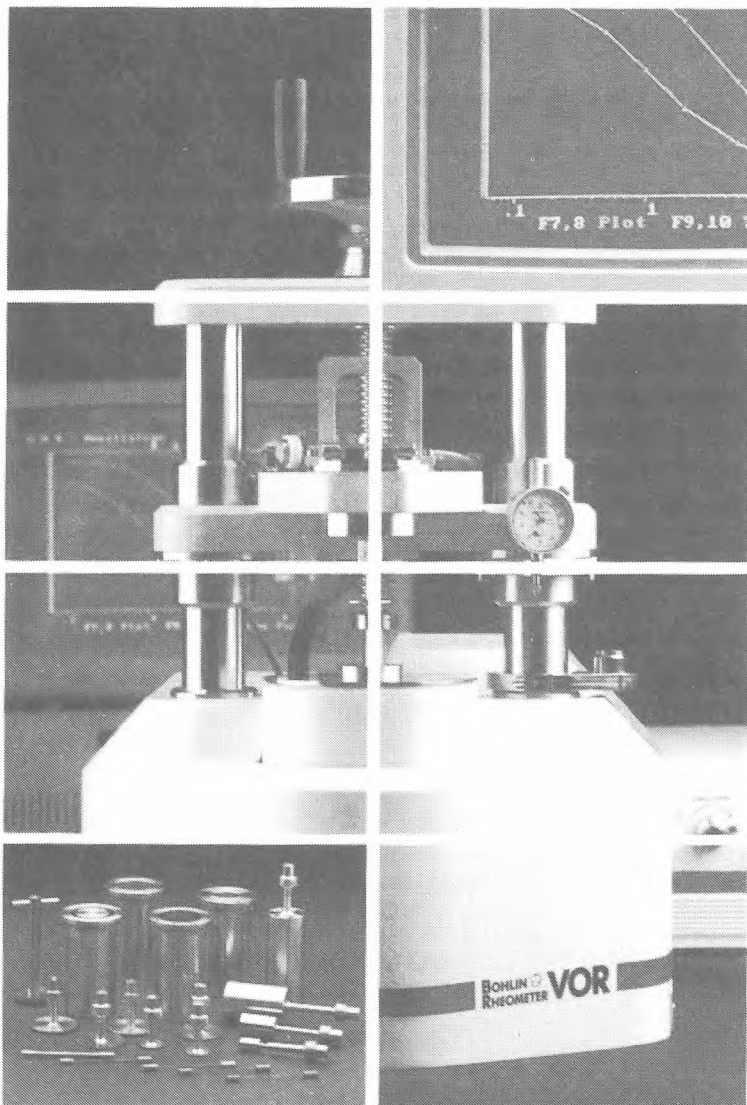
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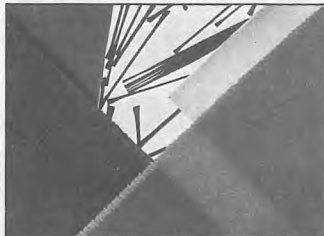
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