

THE BRITISH SOCIETY OF RHEOLOGY

BULLETIN



March 1994

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THE BRITISH SOCIETY OF RHEOLOGY
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1993/94

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I must apologise to members for the late distribution of this issue of the Bulletin which is due to pressure of other work. This may mean that information on some items is too late to be of much use to readers.

As I assembled this issue I realised that about half of it is taken up by information on meetings and conferences. If the health of a science can be measured by the number of such events being organised then this issue is surely confirmation that rheology is thriving.

There is further historical correspondence in this issue and an invitation from the Secretary to give her comments on the Society's possible role in formulating National Vocational Qualifications in rheology as a branch of science and technology.

Finally I would like to urge members to take part in the Young Rheologists' Day to be held in September 1994. This is a novel development in our repertoire of meetings. Please encourage your research students and younger colleagues to present their work in what we hope will be an informal research seminar atmosphere.

Copy date for next issue, June 15th 1994.



RECOGNISED STANDARDS OF SKILLS IN RHEOMETRY

In my capacity as Secretary of the B. S. R. I am attending meetings which ultimately will end with the formation of a lead* body (bodies) for Science Technology and Mathematics (ST+M). It is important that rheology is recognised as a significant science when it comes to improving the wealth of the nation through increasing the skills of the workers and hence the quality of the products we sell. The B. S. R. has an important role to play in ensuring that the knowledge gained by research is transferred to and applied in our industries. *Is there a reason why the B. S. R. should not be the lead body for rheology?*

I believe that there is a perceived view of the B. S. R. which suggests it is composed mainly of highly theoretical and mathematical academics. While the nature of the science demands such skills to underpin the fundamental principles there is equally a demand for engineers to apply these principles in order to build the instruments and plants to develop, manufacture and test the many products of our industries. There is no lack of academics or engineers but the language they speak and the paths they tread are often very different. From my experience at Warren Spring Laboratory and as a member of the Council of the B. S. R. I have made many contacts who can help to bridge this gap. I would like to share my ideas with you, the members, as I have with Council and to hear your views.

Essentially it is the academics who must push for rheology to become a recognised subject in its own right in higher education and which in time will filter back into senior classes in schools. Within industry there are also many well known and respected 'applied' rheologists who have little need for acquiring practical skills or the time to teach others. However between the operative level and middle management there is a vast number of people using rheology and rheometry as part of their everyday work. They may not all appreciate that they are rheologists, they may class themselves as paint or ink technologists, pharmaceutical workers, biscuit makers and so on. In many cases they will gather some type of rheological measurements from cups, spindles, mixers through to sophisticated computer controlled rheometers, in order to develop or control the quality of their product.

Many of us have seen the measurements taken on equipment not suitable for the job or with samples not handled correctly. There are many

*Lead is pronounced 'leed' in this context.

horror stories to be found about the physical state of instruments and geometries and no doubt unbelievable amounts of money have been wasted on purchasing the 'wrong' instrument or interpreting 'dubious' data and manufacturing 'out of spec' product. It is by no means unusual to see different divisions within one company trying to quality check the 'same' product with different instruments and getting very different results. It is always the instrument that is to blame but never the operator or test procedure!

As a consequence I have formed Camtel Ltd. to specialise in *independent* training in rheology with the aim to bring together people from industry, academia and the instrument manufacturers. Following discussions with representatives from these groups and Dr D. C.-H. Cheng we have offered to act on behalf of the B. S. R. as a vehicle for the development of standardised training units along the lines of National Vocational Qualifications in order to increase the practical skills in rheometry and to overcome the above mentioned problems. These training units will be written by well known rheologists who have spent many years working in industry or with industry. There will be a core curriculum which will encompass general methodology for the range of commercial instruments and measuring systems. From this base specific test procedures for measuring the various products of particular industries will be laid down.

A steering committee consisting of key 'practical' rheologists and including a minimum of one appointed representative of the B. S. R., will vet and approve each unit. A certificate of competence will be given to participants for each unit obtained and for a combination of several units a 'master' certificate will be awarded.

Special training courses will be offered to industrial companies who wish to use these units to train their own staff in-house. These training officers will be taught how to train and assess their staff. External verifiers will be appointed to maintain the standards of the qualification (the certificates).

For small to medium sized companies all aspects of training, assessing and verifying can be organised.

The standards should be recognised as B. S. R. approved because the B. S. R. should act as our 'lead body'. The certificates awarded to candidates can be nationally and internationally recognised as standards of competence by employers in industry when vetting potential employees i. e. they will become part of an individual's C. V..

Once a government approved lead body (B. S. R.) is appointed we can apply for national recognition of our standards.

Comments please to: Carole Moules, Camtel Ltd., 5 Carrington House, Royston, Herts SG8 9AZ. Tel.: 0763-244280, Fax: 0763-244298.

LETTER TO THE EDITOR

School of Chemical Engineering
University of Birmingham

Dear Sir,

I recently received a letter from Professor Nissan, formerly of this department now of 6A, Dickel Rd., Scarsdale, New York, NY 10583, U. S. A., and an extract follows. As background, Professor Freddie Garner built up our department (plus a large new building) between about 1942 and 1960. The work referred to in the letter was not his main theme (mass transfer to bubbles and drops) but is of great rheological interest.

"... Perhaps I should describe to you the work we carried out at Birmingham and the conditions governing it. We started in 1942 on work on flame thrower fuels under a contract which Professor Garner had with the government. We continued until 1947 when I left Birmingham to join Bowaters as their research director. I had one Ph. D. candidate — George Wood — with whom I still correspond. He was my first Ph. D. student. I also had others seconded to work with us for short periods. The work was classified as 'secret', so we did not publish till after the war. Professor Garner was meticulous about secrecy, but we did issue monthly reports circulated to other workers in the field both in England and in the U. S. (I was surprised on coming to the States how many physical chemists and chemical engineers knew of this work over in the States). Thus I knew of the work in London University — Weissenberg was an advisor to them, even though he was with the Shirley Institute — and they knew of ours. That is the main reason for some of the mix ups on priorities of discoveries. In the large-scale roll of the history of science, I do not think these 'priorities' are really significant. But if you are interested in what our department was fortunate to discover or note, here is a list. I believe these were the important items.

(1) The rod climbing phenomenon. When this was discovered in our labs, I dug up previous work and found (I believe) Pryce-Jones had noted a similar phenomenon with other systems than the soap-hydrocarbon and rubber-hydrocarbon systems we were working with. But our real contribution here was not the phenomenon itself but linking this climbing to other phenomena. I remember that we did not want to use the phrase 'normal pressure' as it may have been still 'secret', so I

talked of 'spinnbarkeit'. (Please forgive the first person pronoun. Garner and Wood and I worked very closely together of course; but I was the 'rheologist'.)

(2) I am not sure who first noted the pressure under a stationary disc against a parallel rotating one; most probably the London group by a short time ahead of us. But we were the first to use a 'cone-and-disc' version. Weissenberg acknowledged this — if I remember correctly — in his first letter to *Nature* by giving thanks to us for pointing it out to him. However, and this is important, it was *his* interpretation which proved to be correct. So I believe the 'Weissenberg' appellation to the normal pressure is fully merited.

(3) We were the first to add manometers and measure the distribution of the pressure on the stationary cone and the stationary disc in studying the normal pressure. We were also the first to discover a power-law distribution of the pressure (or a logarithmic relationship) with the radius. We published these facts later. We put up a thermodynamic hypothesis for the origin of these phenomena. Weissenberg put up a solid mechanics or elasticity theory. He proved correct and, again, I believe to him belongs the honour. (I still believe that parts of our hypothesis are valid but it needs more work.)

(4) I personally knew of the drag reduction phenomenon because we also went into design considerations. This was only written up in an internal report which we never cleared for public publication. But I can not claim anything in that connection because (a) I really was (too?) totally immersed in the end effects, the swelling at exit, the normal stress, the apparent high dynamic surface tensions, etc. to study it. (b) We discovered the 'negative' sigma phenomenon which implied a layer of *greater* viscosity at the pipe wall. Hence, while such a layer would or could be the agent for suppressing turbulence, I could not see how it could 'increase' the bulk flow. Besides, I did not know what 'viscosity' meant when I found out that 'viscosity' by capillaries was different from 'viscosity' by falling balls."

(Professor A. H. Nissan letter to D. R. Oliver 18/3/94)

I hope that these comments of Professor Nissan will be of interest to readers of the Bulletin.

Yours faithfully
D. R. Oliver

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SCOTT BLAIR COLLECTION

Since there were only a small number of acquisitions in 1993, we will not publish a supplementary catalogue now but incorporate those items in the consolidated catalogue which is now being prepared. We are grateful for the donations of various issues of journals by J. F. Hutton, P. C. Anderson, Dr M. Jones and Polymer Laboratories, Thermal Sciences Division.

RHEOLOGY: AN HISTORICAL PERSPECTIVE

Professor Roger Tanner and I are working on a book entitled *Rheology: An historical perspective*. We are anxious to locate and use any suitable photographs, anecdotes and background information which are not in the public domain but which would nevertheless provide insights into the way our field of study has developed. If any members of the B. S. R. feel they can help in this way, I would be happy to hear from them. My address is: Department of Mathematics, University of Wales, Penglais, Aberystwyth, Dyfed SY 23 3BZ, U. K..

Ken Walters

RECENTLY PUBLISHED BOOKS

Information on recent books is given here for the benefit of members, but the Society cannot answer enquiries about the availability of particular titles. Place orders for books with publishers through booksellers and agents.

Interfacial transport processes and rheology. D. Edwards, H. Brenner and D. Wasan, Butterworth-Heinemann Oxford 1991, pp. xiii+558, £60.00, ISBN 0 7506 9185 9.

This book deals with a macroscale and a microscale view of the interface and reviews methods of measurement, practical applications and theory.

The Mechanics of fluids. A video series, AVC Marketing, The University of Iowa, 215 Seashore Center, Iowa City, IA 52242-1402, U. S. A.. 6 videos, US\$245 each or US\$990 for the whole set.

This series of six videos introduces the principles of fluid mechanics using everyday flow examples and progresses to laboratory demonstrations exemplifying the theories. The programmes are 20-25 minutes long and are entitled: 1. *Introduction to the study of fluid motion*. 2. *Fundamental principles of flow*. 3. *Fluid motion in a gravitational field*. 4. *Characteristics of laminar and turbulent flow*. 5. *Form, drag, lift and propulsion*. 6. *Effects of fluid compressibility*.

COMMENTARY: 276TH MEETING OF COUNCIL

At 11 a. m. the second special meeting on the future of the Society commenced in the Hilton National Hotel, Newbury. Unfortunately your commentator was still somewhere north of Oxford having spent two hours sitting in a traffic jam on the M6. This excuse seemed quite lame compared with Roy's who blamed problems with the doors on the Harwich ferry! Arriving late and blissfully unaware that I was to be elected as scribe, my recollections of the morning session are sketchy but I got the impression that very little was said that had not already been aired at the first special meeting on this topic: the need for more recruitment, young blood and industrial links etc..

Only three potential exhibitionists had obeyed Carole and made the effort to bring along a simple rheological experiment. Balls, being squeezed in a bag and falling in tubes were demonstrated by Ralph and Nick respectively. Peter showed us a liquid that would flow uphill but then had difficulty getting it back into the bottle.

Lunch intervened at 12. 45 and was a very pleasant experience and one could not but fail to be impressed by the way the hotel restaurant staff responded to Carole's bidding.

All too soon the main meeting commenced, there being ten of us present and Carole reported that three others were sorry they were not. It was at this stage that nine of those present thought that it would be a good idea if I wrote the commentary, and that I should refer to previous Bulletins to ensure that I preserved the 'house style'.

The minutes of the previous meeting were agreed. Under matters arising Phil told us of his enquiries concerning alternative ways of distributing the Bulletin. He thought it best to carry on with the present arrangement for now and that any decision should be left to the next Bulletin editor. Phil also thought we should make it clear that the Young Rheologists Day, to be held in Birmingham in September, was open to everyone.

Ralph previewed the agenda and told us of a request for suitable books and videos etc. from the newly formed Fluid Dynamics Research Group of the University of the West Indies. He concluded by reminding us that Carole's stint as secretary ended in September but that fortunately Geoff was willing to take over.

The Dorking branch of Lloyds Bank still think Peter is treasurer and Roy is considering transferring the account to Loughborough where

they, presumably, know who he is. He still had to finalise the Cambridge meeting account.

Carole reported that Tony had written to thank us for the annual award. She went on to tell us that she had recently written to nine young rheologists most of whom had received some kind of financial support from the Society, to invite them to take part in the Birmingham meeting. Four more had applied for travel grants and after some discussion we agreed to help them all and that they too be asked to attend the Birmingham meeting and also to write reports for the Bulletin.

After a quick cup of tea, approval was given for all the new applications for membership including that of the secretary's daughter. Because Doug now had a new day job, Nick has agreed to take on some of the membership secretarial duties now before taking over completely.

Phil was concerned that the next issue of the Bulletin might be a bit thin and he would welcome suitable material. Carole offered something on N. V. Q.s and Nick thought he might be able to write something on his imminent skiing trip to Val D'Isère.

In Gerry's absence, his report was read out and the main points were that issues 3 and 4 of the 1993 Abstracts were about to be dispatched and that Dick Whorlow had agreed to help with an author index.

The next item on the agenda was conferences and September's Young Rheologists Day got another airing. This meeting is also to include a council meeting and the A. G. M.. It was agreed that the Society should co-sponsor two meetings with the University of Wales, Institute of Non-Newtonian Fluid Mechanics: an International Workshop on Numerical Methods in April 1995 and a conference on Polymer Melt Rheology in September 1995. It was thought that the second of these might include papers on general rheology and could also include next year's A. G. M.. There is also to be a joint meeting with the French Society in mid September 1995. After running through all the other important upcoming meetings we were reminded by the other Peter, Swansea's Vice Principal, that we should start thinking about our bid for the International Congress of Rheology, 2000.

A candidate for the gold medal was discussed and we were all of the opinion that he would be an excellent choice and that he should be contacted before his name is formally announced. Discussion of the annual award would be scheduled for the next meeting and we agreed unanimously about a special award for practical rheology.

Carole regretted that there had been no recent progress on the Handbook of Rheology, mainly because 'David is far too busy making

money at the moment". Concern was also expressed that there was nothing to report on the Scott Blair collection.

Peter offered his services as a possible Bulletin editor if no one else could be found to replace Phil when he stands down later this year, but since he had no access to the necessary desktop publishing facilities these would have to be provided by the Society.

It was decided that the sum of £100 be made available for the Fluid Dynamics Research Group of the West Indies and Peter the V. P. agreed to look after the details. A light hearted suggestion to relocate the Scott Blair collection in the West Indies offered interesting possibilities but was rejected.

The meeting ended at 5. 13 p. m. and after sitting in another traffic jam near Oxford for over an hour I wished I had taken Ralph's advice and joined him for a drink before departing.

Neville Waters

MEMBERSHIP NEWS

The following applications for membership were approved at the Council Meeting, March 10th, 1994.

Dr P. Bente,
Dow Corning GmbH,
Rheingaustraße 53,
P. O. Box 130332,
D-65201 Wiesbaden
Germany.

Dr R. H. Blanc,
CNRS,
Lab. Mécanique & Acoustique,
31 Chemin Joseph-Aiguier,
F-13402 Marseille, Cedex 20
France.
(petsa BCO)

Mr W. Collins,
Fisons Instruments,
Sussex Manor Park,
Gatwick Road,
Crawley,
Sussex.
(fetsa ABCDEFGHIJKLMNOP)

Dr E. Peuvrel-Disdier,
Centre de Mise en Forme des Matériaux,
Ecole des Mines de Paris,
BP 207,
F-06904 Sophia-Antipolis,
France.
(fetsaDL O),

Mr B. S. Evans,
AMARC,
Maths Building,
University Walk,
Clifton,
Bristol BS8 1TW.
(petsa ELM)

Mr H. McEvoy,
CBDE
Porton Down,
Salisbury,
Wilts,
SP4 0JQ.
(fetsa DLO)

Ms N. J. Moules,
Camtel Ltd.,
5 Carrington House,
37 Upper King Street,
Royston, Herts SG8 9AZ.
(ea O)

N. Iutes-Petrescu,
Institutul de Cercetari Pentru,
Rafinarii Si Petrochimie,
Bdul. Republicii Nr. 291 A,
2000 Ploiesti, Romania.
(fetsa GO)

Dr J. L. Pitt,
Elsevier Science BV,
P. O. Box 330,
1000 AH Amsterdam,
The Netherlands.
(petsa)

Mr F. Presti,
Dept. of Mechanical Engineering,
University of Liverpool,
P. O. Box 147,
Liverpool,
L69 3BX.
(fetsa DFGJ)

Mr A. P. Shacklock,
Maths Building,
University Walk,
Clifton,
Bristol,
BS8 1TW.
(petsa ELM)

Dr P. Taylor,
Formulation,
Zeneca Agrochemicals,
Jealott's Hill Research
Station, Bracknell,
Berks, RG12 6EY.
(fetsa DFG)

Mr K. G. Tucker,
School of Chemical Engineering,
University of Birmingham,
Birmingham,
B15 2TT.
(feta O)

The following have resigned: Dr W. J. Ferguson, D. S. Marshall, M. G. Sayer, N. van Uffel.

Professor A. Silberberg died in September 1993.

H. Schimanski has been appointed Sales and Marketing Manager for Haake UK, a business formed in January 1991 to be responsible for sales and support for the Haake range of viscometers and rheometers.

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Tel.: 0509-263171, Fax: 0509 234516

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ICI have two R15 Weissenberg rheogoniometers to dispose of. They consist of three motors, three gear boxes, two goniometers and some old and some new electronics. Anyone interested in either taking complete units or scavenging for spares should contact:

Dr R. Buscall,
ICI Wilton Research Centre,
P. O. Box 90 Wilton,
Middlesbrough,
Cleveland TS6 8JE.
Tel.: 0642-437613.

CONFERENCE ANNOUNCEMENTS

YOUNG RHEOLOGISTS' DAY

SEPTEMBER 22ND, 1994

The Society intends to hold a one-day meeting devoted to short presentations on all aspects of rheology and invites contributions from research students and other young rheologists. It will be held in the Crow's Nest Suite at the National Motor Cycle Museum in the West Midlands and will be followed by the Annual General Meeting. We anticipate that talks will be given by those who have received travel or study grants and by the holder of the Society's Scott Blair Scholarship but other speakers will be welcome. There will be an award for the best presentation, as judged by a panel.

Cost, including a buffet lunch will be £30 for students and £45 for members of B. S. R..

Please send offers of papers giving a title and a short description to Carole Moules, Camtel Sciences, 27 Alexander Road, Stotfold, Hitchin, Herts SG5 4NA.

MULTI-PHASE MATERIALS PREPARED BY EMULSION
POLYMERISATIONAN INTERNATIONAL CONFERENCE TO BE HELD AT LANCASTER UNIVERSITY
JULY 4-7TH, 1995

This conference, co-organised by Dr. D. J. Hourston, Lancaster University and P. A. Lovell, Manchester University Materials Science Centre, and co-sponsored by The British Society of Rheology and the Macro Group of the Society for Chemical Industry, will include a half day on latex rheology on Friday July 7th, 1995. The session will consist of a plenary paper and about four submitted papers. The organisers invite papers for their consideration and subsequent publication in the proceedings volume. For further information and to offer a paper (title plus short description), contact Prof.D.J. Hourston, IPTME, Loughborough University of Technology, Loughborough, Leicestershire, LE11 3TU.

CONCENTRATED DISPERSIONS
BRISTOL UNIVERSITY, MARCH 29TH-31ST 1995

The Colloid and Interface Science group of the Royal Society of Chemistry — Faraday Division intends to hold a major 3-day meeting on concentrated colloids. The core of the meeting will be concerned with some of the research sponsored under the DTI Initiative in Colloid Technology (details below). However we wish to invite and issue a call for a limited number of papers on research in related areas. Major themes of the meeting will be the theory and simulation of dispersion rheology of hard and deformable particles, metastable colloids and colloidal networks, composite colloids and new measurement science for characterising colloidal structure, rheology and forces.

For further information please contact: Dr A. Lips, Unilever Research, Colworth Laboratory, Colworth House, Sharnbrook, Bedford MK44 1LQ. Tel.: 0234-222002, Fax: 0234-222401.

DTI PROGRAMME IN COLLOID TECHNOLOGY

This is a major UK collaborative research initiative (£7. 2M) half funded by DTI with the rest from the collaborating industries (Unilever, ICI and Schlumberger). The project commenced in 1992 and is scheduled to finish in 1997. The collaborating groups include the University of Cambridge (mainly the Cavendish Laboratory), Bristol University (Department of Physical Chemistry), Imperial College (Department of Chemical Engineering and Chemical Technology), Unilever Research (Port Sunlight and Colworth), Schlumberger Cambridge Research and ICI Materials (Colloid & Rheology Unit at Wilton). Some of the research is sub-contracted to Edinburgh University (Department of Physics). As a result of the recent demerger of ICI, Zeneca is joining the consortium as a new member.

The project has challenging scientific goals mainly in the colloidal physics of concentrated dispersions. There are several linked work programmes for the academic and collaborative industrial research in the areas of *Flow and Structure of Concentrated Dispersions*, *Composite Colloids* and *Colloidal Forces*. The project sponsors a major emphasis on theory in the condensed matter physics of soft materials and new measurement science.

One of the wider aims of this initiative is in underpinning UK expertise in colloid science. To this end, meetings such as the one planned will facilitate wider dissemination of research findings.

GELS

ROYAL SOCIETY OF CHEMISTRY — FARADAY DIVISION DISCUSSION NO. 101
PARIS, FRANCE, SEPTEMBER 6-8TH 1995

This meeting will deal with the structure and dynamics of gels with the latter heading covering both swelling and rheological behaviour. Mixed systems such as polymer/surfactant and polymer/particle gels will also be discussed. The discussion will bring together experimentalists and theoreticians interested in different types of gelling systems and encourage them to assess the current scene and provide a benchmark for future developments.

Contributions are invited for consideration by the Organising Committee. Titles and abstracts of about 300 words should be submitted by September 30th 1994 to: Dr J. W. Goodwin, School of Chemistry, University of Bristol, Cantock's Close, Bristol BS8 1TS, U. K.. Full papers for publication in the Faraday General Discussion 101 volume will be required by May 1995.

RHEOLOGY AND COATINGS

Information was received too late to give advance notice of this one day meeting held on March 2nd 1994 in Slough. It was structured to provide a progressive discussion of the science of rheology and rheology modifiers as applicable to coatings. Contact the Oil and Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley HA0 2SF.

WARREN SPRING LABORATORY FOUNDATION COURSE IN
RHEOLOGY

This course is to be run at AEA Technology, Harwell, Oxfordshire on June 14-15th 1994. It is the successor to the courses organised for many years by Warren Spring Laboratory. For further information contact Mrs Margaret McCulloch at Harwell, telephone 0235-432820.

NORDIC RHEOLOGY SOCIETY
THIRD ANNUAL MEETING, COPENHAGEN
JUNE 1ST-3RD, 1994

The following papers are expected to be presented and to appear in the published proceedings.

INSTRUMENTATION AND APPLICATIONS

Roy Carter (invited lecture) *The use of thermal scanning rheometry for characterising foodstuffs.*

Tage Christensen, *New Techniques, based on piezoelectric ceramics, for measuring shear and bulk moduli of liquids in the audio frequency range.*

Dorata Johansson, *Fat and sugar crystals in oil — rheology and interactions.*

Annika Sahlström, *Rheology as a tool to predict packability of viscous food products.*

FOOD RHEOLOGY

Susanne Elbrønd Neve, *Effect of emulsifiers on dough rheology.*

Karin Autio, *Viscoelastic properties of rye doughs, the effect of particle size distribution.*

Katerina Wikstrøm, *Biaxial extensional flow and wheat quality.*

Joan Qi Si, *Influence of enzymes on dynamic rheological properties of dough and gluten — a way to understand the effect of enzymes on breadmaking.*

Keihan Mani, *Viscosity measurements on wheat flour doughs.*

Ann-Charlotte Eliasson (invited lecture) *Title to be announced.*

Ann Skriver, *Rheological characterisation of stirred yoghurt. Viscometry and oscillation.*

Grethe Hyldig, *Rheological properties of chymosin induced gels from ultrafiltered milk.*

Beinta Unni Nielsen, *Rheological characterisation of low-fat spreads.*

Helle Wium, *The ability of rheological methods to discriminate between different types of UF-Feta texture.*

Atsumi Tobitani, Haruyoshi Yamamoto, Toshiaki Shioya, Simon B. Ross-Murphy, *Rheological and structural studies on heat-induced gelation of concentrated skim milk.*

Simon Ross-Murphy (invited lecture) *Structure-property relations in biopolymer gels and solutions.*

Pernilla Walkenstrøm, *Rheology of mixed gels of gelatin/whey proteins.*

Richard Ipsen, *Rheological aspects of mixed gels made from protein and κ -carrageenan.*

Åsa Josell and Eva Tornberg, *The relation between rheological properties at small and large deformations and sensory traits of whole meat.*

GENERAL RHEOLOGY

Paul A. Janmey (invited lecture) *Rheological properties of cytoskeletal protein networks.*

Erling Bonne Jørgensen, *Gel and micelle forming triblock copolymers*

Frans Maurer, *Melt-state dynamic mechanical spectroscopy of heterogenous starch and plastic pigments.*

Lars Järnstrøm, *A viscometric study of the interaction between slightly hydrophobic starch and plastic pigments.*

Arne Stavland, *Formation of gel-influence on flow behaviour in porous media.*

Ole Kramer, *Title to be announced*

Søren Hvidt, *On the molecular mechanisms involved in the sol-gel transitions of water soluble triblock copolymers.*

Arild Saasen, *The effect of gypsum and anhydrate on gel formation in cement slurries.*

For further information contact: Arild Saasen, Annual Transactions of the NRS, RF-Rogaland Research, P. O. Box 2503, Ullandhaug, N-4004 Stavanger, Norway.

UNIVERSITY OF WALES INSTITUTE OF NON-NEWTONIAN FLUID MECHANICS
 SETTLING IN NON-NEWTONIAN FLUIDS II
 Lake Vrnwy Hotel, Powys, North Wales
 October 17th-19th, 1994

This will be the second meeting to be held in the popular minisymposium series of the University of Wales Institute of Non-Newtonian Fluid Mechanics. The meeting will commence after lunch on the 17th and finish after breakfast on 19th. Attendance will be strictly limited to twenty or so participants and early booking is recommended through Mrs E. Shouaib, Department of Computer Science, University College of Swansea, Singleton Park, Swansea SA2 8PP, Tel.: 0792-295393, Fax: 0792-295708. The registration fee which includes accommodation and all meals is £180.

NINTH INTERNATIONAL WORKSHOP ON NUMERICAL
 METHODS IN NON-NEWTONIAN FLOWS
 April 19th-22nd, 1995

The Ninth International Workshop on Numerical Methods in Non-Newtonian Flows which is being organised by the University of Wales Institute of Non-Newtonian Fluid Mechanics will take place at Llyndir Hall, Rossett in North-East Wales.

It is hoped that the informal atmosphere of previous workshops will be maintained. Proposed session areas will include

- Constitutive modelling
- Numerical algorithms for the simulation of viscoelastic flows
- Comparison of numerical and experimental results for benchmark problems
- Non-isothermal flows
- Time-dependent flows

The registration fee for the workshop is £320 which will cover the cost of accommodation and all meals. The registration fee will be due by January 15th, 1995.

For further information please contact:

Dr T. N. Phillips, Dept. of Mathematics, University of Wales, Aberystwyth SY23 3BZ, U. K. Tel.: +44-970-622769, tnp@uk.ac.aber.

Dr M. F. Webster, Dept. of Computer Science, University of Wales, Swansea SA2 8PP, U. K. Tel.: +44-792-295656, M. F. Webster@Swansea.

POLYMER MELT RHEOLOGY

ABERYSTWYTH, U. K.

September 4th-7th, 1995

This meeting is being arranged by the University of Wales Institute of Non-Newtonian Fluid Mechanics (Director Professor K. Walters FRS) and is being co-sponsored by the British Society of Rheology as their annual autumn Conference and by the U. K. Department of Trade and Industry through the National Physical Laboratory. The intention is to attract international participation.

The aim of the meeting is to establish the theoretical and related experimental state of knowledge of the rheology of polymer melts, both in understanding their behaviour in varied deformation conditions, and in providing a sufficient characterisation of behaviour to progress the development of modelling of polymer processing. Innovative computer modelling of flow will be included.

An early indication of proposed contributions to the meeting will be appreciated. Communications should be addressed to: Professor Ken Walters, Department of Mathematics, University of Wales, Penglais, Aberystwyth, Dyfed SY23 3BZ, U. k. Fax: (UK) 0970-622777.

CELLULAR AUTOMATA AND THEIR APPLICATIONS TO
MOLECULAR FLUIDS

July 19th-20th, 1994

A conference organised by the Statistical and Thermodynamics Group of the Royal Society of Chemistry will take place in Manchester, U. K.. Papers will be given on the following topics: Dynamics of colloid suspensions, Polymer dynamics, Flow in porous media, Phase ordering kinetics, Modelling chemical reactions, Modelling microbial growth, Material science applications, Flow of immiscible fluids, Boundary effects on fluid flow.

For further information contact: Dr Andrew Masters, Department of Chemistry, University of Manchester, Manchester M13 9PL, U. K..

MEASUREMENT OF FUNDAMENTAL PROPERTIES OF BITUMINOUS
MATERIALS

October 27th, 1994

This meeting will be organised by the Construction Materials Group of the Society of Chemical Industry and held at Belgrave Square, London. The following papers are planned:

What is binder rheology? (T. R. J. Fabb, Refined Bitumen Association),

Rheological measurement of Bitumen (S. Watkins, BP Research),

Surface dressing binder rheology (A. Khaled, Liverpool University)

Rheological measurements using the dynamic shear rheometer

(A. Walton, Bohlin Instruments)

Effect of binder rheology on the properties of bituminous mixtures

(I. Jamieson, NRA Ireland),

What are fundamental properties of bituminous mixtures?

(K. E. Cooper, Cooper Research and Technology),

Relevance of material properties to pavement performance

(A. F. Stock, Sheffield Hallam University).

For further information contact:

Mr R. Stephenson,

16 St. Katherine's Road,

Henley-on-Thames, RG9 1PJ.

CONFERENCE DIARY

DATE	PLACE	DETAILS
31/5-3/6/94	Ross Priory, Scotland	Short Course 'Theoretical, Experimental and Industrial aspects of Rheology', contact: Dr N. E. Hudson, Dept. of Pure & Applied Chemistry, University of Strathclyde, Glasgow G1 1XL.
1-3/6/94	Copenhagen, Denmark	'3rd Annual Meeting' Nordic Rheology Society contact: J. Becker, Dept. of Polymeric Materials, Chalmers University of Technology, S-41296, Gothenburg, Sweden.
14-15/6/94	Harwell U.K.	'Warren Spring Laboratory foundation course in rheology', contact: Mrs M. McCulloch, AEA Technology, Harwell, Oxfordshire. Tel.: 0235-432820.
19-22/6/94	St Andrews, Scotland	'2nd International Meeting on Extensional and Shear Flow of Polymer Fluids from the Solution to the Melt', contact: Prof. J. Ferguson, Dept. of Pure & Applied Chemistry, University of Strathclyde, Glasgow G1 1XL.
5/7/94	London, U. K.	'Electrically conducting and magnetic colloids' contact: Conference Department, Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS.
6-8/7/94	Brisbane Australia	Australian Society of Rheology Annual Meeting, contact: M. E. MacKay, Dept. of Chemical Engineering, University of Queensland, St. Lucia, Brisbane 4072, Queensland, Australia.
7-9/7/94	Galway, Eire	'Flow processes in composite materials 94', contact: Dr C. O. Brádaigh, Composites Research Unit, University College, Galway, Eire.
19-20/7/94	Manchester, U. K.	'Cellular automata and their applications to molecular fluids', contact: Dr A. Masters, Dept. of Chemistry, University of Manchester, Manchester M13 9PL.
8-12/8/94	Minneapolis Minnesota, U. S. A.	Short course: 'Rheological Measurements: Applications to polymers, suspensions and processing', contact: Prof. Chris Macosko, Dept. of Chemical Engineering and Materials Science, University of Minnesota, 421 Washington Ave., S. E., Minneapolis, MN 55455, U. S. A. Tel.: 612-625-6606, Fax: 612-626-1686.
4-9/9/94	Seville Spain.	'4th European Conference on Rheology', contact: Prof. C. Gallegos, Departamento de Ingenieria Quimica, Universidad de Sevilla, (Edificio de Quimica), 41071 Sevilla, Spain.

Travel grants are available to help students attend any of these meetings.

12-16/9/94	Leuven Belgium	Short course: 'Rheological Measurements: Applications to polymers, suspensions and processing', contact: Prof Paula Moldenaers, Dept. of Chemical Engineering, Katholieke Universiteit Leuven, Leuven, Belgium, Tel.: 32-16-28-66-11 ext. 2359, Fax: 32-16-22-15-22.
21-23/9/94	Cambridge, U. K.	'8th European Conference on Mixing' contact: Conference Section (MIX8) I Chem E, 165-171 Railway Terrace, Rugby, Warwickshire CV21 3HQ.
22/9/94	West Midlands U. K.	Young Rheologists' day, contact: Mrs C. A. Moules, Camtel Sciences, 27 Alexander Road, Stotfold, Hitchin, Herts SG5 4NA.
26-29/9/94	Kyoto, Japan	'First Asia-Oceanian Rheology Conference' Society of Rheology, Japan, contact: Professor Kunihiro Osaki, Institute for Chemical Research, Kyoto University, Uji, Kyoto 611, JAPAN Fax: +81-774-331247.
29/9/94	London U. K.	'Grouts and Grouting', contact: Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS.
2-6/10/94	Philadelphia U. S. A.	'66th Annual Meeting, Society of Rheology', contact: N. Wagner, Dept. of Chemical Engineering, University of Delaware, Newark, DE 19716, U. S. A..
17-19/10/94	Lake Vyrnwy Wales	'Settling in non-Newtonian Fluids II', contact: Mrs E. Shouaib, Dept. of Computer Science, University College Swansea, Singleton Park, Swansea SA2 8PP.
10-12/10/94	Sofia Bulgaria	'7th International Conference on Mechanics and Technology of Composite Materials', contact: Dr Y. Yanakiev, Central Lab. of Physico-Chemical Mechanics, Acad. G. Bonchev Str. Bl. 1, 1113, Sofia, Bulgaria.
24-27/10/94	Torquay U. K.	'School of Industrial Rheology', contact: Camtel Sciences, 5 Carrington House, 37 Upper King Street, Royston, Herts, SG8 9AZ, U. K..
27/10/94	London U. K.	'Measurement of fundamental properties of bituminous materials, contact: Society of Chemical Industry, 14/15 Belgrave Square, London SW1X 8PS.

Travel grants are available to help students attend any of these meetings.

6-10/11/94	Yokohama, Japan	'International Adhesion Symposium' Contact: H. Mizumachi, University of Tokyo, Chemistry of Materials, Yayoi 1-1-1, Bunkyo-ko, Tokyo 113, Japan.
29-31/3/95	Bristol U. K.	'Concentrated dispersions', contact: Dr A. Lips, Unilever Research, Colworth Laboratory, Sharnbrook, Bedford MK44 1LQ.
4-7/4/95	Lancaster U. K.	'Multi-phase materials prepared by emulsion polymerisation', contact: Ms L. Edwards, Conference Officer, Bailrigg, Lancaster LA1 4YT.
19-22/4/95	Rossett, Wales	'Ninth International Workshop on numerical Methods in non-Newtonian Flows' contact: Dr T. N. Phillips, Dept. of Mathematics, University of Wales, Aberystwyth SY23 3BZ.
4-7/9/95	Aberystwyth Wales	'Polymer Melt Rheology,' contact: Prof. K. Walters, Dept. of Mathematics, University of Wales, Aberystwyth SY23 3BZ.
6-8/9/95	Paris France	'Gels', Contact Dr J. W. Goodwin, School of Chemistry, University of Bristol, Cantocks Close, Bristol BS8 1TS.
1995	Caracas, Venezuela.	'3rd Caribbean Conference on Fluid Dynamics', contact: Dr H. Ramkissoon, University of the West Indies, Dept. of Mathematics, St. Augustine, Republic of Trinidad and Tobago.
18-23/8/96	Québec City, Canada.	'XIth International Congress on Rheology' Canadian Rheology Group/Groupe Canadien de Rhéologie contact: Prof. D. DeKee, Dept. of Chemical Engineering, University of Sherbrooke, Sherbrooke, Québec J1K 2R1. Canada.

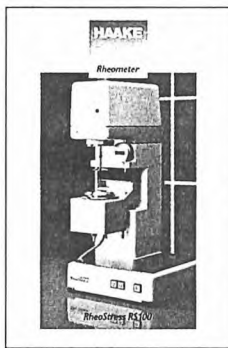
Travel grants are available to help students attend any of these meetings.

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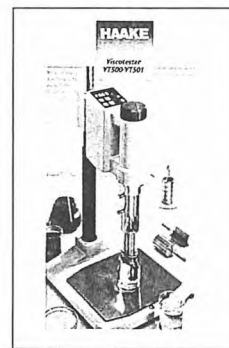
RS 100

A state of the art controlled Stress Rheometer to determine viscosity over a wide range of shear rates and elasticity using creep and oscillation techniques.



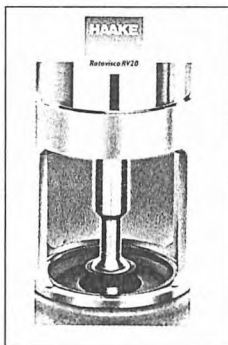
VT 500

This robust but precise viscometer is ideally suited for Viscosity measurement in demanding Quality Control environments. The instrument may be stand alone or computerised.



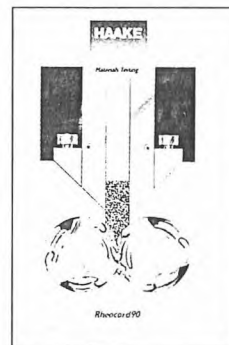
RV 20

A high quality speed-controlled Rheometer for research and development viscosity applications. There are measuring geometries to cover a wide range of shear rates and temperatures.



RC 90

This specialist torque rheometer is designed to meet the challenging requirements of polymer processability testing using a variety of mixers, extruders and accessories.



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