

THE BRITISH SOCIETY OF RHEOLOGY

BULLETIN



December 1993

1993, Vol. 36 No 4

CONTENTS

Officers and Members of Council	ii
Editorial	iii
The early development of the rheogoniometer	
J. E. Roberts	85
Nostalgia: episode 2	90
WSL Applied Rheology to join AEA technology	92
The future role of the Society	93
Letters to the Editor	96
Annual Award 1993	98
Grants and Awards	98
Conference Reports	101
Commentary: 53rd A. G. M.	103
Commentary: 275th Council Meeting	104
Membership News	107
Recently Published Books	108
Conference Announcements	109

Hon. Editor

Dr P. F. G. Banfill,

School of Architecture & Building Engineering,

University of Liverpool,

P. O. Box 147, Liverpool L69 3BX.

ISSN-0045-3145

THE BRITISH SOCIETY OF RHEOLOGY
OFFICERS AND MEMBERS OF COUNCIL
1993/94

- President:** Dr D. R. Oliver, School of Chemical Engineering, University of Birmingham, P. O. Box 363, Edgbaston, Birmingham B15 2TT
Tel.: 021-414-5310 **Fax:** 021-414-5324.
- Secretary:** Mrs C. A. Moules, Camtel Sciences, 27 Alexander Road, Stotfold, Hitchin, Herts SG5 4NA.
Tel.: 0763-244280 **Fax:** 0763-244298.
- Treasurer:** Mr R. E. Carter, Polymer Laboratories Ltd, Jubilee Drive, Belton Park, Loughborough, Leics. LE11 0XS.
Tel.: 0509-233300 **Fax:** 0509-234905 **Telex:** 341383
- Membership Secretary:** Dr D. J. Hourston, The Polymer Centre, University of Lancaster, Bailrigg, Lancaster, Lancashire LA1 4YA.
Tel.: 0524-65201 **Fax:** 0524-63806 **Telex:** 65111 LANCUL G.
- Abstracts Editor:** Dr G. H. Meeten, Schlumberger Cambridge Research Ltd., P. O. Box 153, Madingley Road, Cambridge CB3 0EL.
Tel.: 0223-325204 **Fax:** 0223-467004 **Telex:** 818872 SCHLUM G.
- Bulletin Editor:** Dr P. F. G. Banfill, School of Architecture & Building Engineering, University of Liverpool, P. O. Box 147, Liverpool L69 3BX.
Tel.: 051-794-2619 **Fax:** 051-794-2605 **Telex:** 627095.
- Ordinary Members:** Mr P. C. Anderson, 32 Queensway, Feltham, Middlesex TW13 7NS
Tel.: 081-890-6586.
- Dr G. J. Brownsey, AFRC Institute of Food Research, Norwich Laboratory, Colney Lane, Norwich, NR4 7UA.
Tel.: 0603-56122 **Telex:** 975453 FRINOR G.
- Dr N. E. Hudson, Department of Pure & Applied Chemistry, University of Strathclyde, 295 Cathedral Street, Glasgow G1 1XL.
Tel.: 041-552-4400 **Fax:** 041-552-5664 **Telex:** 77472.
- Dr M. R. Mackley, Department of Chemical Engineering, University of Cambridge, Pembroke Street, Cambridge CB2 3RA.
Tel.: 0223-334784 **Fax:** 0223-334748 **Telex:** 81240 CAMSPL G.
- Prof. P. Townsend, Department of Maths and Computer Science, University College Swansea, Singleton Park, Swansea SA2 8PP.
Tel.: 0792-295398 **Fax:** 0792-295708 **Telex:** 48358 ULSWAN G
- Dr N. D. Waters, Department of Applied Maths and Theoretical Physics, University of Liverpool, P. O. Box 147, Liverpool L69 3BX.
Tel.: 051-794-4004 **Fax:** 051-794-4061 **Telex:** 627095.

The Society is a registered charity, number 249967

EDITORIAL

The Society's Weissenberg Centenary Dinner last summer succeeded in generating interest in aspects of the early history of the rheology of complex fluids and its measurement. In this issue I am pleased to be able to print a previously unpublished article by Jack Roberts in which he describes his involvement in the design and use of the early rheogoniometers. Debates on scientific priority can always be relied upon to fill correspondence columns and the letters I receive show that rheology is not immune from this phenomenon either.

Members will be aware of the Council's current review of the role of the Society and after the meeting in December we agreed to publish the text of an exchange of letters between the Presidents of the German and British rheology societies.

I would like to draw members attention to a novel development in our repertoire of meetings, to be held in September 1994, a Young Rheologists' Day. 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, March 15th.



THE EARLY DEVELOPMENT OF THE RHEOGONIOMETER*

J. E. ROBERTS

INTRODUCTION

In the mid 1940s, it was becoming increasingly important to be able to determine the true parameters of materials which exhibited the properties of both viscosity and elasticity. By this time, Merrington¹ had demonstrated that thickened hydrocarbon liquids exhibited recoverable strain when ejected from a nozzle, whilst Russell, working at Imperial College, and I, working at the Armament Development Establishment (A. D. E.), Langhurst, had independently conducted experiments to show that gels of high viscosity also possessed elastic properties.

Much experimental evidence on the physical properties of hydrocarbon gels as flamethrower fuels had been gathered by work at Langhurst, by consultants and by exchange of information with the United States. In particular, the dispersion of the jets had been studied in model experiments by Rosin & Fehling at Imperial College and in full scale by me at Langhurst for a range of materials, nozzle sizes, nozzle configurations and wind conditions in ignited and 'wet' shots. Work at Birmingham University by Garner, Nissan & Wood on chemical composition, stability and flow problems augmented that at the Fuel Research Station, by Greenwich and Langhurst. Frazer of Lagonda Motors helped with research on nozzle design and break-up where the complex forms of Merryweather and Sir Geoffrey (G. I.) Taylor (Cambridge) presented machining difficulties.

I studied the flow in pipes, bends and nozzles with the aid of a 3000 fps camera. Various anomalies of flow were observed showing that the elasticity of the gels played an important part in the stability of flow and dispersion (for example, reverse flow in nozzles was observed).

However, the real complexity of viscoelastic flow and its possible characterisation were not appreciated at that time. It was not until Karl Weissenberg, who was then Director of Physics Research at the Shirley Institute in Manchester, agreed to act as consultant to A. D. E. Langhurst that the formulation and conduct of experiments was coordinated.

Weissenberg had already shown in two outstanding papers^{2, 3} his grasp of the theoretical principles involved and it became clearer as

*This article was written in about 1962 but never published.

further preliminary experiments were made by Rosin & Fehling, Russell, Garner Nissan & Wood, Freeman, and me that new and better instrumentation was required. Among Weissenberg's many abilities were those of clearly stating his theories (at least in informal discussion) and enthusing others to overcome the experimental problems. Indeed, it is now difficult to conceive how control could have been gained over the phenomena of viscoelastic flow without goniometric studies since, whenever the physical quantities to be measured are anisotropic, shearing components in the deformation will ensure different stress values in different directions in all but Newtonian liquids, which are special cases of the general fluid. We can therefore define an ideal flow goniometry as the measurement of the distribution of stresses and strains within the flowing material at every instant in time and at every point in space around the full solid angle.

DEVELOPMENT OF THE RHEOGONIOMETER

Prior to Weissenberg's concept of making goniometric measurements, the study of flowing materials has been restricted to measuring and relating the tangential or shear stresses and the displacements. Weissenberg pointed out that in the flow of viscoelastic liquids, additional forces were generated. His theoretical approach required the application of three fundamental principles, each of which involved goniometry. These principles are:-

- a) the dynamic equilibrium of forces at every point in the flowing material;
- b) the maintenance of continuity;
- c) the stress/strain relation (the mechanical equation of state).

These principles were clearly established by the time that the initial team dispersed and Weissenberg^{4, 5}, Freeman⁶, and Russell⁷ reported preliminary development of an instrument which approximated to Weissenberg's ideal, at least in a phenomenological way. The instrument was named the rheogoniometer in 1946 and was described as such by Weissenberg⁸ at the Second International Congress of Rheology in 1948. The instrument demonstrated that normal and shear stresses were present when viscoelastic materials were sheared in continuous flow. It was also shown that, in oscillatory shear, normal stresses were small or negligible for small-amplitude vibrations but for large amplitude vibrations, the frequency of the normal stress was twice that of the shear stress. A modified form of rheogoniometer for the study of molten plastics was devised by Pollett and Cross^{9, 10}.

Although these early trials did not in fact achieve Weissenberg's goal of enabling measurement of all the components of stress and strain,

it was clear that development should continue. Unfortunately at this point, Freeman's expertise and experience were lost to the project when he left the Shirley Institute to go into industry.

In 1951 it was decided that a quantitative model would be built to measure the physical properties of gels and to check the validity of the then available theories. Weissenberg agreed to advise and model R1 was designed and built at A. D. E. Langhurst.

Using this apparatus fitted with a cone-and-plate configuration for the sample and the top plate pierced by a series of manometer tubes, I was able to make the first measurements of the distribution of normal pressures.^{11,12} This demonstrated that, to a first approximation, the normal pressures P_{22} and P_{33} were equal as predicted by Weissenberg's hypothesis that planes which had suffered the same normal displacements would have the same normal pressures. All relevant normal and shear stresses were measured.

A subsequent modification was the development of an air bearing thrust and shear measuring head using a null method. This had the advantage of a very large measurement range but the disadvantage of high mass so a spring head was also developed with low mass but a limited range.

In 1952, a small rheological team working closely with me began to be built up in the Department of Colloid Science at Cambridge under Dr Jack Schulman, who with various workers had previously been concerned with the chemistry of the aluminium soaps used as thickeners for hydrocarbon gels. Jobling^{13, 14} was joined shortly after by Weissenberg and then by Egan and the experimental techniques were extended. One finding was that the apparent shear thinning of a polyisobutylene solution was mostly due to a divergence in the main axes of the stress and strain velocity tensors as predicted by Weissenberg. At the same time, other rheogoniometer studies were undertaken by Shaw & Palmer at the Fuel Research Station (the forerunner of Warren Spring Laboratory), Pilpel^{15, 16} at King's College, London, and Kotaka¹⁷ in Kyoto.

Modification and improvement of the rheogoniometer continued during this time. Drive through the lower platen and measurement through the upper were changed to drive and measurement of normal thrust on the lower platen and measurement of shear (torsional stress) via the upper. The facility to have both oscillatory and continuous shear was achieved by a worm gear so that oscillating the worm along the gear produced an oscillating drive plate and rotating the worm produced a continuous shear — both being of variable rate and capable of

operating together or separately. A magnetic clutch enabled the plate to be quickly started (or stopped) and at varying rates. A combination of quick response of measurement with very small strains enabled high viscosity materials to be studied with minimal joule heating.

These advances enabled the instrument design to be simplified and the designs and patents¹⁸ were then given gratis by the Ministry of Supply to Weissenberg and to Farol Research of Bognor Regis for the commercial manufacture of the rheogoniometer. The initial proposal was that Weissenberg would be designated the inventor, I would be designated the designer and Farol the maker. Weissenberg and Farol were to contribute £1000 each for the manufacture of six instruments which I would design. The profits were to be shared. In the event, the Ministry would only grant me permission to design the Esso instrument.

In 1958, with changing priorities, the Ministry of Supply ran down its support for rheology research. However Weissenberg¹⁹ continued his work and one who was influenced by him was Lammiman of Esso Research at Abingdon. Lammiman²⁰ recognised that bitumens were viscoelastic and wished to make fundamental studies so he and I designed a rheogoniometer of much greater versatility, which was largely built by King of Farol Research. This instrument was designed for the study of highly viscous fluids over a wide temperature range. Improvements were made to the ease of handling and in particular, a servo-mechanism was incorporated in the normal force measuring system. Esso kindly gave the designs to Farol.

So, in all, some 9 models (R1-R9) were designed at A. D. E. Langhurst of which R7 and R8 were the first to be marketed by Farol Research. As already noted, I was intimately involved with their design and use.

BREAK-UP OF MATERIALS

It is not always appreciated that Weissenberg²¹ was also keenly interested in the way in which materials break up under various mechanical actions and that for the study of this, he had in mind another type of rheogoniometer. All who attended his classic lectures will recall his use of diagrams drawn on rubber sheets to illustrate various mechanical deformations. He appreciated that the ink or paint of the marking was itself subject to deformation and that if a test material could be sandwiched between two such deformable membranes, its response could be studied under a much wider range of controlled deformations.

As is well known, 'simple shear' is a most complex mechanical action. Weissenberg's concept encouraged me and Jobling²²⁻⁴ to devise instruments for controlled deformations in which the stresses, strains,

and their derivatives would be colinear, thus simplifying the mathematical analysis. Later Grossman²⁵⁻⁶ was engaged to assist Weissenberg in the theoretical aspects and conduct further experiments.

Weissenberg's great contribution to rheology was that he broadened the whole concept of mechanical testing of real materials and the wonder is that he was able to achieve so much on very modest funding and resources. Perhaps it was because he was not only a man of remarkable scientific ability but one whom everyone respected for his human qualities — anyone could approach him and receive wise counsel with courtesy. All who worked with him have been affected by them and are proud of their association.

¹ Merrington, A. G. *Nature* 152, 663 (1943).

² Weissenberg, K. *Abhandl. preuss. Akad. Wiss. Math. naturwiss. Kl.* No. 2 (1931).

³ Weissenberg, K. *Arch. sci. phys. et nat.* [5] 17, 1 (1934).

⁴ Weissenberg, K. and Freeman, S. M. *Proc. 1st Intern. Rheol. Congr. Scheveningen* p. II-12 (1948).

⁵ Weissenberg, K. *Proc. 1st Intern. Rheol. Scheveningen* p. II-114 (1948).

⁶ Weissenberg, K. and Freeman, S. M. *Nature*, 161, 334 (1948).

⁷ Russell, R. J. PhD. thesis, London Univ. (1946).

⁸ Weissenberg, K. *Proc. 1st. Intern. Rheol. Congr. Scheveningen* p. I-29 (1948).

⁹ Pollett, W. F. O. and Cross, A. H. J. *Sci. Instr.* 27, 209 (1950).

¹⁰ Pollett, W. F. O. *Proc. 2nd Intern. Rheol. Congr. Oxford*, 85 (1953).

¹¹ Roberts, J. E. Ministry of Supply report ADE 13/52 (1952).

¹² Roberts, J. E. *Proc. 2nd Intern. Rheol. Congr. Oxford*, 91 (1953).

¹³ Jobling, A. and Roberts, J. E. J. *Polymer Sci.*, 36, 421 (1959).

¹⁴ Jobling, A. and Roberts, J. E. J. *Polymer Sci.* 36, 433 (1959).

¹⁵ Pilpel, N. *Trans. Faraday Soc.*, 50, 1396 (1954).

¹⁶ Pilpel, N. *Trans. Faraday Soc.*, 51, 1307 (1955).

¹⁷ Kotaka, T. Thesis, Kyoto Univ. (1960).

¹⁸ Roberts, J. E. and Weissenberg, K. *Brit. Pat. Appl.* 20583/53.

¹⁹ Weissenberg, K. *Proc. Roy. Soc. London*, A200, 183 (1950).

²⁰ Lammiman, K. and Roberts, J. E. *Lab. Practice*, 10, 11 (1961).

²¹ Weissenberg, K. *Bull. Brit. Soc. Rheol.* no. 43, 6 (1955).

²² Jobling, A. and Roberts, J. E. *Brit. J. Appl. Phys.*, 9, 235 (1958).

²³ Jobling, A. and Roberts, J. E. "Some observations on dilatancy and thixotropy" in *Rheology of Disperse Systems*, Pergamon Press (1959).

²⁴ Jobling, A. and Roberts, J. E. Chapter 13 in Vol. II of "Rheology, Theory and Applications" ed. F. R. Eirich, Academic Press Inc. (1959).

²⁵ Grossman, P. U. A. J. *Sci. Instrum.*, 35, 131 (1958).

²⁶ Grossman, P. U. A. *Kolloid Z.*, 174, 97 (1961).

NOSTALGIA: EPISODE 2

The article by Dr Jobling (BSR Bulleitein 36(3) p. 65) raised feelings in at least one of his readers and reminded me of a 1956 visit to Cambridge I took part in with A. S. Lodge, D. W. Saunders and P. Lord, for discussions with Professor Weissenberg and Dr Jobling himself. We four were then working at the British Rayon Research Association in Manchester, with L. R. G. Treloar.

His reference to Professor Lawrence stirred another memory. Lawrence told me that one of his projects for the Royal Navy was to develop a surface treatment for ships on Arctic convoy to reduce the accumulation of ice, which could be so bad as to cause a ship to capsize. Navy personnel were extremely sceptical about the durability of his proposed treatment even after he told them it had 'withstood a 70 m. p. h. gale in my lab'. His triumph came later when the ship was transferred from the Arctic to the Mediterranean theatre and they had to come to him to say 'Hey Lawrence, will you get your bloody bird lime off our ship'.

My own research career began during the war when, in a very junior capacity, I assisted in a programme aimed at putting a hard surface onto perspex sheets. Nearly all perspex, which was then a very new material, went straight in to use on military aircraft where its susceptibility to scratching was a major disadvantage, counterbalancing to some extent its advantage of not shattering when hit by a bullet. If a rear gunner thinks a dark spot on his perspex is a scratch, and it turns out to be a ME 109, he does not get the chance to repeat the mistake. So an effort, that was never wholly successful, was made to polymerise a thin film of cross-linked allyl methacrylate on the softer methyl methacrylate. Allyl methacrylate vapour is extremely lachrymatory, out-performing onions by a large factor, so for much of the time we worked wearing gas masks and generally under conditions that would never be tolerated today by the HSE. Neither presumably would the HSE be happy to see the mercury that, in those days, was present round the plughole of most laboratory sinks, the general use of benzene as a solvent and its unofficial use for breathing fire, or the use of carbon tetrachloride in a common form of fire extinguisher. In fact, when I consider the precautions now thought necessary in labs I wonder that there are any survivors from those days of research.

My own initiation in rheology began with some fairly hack work on molten chocolates but became more serious when I started to look at cement pastes and their structural breakdown under shear. In 1950, I

started with an empty room to be converted into a laboratory, and that was in the days when hardware was something you bought from an ironmonger, delivery on ordinary lab glassware was about 6 weeks, and you could not get an instrument of any sort in less than about 18 months. You certainly could not buy a rheometer off the shelf.

I asked for, and was allowed, £200 to permit me to build a coaxial cylinders viscometer. It was perhaps a little more sophisticated than Dr Jobling's apparatus in one respect because instead of using a dustbin as an oil bath I used a domestic 10 gallon galvanised water tank. The variable speed drive was provided by an electric motor driving through a hydraulic transmission that was ex U. S. Air Force (war surplus) and cost me £15. Torque was measured by deflection against springs and since there were no suitable ones available I had to make them myself, and deflection was measured by a simple bent needle moving over a curved scale that was an ordinary 6" steel rule bent to the right curvature over three brass pillars. No recording method was available and, believe me, you can get quite good at reading quickly and simultaneously a stopwatch and a moving needle, if you practise enough. Anyway, this apparatus served for me to produce an M. Sc. thesis and my first published papers^{1, 2}

I could go along with Dr Jobling's admonition to those who think that current times are hard, 'Brother you ain't seen nothing', but I would say it without any envy. True, we did not have computers to enable us to economise on thinking, or photocopiers to produce large quantities of paper for filing, and I have had to use 7 figure logs (if you know what they are) to carry out calculations that today could be done in seconds on a cheap calculator, but we did spend time on research rather than on completing forms, we did discuss technical matters rather than administrative ones in committee, and, in general, we did not have bureaucrats and accountants on our backs.

They say that knowledge doubles every ten years so, if that is true, there was only about $4^{1/2}$ % of present knowledge existing when I graduated. This had the advantage that some of us simpletons did not need to know so much before we could get going on some interesting and satisfying work. Perhaps that was our main advantage.

REFERENCES

- ¹ Tattersall, G. H. *Nature* 175 (4447), 166, 1955.
- ² Tattersall, G. H. *Brit. J. Appl. Phys.* 6 (5), 165-167, 1955.

Where for others rheology may stop, for us it only really begins.

We take pride in co-operation with customers to achieve solutions in all sectors of rheology.

This information is being passed on to you by the events listed opposite.

Complete the coupon to receive your own regular information from:

PHYSICA

Physica Division,
Paar Scientific Ltd.
594 Kingston Road,
Raynes Park,
London. SW20 8DN.
Tel 081 540 8553
Fax 081 543 8727

**Applications
Notes**

SEMINARS

**Latest
Software**

**NEW
Instruments**

Name

Address

.....

..... Tel. No.

WSL APPLIED RHEOLOGY SECTION SET TO JOIN AEA TECHNOLOGY

During the last few months you may have read about the decision to form a new National Environmental Technology Centre (NETC) following a merger of Warren Spring Laboratory (WSL) and AEA Technology (AEA). As a result, you may have wondered about the future of WSL's Applied Rheology Section.

Whilst most of the WSL Business Centres will be transferred to the NETC at Culham on 1st April 1994, the Applied Rheology and Wet Solids Handling Sections of the WSL Process Technology Business Centre will be joining the AEA's Environmental and Process Engineering Division at Harwell at the same time. Work on building new laboratories and offices for the Applied Rheology Section at AEA is currently underway.

The Applied Rheology Section at WSL has its origins dating to the early 1960's. Through rheological research and contract work, WSL has built up extensive experience of industrial problems associated with the handling and processing of non-Newtonian materials such as slurries, pastes, emulsions and other 'difficult' materials. This experience is backed up by a comprehensive range of rheological testing facilities. These facilities will be transferred to Harwell. Since the early 1970's, two-day and five-day rheology courses (including practical sessions) and one-day seminars on various specific rheological topics have been run successfully on a regular basis. More recently, customer-designed rheology courses have been held in Australia, Canada, Denmark, Finland, the Netherlands, Sweden, USA and Venezuela, as well as in the UK.

At AEA, the WSL Applied Rheology Section will continue to provide a comprehensive service to industry through

- * small or large confidential research contracts
- * consultancy
- * hire of viscometers/rheometers for use under our instruction
- * WSL rheology courses and seminars
- * on-site customer-designed courses in applied rheology

For further information on any of the services provided, please contact Dr Neil Alderman on 0438-741122 ext 2757 or Dr Nigel Heywood on ext 2529.

THE FUTURE ROLE OF THE SOCIETY

Members will be aware of the discussions taking place in Council Meetings to consider the British Society of Rheology's future role. As part of our policy of keeping members informed, correspondence between Prof. Dr. Ing. M. H. Wagner of the German society and Dr D. R. Oliver of the British society is presented as follows.

Dear Dr Oliver,

It has been a pleasure for me to meet you in Cambridge recently, and to have the opportunity to exchange some ideas on the future role of our rheological societies.

Before making specific suggestions, let me first specify the present situation of the Deutsche Rheologische Gesellschaft (DRG):

1) After absorbing the former East German Rheology Group, we have now a membership of ca. 300; our membership dues are DM 15./annum.

2) After termination of 'Dokumentation Rheologie' due to lack of (government) funds, we do not have a publication presently.

3) Our main activity consists in organisation of an annual meeting (rather a biannual meeting as we have decided some years ago to have no national meetings in years of either international or European rheology conferences). The next meeting (May 1995 in Berlin) is planned as a joint meeting of the Swiss, Austrian and German societies.

At a recent council meeting of the DRG, we discussed ways to improve service to the membership. We have an offer from Springer, which (in an attempt to broaden readership) is willing to supply Rheol. Acta to every member of DRG at a huge discount (if we make the Rheol. Acta compulsory for our members), plus free pages for announcements of the DGR in Rheol. Acta. The council has declined the offer, but will bring it before the membership at our next AGM in 1995. If we understand the motivations of Springer correctly, they might approach other European societies with a similar offer.

With these developments in mind, I would like to make the following suggestions to the BSR on behalf of the DRG:

There should be a European Society of Rheology as a formal body of the national rheological societies with the following aims:

1) To serve as a steering body for the European Rheology Conference;

2) To publish a European Rheology Newsletter with news from the European Society and from the national member societies (2 issues/annum and 1 page/member society might do for a start);

3) To offer further publications, which so far are tied to the membership of a national society, to all members of participating European rheological societies.

The European Society should be financed on a per capita basis by the member societies.

As the BSR is both the oldest and the largest rheological society in Europe with a fine tradition, we are convinced that a European initiative of the BSR would be a very successful move, and the DRG would be more than happy to support such an initiative. The 1994 European Rheology Conference in Sevilla could be an ideal place for such a joint effort.

I look forward to hearing from you about the future plans of the BSR.

Yours sincerely

M. H. Wagner,
President, Deutsche Rheologische Gesellschaft

Dear Prof. Wagner

We have now had the B. S. R. Council Meeting which I mentioned to you in my letter of 8th October 1993.

The feeling of the meeting was that we should initiate steps towards the formation of a European Society of Rheology, with the current National societies retaining their own character and identity.

It was felt that we should first contact the secretaries of all the European societies with a quite simple outline of our ideas, as below, and to consider their replies. I was in the process of writing another letter to Prof. J. M. Piau (G. F. R.) and have briefly mentioned to him that a "European Society" concept was about to be promoted.

The European Society would:

a) Act as a steering body for the European Rheology Conference;

b) Act as a liaison body (and source of information) about combined and joint meetings in Europe;

c) Publish some form of European Rheology News Letter;

d) Consider further publications, possibly of the "Rheology Abstracts" type, but with Euro-wide circulation;

e) Further the Promotion and Funding of rheological projects.

The European Society would need to be financed by the member societies in proportion to their size. Initially, the management team would consist of one member representing each of the founding societies, and the 1994 European Rheology Conference in Seville would be an ideal place for an exploratory meeting. I think it is true to say that we have discussed most of these items previously, and that they were well summarized in your recent letter.

We will make the above suggestions to other European societies, and inform our own members of the process in our Bulletin. I hope that, when we meet in Seville, we shall have had the feedback from all sources and be able to have a constructive and useful meeting.

Best Wishes

Sincerely yours

D. R. Oliver

President, British Society of Rheology

LETTERS TO THE EDITOR

Madison, U. S. A.

Dear Sir,

In a letter to the last Bulletin (vol. 36, no. 3), Alan Jobling objected to the following sentence, quoted from an earlier Bulletin: 'In about 1953 Weissenberg advised Arthur (Lodge) to try to measure these normal stress differences'. Alan stated that Jack Roberts' part in the development of the rheogoniometer has been greatly underestimated, and referred to Roberts' 1952 report and 1953 paper. There has in the past been controversy about assigning priority for discovery and activity in this field, in part because the war perturbed peacetime publishing procedures. I have made a few attempts, by discussion and correspondence with Weissenberg and others, to ascertain the facts.

At the Weissenberg Centenary, I stated that, to the best of my knowledge the first measurements of normal stress differences in shear flow were those of R. J. Russell, who described them and acknowledged Weissenberg's help in his Ph.D thesis dated February 1946. In his Bulletin letter, Alan Jobling did not mention Russell's work. Am I right in according this priority to Russell? It would be very helpful to have information for the record.

I went on to acknowledge the fact that most of my own research has been devoted to developing a few of the many ideas which I was fortunate to get from Weissenberg. As an example, I recalled that, in 1953, I had asked his advice about my future research programme. I had suggested measuring shear stress for polymers subjected to large oscillatory shear strains. Weissenberg thought that it would be better if, instead, I tried to measure normal stress differences. The statement to which Alan objected is thus, in fact, true; it implies nothing about priority or about Jack Roberts' or anyone else's work.

I share Alan's high opinion of Jack Roberts' important contributions to the measurement of normal stress differences. However, at the Weissenberg Centenary, influenced by the Doctrine of Unripe Time, I did not see fit to do full justice to Jack's contributions. When the time is ripe for celebrating Jack's (or Alan's) Centenary, I will, if invited, be glad to go into the matter in more detail. Meanwhile I remain

Yours faithfully
Arthur S. Lodge

Editor's note: Russell's work was mentioned by John Harris in the short appreciation of Weissenberg which appeared in Bulletin 36 (1), pp. 1-3

and indeed Russell contributed to the Karl Weissenberg 80th Birthday Celebration Essays which John Harris edited in 1973. Certainly Russell and Weissenberg collaborated in the 1940s.

Glasgow

Dear Sir,

May I inform members through the medium of the Bulletin that, following my recent retirement, I have a collection of Rheology Abstracts and back numbers of the Bulletin for disposal. There is an almost complete set of Rheology Abstracts from Volume 10, No. 1, March 1967 to the latest. Most Bulletins from 1959 to the present day are also available. If any of the newer members are interested I shall be pleased to hear from them.

My address is 2, Auckland Park, East Kilbride, G75 8QJ. Tel. 03552-23235

Yours faithfully
Dr J. M. Hobbs

Are your rheological
application measurements
now beyond the capabilities
of your current rheometer?

SOLUTION

*Why not talk to Rheometrics
about our NEW controlled
stress rheometer for fluids
soft solids and polymer
melts.*

Rheometrics[®]

Rheometrics (UK)

Tel: (44) 0784 43 96 94

Fax: (44) 0784 43 18 09

**Characterising fluids,
soft solids or polymer melts?**



**Have you tried the
Rheometrics controlled stress rheometer?**

Rheometrics[®]

Rheometrics (UK)

Tel: (44) 0784 43 96 94

Fax: (44) 0784 43 18 09

THE ANNUAL AWARD 1993

The Annual Award of the British Society of Rheology for 1993 is made to Dr. Anthony E. Evans in recognition of his long and dedicated service to the Society. He was elected to the Council in 1969 and served one four year term as Abstracts Editor and two separate terms as Honorary Treasurer. Together with intervening stretches as an ordinary member of Council he served for a total of 24 years continuously up to his retirement from Council in 1993. It therefore needs no great mathematical skill to realise that this is nearly half the lifetime of the Society. Indeed, he is proud of the fact that he has missed only three of the 96 Council meetings held during that time. His connection with the Council will continue through his membership of the Scott Blair Collection Working Party.

His professional life was concerned with the Victoria Royal Infirmary in Newcastle, where his address "The Compression Chamber, ..." has long intrigued those reading the list of Officers and Members of Council printed in the Bulletin. The truth can now be told: this was concerned with the effects of the high pressures experienced by divers, and produced the information to enable him to talk at Autumn Meetings on, for instance, the cosmic nucleation rate of air bubbles in blood.

He will be remembered by Councillors for the care he exercised over the Society's finances and also for his interest in, and ability to discuss knowledgeably, all aspects of public transport. Indeed, it was a very rare happening for him to arrive at a Council meeting by car and many mid-meeting lunches were enlivened by his anecdotes of rail travel.

SCHOLARSHIPS AND GRANTS

ANNUAL AWARD

The Secretary would be pleased to receive nominations for the Annual Award 1994 as soon as possible, and in any event not later than June 1st, 1994. The Annual Award is either designed to reflect contributions made over a prolonged period or to be used in appreciation of a particular contribution to the field including a single published paper. Council particularly welcomes nominations of younger members whose contributions are judged to be of especial merit or promise.

SCOTT BLAIR SCHOLARSHIP AND SCOTT BLAIR BIORHEOLOGY SCHOLARSHIP

In memory of the work and example of Dr G. W. Scott Blair, the Society and Pergamon Press make available a series of scholarships to encourage excellence in research. The Scott Blair Scholarship of the

Society is for research in any field of rheology while the Scott Blair Biorheology Scholarship, funded by Pergamon Press, but administered by the Society, is for research in biorheology. The aim is to enable the scholars to undertake activities which would not normally be possible without such a grant, such as a period of work at an overseas University. Both scholarships are available for award.

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

The scholarships 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 their supervisors, the scholarships will be renewable for a maximum of one more year. Thus they 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 awardees of the Biorheology Scholarships will be expected to present the results of their research at meetings of the British Society of Rheology, and will be encouraged to publish them in the Journal "Biorheology" in accordance with its editorial policy.

The award of the Scholarships 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 Scholarships should be sent to the Secretary of the British Society for Rheology before June 1st, 1994. 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.

TRAVEL GRANTS FOR STUDENTS

The Society makes grants to students engaged in research in rheology to attend and present their work at meetings on rheology, both its own and those of other societies. Members of the Society, who are full-time students, may apply in writing to the Secretary to be considered for an award and that application should be supported by

the student's supervisor. The application should give details of the proposed expenditure, the title and date of meeting and the title of the paper to be presented. They should be submitted in time for consideration at a Council meeting before the money is needed, i.e by the beginning of March, June, September or December.

The amount and number of such awards will be at the discretion of Council.

CONFERENCE REPORTS

RHEOLOGY OF SUSPENSIONS, WITH GENERAL PAPERS
THE SECOND ANNUAL CONFERENCE OF THE NORDIC SOCIETY OF RHEOLOGY
Gothenburg, Sweden, 19 - 20 August, 1993

The Second Annual Conference of the Nordic Society of Rheology was held at Chalmers University, in southern Gothenburg. With some 83 delegates, this was a lively meeting, conducted — to my heartfelt relief! — in English. There were two invited papers on Suspension Rheology, one from Prof. Jan Mewis of the Katholieke University Leuven and one from Prof Eric Dickinson of the University of Leeds. There were ten papers, including posters, concerned with the Rheology of Suspensions, and a further twelve general papers. The papers were published in the first edition of the "Annual Transactions of the Nordic Rheology Society", and abstracts have been passed to the Abstracts Editor. An exhibition of equipment was provided outside the lecture room by five suppliers.

During the meeting, Prof. Olé Kramer introduced Prof. Leif Bohlin and described his significant contribution to rheology in the Nordic countries, for which he was presented with an award and diploma by Prof. Ann Marie Hermansson. Additionally, Bertil Olofsson, who had retired, was made an Honorary Member of the Nordic Society.

The conference dinner was preceded by a coach and boat tour on the River Göta of the city of Gothenburg, complete with running commentary. An excellent meal was provided in a riverside (or is it fjordside?) restaurant, the "Westra Piren" in Eriksberg, before the return journey back to the Panorama hotel, which used to be student accommodation before being converted to a hotel. One cannot help but be a little envious of the students who used to inhabit this palatial multi-storey building.

All in all, this was a very worthwhile meeting with a very high quality of work presented. The next Annual Meeting of the Nordic Society will take place in Copenhagen on June 1-3, 1994, the special topic being "Food Rheology".

Roy Carter

RHÉOLOGIE DES POLYMERES FONDUS

28TH ANNUAL MEETING OF THE GROUPE FRANÇAIS DE RHÉOLOGIE LE MANS
October 11 - 13, 1993

The meeting took place in the Congress Centre in the town of Le Mans, more famed for motor racing than rheology. Directions to the centre were displayed throughout the town, a welcome aid to one who had travelled to Caen on the previous evening's ferry then driven through the Normandy countryside early in the morning. The meeting was organised largely by Prof. Jean-François Tassin of the nearby Université de Maines. The venue, near the confluence of the rivers Sarthe and Huisne, was a modern civic centre within walking distance of the old walled city of Le Mans, with its impressive cathedral and, startlingly, a monument to the Wright Brothers, who had worked with pioneers from Le Mans after their initial experiments in flight in the USA.

The technical programme consisted of some 39 papers, organised into a plenary session then two parallel sessions. The papers, published in *Les Cahiers de Rhéologie* Volume XI Numbers 3-4 (October 1993), covered a wide range of topics within the overall remit of polymer melt rheology.

The conference dinner was held in the magnificent Abbé de l'Épau on the outskirts of Le Mans. Pre-prandial drinks were served in the huge dormitory to the somewhat anachronistic if highly enjoyable sounds of a jazz band, and we repaired to the vaulted cellar for an excellent meal.

Roy Carter

The time was rapidly approaching 18.30 for the A. G. M., being held in the same theatre at Robinson College as the Autumn Meeting. By 18.35 the numbers had risen to 20 of which only 11 were non-council members. The A. G. M. was taking place in a very big lecture theatre and so people were well dispersed. Politely, they were asked to move forward. On stage sat the President (Ralph, with chain of office) flanked by the Secretary (Carole) and the Treasurer (Peter). At 18.36 the meeting got under way. Ralph thanked Malcolm Mackley for another fine meeting at Cambridge, his voice echoing around the almost empty hall. Quickly he ran through the agenda to the Reports of the Officers. The President noted that the Society had had a successful year with few failures. The highlights had been the Cambridge meeting (last year) and the Weissenberg meeting. The Scott Blair fellowship — in fact both scholarships — had been taken up whilst the Society had awarded three student grants, quite definitely a move in the right direction. Other points to note were that the Society now had quite a large number of honorary members and now a Society archivist (Dr J. Benbow). Looking forward the hope for 1995 is the September Bordeaux meeting (4-9th Sept. in Seville). The President noted that at the next Council meeting (December) the chief matter at issue would be the role of the Society, and could the membership make any suggestions please. The Council will also consult others. Finally, a general thanks to Council members.

The Treasurer 'we have again failed to make a loss', presented the accounts with some muttering in the audience and much paper rustling. Expected expenditure of £16k with an income of £15k for next year. President asked for questions. Tony Evans asked if the Council would change subscription levels. Peter said this was not expected but that in looking back, the subscription charges seem to go up every 10 years. It causes a lot of effort for the Membership Secretary though. Peter, who was now standing down from this post, had wrestled with VAT for most of his term in office. On course for a short meeting (18.56) we moved on to the Secretary who informed us that her workload (correspondence) had increased. The President she said, had given the Society more of a club atmosphere. Carole emphasised the continued joint meetings role, that is the way the Society is developing. The Membership Secretary said that he expected updating the booklet (Membership List) in possibly 3-4 years' time. There was a slight increase in membership and the growth in the total membership numbers was pleasing. The

Bulletin Editor said that the fruits of his efforts were received quarterly and yes, it is a good read. So too were Rheology Abstracts. A slight hiccup over the election of officers for the next year whilst the names were read from the Bulletin and taken *en block* as agreed. Sadly we said goodbye to Tony Evans from Council, retiring after more years on Council than I can remember. Finally, to any other business with a request for joint meeting with the University of Dublin suggested. This was warmly received and on the stroke of 19. 30 the meeting finished, sadly without a photographer to immortalise the new Council for the Bulletin.

Geoff Brownsey

COMMENTARY: 275TH MEETING OF COUNCIL

Nine members of Council gathered at the George Hotel in Solihull, starting at 11 a. m. with a special session before lunch devoted to a discussion on the Future Role of the Society. Members had circulated each other before the meeting with summaries of their individual views (at least, some of them had, but not before the deadline). President Ralph summarised the views which had showed a significant degree of accord over suggestions such as that we needed more recruitment, younger blood, more training schemes and a stronger educational role, more industrial links and a modern electronic replacement for Rheology Abstracts. It was agreed that the British Society was in a good position to take a strong lead in forging more European links, without going as far as forming a European Society. Further discussion on this topic was scheduled for our next meeting.

Our President was on good form at a Christmas lunch, renewing acquaintance with a sparkling waitress met at the meeting of the year previously. It had to be agreed that the contents of a Christmas cracker did not quite meet up to B. S. R. standards for the demonstration, by the President, of the Bernouilli effect on suspending a small ball in an upward stream of air.

Following lunch we return to the formal agenda of the meeting. It is noted that the three absentees include both holders of the Society cheque books and that we will therefore have to forgo our expenses cheques until the claims can be dealt with by post. The previous minutes are agreed following further discussion on the correct spelling of Fontevraud. Ralph thanked Malcolm and his helpers for the excellent conference that they had organised at Cambridge. Malcolm

proudly reported that he was one of the few B. S. R. conference organisers who had achieved the target of not making a substantial profit on a meeting. We noted with relief that the small deficit had not been much larger, due to Malcolm's successful efforts in getting a hefty £5. 6K cancellation charge waived by his College. It seems that these days, Universities are even harder nosed than hotels in holding to the small print of conference venue contracts.

The officers' reports are given. It is agreed that we would have liked to do something for the British Association's National Science, Engineering and Technology week, but that it might be difficult in the limited time before March. This linked in to the earlier suggestions that we needed material for school and public demonstrations and that we should consider publishing 'Fifty Funny Fluids for Rheological Demonstrations'. Malcolm apparently had a chocolate exhibit thought to be suitable. Carole's suggestion that we needed to hit people at a lower level seemed a bit below the belt, but we agreed with the principle expressed that the Society needed to encompass the laboratory and quality control technician as well as the industrial and academic researcher. Each Council member was tasked to bring to the next meeting an idea (and preferably the physical reality) for a suitable demonstration. Ralph's idea had something to do with squeezing balls in a bag, causing liquid in an attached tube to drop rather than rise. The rest of us were warned off from pinching his balls. Council will of course welcome any ideas from the membership at large — suggestions to the Secretary, please.

A Treasurer's report was forthcoming, despite his absence, as yours truly had prepared one for him when the 'treasures' were finally handed over only a few weeks ago. The huge turnover of £22K for one quarter was largely due to the Cambridge conference. The other finances were still well in line with normal and expenditure and income were in balance. The Bulletin Editor apologised for the late appearance of the last Bulletin; work commitments at the beginning of the academic year were his feeble excuse. He suggested that since his term comes to an end soon, some thought should be given to whether the next editor should also be responsible for the packaging and mailing of the Bulletin, as he had been. This is a very laborious task which in the past has also been done by the Membership Secretary. It often depends on which Officer has the most accomodating kids prepared to accept a little backhander to stuff envelopes, but it might be better to put it out to a professional outfit. I know now why it has been suggested we need younger blood on the Council. A small increase in line with inflation was agreed in the price of advertising in the Bulletin.

The Abstracts Editor pointed out that declining subscriptions by libraries to the journal was undermining the subsidy members receive. Despite the potential short life given the journal in its present form, and the more widespread availability of computerised data based literature searching facilities to many members, it was still considered to be a very important service to members which should be maintained for as long as possible, whilst we actively pursued alternatives.

Other discussion during a busy afternoon covered the topics of awards, future conferences and meetings, and the proposed rheology handbook. The funding of the preparation of this publication and the allocation of any royalties proved too contentious to settle once again and was postponed to a future meeting. With our time rapidly running out we also had to pass over discussion on the archivist and the Scott Blair collection.

The meeting ended promptly at 5.30 with the arrival of Tony Evans and his wife at Ralph's invitation to receive the Society's Annual Award for his long (24 years) and meritorious service to the Society on Council. We adjourned to the bar to crack a bottle or two and drink their good health and wish him well in his retirement from Council. Given Tony's mysterious address at the Compression Chamber, there was some discussion of what other low dives he and other members might have visited during his long service.

Peter Anderson

MEMBERSHIP NEWS

The following applications for membership were approved at the Council Meeting, September 23rd, 1993.

Mrs S. D. Powell,
Rhône-Poulenc Chemicals,
Sturge Lifford, Lifford Lane,
Kings Norton,
Birmingham
B30 3JW
(pesa O)

Mr A. J. French,
Ciba Polymers,
Structural Adhesives RMB,
Duxford,
Cambridge
CB2 4QA
(pea BCDFGO)

Mr M. A. Mohammed,
Saudi AramCo,
Dhahran 31311,
P. O. Box 6257,
Laboratory Department,
Saudi Arabia
(feta CDFG)

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

The following have been elected to honorary membership of the Society: Dr. N. Casson, Dr. P. Howard, Prof. D.W. Saunders, G.R. Sothorn, Dr. D. Tabor.

D.J. Hourston has been appointed to the Chair of Polymer Technology in the Institute of Polymer Technology and Materials Engineering at Loughborough University of Technology, taking up his appointment on April 1st, 1994.

K.E. Evans has been appointed to the Chair of Materials Engineering in the School of Engineering at Exeter University, taking up his appointment on July 1st, 1994. He was also awarded the Leslie Holliday Prize for novel material development by the Institute of Materials for his work on auxetic (negative Poisson ratio) materials.

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.

Boger, D. V., and Walters, K., *Rheological phenomena in focus*, Elsevier, Rheology Series Volume 4, 1993, ISBN 0-444-89473-x, pp. 166, \$128. 50.

This book contains illustrations of the many and varied types of flow behaviour shown by different fluids. Flow visualisations of contraction and expansion, confined flows, rotating and oscillating flows and the breakup of jets are all illustrated and the book is expected to be "an indispensable support manual to all those who teach rheology or have to convince colleagues of the practical relevance of the subject in an industrial setting".

Bartz, W. J., *Lubrication of gearing*, (translated by A. J. Moore) Mechanical Engineering Publications, 1993, ISBN 0-85298-831-1, pp. 510, £139.

This book brings together research studies and practical experience to consider the lubricant not just as a functional element but also as a design element. It covers principles of the lubrication of toothed gear sets, loadbearing capacity, lubricants for gear mechanisms, selection of lubricants, lubrication in special conditions, solid lubricants, lubricant supply and gear and transmission failure.

Benkreira, H. (editor), *Thin film coating*, Royal Society of Chemistry, Special Publication No. 129, 1993, ISBN 0-85186-695-6, pp. viii+218, £45. 00.

This book reviews the fluid mechanics of coating flows, the rheology of coating suspensions, drying and solvent recovery. It is written by world experts and gives an update on the recent advances in the subject, both academic and industrial.

Mills, N. J., *Plastics: microstructure and engineering*, Edward Arnold, Second edition, 1993, ISBN 0-340-56043-6, pp. xi+376, £19. 50.

This is a textbook for students of engineering and materials science. It explains physical properties in terms of microstructure and compares mechanical, chemical and electrical properties of plastics to those of alternative materials. Manufacturing processes are considered together with their impact on the design of plastic products. Melt flow, moulding, viscoelasticity, creep and fracture are all dealt with.

Illston, J. M. (editor), *Construction materials: their nature and behaviour*, E & F N Spon, 1994, ISBN 0-419-15470-1, pp. xxii+518, £24. 99.

This is a textbook for students of construction dealing with metals, concrete, brickwork, fibre-reinforced polymers and cements, bituminous materials and timber. It concentrates on the engineering properties but deals with rheological properties where relevant, e.g. workability of concrete, creep of viscoelastic materials and fracture behaviour.

CONFERENCE ANNOUNCEMENTS

RHEOLOGY AND WATER SOLUBLE POLYMERS

Joint meeting between the British Society of Rheology and the
British Association for Chemical Specialities (Water Soluble
Polymers Group)

April 28th, 1994

Clayton Lodge Hotel, Newcastle Under Lyme

Water soluble polymers are used for modifying the rheology of products in a wide range of industries. The aim of this joint meeting is to introduce participants to rheology and rheological measurements and to give examples of the ways in which they can be helpful in tackling problems in different industries. The speakers are all acknowledged experts in their various subjects.

PROGRAMME

- | | |
|--------|--|
| 10. 00 | Registration and coffee |
| 10. 30 | "Introduction to rheology"
Dr. P. F. G. Banfill, University of Liverpool. |
| 11. 10 | "Rheological measurements - principles"
Dr. D.C-H. Cheng, Independent consultant. |
| 11. 50 | "Rheological measurements - instruments"
Mrs. C.A. Moules, CAMTEL Sciences. |
| 12. 30 | Lunch |
| 14. 00 | "Rheological laboratory tests of building formulations"
Dr. D. Schweitzer - Aqualon. |
| 14. 35 | "Rheology of associated thickeners in latex paints"
Mr. P. Boström - Berol Nobel AB. |
| 15. 10 | Tea |
| 15. 30 | "Solution, gel and 'weak-gel' properties of food hydrocolloids"
Professor E.R. Morris - Silsoe College. |
| 16.05 | "Toiletries - products, manufacture and rheology"
Dr. G. Price - Unilever Research Laboratory. |
| 16.40 | Close |

COST

Members of BACS or BSR

£42.00 + VAT = £49.35

Non-members

£55.00 + VAT = £64.63

The cost of the meeting includes abstracts of each talk, lunch and refreshments.

REGISTRATION FORM

Please register me as a delegate for the meeting 'Rheology and Water Soluble Polymers'.

NAME:

ADDRESS:

.....

.....

.....

TELEPHONE/FAX:

.....

I enclose payment of £49.35 Member

BACS

BSR

☐
☐

£64.63 non member

☐

Cheques made payable to: British Association for Chemical Specialities

Special dietary requirements

Please return this form to: BACS, 246-254 High Street, Sutton, Surrey SM1 1PA.

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 at the National Motor Cycle Museum in the West Midlands at a venue to be announced later 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. 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
POLYMERISATION

AN 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 Dr D.J. Hourston, Polymer Centre, Lancaster University, Lancaster, LA1 4YA.

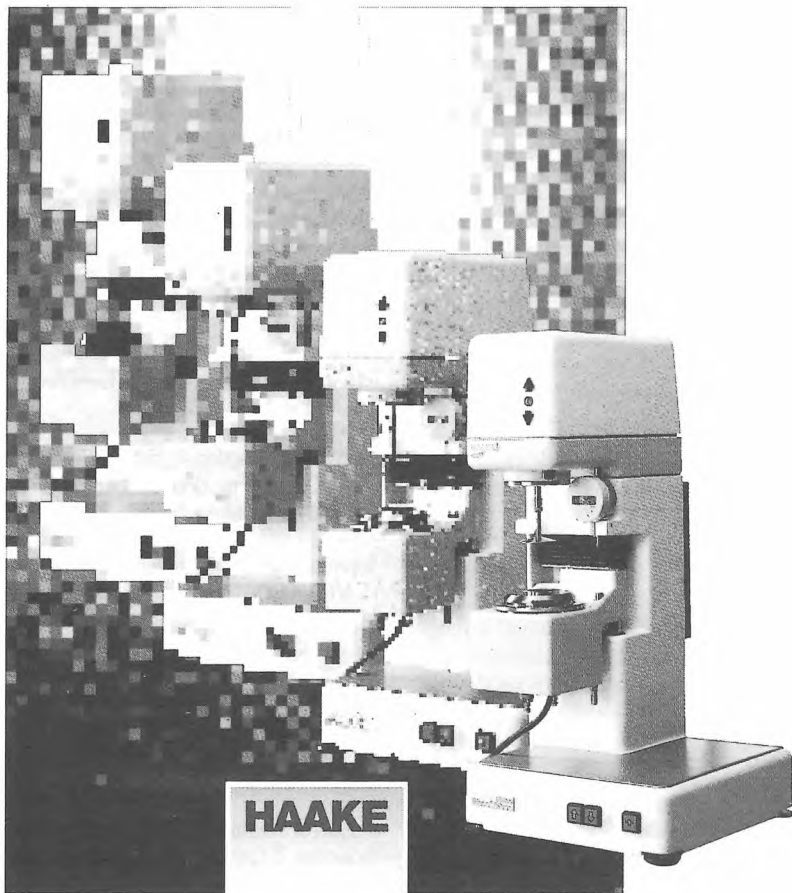
CONFERENCE DIARY

DATE	PLACE	DETAILS
23-25/3/94	Dijon, France	'Food Macromolecules and Colloids', contact: Prof. E. Dickinson, Proctor Dept. of Food Science, University of Leeds, Leeds LS2 9JT.
3-7/4/94	Akron, Ohio, U. S. A.	'10th Annual Meeting' Polymer Processing Society, contact: PPS Secretariat, 13400 A. David, St. Janivier de Mirabel, Québec, CANADA JON 1L0. Fax: +1-514-433-9041.
11-14/4/94	Cambridge, U. K.	'Deformation, Yield and Fracture of Polymers' contact: Conference Dept. Institute of Materials, 1 Carlton House Terrace, London SW1Y 5YY.
14/4/94	London, U. K.	'Tribology of ceramic materials' contact: Institute of Physics, 47 Belgrave Square, London SW1X 8QX.
28/4/94	Newcastle under Lyme U. K.	'Rheology and Water Soluble Polymers', contact: BACS, 246-254 High Street, Sutton, Surrey, SM1 1PA, U. K.
24-26/5/94	Moscow, Russia	'International Conference on Superplasticity in Advanced Materials', contact: T. G. Langdon, Material Science and Engineering, University of Southern California, Los Angeles, CA 90089-0241, U. S. A..
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.
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.
7-9/7/94	Galway, Eire	'Flow processes in composite materials 94', contact: Dr C. O. Brádaigh, Composites Research Unit, University College, Galway, Eire

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

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.
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.
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.
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..
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.
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..
1995	Caracas, Venezuela.	'3rd Caribbean Conference on Fluid Dynamics', contact: Dr H. Ramkisson, 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.



**FOCUS YOUR
ATTENTION
ON THE NEW
HAAKE
RHEO
RS100**

- Unsurpassed resolution and precision
 - User Friendly Rheometer
 - Fully automatic Computer controlled
 - Adaptable to a wide range of viscosities
 - Auto Gap Setting
 - Variable speed plate lift
- Many other unique features

Call Harry Schimanski **NOW !** on 0509 231166
to book your demonstration

HAAKE

Fisons Scientific Equipment
Bishop Meadow Road,
Loughborough,
Leicestershire LE11 0RG
National Tel: 0509 231166
National Fax: 0509 231893
Telex: 341110 FISCEG G

© Fisons plc 1993

FISONS
SCIENTIFIC
EQUIPMENT