

THE BRITISH SOCIETY OF RHEOLOGY

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THE BRITISH SOCIETY OF RHEOLOGY
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1992/93

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EDITORIAL

This year is the centenary of the birth of Karl Weissenberg and I would like to urge all members, who are able, to attend the Society's lecture and dinner in June, which promises to be a splendid event. Professor Arthur Lodge is a first class speaker and the dinner, co-sponsored by Carri-Med, the present manufacturers of the Weissenberg Rheogoniometer, will be a good opportunity to renew old acquaintances. Please use the form in this issue to request a (free) ticket. John Harris has written an appreciation of Weissenberg's work for this issue of the Bulletin.

This issue has our periodic update to the catalogue of the Scott Blair Collection, as well as an invitation for nominations for Scholarships and Awards. Why does nobody come forward wishing to be a Scott Blair Scholar? Who can afford to ignore the offer of £500? Please nominate someone.

It is not too late to start planning your trip to Cambridge in September. The list of papers to be presented at our autumn conference looks very interesting, with something for most people, and Robinson College is an excellent venue. Who could resist the possibility of an informal musical evening in addition? That reminds me of a Concrete Society meeting which was entertained to Chopin sonatas by the organiser, an accomplished pianist.

Finally, Geoff Tattersall tells me he is getting depressed about his local group, The North Midlands Group, based around Sheffield. Only a handful of people come to meetings and none of those are from industry. Is life really so hard for you industrialists that you cannot spare a couple of hours to discuss rheological topics? I doubt it, so make an effort to attend.

Copy date for next issue: June 15th 1993



KARL WEISSENBERG: 1893-1976

IN RHEOLOGY

Many members of the British Society of Rheology would certainly identify Karl Weissenberg with the well known rheogoniometer, with the Weissenberg, or rod-climbing effect and probably also with a zero value of the second normal stress difference in viscoelastic flow. But it was a certain natural reticence about him regarding his own achievements that made many people unappreciative of the full range and depth of his scientific contributions.

Fortunately, it has been possible to collate information from various sources, and to establish a reasonably complete record, and from it interesting aspects emerge. Markovitz¹ is categorical in asserting that it is Weissenberg who should be credited with the wall shear rate formula from experimental data in capillary (tube) flow, without assuming a specific form for the rheological relation. Again, Philippoff² is very clear that the so-called Mooney-Rabinowitsch correction is more correctly attributable to Weissenberg.

Now as his period slips further into history, it could become increasingly difficult to focus on his various and significant contributions to science. It is therefore heartening to note that the British Society of Rheology is taking up the idea of marking the centenary of the birth of Karl Weissenberg in 1893.

With the benefit of hindsight it is not easy to appreciate the conceptual difficulties that faced rheologists in the anomalous fluids, as they were called. Weissenberg's hypothesis of extending elastic solid properties to liquids to explain the rod-climbing effect was uncomfortable to some, and in the 1940s it was dismissed by several important figures, but of course this hypothesis has since prevailed. It has proved in time to be a fertile idea and acknowledge by several rheologists to have been of seminal influence. Lodge³ has refined and developed Weissenberg's hypothesis of recoverable strain and also that of the stress tensor. Weissenberg also saw that the stress tensor in steady laminar shearing motion must have symmetry corresponding with that of the velocity field and that therefore in common notation:

$$P_{13} = P_{31} = P_{23} = P_{32} = 0$$

The stress tensor is reduced at the most to four non-zero components.

It was an objective of Weissenberg's to create definitive experiments that would admit relatively simple mathematical analysis of the components of stress around the full solid angle at every point in space of a liquid in steady laminar shearing motion. As Russell⁴ has described, this also had an application in the need to establish design data for equipment to handle a class of non-Newtonian fluids which showed

'elastic after effects'. Russell⁴ found significant experimental evidence for the fact that the normal (tensile) stress along the streamlines was much greater than the other two stresses and that was in accordance with Weissenberg's theory about the rod-climbing effect. The apparatus used had a cone and plate geometry and also transverse capillary tubes to measure axial pressure. It was named the Rheogoniometer by Weissenberg. Roberts⁵ and Lammiman designed and produced a much more refined and versatile rheogoniometer measuring total axial thrust and it was the direct forerunner of modern instruments of that name. Their work on viscoelastic liquids and also that of Grassman and Jobling confirmed Russell's work; the logarithmic distribution of axial pressure was well established.

Russell⁴ was also associated with Weissenberg in the 1940s in the use of torsional vibrations to experimentally detect and analyse liquid elasticity. This was achieved by applying torsional oscillations to a cup of liquid. The effects of elasticity on the transverse standing wave could clearly be seen. Weissenberg had postulated that the stress field in vibratory motion was equivalent to the cyclic stress field experienced by a rotating fluid element in laminar shearing motion. Also that the fall in viscosity with increasing shear rate was due to the rotation of the principal stress axes relative to the principle strain rate, in accordance with vibrational stress/strain rate phase-lag. Weissenberg had thus conceived the underlying physical relationship. This is clear from the striking visual demonstration at the First International Congress on Rheology (1948) by Weissenberg showing a rubber sheet that was marked and deformed to show the effect of rotation and large deformation of axes embedded in a material element; rotation and deformation of axes was the basis of the later elegant mathematical treatment of rheological (or constitutive) equations of state by Oldroyd.

Weissenberg obviously had a vivid scientific appreciation of spatial relationships which found fertile ground in rheology. The geometric imagination that he displayed in rheology was not an isolated phenomenon however.

IN CRYSTALLOGRAPHY

In 1946 Weissenberg was awarded the Duddell medal and prize of the Physical Society of London. At this gathering he gave a lecture on anomalous viscosity: unremarkable except for the fact that the award was for the invention of the X-ray goniometer and not the rheogoniometer, which it might have been for.

Lipson⁶ has written an interesting essay on Weissenberg's place in crystallography and put it into context in the history of X-ray crystallography and also of other important contributors. He concludes

in this essay that 'the name of Weissenberg will live in crystallography as long as there are crystal structures to be solved'. Lipson himself is an authority in crystallography and started research in it in 1930. Weissenberg joined the Kaiser Wilhelm Institut für Faserstoff-chemie in 1922, just before Mark, and a team including Polyani, Schiebold, Brill, Gomperz and Schmidand who were pioneering in the new field of X-ray diffraction. Weissenberg was a key figure on the mathematical and crystallographic aspects.

The 1922-1928 period was particularly fertile for him. In it he conceived the idea and design of an X-ray instrument which was an important advance at that time. Mark⁷ asserts that no complicated macromolecular system would have been elucidated without it and in particular all modern and advanced structure proposals for proteins, nucleic acids and enzymes owe their existence entirely to the systematic use of the Weissenberg goniometer.

Beside this major contribution to science on the experimental side. Weissenberg made a corresponding theoretical contribution in a procedure for systematically correlating the geometric results from a crystallographic X-ray study of organic substances, with the symmetry, size and structure of individual molecules forming the lattice.

Clearly, the spatial imagination displayed by Weissenberg in rheology was no accident. His list of publications in X-ray applications dates from 1915 and is longer than that in the field of rheology.

Markovitz¹ ends his essay with the words 'we are all in his debt.' Of this there is little doubt, and the debt is greater than some realise.

IN PERSON

Mark⁷, who was a close associate of Weissenberg in the 1920s wrote of him that socially he was a 'delightful companion, an ever helpful friend and also an excellent tennis player'. Roberts⁵ writing of him in latter years as a fellow rheologist said that 'everyone respects him and that anyone could approach him and receive wise counsel with courtesy'. Certainly, few of us who knew him would wish to do other than gladly assent to these remarks.

John Harris

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COMMENTARY ON 272nd COUNCIL MEETING

It seemed to be a small group which assembled in a rather airy room in the Swansea Marriott Hotel, overlooking the recently refurbished marina, which local knowledge informed us had been reclaimed from a previously filled in dock. It was certainly pleasant to be able to relax one's ciliary muscles and take in a selection of ancient and modern sailing vessels. Since twenty years had elapsed since my last visit to Abertawe, I found some of the improvements to the seafront area most interesting.

In fact only six of us were present when Ralph called the meeting to order, so where was Carole? So we scuttled through the minutes of the last meeting and decided that there are no significant errors and were well into matters arising when Carole arrived, casting aspersions on the geographical knowledge of her informant, who had advised her that the journey from Hertfordshire would take an hour less than it did. Incidentally, of the eight members who eventually made up the meeting, only one had come by train, reflecting the inevitable corollary of choosing to hold our Council meetings around the country, rather than always in London as some societies choose to do. Peter, the local hero, had been to a Board Meeting already before joining us. Now we were twenty minutes into the meeting and had reached item four, the President's report, could this perhaps be a record breaking meeting? Most of Ralph's news related to items coming later in the agenda, so we continued our headlong progress.

During his treasurer's report, Peter drew our attention to a legal requirement of the Charities Act 1992 which requires all official documents, including cheques, to state that the body is a charity and give the registered charity number. Agonising decisions time! Do we put it on the front page of the Bulletin, or somewhere else? Your Bulletin Editor quietly made up his own mind. See if you can find where it is in this issue!

By now Roy had arrived, bringing our complement to eight, this time commenting on the length of the journey from Leicestershire, and we were able to get on to the secretary's report. Carole had received an effusive letter from someone in Indonesia, misheard by some as Jack Carter, who would like to collaborate in publishing scientific books, translations, journals etc in the local language. No-one was quite sure what language that would be but we decided that it was not something we should get involved in. She had also had a request from Geoff

Tattersall about his large collection of papers on workability and related properties of concrete. He had been evicted from his part-time base in the University of Sheffield and hoped to give the collection to a good home, but did not want it to be added to the collection at Aberystwyth, a sentiment shared by many around the table, who recognise the inaccessibility of that town from just about anywhere in Britain but are also conscious that the Scott Blair bequest specified Aberystwyth. We agreed to his suggestion that they should go to the Institution of Civil Engineers and agreed to offer the services of John Benbow, our newly appointed archivist, to catalogue them.

In his absence, Geoff Brownsy had sent a pessimistic report about the future of Rheology Abstracts. Apparently the publishers had responded to pressure from academic institutions to reduce the subscription, by anticipating a reduction in revenue through cancelled subscriptions instead. This anticipation had taken the form of a 35-40% rise in the UK subscription which would be combined with the probable imposition of VAT to become a self-fulfilling prediction.

After lunch overlooking the underutilised swimming pool, we discussed future conferences. The report about the forthcoming meeting on experimental methods in Manchester was not optimistic, with few registrants and no exhibitors nor much interest from manufacturers. Despite Carole's hard work raising a good set of papers it rather looked as though the authors would be speaking to each other. By the time this is in print we will know the outcome. In contrast, Malcolm's report *in absentia* was much more optimistic about the Cambridge meeting in September with a full programme of papers. We considered other meetings in later years. Ralph had suggested to the French society that we have a joint meeting in 1995 as a return collaboration for that in 1992. They had agreed and so we decided to have a half day meeting and AGM in London with a subsequent scientific meeting in France, but where? The *bons vivants* were in favour of Burgundy and suggestions that perhaps it was more important to think of the topic were quietly dealt with by those who had spent many happy meetings in the French Alps studying rheology at the ski-snow interface. There are those who like to go to a meeting and get their heads down to some work, concentrating on the science regardless of the venue, and those for whom the venue is paramount, although thinking of Acapulco for the International Congress in 1984 we have to recognise that accountants who pay staff for their travel expenses are more likely to question exotic venues. Finally, we decided that a meeting on printing might be a possibility for autumn 1994 and that a joint meeting with an appropriate society for spring 1994 was worth exploring. Explorers were duly appointed.

We heard brief reports to say that the handbook, Rheology A-Z, was progressing and preliminary discussions with a publisher were underway, and that the Scott Blair Collection management group had not visited it for a few months. John Benbow had recently taken away a lot of the secretary's papers to form the archive and was looking forward to the task. A suggestion that the archivist would be an intelligent dustbin was thought to be unworthy, but nevertheless apt, because we all immediately thought of the papers filling our filing cabinets which we could send to him. However, we all felt it would be interesting to publish snippets of information culled from the archive in the Bulletin.

A major item of the agenda which was dealt with after the routine business concerned the role of the Society — what are we trying to do? Some preliminary thoughts which emerged included lectures for schools, targetting young industrialists (how?) and student members. We also considered that more local group meetings would be good (volunteers to organise them are needed). However, it is worth noting that 5-10 new members join every quarter, so perhaps a Society which is growing by 5% per annum cannot be too bad: it is certainly growing faster than the British economy!

After a short discussion about the imminent changes of Officers caused by this year's retirements we closed at 16. 30, within the 90% confidence interval on Ralph's target time for completion of the meeting and, more important, early enough to let me get through that notorious traffic blackspot of Builth Wells before the traffic built up. I think I did see one other vehicle as I went through.

Phil Banfill

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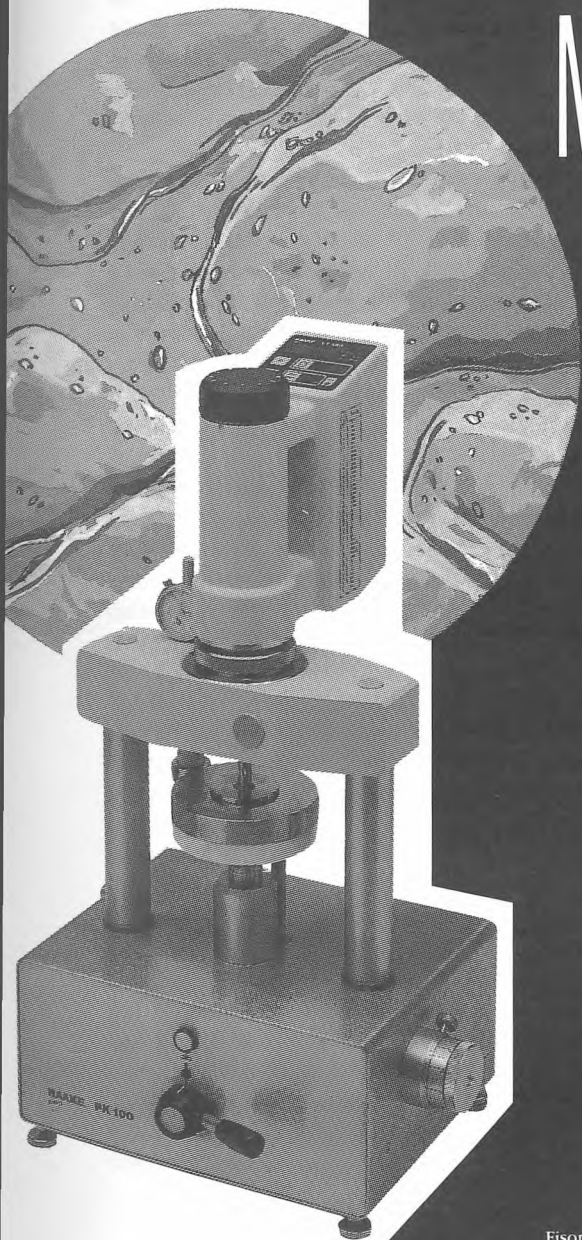
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THE ANNUAL AWARD OF THE BRITISH SOCIETY OF RHEOLOGY

After the successful and highly regarded Gold Medal of the Society was introduced in 1966 as the Society's premier award, a feeling grew that the Society's status and finances could justify introduction of a second award to be made more frequently. This eventually took the form of an Annual Award, made for the first time in 1978. The award made in 1992 being the fifteenth, this article looks back on the contributions recognised by those fifteen awards, and complements a previous article on the Gold Medal¹.

The scope of the award was deliberately set as wide as possible being initially stated as 'made to an individual or a group of individuals or an institution for significant or promising contribution(s) and/or services to the advancement of rheology in any of its many aspects.' (1980). By 1991 the emphasis had been clarified and the award 'is designed to reflect either contributions made over a prolonged period or it can be used in appreciation of a particular contribution to the field including a single published paper.' Council particularly welcomes nominations of younger members whose contributions are judged to be of especial merit or promise.

Of the fifteen awards, only one (1981) has been to a group. Two awards (1988 and 1991) were for a single paper, while the rest have been in recognition of a contribution made over a number of years, either through research effort or service to the Society. A brief summary of each award follows, with the reference to the full citation given in the Bulletin (in every case except 1989 for which there is only a photograph).

The first award, in 1978, was made to R. W. WHORLOW in recognition of his role in education, running annual series of postgraduate evening lectures on Rheological Techniques at Battersea College of Technology, and of his service to the Society as Council Member for 16 years, including terms as Editor of Rheology Abstracts and Treasurer².

J. F. HUTTON received the award in 1979 for his contribution to rheology in industry, having led rheology research at the Shell Thornton Research Centre, Cheshire, having built up many contacts with University research groups, and for his service to the Society as Council Member for 14 years, including a term as Bulletin Editor³.

DR. E. J. HINCH's international reputation as the leader of a younger generation of theoretical rheologists was the basis for the 1980 award. In twelve years after graduating he had completed a doctoral thesis, published many papers in major journals on Brownian motion, turbulent drag reduction and suspension mechanics, and had built up a thriving research group at Cambridge⁴.

The 1981 award was made in recognition of the joint contributions to the development of elongational rheometry of PROFESSOR J. MEISSNER, DR. H. M. LAUN, DR. H. MUNSTEDT AND DR. M. WAGNER. This is the only award to have been made to a group and the first to go overseas and recognised the collaboration between industrial laboratories at BASF in Germany and academia (ETH Zurich)⁵.

The 1982 and 1983 awards were both made in recognition of major individual scientific contributions over a long period. PROFESSOR F. M. LESLIE'S⁶ was for work on the rheology of liquid crystals and that of PROFESSOR D. BOGER⁷ was for contributions to the understanding of viscoelastic fluids, in both case spanning over two decades.

Service to the Society returned as a main theme for the award to DR. K. M. BEAZLEY in 1984. He was a Council Member for ten years, Secretary for four at a time when joint meetings with the other European Societies started, and a regular organiser of conferences. His contribution to industrial applications of rheology through his work on clay suspensions and on paper was also noted by the citation⁸.

The citation for DR. R. BUSCALL'S award in 1985 explicitly noted the aim of encouraging young rheologists through the award and referred to his work on concentrated disperse systems which had gained him international recognition through his papers and invitations to speak at conferences and other events⁹.

The 1986 award to DR. B.A. TOMS recognised his long scientific career and, in particular, his work on turbulent drag reduction which came about through some chance observations in dilute polymer solutions. The so-called Toms Effect had been widely investigated over succeeding decades and many practical applications developed¹⁰.

DR. D. C-H. CHENG, the recipient of the 1987 award, had by then spent 25 years in the Applied Rheology group at Warren Spring Laboratory, during which time he had produced a large number of reports and papers and served on numerous committees and working parties concerned principally with the application of correct rheological measurement principles to a wide range of 'real' materials. He had served on the Council of the Society, including a term as Membership Secretary¹¹.

The paper 'an approximate analysis for contraction and converging flows', presented at the Society's 1987 conference and subsequently published¹² gained the 1988 award for DR. D. M. BINDING¹³.

The 1989 award was made to DR. J. J. BENBOW, but due to an oversight a photograph but no citation was published in the Bulletin¹⁴. Having retired from ICI where he had studied the rheology of pastes he was now at Birmingham University. He had served the Society for many years including terms as President and Secretary.

The impact of his contribution to the elucidation of the molecular origins of non-Newtonian and viscoelastic behaviour by means of computer situation was recognised by the award for 1990 to DR. D. M. HEYES¹⁵.

DR. P. MOLDENAERS received the 1991 award for her paper 'Intermittent shear flow in liquid crystalline polymers: rheo-optical behaviour', presented at the Society's Golden Jubilee Meeting in 1990 and published in the Proceedings¹⁶. The citation noted that her contribution to rheology was much wider than this single paper would suggest, including being Secretary of the 11th International Congress on Rheology, Brussels 1992¹⁷.

The fifteenth annual award was made to DR. C. J. S. PETRIE, recognising his scientific contribution to theoretical rheology and extensional flow as well as his administrative contribution as Secretary of the Society, Secretary of the informal European grouping of Societies and frequent conference organiser¹⁸.

As this note has tried to show, the Society's Annual Award has recognised a range of contributions to rheology, while at the same time establishing for itself a wide international reputation. It is particularly gratifying that those recipients who were comparatively early in their scientific careers have maintained the promise which contributed to their recognition, and their influence continues to increase. It is a reflection of the healthy state of the science of rheology that Council often has a hard job deciding between the contrasting claims of different nominees for the award.

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SCHOLARSHIPS AND GRANTS

ANNUAL AWARD

The Secretary would be pleased to receive nominations for the Annual Award 1993 as soon as possible, and in any event not later than June 10th, 1993. The scope of the award is as described in the preceding article.

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 as soon as possible. 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.

THE SCOTT BLAIR COLLECTION

During 1992 books and journal issues were donated by the following people. We would like to acknowledge their donations with gratitude.

Dr N. Alderman (5 years of a periodical), J. J. Benbow (6 books and several volumes of journals), Dr A. Evans (one book) J. F. Hutton (8 books and several journal issues), Professor Z Rigbi (one book), Professor K. Walters (one book).

THIRD SUPPLEMENT TO THE CATALOGUE, 1992.

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RECENTLY PUBLISHED BOOKS

Information is given here for the benefit of members, but the Society cannot assist members in obtaining copies of books mentioned. Order them through your normal bookseller or agent.

Transport Phenomena in Heat and Mass Transfer, Proceedings of the 4th International Symposium, Sydney, Australia, 14-19 July, 1991, edited by J. A. Reizes, Elsevier, Amsterdam, 1992, xviii+1642 (in 2 vols.) \$US 453.00. ISBN 0-444-89851-4. Theoretical, numerical and experimental studies of transport phenomena in heat and mass transfer are reported in depth in this volume. Papers are presented which review and discuss the most recent developments in areas such as: Mass transfer; Cooling of electronic components; Phase change processes; Instrumentation techniques; Numerical methods; Heat transfer in rotating machinery; Hypersonic flows and industrial applications.

Finite Elements for Solids, Fluids, and Optimization, G. A. Mohr, 1992, 620pp. Hardback ISBN 0-19-856369-8 £65, Paperback 0-19-856368-X £29.50. The author's extensive experience of the application of finite element methods gives this book a practical slant. Worked examples are scattered throughout the text. Care is taken to explain and demonstrate techniques for formatting finite element apparatus to problems. Programming techniques for solving the resulting FEM problems are also thoroughly covered. This ensures the book is complete and self-contained both in terms of coverage of the theory and in practical methodology.

MEMBERSHIP NEWS

The following applications for membership were approved at the Council Meeting, March 2nd, 1993

Ms A. M. Adams,
ET Building, Dept. of Engineering
Science, Parks Road,
Oxford
OX1 3PJ.
(fetsa C)

Mr C. S. Brown,
NPL, Queens Road,
Teddington,
Middlesex
TW11 0LW.
(fetsa BD)

Mr J. W. Davison,
Davison Chemographics Ltd.,
Unit 28, Woolmer Way,
Borden, Hants
GU35 9QF.
(fetsa FGJ)

Dr Ruifeng Liang,
Dept. of Chemical Engineering,
Cambridge University,
Pembroke Street,
Cambridge
CB2 3RA.
(fetsa BCDG)

Mr R. T. J. Marshall,
Dept. of Chemical Engineering,
Cambridge University,
Pembroke Street,
Cambridge
CB2 3RA.
(fetsa CDFGL)

Dr G. M. Wells,
Kobe Steel Europe Ltd.,
10 Nugent Road,
Surrey Research Park,
Guildford, Surrey,
GU2 5AF.
(fetsa BCD)

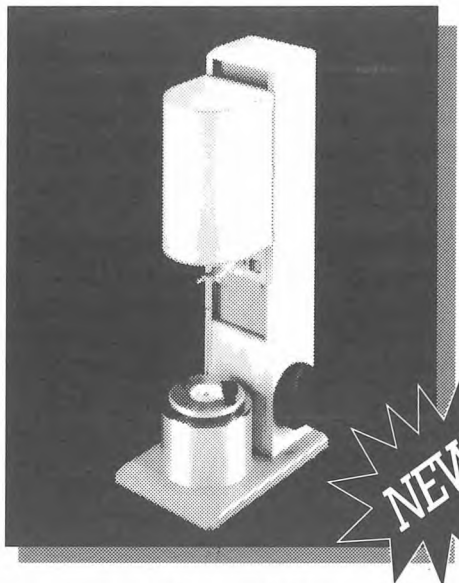
S. A. Munro has resigned.



PL-TSR

RHEOLOGY

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Polymer Laboratories Thermal Scanning Rheometer is a versatile and robust instrument for measuring the dynamic rheological properties of many materials such as foodstuffs, epoxy resins, rubbers, cements, polymer melts and bitumens.

- Disposable Probes And Containers
- Simple To Use
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- Fast Thermal Response
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The PL-TSR is part of the range of rheological instrumentation from Polymer Laboratories. The range includes the ACER 2000, advanced capillary rheometer, the PL-DMTA torsion system and the PL-DMTA torsion system and the PL-Minimat, miniature materials tester. Further details on request.

Polymer Laboratories

THERMAL SCIENCES DIVISION

Polymer Laboratories Ltd, Thermal Sciences Division, The Technology Centre, Epinal Way, Loughborough, LE11 0QE U.K. Tel: (0509) 233300 Fax: (0509) 234905

LETTER TO THE EDITOR

Coventry, U.K.

Dear Sir,

In the last issue, Profesor Z. Rigbi cast doubt on the use of the G'/G'' crossover point for characterising the gel point for a curing liquid system.

In our work with room temperature systems the crossover point has been found to be sensible. We have seen this point as one where viscous flow becomes less important in the overall polymer behaviour. We have found that G'' levels off whilst G' continues to rise, so perhaps the point at which G'' levels is just as valid. In addition we have found that a peak in tan delta occurs with some systems, so perhaps this is a valid point to represent the change from a liquid to a solid.

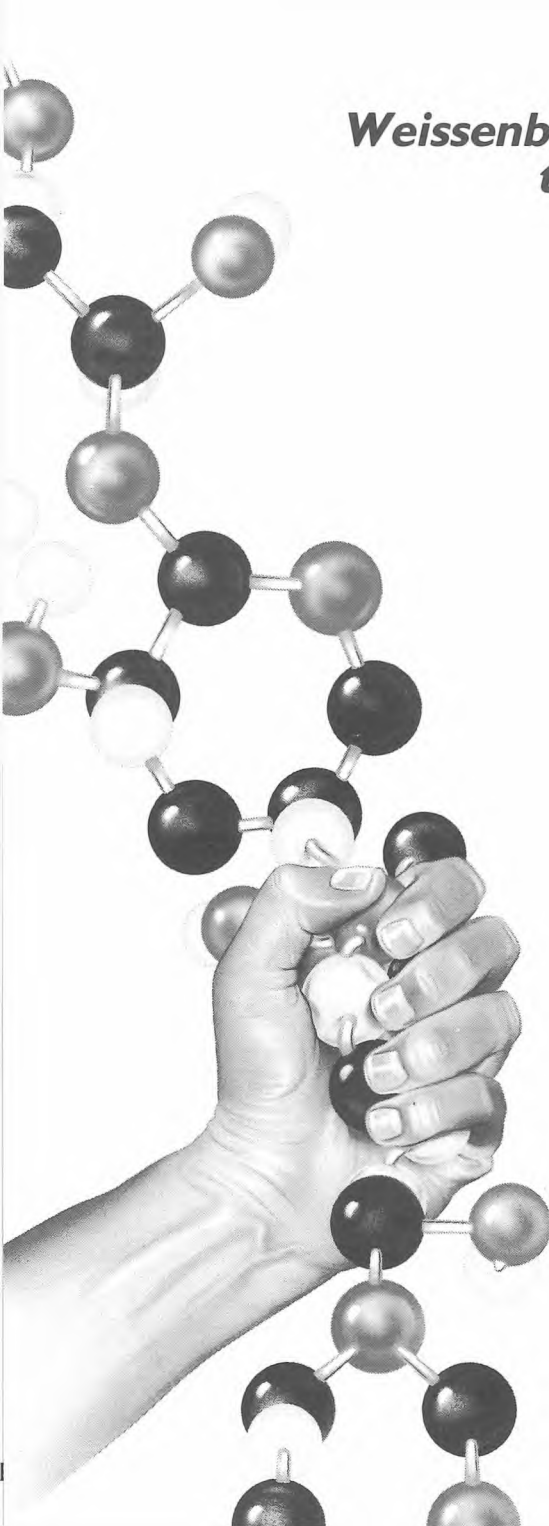
Professor Rigbi is correct in his statement that a gel point is a diffuse one to try to determine, but, in defence of the crossover point, it does allow for precise comparisons and in our case offers a method of distinguishing between discrete differences in polymer structure.

The use of the crossover point is convenient and for practical industrial applications this kind of approach has to be used.

Yours faithfully,

D. Cherrington

Morton International Ltd.

A detailed illustration of a hand squeezing a long, flexible polymer chain. The chain is composed of black and white spheres connected by thin rods, representing atoms and bonds. The hand is shown from the wrist up, with fingers firmly gripping the chain, symbolizing the application of shear stress.

Weissenberg Rheogoniometer takes the shear stress out of rheology.

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NEWS OF OTHER SOCIETIES

THE SOCIETY OF RHEOLOGY

Some items of interest culled from Rheology Bulletin volume 61, 1992 are as follows. The 64th Annual Meeting was to be held, later than usual, in Santa Barbara, California, February 7-11th, 1993. The technical programmewould cover polymer rheology, rheology in polymer processing, complex fluids (multi-component and multi-phase systems), experimental methods and non-Newtonian fluid mechanics. The 65th Annual Meeting will be held in Boston, October 17-21st, 1993 and future meetings are planned for Philadelphia (1994) and Sacramento (1995). Annual Meetings currently generate over 150 papers and 300 delegates.

The Society's membership stands at over 1200 and there are over 500 non-member subscriptions to the Journal of Rheology. During the year the Society agreed to change the format of the Journal slightly to reduce costs. The typical time to publish papers is 7-8 months from receipt with a maximum of 14 months. 615 of the 126 manuscripts submitted in 1991 had been accepted for publication.

A proposal to establish an award for younger rheologists, which would be open to candidates resident outside North America, was rejected by a membership ballot, leaving the Bingham Medal as the only award of the Society.

THE SOCIETY OF RHEOLOGY, JAPAN

The Society of Rheology, Japan, publishes a Journal, Nihon Reorogi Gakkaishi, which appears four times a year and contains original scientific papers, texts of Award Lectures, technical notes, correspondence and a news section describing the Society's activities. The papers are in Japanese with English abstracts and just a handful of papers each year are entirely in English. In addition, abstracts of papers from the Journal of Rheology are reprinted. Overall, volume 19, 1991, extended to about 230 pages. Professor Nemoto, one of the Editors, visited this Society's Annual Conference in Cambridge in September 1992 and we agreed to exchange copies of the two Society's publications. Therefore it is a pleasure to be able to report to members that abstracts of papers published in the Journal of the Society of Rheology, Japan, will appear in Rheology Abstracts and the journal itself will be held as part of the Scott Blair Collection at Aberystwyth.

CONFERENCE ANNOUNCEMENTS

KARL WEISSENBERG CENTENARY LECTURE AND DINNER

This will be held on Thursday June 10th, 1993, at the Hilton International Hotel, Newbury. The Lecturer will be Professor A. S. Lodge, University of Wisconsin and the programme will start at 18. 30 followed by dinner at 19. 30 for 20. 00. The event will be sponsored by the British Society of Rheology and Carri-Med plc, manufacturers of the Weissenberg Rheogoniometer. Admission, including dinner, will be by ticket, obtainable by returning the form below. The Society has reserved a block of rooms for those attending. Please indicate your requirements on the form.

BRITISH SOCIETY OF RHEOLOGY KARL WEISSENBERG CENTENARY LECTURE AND DINNER June 10th, 1993

Please send me a ticket for the above event.
(BLOCK CAPITALS)

NAME

AFFILIATION

ADDRESS FOR CORRESPONDENCE

.....

.....

.....

.....

TELEPHONE:.....FAX:.....

I require overnight accommodation for the night of June 10th, please book me a

single/double room (delete as appropriate).

I understand that I will settle my own account for accommodation.

Price of Accommodation:

Single room and breakfast £70.00. Double room and breakfast £85.00.

Please return form to Mrs C. A. Moules, Camtel Sciences, 27 Alexandra Road, Stotfold, Hitchin, Herts., SG5 4NATel.: 0763-244280. Photocopies accepted

RHEOLOGY COURSE

THEORETICAL, EXPERIMENTAL AND INDUSTRIAL ASPECTS OF RHEOLOGY
JUNE 1ST TO 4TH, 1993

This Rheology Course, sponsored by Carri-Med Ltd., of Dorking, Surrey, will take place at the University of Strathclyde's Educational and Recreational Centre, Ross Priory, on Loch Lomond, Scotland. The course, which is residential, is intended to cover the basics of rheology, modern experimental techniques (including constant stress rheometry, rheogoniometry, elongational flow and industrial aspects of rheology) and lead to state-of-the-art concepts in flow, data acquisition and interpretation.

The lectures will be given by well known rheologists follows Professor H. A. Barnes, Unilever plc, Professor J. Ferguson, University of Strathclyde, Mr. S. Goodyer, Carri-Med Limited, Dr. N. E. Hudson, University of Strathclyde, Professor T.E.R. Jones, University of Plymouth, Mr. S. Smith, Carri-Med Limited, Dr. A. Tanner, DEVRO Ltd, Professor K. Walters, U. C. W., Aberystwyth.

The cost of the course is £550.00. This includes the course fee, lecture notes, textbook, accommodation (full board) and transport to and from the centre of Glasgow. Accommodation at the Priory is limited and the overflow will be accommodated in a local hotel. All rooms have full facilities.

If you wish to enroll, please complete the attached form (photocopy acceptable) and return it to me. It should be emphasised that the numbers on the course will be limited, so please book as soon as possible to avoid disappointment.

To: Dr N. E. Hudson, Department of Pure and Applied Chemistry, University of Strathclyde, 295 Cathedral Street, Glasgow G1 1XL, Scotland.

I wish (a) more information (b) to attend the Rheology Course.
Please send details to:-

NAME (Mr, Mrs, Miss, Ms, Dr, etc)

ADDRESS

.....

.....

TEL NO. FAX NO.

FOUNDATION COURSE IN RHEOLOGY
WARREN SPRING LABORATORY
JUNE 8TH-10TH, 1993

This course is designed as an introduction to rheological properties. The main topic is the operation and recommended practice for viscosity/non-Newtonian flow curve measurement. This is the basic characteristic of fluid materials and it is the best understood. There are a lot of commercial instruments to choose from and it is the most measured property.

The course will be a mix of lecture and practical sessions making use of all sorts of measurement geometries and pointing out the various necessary instrument corrections.

The cost is £475 plus VAT excluding meals and accommodation. For further information contact Susan Gartside, Warren Spring Laboratory, Gunned Wood Road, Stevenage, SG1 2BX, Tel: 0438-741122.

THEORETICAL AND GENERAL RHEOLOGY
AT ROBINSON COLLEGE, THE UNIVERSITY OF CAMBRIDGE
Wednesday 22nd to Friday 24th September, 1993

A JOINT MEETING ORGANISED BY
THE BRITISH AND DUTCH SOCIETIES OF RHEOLOGY

This meeting will cover recent advances in the rheology of fluids, pastes and particles, and both theoretical and experimental papers will be presented.

Robinson College is the most recent addition to the Cambridge Colleges, and enjoys excellent conference facilities. The College offers accommodation of the highest standard and is set in beautiful grounds. There will be a programme for accompanying partners and a full range of social, musical and wine-tasting events should help to ensure that this will be a memorable meeting.

The academic sessions start at 10.30am on Wednesday 22nd September and finish at 12.30pm on Friday 24th September.

PROVISIONAL LIST OF PAPERS

Isolating component contributions to the overall rheology in 1, 4-polyisoprene/1,2 polybutadiene miscible blends, Professor G. G. Fuller (Stanford University, California).

Biot poroelasticity of a chemically active shale, Dr J. D. Sherwood (Schlumberger Cambridge Research).

Growth process of polymers near the gelation threshold, Professor D. Durand (Université du Maine).

Zero shear viscosity of MDPE and its influence in production of large pipes, Dr J. Pittman (University College Swansea).

Some comments on inelastic fluids, Dr D. M. Binding (The University College of Wales).

Multi-phase models for rheologically complex fluids, Professor J. R. A. Pearson (Schlumberger Cambridge Research).

Nonlinear rheology of micelles and polymers, Dr M. E. Cates (University of Cambridge).

Corner flows on viscoelastic liquids, Professor A. R. Davies (The University College of Wales).

Steady states in the theoretical rheology of suspensions, Dr L. Woodcock (University of Bradford).

Brownian dynamics simulations of dense suspensions: viscoelastic behaviour, Dr D. M. Heyes (University of Surrey).

Velocity distributions in granular materials discharging from hoppers, Dr R. M. Nedderman (University of Cambridge).

Control of the displacement of one fluid by a second, in an annulus, by altering the rheologies, Dr S. H. Bittleston (Schlumberger Cambridge Research).

Rheology of associating polymers, Dr R. Buscall (ICI).

A finite element analysis of the squeeze-film flow of plastic fluids, Dr M. J. Adams (Unilever).

Deformation behaviour of polymer melts and rubbers, Prof. Dr-Ing M. H. Wagner (Universitat Stuttgart).

Extensional viscosity and recoverable strain, Dr C. Petrie (University of Newcastle).

Computation of converging flows, Dr E. J. Hinch & Dr R. A. Keiller.

Effects of thermotropic liquid crystalline polymers on the rheology of high density polyethylene, Dr C. K. Chai et al.

Determination of molecular weight distributions from linear viscoelasticity, D. W. Mead.

Multiphase chaotic flow, Dr M. R. Mackley, N. D. Wise & K. Smith (University of Cambridge).

In addition there will be contributions from members of the Dutch Society of Rheology.

THEORETICAL AND GENERAL RHEOLOGY
A JOINT MEETING OF THE BRITISH AND DUTCH SOCIETIES OF RHEOLOGY
at Robinson College, Cambridge, 22nd-24th September 1993
REGISTRATION FORM

please tick [✓]
as appropriate:

Please register me as a delegate for the above meeting []

CONFERENCE FEE (includes lunch on 22/23/24 September, conference dinner on 23 September, refreshments, conference folder) £95-00 []

STUDENT DELEGATE reduced fee £35-00 []

ACCOMPANYING PARTNER reduced fee (includes conference dinner on 23 September) * £35-00 []

Accommodation at Robinson College:	for delegate only:	for delegate's partner sharing twin room add:
Dinner, bed & breakfast, Tues 21 September	£57-00 []	£42 []
Dinner, bed & breakfast, Weds 22 September	£57-00 []	£42 []
Bed & breakfast, Thurs 23 September	£42-00 []	£26 []
Bed & breakfast, Fri 24 September	£42-00 []	£26 []

I enclose a cheque for £ _____ made payable to The British Society of Rheology.

or

I would like to pay by Visa/Mastercard. Please pay The British Society of Rheology £

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Signature of cardholder _____ date _____

Full name of delegate _____

and accompanying partner _____

(if applicable)

Address: _____

Daytime telephone number:

* a residential delegate accompanied by their partner will be provided with a twin-bed room.

Would you be prepared to perform at an informal musical evening during the conference? []
instrument: _____

Please return your completed registration form and payment by Monday 16th August 1993, to:

Dr M. R. Mackley, University of Cambridge, Department of Chemical Engineering, Pembroke Street, Cambridge, UK, CB2 3RA. Telephone 0223-334777. Fax 0223-334796

CONFERENCE DIARY

DATE	PLACE	DETAILS
1/6-4/6/93	Ross Priory, U. K.	Short course 'Theoretical, Experimental and Industrial Aspects of Rheology', contact: Dr N. E. Hudson, Dept. of Pure and Applied Chemistry, University of Strathclyde, 245 Cathedral St., Glasgow G1 1XL Tel.: 041-552-5664 ext. 2162.
1-5/6/93	Perm, Russia.	'Influence of Microstructure on the Constitutive Equations of Solids' Euromech 303, contact: Prof. O. B. Naimark, Institute of the Mechanics of Continuous Media of the Russian Academy of Sciences, 1 Akad. Korolev Str., 614061 Perm, Russia.
8-14/6/93	Kiev, Ukraine	'Eighth International Conference on Fracture', contact: ICF8 Secretariat, Karpenko Physico-Mechanical Institute of the Ukrainian Academy of Sciences, 5 Naukova Str., LVIV 290601, UKRAINE.
12-16/7/93	Wrexham, U. K.	'7th Gums and Stabilisers for the Food Industry Conference', contact: Conference Secretariat, Faculty of Science, North East Wales Institute, Connahs Quay, Deeside, Clwyd CH5 4BR.
22-26/8/93	Moscow, Russia	'Advances in Structured and Heterogeneous Continua', contact: Prof. Y. G. Yanovsky, Institute of Applied Mechanics, Russian Academy of Sciences, 117334 Moscow, Russia or Prof. D. A. Signer, Dept. of Mechanical Engineering, Auburn University, Auburn, AL 36849 U. S. A..
23-27/8/93	Rhodos, Greece	'The Mechanics of Swelling' Euromech 290, contact: Prof. T. K. Karalis, Democritus University of Thrace, 67100 Xanthi, GREECE.
30/8-3/9/93	Minneapolis, Minnesota, U. S. A.	'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.
15-17/9/93	Reading U. K.	'Physical aspects of polymer science', contact: Prof. D. C. Bassett, J. J. Thomson Physical Laboratory, University of Reading, P. O. Box 220, Reading RG6 2AF.
22-24/9/93	Cambridge, U. K.	'Theoretical and General Rheology' contact: Dr M. R. Mackley, Dept. of Chemical Engineering, University of Cambridge, Pembroke St., Cambridge CB2 3RA.

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

17-21/10/93	Boston, Mass., U. S. A.	'65th Annual Meeting', Society of Rheology, contact: Dr A. M. Kraynik, Division 1511, Sandia National Laboratories, Albuquerque, New Mexico 87185, U. S. A..
29/11-3/12/93	Boston U. S. A.	'Symposium O: Complex Fluids', Materials Research Society Fall Meeting, contact: Eric Kaler, Dept. of Chemical Engineering, University of Delaware, Newark, DE 19716 U. S. A..
4-7/1/94	Tobago West Indies	'International Symposium on Viscoelastic Fluids', contact: Dr H. Ramkissoon, University of the West Indies, Dept. of Mathematics, St. Augustine, Republic of Trinidad and Tobago.
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. Janvier de Mirabel, Québec, CANADA JON 1L0. Fax: +1-514-433-9041.
4-9/9/94	Seville Spain.	'4th European Conference on Rheology', contact: Prof. C. Gallegos, Departamento de Ingeniería Química, Universidad de Sevilla, (Edificio de Química), 41071 Sevilla, Spain.
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.
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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