

BULLETIN



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Hon. Editor:

M. CAMINA,

Paint Research Association,

Waldegrave Road,

Teddington,

Middlesex.



FOREWORD

Every now and then it's right to question where we're going and consider where we have been. The answers to the recent questionnaire ought to indicate our opinions of future trends. The long-term need by industry for rheological knowledge and technique will depend upon the importance of rheological work for the newer materials and processes being produced now by Research Laboratories. Or perhaps, as Edison is supposed to have said to his bank manager, "It will be about 18 months before I even know whether I'll have a product or not".

As forecasting future trends is still more of an art than a science, the best method of obtaining a forecast of future developments is to ask the intuitive opinion of experts, and who better than our own members?

P.S. Edison did not get the loan.

P.P.S. Will you please fill in the membership information form and also send it.

OFFICERS AND MEMBERS OF COUNCIL 1977-1978

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DR. D. R. OLIVER, Department of Chemical Engineering, University of Birmingham, Birmingham.

DR. C. J. PETRIE, Department of Engineering Mathematics, University of Newcastle upon Tyne, Newcastle upon Tyne.

PERSONAL NOTE

Dr. C. J. S. Petrie

Chris Petrie was educated at the same Scottish school as James Clerk Maxwell which may explain the obsession with Maxwell liquids. From there he went to Trinity College, Cambridge, and after graduating in Chemical Engineering in 1961 he was infected by the enthusiasm of J. R. A. Pearson and remained to write a Ph.D. dissertation on polymer flow instability. He has since applied his mathematical talents to engineering problems associated with polymer processing. At Newcastle, where he has lectured in Engineering Mathematics since 1966, his interest in mathematical modelling has also involved him in projects from sewage treatment to haemodialysis. In 1974 he was awarded a Leverhulme Research Fellowship to study the elongational flow of molten polymers in the Department of Chemical Engineering at the University of Delaware, for six months, while on leave from the University of Newcastle upon Tyne. He has been a member of the Society since 1962 and an abstractor for about ten years.

As a result of this hard work—or perhaps the passage of years and the effect of three energetic small boys—his hobbies have changed, from rock-climbing to showing visiting rheologists Hadrian's Wall and other sights of Northumbria, and from fencing to bridge where he is equally at the mercy of skilful opponents and sometimes more at risk of physical injury. Latest achievements include a proof of existence (of solutions of a differential equation) and a proof of non-existence (of B.S.R. Bulletin 1962 No. 4 which the secretary has been seeking for some time).

Joint Meeting of the British, Netherlands and Italian Societies of Rheology, University of Pisa

April 13-15, 1977

This Spring joint meeting of the three societies took place in the historic Italian city of Pisa. The conference, entitled Polymer Processing and Rheometry, attracted some 135 delegates, over one third from the industrial section, from ten countries. There was a full programme of three invited and 52 contributed papers.

The British contingent of 14, nine of whom took advantage of Canterbury Travels special arrangement, had to contend with the strike of British Airways maintenance engineers. This resulted in a round Europe trip finally ending in Milan, where with a sizeable contingent from the Netherlands, a deep knowledge of the airport and its operations was forced upon the group. Consequently the

weary travellers were unable to attend the welcome party in the former Abbey of Saint Zeno on the evening of April 12.

Of the 52 papers offered, divided into ten sections, nine were contributed by U.K. delegates. Unfortunately, two of these were eventually not presented. The ten sessions necessitated paralleling throughout the conference, with the consequent difficulties for the delegate of choosing where to be and when, made on occasions more difficult by enthusiastic debate from the floor stretching out a number of the sessions.

Although the great majority of contributions were from academia, there were a dozen or so from the polymer industry.

The three initial speakers, Professor Astarita, Professor Pearson and Dr. Struil, presented papers which were well received by the delegates, as presenting the up-to-date pictures in their fields, whilst posing state-of-the-art problems which rheologists might address themselves to in the future.

Of the contributed programme the largest grouping was that of Mechanical Properties and their Measurement, taking three sessions in all. An acknowledgment perhaps of the uncertainty with which existing data is treated, coupled with the sparsity of non-biased satisfactory data in certain areas. The paper, as well as producing fresh data for a number of materials, did on a number of occasions present novel techniques, which many delegates noted for future reference.

The two sessions devoted to processing were largely concerned with the effects of processing on structure, although there were contributions which examined the process for its own sake. Is this a sign of the times in that rheologists feel the need to examine now in greater depth the consequences of processes, or indeed that conferences presented by societies of rheology are now attracting contributions from a much broader spectrum.

It was disappointing that there was only a single session of strictly "Structure-Property Relationships"; however, in both the sessions concerned with Processing and those on Mechanical Properties, a number of authors raised such relationships, whilst acknowledging the difficulties involved in such work. Obviously, this is one area in which activity might well grow in the next few years.

With two parallel sessions, of course, one's own interests, obviously are dictated by current research activities and therefore only a distorted picture of the conference programme is possible, as quite large chunks are left out by any individual. Such was the writer's care with respect to the four remaining sessions, namely those on the "Behaviour of Polymeric Liquids and Rheometry", and I was only able to listen to a very small number of contributions in these areas.

Of those attended it appeared that there was the now accepted mixture of practical and theoretical in both groups. This was in some contrast to the previously reported areas of the programme, where the majority of contributions were phenomenological in nature.

The programme as a whole seemed well balanced with something for everyone, from widely different backgrounds. This is always a pleasant feature of rheological conferences. Facilities of the Engineering College, University of Pisa, were excellent and more than met the needs of delegates.

The social programme, and for some it is this that leaves the most enduring impression, was well organised and well received by delegates.

For delegates and their ladies (or gentlemen) there was, as well as the welcome, an evening concert on April 13, a half-day visit to the walled town of Lucca and the Villa Luchesi on April 14. The latter giving an opportunity to view the dramatic scenery around Pisa. For the attending non-delegates there was also a whole day trip to Volterra. Then, of course, there was Pisa itself, and for the brave or "Chianti Laden", the tower.

Finally on the night of April 15, the informal conference dinner, a most enjoyable function attended by a large number of delegates and their guests.

Overall, the choice of Pisa plus the hard work of Professor Bulta and his organising committee combined to produce a conference which the British contingent thought well worthwhile and most enjoyable. One at which old acquaintances were renewed and new ones made. Professor Bulta is indeed to be congratulated.

D. Marshall.

MOLECULAR INTERACTIONS, MICROSTRUCTURE AND RHEOLOGICAL BEHAVIOUR

Cranfield Institute of Technology, Cranfield, Bedford

January 4-5, 1978

The Informal Discussion was organised by the Industrial Sub-Committee of the Faraday Division, Chemical Society, as a follow-up to the joint B.S.R.-Chemical Society, Colloid and Interface Group meeting on "Rheology of Colloids", held at Bristol University in April 1976 (*Bulletin*, 1976, 19, (1) 3-5, (2) 15-16). It was attended by well over 60 participants from as far afield as Sweden, Switzerland and U.S.A. During the one and a half days, two keynote lectures and 11 contributed papers were presented and discussed. A full list is appended at the end of this report.

The aim of the meeting was to consider the contribution that rheological studies at low deformations and low deformation rates have made and can make towards the characterisation and understanding of molecular interactions and structural changes in systems containing polymers, natural and synthetic, and low molecular weight species, such as solvents, aqueous and non-aqueous, ions, surfactants, drugs, etc. It is a necessary adjunct that results obtained from many diverse physico-chemical techniques of analysis (optical and electron microscopy, light scattering techniques and X-ray diffraction, solubility, critical precipitation and turbidometry) have also to be included so that results and conclusions drawn from rheological measurements can be properly assessed. A number of lectures and papers in fact concentrated on physico-chemistry and thermodynamics at the exclusion of rheology. In preparing this report for the British Society of Rheology, I will only highlight the rheological aspects.

In his lecture, Warburton gave a general, philosophical discussion of the relation between rheology and molecular interactions, networks and thermodynamics. Spaul presented an idealised theory of surface tension of the gas-solid interface. A third theoretical paper (Kaye et al) considered the details of adsorbed polymer layers on capillary walls and how they are affected by hydrodynamic interaction with the flow of the solvent; this work is intended to relate to the flow times obtained using capillary viscometers.

A wide range of rheological properties were discussed in the experimental papers. Newtonian viscosity was measured using the Ubbelohde Viscometer (Molyneux et al) and an oscillatory low shear viscometer (Strivens). Steady shear non-Newtonian viscosity functions were measured using rotational viscometers (Eagland and Bateson, Franks et al, Horn and Kléman). Creep data were presented by Eccleston. Dynamic properties (storage and loss moduli, dynamic viscosity) were determined on the Weissenberg Rheogoniometer (Maitland and Sayegh), on a magnetic microrheometer (Marriott et al) and by Eccleston. Mathia and Georges used a tribometer consisting of a hemispherical rider sliding over a planar surface coated with substrate. These measurements were used to make deductions about or to relate to a variety of phenomena. Namely: gel structure and gelation mechanism (Maitland and Sayegh), surfactant adsorption on latex particles (Eagland and Bateson), binding of small-molecule cosolute on soluble polymers and consequent precipitation (Molyneux et al), effect of divalent cations on the mucocilliary transport of tracheal mucus (Marriott et al), influence of solvent molecules on structural reorganisation in graft copolymer and in linear copolymers (Strivens), morphology, shape, size and interaction of macromolecules in aqueous solutions

(Franks et al) and of emulsion systems (Eccleston), behaviour of adsorbed mono-layer under sliding friction (Mathia and Georges), and defect structures in lamellar liquid crystals (Horn and Kléman).

It is difficult to sum up the lectures, papers and discussions which covered such a very wide range of topics. On the questions of molecular interaction and microstructure, it is obvious that much has yet to be discovered and understood. As regards rheology, rheological measurement techniques have a useful role to play, but one yet to be fully realised. However, such techniques are not the panacea: they have to be supplemented with other physico-chemical techniques if the full picture of molecular interaction and microstructure is to be characterised. Even in rheological measurement, one has to guard against making comparisons and drawing conclusions from data obtained over restricted ranges of shear rate or frequency. This is because molecular structure and interaction have many degrees of freedom, each showing different responses to different magnitudes, rates and/or frequencies of deformation. At the present state of knowledge, these responses are independent of each other in the sense that it is not possible in general to predict, for example, low frequency behaviour from high frequency behaviour, and vice versa. The researcher has therefore to be prepared to cover as wide a shear rate or frequency range as possible if he wishes his rheological results to have the widest relevance. As a final observation, this Informal Discussion considered mainly the interpretation of shear properties of polymeric systems. Surface rheology was briefly touched on. But there was no mention at all of what one might learn from normal stresses and elongational properties.

The British Society of Rheology has the Faraday organisers to thank for arranging the meeting, in particular Messrs. Bryn Roberts and Terry O'Brien, who attended to the innumerable details that ensured smooth running. It is not the practice of the Faraday Division to publish the proceedings of such informal meetings. But complete sets of the preprinted lectures and papers are available from the organisers for a small price. Those interested should contact Mr. B. Roberts at Pafra Ltd., Bentalls, Basildon, Essex, SS14 3BU, as soon as possible.

D. C-H. Cheng.

Keynote Lectures

- B. Warburton, Molecular interactions, microstructure and rheological behaviour, with special reference to interaction between polymers and low molecular weight species such as drugs, surfactants and ions.
- R. Koningsveld, Thermodynamics of polymer compatibility.

Contributed papers

- G. C. Maitland and S. A. Sayegh, Studies of polyvinyl alcohol-congo red gels using rheological and inelastic light scattering techniques.
- D. Eagland and D. B. Bateson, Adsorption of a homologous series of alkyl sulphate surfactants on a clean polystyrene latex.
- P. Molyneux and S. Vekavakayanondha, Binding and viscosity studies on the precipitation of polyvinylpyrrolidone from aqueous solution by phenolic cosolutes.
- C. Marriott, C. K. Shih and M. Litt, Effect of cations on the rheological and mucocilliary transport properties of tracheal mucus.
- A. J. B. Spaull, Rheological equations of state consistent with thermodynamics.
- T. A. Strivens, The phase separation of binary copolymers of styrene and methyl methacrylate from solvent/non-solvent mixtures in relation to copolymer structure and polymer-solvent interactions.
- F. Franks, M. H. Asquith, H. Le B. Skaer and B. Roberts, Comparisons of microstructure of aqueous polymer solutions—as revealed by electron microscopy—with predictions based on their flow behaviour.
- A. Kaye, M. Lal and R. F. T. Stepto, Hydrodynamic properties of adsorbed polymer layers.
- T. Mathia and J. M. Georges, Wear initiation of boundary lubricated surfaces.
- R. G. Horn and M. Kléman, Observations on the defect structure and rheology of lamellar liquid crystals.
- G. M. Eccleston, Rheology and microstructure of the continuous phases of liquid paraffin in water emulsions.

CALL FOR PAPERS

Poster Sessions

THE RHEOLOGY AND RHEOMETRY OF MULTIPHASE SYSTEMS

Plymouth Conference, September 6-8

Papers on General Rheology and Rheometry will be welcomed for inclusion in Poster Sessions at the Plymouth Conference.

These sessions are ideal for the discussion of programmes which are still in the development stage.

Please send a title and abstract to the Secretary, Mr. F. N. Cogswell, as soon as possible.

CONFERENCE ON CHEMICAL-ENGINEERING-RHEOLOGY

In Spring 1979, this conference will be consolidated with the annual meeting of the German Society of Rheology. While the official language of the annual meeting will be German, the official language of the conference will be English.

A summary of the paper should be sent to Institut für Verfahrenstechnik der Rhein.-Westf. Techn. Hochschule Turmstrasse

FUTURE MEETINGS

FLOW—RUNNING INTO PROBLEMS

Wednesday, March 29, 1978

at the Lorch Foundation Conference Centre, High Wycombe

The meeting, organised by the Reinforced Plastics Group of the P.R.I. for March 29, 1978, aims to highlight key problems related to flow and to identify significant developments which could lead to better and more readily reproducible product performance. The format will follow that of the successful Discussion Meeting (Curing—Your Problem?) of October 1976, which dealt with problems associated with cure variables and possible solutions. A series of experts will present introductions to problem areas likely to arise in practice through poor understanding or control of flow and indicate current and possible future innovations which may result in substantial improvements.

Delegates will be provided with brief notes beforehand to indicate salient points and preliminary reading is advised in order to allow the meeting to concentrate on application problems.

Registration forms and further details from Mrs. Carol-Anne Alcorn, The Plastics and Rubber Institute, 11 Hobart Place, London, SW1W 0HL.

- 1200 Informal discussion with contributors around a small table exhibition covering discussion topics (cash bar available).
- 1245 Buffet Lunch.
- 1345 Chairman's Introduction—Dr. A. A. L. Challis (Polymer Engineering Directorate). An outline will be given of areas in F.R.P. materials manufacture where lack of understanding, etc., can cause problems.

- 1400 Problems of G.R.P. Production related to flow. W. Hodgson (B.T.R.). The speaker will highlight practical problems and indicate where improvements could be made.
- 1420 Current materials and control features. R. Burns (Pilkington Bros. Ltd.). Possible short term improvements leading to improved control in production quality will be discussed.
- 1440 Progress and future developments in understanding. Professor W. Wilkinson (University of Bradford). Will cover basic material characteristic variables with indications of benefit from current and future work.
- 1500 Discussion.
- 1645 Summary by Chairman.
- 1700 Conclusions and tea.

International Conference

THE TOUGHENING OF PLASTICS

July 4-6, 1978

at the Regent Centre Hotel, London

The Polymer Properties Group of the Plastics and Rubber Institute is planning a major international conference on Toughening of Plastics to take place in July 1978. A major sector of the plastics industry is concerned with the production and processing of rubber toughened plastics, including H.I.P.S., A.B.S., toughened grades of P.V.C., polypropylene, epoxy resins, and other related products. The aim of the conference is to take stock of current knowledge relating to the industry, including the chemistry of toughening manufacture of toughened polymers, structure-property relationships, rheology, melt processing and fabrication, and the economic outlook for toughened plastics.

PRELIMINARY NOTICE

The Rheology of Associating, Structured and Biological Systems

A joint meeting of the Netherlands, Italian and British Societies of Rheology supported by the Polymer Physics Group of the Institute of Physics will be held in Amsterdam from April 18th to 20th 1979.

Members will recall the successful and enjoyable joint meetings at Shrivernham and Pisa. Early notification of intention to submit a paper would be appreciated by the Secretary who would also be pleased to know of persons who would like to join a "package tour" similar to that operated at Pisa and Gothenburg in recent years.

COURSES

POLYMER PROCESSING

Course II

A series of 14 60-minute lectures on May 8-12, 1978
given by Professor J. R. A. Pearson

Suitable for graduate physical scientists and engineers having some familiarity with polymer processing operations. The aim will be to present mathematical models based on continuum mechanics leading to quantitative methods of engineering analysis of the major problems.

Cost

Course II: £35 to include printed notes and refreshments.

Details

Further details including lecture outlines for Course II are available from: Ms. Susan Hartman, Dept. of Chemical Engineering & Chemical Technology, Imperial College, London SW7 2AZ; phone: 01-589 5111, ext. 1998.

LETTER TO EDITOR

May we, through the bulletin, make the following comments in reference to one of the projects of the non-newtonian flow panel:

From available information, one of the important aims of the panel would seem to be: an investigation into the instrumentation requirements of both industry and academic research, leading to the instigation of a development programme for the design of a new rheometer, or series of such instruments. In particular, one of the projected schemes being the development of a "constant stress" instrument. This work possibly being carried out at the Rutherford Laboratories, Culham.

It is open to question whether a panel or other investigatory body, sitting in comparative isolation, can acquire the information available to the manufacturing organisations through the contacts made by their technical representatives.

In view of the fact that established instrument companies are probably aware, not only of most, if not all the problems outlined by the panel, but also of limitations to development imposed by technology, and more important, economic considerations, is it necessary, or even desirable that public funds should be expended in the manner proposed?

Would it not be more rewarding to devote at least part of the available funds to provide additional financial assistance to those

already engaged in such work? And also to the education, or perhaps re-education of the wide but dormant sections of industry, and even some sections of the academic world in the science of "Rheology", as opposed to the commonly held restrictive concepts of simple viscous flow.

As far as the constant stress rheometer is concerned, the technology already exists. Indeed one wonders if the panel are aware of, or perhaps prepared to acknowledge what is available.

For example, the constant stress instrument now known as the Deer Rheometer, though enjoying a growing popularity in applications as widely separated as paint, and biological fluids, would seem to be still unknown to the panel, in spite of having been commercially available for the past three years.

The manufacturers of this particular instrument would be interested to know why a twice repeated offer to loan a demonstration model for use in the Warren Springs symposium was ignored.

Yours sincerely,
J. J. Deer
B. Warburton

REVIEWS ON THE DEFORMATION BEHAVIOR OF MATERIALS

Editor: Professor P. Feltham, Brunel University, Uxbridge, England
Freund Publishing House, P.O.B. 35010, Tel Aviv, Israel

A quarterly authoritative review to provide research workers and specialists with up-to-date surveys on applied and theoretical developments in all fields of deformation, excepting *High-temperature Materials*, to which a separate journal in this review series is devoted.

Contents:

Volume I (1975-6)

- No. 1 Collective Dislocation Models in Crystal Plasticity
by *P. Feltham*
A Review of the Deformation Behavior of Tungsten at Temperatures less than 0.2 of the Melting Point (K)
by *J. R. Stephens*
- No. 2 Work Hardening of B.C.C. Metals
by *Tomoyuki Takeuchi*
Stress Relaxation
by *R. DeBatist*

- No. 3 The Deformation Behaviour of Crystalline Mercury
by *A. G. Crocker*
On the Macroscopic Yield Behaviour of Isotropic and Anisotropic Polymers
by *R. M. Caddell and R. S. Raghava*
- No. 4 Low-Temperature Plasticity of Crystals with the Diamond Structure
by *P. Feltham and R. K. Banerjee*
The Low Temperature Plastic Deformation of B.C.C. Metals
by *L. P. Kubin*

Volume II (1977)

- No. 1 Application of the Eyring Rate Theory to the Deformation of Glassy Polymers
by *E. Pink*
Factors Affecting the Determination of Activation Parameters
by *R. E. Reed-Hill and J. R. Donoso*
- No. 2 Pseudoelasticity and Stress-Induced Martensitic Transformations
by *K. Otsuka and C. M. Wayman*
- No. 3 Probabilistic Micromechanics of Inhomogeneous Solids
by *J. W. Provan and D. R. Axelrad*
The Plastic Behaviour of Polycrystalline F.C.C. Metals at Large Strains
by *I. Kovacs*

Papers in preparation include:

Micromechanics of Deformation of Slip-Bands under Monotonic and Cyclic Loading
by *T. H. Lin*

Computer Simulation of the Equilibrium Form of a Dislocation under Stress
by *D. J. Bacon and R. O. Scattergood*

DYNASTAT

A Complete Transient and Dynamic Viscoelastic Analyser

Imass Inc. is pleased to announce the introduction of a new concept in instrumentation for measuring time-dependent behaviour of viscoelastic solids. The DYNASTAT employs high reliability, state-of-the-art electronics to produce meaningful data at 50 milli-

seconds in creep or stress relaxation experiments with control stability which extends useful data out to hours and days. The instrument can also perform dynamic oscillatory experiments from essentially D.C. to 200 Hertz at peak amplitudes as high as ± 6.0 m.m.

For more information, please contact: E. J. Tolle, President, Imass Inc., Box 134, Accord (Hingham), Mass. 02018, U.S.A. Telephone (617) 749-5728.

APPLICATIONS FOR MEMBERSHIP—DECEMBER 1977

Dr. David Michael Binding, B.Sc., Ph.D. f,et,sa,D,F,N.	Depto Ingenieria Mecanica y Electrica, Facultad de Ingenieria, Ciudad Universitaria, Mexico 20. D.F.
Mr. S. L. Citroen, B.Sc. f,et,sa,D,N.	Dept. Applied Mathematics, University College of Wales, Aberystwyth.
Dr. Joe Dean Goddard, Ph.D. f,et,sa,B,C,D,G,M,N.	Dept. Chemical Engineering, University Southern California, University Park, Los Angeles, C.A. 90007 U.S.A.
Mr. Donald Keith Gooden, B.Sc., M.Sc. f,t,sa,N.	Dept. Applied Mathematics and Theoretical Physics, M & O Building, University of Liverpool, Liverpool.
Mr. Seyd Hossein Javadpour, B.Sc., M.Sc. f,t,sa,N.	Dept. Applied Mathematics and Theoretical Physics, University of Liverpool, Liverpool L69 3BX.
Dr. Hans Martin Laun, Dip.Phys. f,et,sa,D.	B.A.S.F. A.G. McBund Pruflabor G 201, D-67 Ludwigshafen, Rh. West Germany.
Dr. Peter Prentice, D.Phil. f,et,sa,D.	British Industrial Plastics Ltd. Brantham, Manningtree, Essex.
Dr. Michael John Sleeman, B.Sc., Ph.D. p,et,sa,C,D.	British Cellophane Ltd., Bath Road, Bridgwater.
Manfred H. Wagner, Ph.D. f,et,sa,B,C,D,4.	Techn.Chem.Lab. E.T.H.Z., Universitats str. 6, C.H. 8006 Zurich.

RESIGNATIONS

Dr. W. A. C. Swift
Dr. D. G. Bell

NEW MEMBERSHIP LIST

The previous List, produced in 1973, is now out of date and a new Membership List is being prepared. To get the information as up-to-date and accurate as possible please complete the attached form and return it to me as soon as possible. The section on rheological interests should be completed using the following code letters:

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

Dr. J. Ferguson
Department of Fibre Science
University of Strathclyde
Glasgow G1 1XW

RHEOGONIOMETRY COURSE

May 10-12, 1978

A two-day course on Rheogoniometry, sponsored by Sangamo Weston Controls Ltd., will be held at the University of Strathclyde's Staff Educational & Recreational Centre, Ross Priory, on the banks of Loch Lomond. The course will be concerned with rotational rheometry, and is aimed at users and potential users of the Weissenberg Rheogoniometer and similar instruments. In addition, techniques for measurement in the rapidly expanding field of elongational viscosity will be dealt with.

The programme will include the following lectures: Fundamentals of steady shear; fundamentals of oscillatory measurements; new developments in rheometry; specialised techniques for polymer melts, biological materials, suspensions, solutions, etc.; data treatment; elongational flow techniques and their interpretation.

Group Clinic sessions will also be held to discuss particular flow problems and consider case studies.

Those attending the course will meet in Glasgow on the morning of May 10, 1978 and be taken to Ross Priory by bus. The house itself is situated in 55 acres of policies at the south end of Loch Lomond. Parts of the building date back to the 14th century. Accommodation is limited and those attending will be expected to share a room as all the bedrooms are double.

The course will disperse after breakfast on Friday, May 12, when members will be returned to Glasgow.

Course fee: £40 including full board.

Lecturers:

Professor K. Walters
Department of Applied
Mathematics
University College of Wales
Aberystwyth

Dr. J. Ferguson
Department of Fibre Science
University of Strathclyde
Glasgow G1 1XW

Mr. R. Spooner
Sangamo Weston Controls Ltd.

Those wishing further details should complete the form below and return it to Dr. J. Ferguson.

I wish (a) more information,* (b) to attend* the Rheogoniometry Course.

Pleased send course details to:

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

ADDRESS

.....

..... POST CODE

*Delete whichever is inapplicable

DIARY

1978

March 29. "Flow—Running into Problems", High Wycombe.

April 6-7. "Production Congress—I. Chem. Eng. A.G.M.", Birmingham.

July 4-6. "The Toughening of Plastics", London.

August 28-September 1. "Non-Newtonian Fluid Mechanics", Louvain-la-Neuve, Belgium.

September 6-8. "The Rheology and Rheometry of Multiphase Systems", Plymouth.