

BULLETIN



BRITISH SOCIETY OF RHEOLOGY

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Dr. C. R. DIMOND,
Morgan Thermic Ltd.,
Technological Centre,
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FOREWORD

In the present economic climate with many large companies and even those companies thought as British institutions finding it hard going I wonder whether conference organisers have found or expect to find a decrease in the number of people, both from industry and academic establishments attending conferences. Conference organisers will have to think very hard about the titles of conferences; whether to make them more general or whether to make them very specialised. Another aspect which I think also requires attention is greater discussion between societies and scientific groups so that the total conference scene can be set with no apparent duplication or clashes of interest.

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Treasurer: MR. A. EVANS, Department of Surgery, Royal Victoria Infirmary, Newcastle upon Tyne.

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MR. T. A. STRIVENS, Physics Section, Research and Development Department, I.C.I. (Paints Division) Limited, Wexham Road, Slough.

ANNUAL SCIENTIFIC MEETING

London, 9th September, 1980

As is usual every four years, when there is an International Congress, the Society did not hold a three-day residential conference in the autumn. Instead an afternoon meeting was held, with lectures by a distinguished group of rheologists. The Victorian setting—the Gustave Tuck lecture theatre in University College—was one in which F. T. Trouton (who was Quain Professor of Physics there from 1902 to 1914) would not have been out of place.

Before tea we were entertained and educated by the two distinguished academicians from overseas. R. I. Tanner, recently elected to the Australian Academy of Sciences, from Sydney and A. B. Metzner from Delaware, member of the National Academy of Engineering. Professor Tanner reviewed theories of the extrusion of material from a die and presented the results of recent calculations for non-isothermal flow of an inelastic fluid. There are now theories for three complementary mechanisms which contribute to extrudate swell after flow through a long die-velocity profile rearrangement, elastic recovery and the effect of non-uniform temperature of the flowing material in the die. The first of these gives, from finite element calculations, the observed 13% swell for isothermal flow of a Newtonian liquid. Quantitative theories for the second mechanism are still somewhat bold in their approximations but give better results than attempts at finite element calculations for viscoelastic fluids. A similar approximation for the third mechanism was presented, based on finite element calculations with which it compared quite well. In discussion important points of mathematical and experimental technique were raised.

Our second guest, Professor Metzner, also addressed an aspect of non-isothermal rheology and challenged his audience to guess in advance whether a cooling material would have a higher or a lower temperature at the instant when its stress-time curve crossed that for an isothermal experiment. The audience response was predictably wrong (for the data shown). It was argued that, since cooling rate in melt spinning and film blowing may be quite large, correct non-isothermal rheology was of great importance—how does one average over temperature and deformation histories? Like the audience, all established constitutive equations predict that the effect will be in the wrong direction. Metzner showed how introducing temperature dependence of the equilibrium end-to-end length of a flexible dumbbell gives the right behaviour for a dilute-solution model. He presented a Maxwell model with a single new adjustable parameter to describe the stresses due to the resistance of molecules to changes in conformation with changes in temperature. This line

of work is promising and application to film-blowing results was discussed. This seemed satisfactory for small blow ratios, but at large blow ratios the transverse stress predictions were badly astray. Again the lecture prompted thoughtful discussion which was all too brief.

After tea the President took the chair for the main event. After the citation (printed elsewhere in this Bulletin) had been read by F. N. Cogswell, Professor Metzner added his congratulations (as a past president of the Society of Rheology and a Bingham medalist) to Professor Oldroyd on the occasion of the award of the Gold Medal. He referred to the fact that, like many a novel, rheology appeared to have a beginning, a muddle and an end, and that now that we were emerging from the muddle the value of the early contributions of Professor Oldroyd was becoming more and more clear. Professor Oldroyd thanked the Society for the award of the Gold Medal, which was presented by the President. The Secretary read the citation for the Annual Award to Dr. Hinch (printed elsewhere in this Bulletin) and the President made the presentation.

The Gold Medal address by Professor Oldroyd presented ideas on the duty of an applied mathematician to present things simply and approach physical problems with the aim of clarifying rather than muddling the issues. The fruitless arguments about the "correct" nonlinear strain measure were an instance of confusing mathematical debate—there is no "correct" measure and the choice should be dictated by convenience. Professor Oldroyd argued that mathematicians use too many symbols and should confine themselves to *relevant* quantities, otherwise the essential physics would be lost. Here, and throughout the talk, Professor Oldroyd pronounced the word *relevant* with emphasis and evident relish. The thesis was illustrated by examples chosen deliberately for their familiarity; the material derivative, and the rate of strain tensor as the convected derivative of a strain tensor. It was shown how a stress rate (convected derivative) arose naturally out of consideration of the rate of working per unit mass of material and it was emphasised that this was natural or *relevant* in this context and not necessarily *relevant* otherwise. The President ruled that the address was not open for discussion, but was to be regarded as a contribution to the scientific culture of our subject.

Dr. Hinch hoped that his choice of presentation would be *relevant* to the meeting. It marked an end to his interest in the area of stretching of dilute solutions, and it was noteworthy that behind it all lay an Oldroyd equation. The physics of very dilute solutions of polymer molecules was used to allow simplifications of constitutive equations so that it became feasible to look at fluid dynamical problems. The way in which different physical mechanisms dominate during different stages of the extension of a cylinder of

material was presented in a most illuminating way. It was seen how first there must be time allowed for the polymer to stretch. Then, when it will have an effect on the flow, more time is needed for the stress to build up. Once the stress is increasing rapidly the rate of strain has to decrease again to zero or close to zero and the stress is at this stage basically due to the elastic stretching of the molecules with no solvent contribution. Applications were discussed, and in a final review the importance of diluteness of solutions for these effects was emphasised. One has an Oldroyd model with relaxation time and retardation time close to each other in magnitude.

The scientific proceedings closed with thanks to all speakers, and were followed by the Society's Annual General Meeting. This is reported formally elsewhere in this Bulletin and it is worth recording here only that the Australian branch played an important role in the application of rule 5(b). Their past-president, Dr. D. V. Boger, had purchased a cap during his visit to London and this proved to be the only container suitable for the lots drawn to resolve the tie in voting. Our thanks go to Dr. Boger for this service as well as for chairing the session before tea. Thanks also go to the lecturers who gave us a memorable afternoon and to Mr. Cogswell who was responsible for the organisation of the meeting. After the A.G.M. a few dedicated souls repaired to Simpson's in the Strand where we were joined by Mesdames Metzner and Cogswell for a meal which proved to be a fitting and *relevant* end to the day.

DR. C. J. S. PETRIE

GOLD MEDAL AWARD

Professor James Gardner Oldroyd, M.A., Ph.D., Sc.D. (Cantab); Professor of Applied Mathematics and Head of Department of Applied Mathematics and Theoretical Physics, University of Liverpool.

Professor Oldroyd began his professional career with the Ministry of Supply (at Aberporth, near Aberystwyth!) in 1942-5. He then moved to the Fundamental Research Laboratory, Courtaulds Ltd., Maidenhead (1945-53). He was a Fellow of Trinity College, Cambridge, in 1947-51. He was appointed Professor of Applied Mathematics at University College, Swansea, in 1953. He was awarded the Adams Prize in 1963-64 and was President of the British Society of Rheology in 1955-57. In the early 1950's whilst at Courtaulds, Professor Oldroyd published his seminal papers on theoretical rheology, arguably *the* most influential, particularly that in Proc. Roy. Soc. A200 which is an acknowledged classic. In 1958

he applied his ideas of 1950 to simple situations, producing the Oldroyd 8-constant fluid model, a paper which has had as much impact as the early one of 1950. In 1965 he developed his ideas for a general model seeking to see how far one could go by applying it to simple flows, without specifying the actual equation. There are many gems in this paper, a paper which possibly is not fully appreciated. More recently he has considered liquids with high elasticity and has applied thermodynamics and relativistic principles to rheology.

In addition to these extremely important fundamental ideas, Professor Oldroyd was associated with Toms's discovery of drag reduction (in suggesting a mechanism) 1948 and was also associated with Strawbridge and Tomms in the developing fundamentals of the oscillating co-axial cylinder viscometer (1951). Also in the mid-1950's, he considered the microrheology of emulsions, a paper which corresponds with that of Frohlich and Sach on suspensions.

Professor Oldroyd's considerable work has given him a high inter-research school, training and inspiring many eminent rheologists who have contributed much to the field.

Professor Oldroyd's considerable work has given him a high international reputation which we are here to recognise today. We also think it important that he has been Membership Secretary and Treasurer of the Society of Rheology before being President and he has continued to be a keen member and supporter, frequently attending Society meetings.

Contribution from Professor A. B. Metzner

"Scientific advances may arise in the format of a book, which, as noted by the eminent novelist Peter de Vries, usually has a beginning, a muddle and an ending. The conceptual beginnings of what we now refer to as Oldroyd-Maxwell equations arose with remarkable clarity, brevity and insight in the papers published by Professor Oldroyd in the 1950's. While he and several others published substantial further contributions during the following one to two decades this latter period will also be remembered for a wide variety of analyses which shed little further light on the basic physics of polymer flow phenomena but which added innumerable complexities now known to be spurious. This might have been the 'great muddle period' of Oldroyd-form equations.

"It is too early to venture a definitive opinion as to the ending—the final choice of equations which will endure. Everyone of us who has been involved may dare to hope that his contribution will prove to have been a definitive one. One clear contender, however, appear in the paper of another participant in today's meeting. The equations of Phan-Thien and Tanner (J.N.N.F.M. 2, 353 (1977))

add very little in complexity to the simplest original proposals by Professor Oldroyd while bringing the basic physical, concepts, the mathematical expression of these and the results of experiments into much closer harmony. It's a very deep pleasure to be here today with Professor Tanner to honour Professor Oldroyd."



Dr. W. M. Jones (left) presenting the Gold Medal to Professor J. G. Oldroyd on the occasion of the September Meeting. A report of the meeting and presentation is given in this Bulletin.

ANNUAL AWARD—1980

Citation read out by the Secretary (Dr. Petrie) on the occasion of the presentation in London on 9th September, 1980.

John Hinch graduated in mathematics at Cambridge University in 1968. He remained there to do research under Professor G. K. Batchelor and has since held posts in the Department of Applied

Mathematics and Theoretical Physics and in Trinity College, Cambridge. His Ph.D. thesis is entitled *The mechanics of suspensions of particles in fluids, with an additional section on convection due to a moving heat source*, and this encapsulates two of his contributions—the major one in suspension mechanics and that to which he refers as an excursion into geophysical fluid dynamics. This excursion earned him a Smith's prize at Cambridge, one of a number of successes which he describes as "merely the peculiarities of Cambridge and nothing of distinction". The biographer has to expose this undue modesty (no doubt to John's great embarrassment) and claim that his academic progress has been outstanding, in what many would claim to be the pre-eminent institution for applied mathematics in the world.

His work on suspension mechanics fills many papers published in the *Journal of Fluid Mechanics* and elsewhere. The early work deals with the effect of Brownian motion and later he has considered particle interactions and developed an averaged-equation approach to constitutive equations. In this work can be seen evidence of abilities to carry out detailed and extensive mathematic analysis, significant numerical computation and to make conceptual advances in the application of the mathematics to real physical problems.

Rheologists should also be familiar with John's contributions to the attempts to explain the mechanism of turbulent drag reduction by long-chain polymer molecules in dilute solution. He has developed constitutive equations for such dilute polymer solutions in strong flows, which are relevant to more obvious extensional flows as well as in turbulent drag reduction. Recently he has been turning his attention to the extension of long slender drops suspended in shearing and stretching flows.

Noteworthy in all this, which in sum represents an extremely large output of significant work from a rheologist of ten years' standing, is that John has travelled widely. He has been welcomed in a number of centres of work on drag reduction and suspension mechanics, notably California Institute of Technology (L. G. Leal), the Royal Institute of Technology in Stockholm (M. T. Landahl) and Stanford University (A. Acrivos). He has collaborated with Professors Leal, Landahl and Acrivos and has helped to make Cambridge another centre to which such people are drawn. He acknowledges the enjoyment he gets from working closely with others, and this applies also to the direction of a number of research students, some of whom this Society has heard in action at its conferences. He describes the relationship as "being helped by his students", but there is no doubt that he has helped to educate a future generation of potential rheologists. He has successfully recruited some of his students to this Society and is himself a regular and active participant at its meetings.

In addition to his teaching and research John has found time to get married and lives with his wife and two small children in a village just outside Cambridge. He admits to an interest in wine, and his experience of eating abroad on his rheological travels has made him a useful companion in restaurants, as participants in the VIIth International Congress on Rheology in Gothenburg and the Society of Rheology's Golden Jubilee Meeting in Boston can attest.

However, it is not as a gourmet, but as an internationally recognised leader of a younger generation of theoretical rheologists, that John Hinch is given the third Annual Award of the British Society of Rheology.



Dr. W. M. Jones presenting the 1980 British Society of Rheology Annual Award to Dr. John Hinch.

ANNUAL AWARD—1981

Members are reminded that nominations for this award should be made in writing to the Secretary. This year nominations are requested before Wednesday, 4th March, 1981, for consideration by Council in time for the 1981 Annual General Meeting. Nominations received after this date will be considered if possible, and if the Bulletin does not reach members until March, Council will take account of this. The award is made "by Council on behalf of the Society 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."

C. J. S. PETRIE

FREUNDLICH CENTENARY

As reported in Vol 22 No. 4 of the Bulletin a symposium organised to commemorate the life and works of Herbert Freundlich (1880-1941) took place on Monday, 28th January, 1980. Further to the meeting, which was sponsored by the Colloid and Surface Chemistry Group of the Society Chemical Industry and the Colloid and Interface of the Faraday Division of the Chemical Society, the papers presented by many distinguished scientists have been published in Chemistry and Industry No. 9, 1980. The whole issue is based on the life and works of Freundlich and makes valuable and interesting reading for all those with an interest in rheology and surface chemistry.

The full list of contributors is as follows:

- Reminiscences—personal and scientific—David W. Gillings
- Colloid systems within colloid systems—Allan Southorn
- Gas separation by adsorption—W. J. Thomas
- Nucleation and crystal growth—John W. Mullin
- Herbert Freundlich—his contribution to the physical chemistry of colloidal dispersions—R. H. Ottewill
- Surfactant layers at interfaces—Armir Weiss.

PERSONAL NOTE

PRESIDENT OF THE BRITISH SOCIETY OF RHEOLOGY— PROFESSOR J. R. A. PEARSON

The new President joined the Society 21 years ago and has served on Council when he was Chairman of the Research Committee. His interest in Rheology goes back to the days when he

worked with Kolsky, Benbow, Roesler and others for I.C.I. at the Frythe, Welwyn, on polymer viscoelasticity—on and off between 1947 and 1959. During that period he took time off to be a subaltern in the Royal Signals, an undergraduate at Trinity College, Cambridge, a graduate student at Harvard University, and a research student at Trinity College, Cambridge again. A chance reading of Oldroyd's celebrated 1950 paper confirmed his enthusiasm for the fluid mechanics of rheologically complex fluids, although his Ph.D. thesis was on more traditional aspects of fluid mechanics. After a rather practical year with the Metal Box Company learning about the processing of plastics, he returned to University teaching and researching at Cambridge in the Department of Chemical Engineering and Trinity Hall, and thence to be Professor of Chemical Engineering at Imperial College. His work has been largely in the mechanics of polymer processing. He wrote a short monograph on the subject in 1966 and is currently completing a larger text on the same subject. He was recently made a Foreign Associate of the (U.S.) National Academy of Engineering. He is consulted widely by industrial firms and international agencies.

His interests outside science and engineering include playing Real Tennis and other games, and enjoying wine.

MEMBERSHIP NEWS

The following applications were approved by Council at its last meeting (December 1980):

ZUVCENKO Dinah Margaret
BSc
fea DF

STILE Jacqueline Anne
BSc
feta FGO

FANJEAU Yves
Doctor in Fluid Mechanics
fetsa DM

EMENGO Fred Nnamdi
BSc, MSc, PhD
pea DFGKL

KATCHY Emesi Mofunanya
BSc, PhD
peta CDGL

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HSU Yuan-Tse
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fetsa CD

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fea CDGHIK

RICHARDS Gwynfor David
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p NO

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pea DGIO

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peta BCD

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BTech, PhD
feta D

HANDFORTH John Anthony
fetsa DG

GRAZIANO Diane J.
BS
feta DM

ANDERSON Clive
HNC
feta BD

CLEGG Alan James
BSc, PhD
peta DF

BURBAGE Andrew Samuel
BSc, PhD, MPS
fetsa FG

FORD David Michael
MPhil, PhD, CChem,
MRIC, AIFST
pea L

BRIERLEY John Martin
BSc, CChem, MRSC
pea FGO

MISTRY Dalubhai B.
BPharm, MPhil
peta FG

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ICI Ltd.
Pharmaceuticals Division
Hurdsfield Industrial Estate
Macclesfield
Cheshire

Biospecialities
4a South Street
Reading
Berks

Resignations (December 1980)

G. B. Hodgetts, Ciba-Geigy Plastics and Additives Co., Duxford.

W. A. Dukes, MOD (PE) PERME, Waltham Abbey.

Dr. V. V. Chavan, Unilever Research, Vlaardingen.

F. S. M. van Kleef, Unilever Research, Vlaardingen.

H. J. Ward, British Cellophane Ltd., Bridgwater. Mr. Ward joined the Society in 1957, Victoria Branch. He is eligible for Honorary Membership. Current Address: 11A Weston Road, Failand, Bristol BS8 3UR.

Death

Prof. S. G. Ward, University of Birmingham, Dept. of Minerals Engineering.

Society Member Honoured

University Park, Pa.—Dr. John C. Snowdon, professor of Engineering at The Pennsylvania State University's Applied Research Laboratory, is the recipient of the Acoustical Society of America's Trent-Crede Medal for 1980.

The medal recognizes Dr. Snowdon's "multi-faceted activities in the field of mechanical vibrations and shock, as an outstanding teacher and lecturer, author, and researcher" during the past 26 years.

According to the citation accompanying the Trent-Crede Medal, "Those who have had the opportunity to watch John work over the past many years, and those who are professional peers in his field, applaud his many excellent accomplishments. They judge it fitting that he is to be recognized with the enthusiastic praise of his colleagues . . ."

Born and educated in London, Dr. Snowdon received baccalaureate degrees with honors in physics and mathematics from the University of London in 1952 and in physics in 1953. He was awarded the Ph.D. from the University of London and the Diploma of Imperial College from Imperial College in 1956.

In 1965, the University of London conferred the degree of Doctor of Science on Dr. Snowdon in recognition of his research accomplishments.

After immigrating to the United States in 1956, Dr. Snowdon worked for the Philco Corporation in Philadelphia before joining the University of Michigan faculty in 1958. Illness in his family forced him to go back to England in 1960. He was employed as a research scientist with an aviation firm until 1961 when he returned

to America and joined the Penn State faculty as an assistant professor. He was promoted to associate professor in 1964 and to full professor in 1967.

Dr. Snowdon's work has been published in more than 55 scholarly articles and he has made numerous oral presentations on his research. In 1968, his authoritative graduate text and reference book, "Vibration and Shock in Damped Mechanical Systems," was published.

He is a fellow of the Acoustical Society of America, the British Institute of Physics, the American Academy of Mechanics and the British Institute of Acoustics.

In addition, he holds memberships in numerous professional organizations, including the American Society of Mechanical Engineers, the British Society of Rheology and the Society of Sigma Xi.

He also has held committee membership for the National Academy of Sciences-National Research Council, the evaluation Panel for the Mechanics Division of the National Bureau of Standards, the Shock and Vibration Technical Committee of the Acoustical Society of America and numerous others.

Dr. Snowdon was elected president-elect of the Acoustical Society of America in 1976, but was unable to serve his term as president in 1977 because of illness.

He served as program chairman of Internoise-74, sponsored by the International Institute of Noise Control Engineering.

Dr. Snowdon and his wife, Anne, live in State College. They have a daughter, Jane, born in 1959, and a son, Mark, born in 1962.

Notice to Overseas Members

For a number of years now the Bulletin and other communications from the Society have been despatched by airmail overseas to speed up news to members. At the recent AGM, much to Council's concern, we were informed that the Bulletin had been arriving in Australia by surface mail. Council had discussed with the Post Office, but without specific evidence the Post Office was unable to investigate the matter properly. Will any Australian or other overseas member having trouble in this way please let the Membership Secretary have some evidence, such as an envelope without an airmail label or incorrectly franked, so that Council can make further representation to the Post Office?

LETTERS TO THE EDITOR

2 Chessington Close
West Ewell
Surrey
December 15th, 1980

Dear Dr. Dimond,

With your permission, I would be glad if the following could be included in the next issue of the Bulletin.

The recent issue of Rheology Abstracts, vol 23, number 4, item 666 refers to a paper presented by Antonio Chauvin and myself in Paris during June of this year (1980), and notes that no address is given. For the benefit of any interested persons my U.K. address is attached. But I would mention that having resigned from Deer Rheometers Ltd. since the paper was presented, I have no further interest in, or connection with either that company, or the instrument known as the 'Deer Rheometer'. The company retain the exclusive right to use of the registered trade mark, but have no further call upon my services.

Needless to say, an interest of more than 25 years in the subject of instrumentation, in particular with respect to rheological measurement, is not easily terminated, and I am now acting as consultant to an Anglo-European consortium in the development of a more advanced version of the constant stress instrument, the process control version of which is currently completing tests in an industrial laboratory.

Yours sincerely,

J. J. DEER

Dr. R. S. Lenk
18 Maiden Erlegh Avenue
Bexley, Kent
DA5 3PD

Dear Editor,

Many of our members and readers will recall that during the AGM of the Society in Plymouth not many years ago I proposed a motion in which I asked for the reduction to a minimum of our contacts with scientists in the Soviet Union because of that country's scandalous disregard of its obligations under the Helsinki Agreement. This was turned down by specious legalistic contentions and by the usual "wet" arguments.

Meanwhile, however, I wish to inform you that some 7,900 scientists and engineers in 44 countries are boycotting co-operation with their Soviet counterparts as part of a world-wide protest

against the Soviet jailing in 1978 of Anatoly Slicharansky (mathematician), of Dr. Yuri Orlov and of the internal exiling of Academician Andrei Sakharov, three men who were prominent in the Helsinki human rights monitoring group in Moscow. The boycott was announced simultaneously in London, Washington, Paris and Geneva on 16.10.1980 by the "Scientists for Sakharov, Orlov and Slicharansky (SOS) Committee. 150 scientists at CERN are also taking part in the boycott.

The scientists and engineers have signed a pledge imposing a "moratorium" on professional co-operation with the Soviet Union's scientific community to mark the anniversary of the founding of the Moscow Helsinki Watch Group. The moratorium will be observed at least until the end of the forthcoming Madrid conference which will review the working of the 1975 Helsinki agreements.

The Western scientists involved in the moratorium include 32 Nobel prize winners 82 F.R.S.'s, 187 members of the U.S. National Academy of Sciences and members of the French and Italian Academics of Sciences.

Since past experience has shown that the British Society of Rheology as a corporate body lacks the will and conviction to act likewise (or that its representatives prefer to avoid facing a moral issue by throwing up legalistic barricades) I would ask your readers to search their individual consciences and do what the committee cannot or will not do and so bring pressure to bear on the Soviets (who strangely enough, are not entirely indifferent to such action) to release and stop harassing scientists who are only trying to exercise their basic human rights.

Yours sincerely,

R. S. LENK

REPORT OF SEMINAR ON SUSPENSION RHEOLOGY

organised by Warren Spring Laboratory

The Department of Industry's Warren Spring Laboratory (WSL) are currently holding a series of one-day Seminars on Suspension Rheology. The meetings cover the 'state of the art' in suspensions, dispersions, colloids, emulsions, slurries and pastes, and are aimed at all concerned with the formulation and manufacture of products in the chemicals, food and confectionery, paints and inks, pharmaceuticals, cosmetics, plastics, building materials and other industries. The first meeting was held at Warrington on 22nd October, 1980. It attracted 55 delegates, mainly from NW England, and was favourably received. The next meeting is to be held in London on 19th February, 1981. Future meetings are planned for other venues.

Dr. P. L. Bransby, Head of Material Handling Division at WSL, chaired the meeting at Warrington. Six papers were presented (which will be repeated in London).

The first is by Dr. J. W. Goodwin (University of Bristol), entitled *Physico-chemical Basis of Suspension Rheology*. As viscous behaviour of suspensions is well known, Dr. Goodwin points out the importance of elasticity and viscoelastic behaviour. The viscous properties of dilute suspensions are related to the nature of the particles. The interplay of repulsive and attractive forces between particles is described and related to the viscoelastic properties of concentrated suspensions.

The other five papers were given by staff of WSL.

Dr. D. C.-H. Cheng discussed *Macroscopic Flow Properties of Suspensions*. Suspension flow properties (viscosity, dilatancy, granuloviscosity, shear-thinning, yield stress, thixotropy, paste-and gel-like) are related in broad terms to the basic physics and chemistry at the molecular and particulate levels. Viscosity-concentration equations and shear stress-shear rate flow curves are described and guide-lines are given on the choice of equations to use in industrial applications.

Dr N. I. Heywood discussed *Measurement of Suspension Flow Properties*. Difficulties in the measurement of suspension flow properties arise because of settlement or the formation of flocs or aggregates. The experimental methods available to measure suspension viscosity and other related flow characteristics are described, and the precautions and corrections necessary when measuring viscosity using the co-axial cylinder, cone-and-plate, parallel plate and tube viscometers are discussed.

Mr. P. J. Tily considered *On-line Measurement and Control of Rheological Properties*. A description is given of the scope of on-line viscometers and other measurements relating to rheological property, highlighting basic selection of type, temperature compensation, selections of appropriate shear rate and relationship between measured variable and controlled action.

Mr. I. W. Stewart considered the *Effects of Processing on Rheology*. Industrial processes such as mixing, reaction etc produce non-reversible changes in physical or chemical properties of materials. The various macroscopic mechanisms that occur during processing produce microscopic effects which cause the changes in rheological behaviour. Various examples of processes, their mechanisms and the effects are discussed.

Mr. D. N. Moir presented a paper on *Flocculation, Dispersion and Suspension Stability*. Flocculation and dispersion are considered as two different and opposite aspects of suspension behaviour, and discussed. The reasons for preparing a suspension in the flocculated

or dispersed form are enumerated. Some practical examples are given of the uses of flocculation and dispersion in industry, including storage stability.

There were questions after each paper and a general discussion at the end of the meeting. The Seminar also provided a forum for people from different industries to interchange experience. A full set of reprints of the six papers was distributed to each delegate.

Details of further meetings planned for other venues in 1981 are available from Mr. K. W. Payne, Warren Spring Laboratory, PO Box 20, Gunnels Wood Road, Stevenage, Herts. SG1 2BX. Telephone: Stevenage 3388.

COLLOIDAL PROPERTIES OF CERAMIC SYSTEMS

24th April, 1981

University of Sheffield

A one-day colloquium on this topic is being organised jointly by the Basic Science Section of the British Ceramic Society and the Colloid and Surface Chemistry Group of the Society of Chemical Industry.

Papers are requested dealing with the deflocculation studies of clays and other ceramic materials, rheological properties, slip casting, filtration, hindered settling and clay plasticity. Contributions on the relationships between floc structure and the above properties are particularly welcome.

Further information for those wishing to contribute can be obtained from:

Dr. B. Rand,
Dept. of Ceramics, Glasses and Polymers,
University of Sheffield,
Sheffield. S10 2TZ
Tel. 0742 - 78555 ext. 6139

CONFERENCE INFORMATION

Joint Conference of the British Society of Rheology and the Belgian Group of Rheology

A Joint meeting is to be held at the University of Liege from 7th to 9th April, 1981.

The papers to be presented will be in the following areas:

Rheology of mixing
Processing of rubber compounds
Dynamic Properties of cured materials
Process modelling and design

FOURTH INTERNATIONAL CONGRESS ON BIORHEOLOGY

JULY 27th — AUGUST 1st, 1981

This conference to be held in Tokyo Japan, has a scientific programme which includes all aspects of deformation and flow in biological systems: (a) blood (plasma, cellular elements, coagulation, etc), (b) blood vessel and blood flow (hemorheology), (c) bio fluids (mucus, synovial fluid, sputum, etc.), (d) biosolids (bone, cartilage, joint, tooth, etc.), (e) muscle, lung, skin and other organs and tissues, (f) biopolymers, (g) membrane and interface, (h) cellular and subcellular rheology, (i) experimental methods, (j) theories, and (k) clinical biorheology. Topics in the wide area of biorheology such as electrical phenomena related to mechanical deformation, rheology of cells and tissues of plant, and rheology of edible substances except industrial products may also be included.

FIFTH INTERNATIONAL CONFERENCE

Deformation, Yield and Fracture of Polymers

MARCH 29th — APRIL 1st, 1982

Those interested in submitting papers for presentation at the conference are asked to complete the attached form and send it to the Secretary, Plastics and Rubber Institute, 11 Hobart Place, London SW1W 0HL. Detailed outlines of papers, 300-500 words in length, will be required not later than August 1st 1981 and the committee will select papers for inclusion in the programme on the basis of these outlines.

Joint Conference of the British and Italian Societies of Rheology

The organisers of this conference, to be held between the 8th and 11th of September this year in Newcastle, are considering holding a session of short reports of recent results and possibly a linked poster session. Would anyone interested in contributing a five-minute presentation to this session please write, as soon as possible, to :

Dr. C. J. S. Petrie

Department of Engineering Mathematics

University of Newcastle upon Tyne

Newcastle upon Tyne NE1 7RU

England

The next Bulletin, due to reach members at the end of May or early in June, will have a provisional programme and registration details.

FRACTURE

The sub-committee on fracture of the Royal Society's British National Committee for Theoretical and Applied Mechanics has set up a working group under the chairmanship of Professor F. M. Burdekin (U.M.I.S.T.) to consider the teaching of fracture. This covers areas of aeronautical, materials and mechanical engineering. Any members of the British Society of Rheology wishing to obtain further information or to submit any comments, information or suggestions to the working group are invited to write to the group's secretary, Professor A. D. Baxter, at the Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1. An article is to appear in Royal Society News.

It has also been reported that the Science Research Council is proposing to gather data on University fracture research.

C. J. S. PETRIE

DIARY

1981

February 22-26. Williamsburg. 52nd Annual Meeting (Society of Rheology).

April 7-9. Liège. Rheology of Rubbery Materials and Rubber Compounds—Theory and Practice (Belgian Group of Rheology and British Rheology Society Joint Conference).

May 13-14. Sydney. Sydney 2nd National Meeting (Australian Branch of the British Society of Rheology).

July 2-August 1. Tokyo. 4th International Congress on Biorheology.

September 8-11. Newcastle. Stretching Flows and General Rheology (British Society of Rheology—Italian Society of Rheology).

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March 29-April 1. Cambridge. Deformation, Yield and Fracture of Polymers (Plastics and Rubber Institute with the British Society of Rheology and other societies).

April 14-16. Graz. Topic(s) to be decided (Austrian, German and other rheological societies).

September 21-24. Rheology and Microstructure. Trinity Hall, Cambridge.