

BULLETIN



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Hon. Editor:

Dr. C. R. DIMOND,
Morgan Thermic Ltd.,
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Bewdley Road,
Stourport-on-Severn.



FOREWORD

It is fitting that two major articles in this issue should be devoted to the contribution Professor Oldroyd has made both to rheological literature and to the British Society of Rheology.

He holds the unique record of having served the Society as Membership Secretary, Treasurer and President, and we confidently assume that he will continue to play an active part in our affairs.

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PROFESSOR OLDROYD'S 60th BIRTHDAY

FOREWORD

by Dr. W. M. Jones

During my period as President of the Society, Council agreed that there should be an occasional review of the award of the Gold Medal of the Society. Following this a sub-committee was formed and persons eminent in the rheological field were considered. It was unanimously agreed by all those consulted that it was high time Professor Oldroyd's unique works should be recognised by the Society of which he has been a member for several years. The medal has been struck and was awarded at the A.G.M. of the Society in September. At the same time it was seen by Council that Professor Oldroyd was celebrating his sixtieth birthday in April of this year and it was decided to invite special articles on Professor Oldroyd's work to appear in the April issue of the Bulletin. Professor Bob Bird and Professor Ken Walters were very happy to write these articles. They appear immediately following this brief introduction.

PROFESSOR J. G. OLDROYD

— AN APPRECIATION ON HIS 60th BIRTHDAY

by PROFESSOR KEN WALTERS

(University College of Wales, Aberystwyth)

I had the privilege and pleasure of carrying out research work under the supervision of Professor Oldroyd between 1957 and 1959. Those were formative years for me and dictated the future course of my academic career. I am therefore more than happy to associate myself wholeheartedly with the richly deserved honour bestowed on Professor Oldroyd by the British Society of Rheology.

Over the years, Professor Oldroyd has been a constant source of encouragement to me and many other research workers and I hope that he has gleaned some pleasure from the way that many of us have taken up and developed his distinctive outlook and ideas. These are closely associated with his classic 1950 paper (1) which, in my opinion, is the most important research paper ever published in the field of Rheology. It appeared years before its time and contains a complete and all embracing study of the formulation of equations of state for rheologically-complex materials, including a discussion of the basic principles and how one can write down equations which satisfy them.

The conciseness of the 1950 Royal Society paper contrasts vividly with the broad expanse and generality of the basic ideas developed in the paper and this may account for the apparent reluctance in some quarters to give to the paper the credit it manifestly deserved; but as

time has passed such injustices have been slowly rectified. However, it is sad that it has taken between twenty and thirty years for the wrong to be completely righted. In the meantime, there has been an unnecessary and damaging polarisation of attitudes and our research field is the poorer because of it.

Influential papers written by other workers in the field in the middle and late 50s failed to stress adequately the relationship between the new 'formulation' ideas being developed and those of Oldroyd. As a result, the mistaken impression arose that the various approaches were somehow different. Many of us mortals must take some of the blame for not reasoning the issues through for ourselves, but at the same time our work would have been made so much easier with a little help from these giants in the field.

As the subject developed, new researchers were minded to follow either the formulation ideas of Oldroyd or those of later workers and there arose the impression that the various approaches were mutually exclusive. Research papers by Lodge and others (2, 3) have put matters straight and there is now the realisation that the whole process of formulating rheological equations of state has an invariance which is independent of the researcher! One thing is clear: Oldroyd's 1950 paper may be concise but it is manifestly sound and completely general. Indeed, while others may have usefully expressed matters in an alternative way and proceeded along different paths, they have not taken away or added substantially to anything stated by Oldroyd in his 1950 paper.

The fact that Oldroyd decided to illustrate the general formulation principles by considering simple examples (e.g. generally valid extensions to the so-called Jeffreys model) led to the mistaken impression that the work in the 1950 paper only applied to these simple special cases and was therefore in a certain sense "less general" than the later influential works of other authors. The passage of time, bridge building attempts by other research workers and more objectivity on the part of review writers in the field have all combined to remove this mistaken impression and to emphasise the massive contribution embodied in Oldroyd's 1950 paper.

At the same time, the "simple" examples chosen for illustration purposes in Oldroyd's earlier papers (1, 4, 5) have had an important influence on the development of non-Newtonian fluid mechanics. Engineers in particular, especially those from the U.S.A., have popularised the use of the so-called Oldroyd models in the solution of practical engineering problems and Oldroyd's 1958 paper (5) provided a suitable background for such studies. The fact that such models are still used extensively some twenty or thirty years after their introduction in what is a rapidly expanding research field is mainly due to two factors. First, attempts to construct more complicated models which give a better description of observed behaviour in simple flows

and yet are simple enough to use in the solution of flow problems have been largely unproductive. Secondly, the advent of high speed computers and advanced numerical analysis techniques has meant that complex flow problems can now be attacked — with the common acknowledgement that the complexity of the fluid model used in any analysis has to be inversely proportional to the complexity of the flow problem under consideration. Simple Oldroyd models are therefore still very much in vogue and are employed in important new developments in non-Newtonian fluid mechanics (see, for example, 6).

As if to keep a proper balance between generality and simplicity, Oldroyd published in 1965 an important paper on “some steady flows of the general elastico-viscous liquid” (7). Here, there is no mention of simple rheological models. Rather, an attempt is made to see how far one can proceed without postulating a specific response between stress and deformation. Interestingly, the paper has had nothing like the impact and influence of his 1950 and 1958 papers, although it contains a wealth of novel ideas. Newcomers to the field should be encouraged to study this 1965 paper since it contains ideas which are as yet not fully explored. If the need ever arises to bore deeply into existing scientific literature to explore secondary and tertiary wells of rheological truth, Oldroyd’s 1965 paper will be high on my list of possible drilling sites!

In recent years, Oldroyd has given consideration to “fluids with high elasticity” and has also attempted to place the formulation of rheological equations of state within a proper relativistic and thermodynamic framework (8). He has also encouraged those who work in the field of anisotropic fluids to take seriously some of his 1950 ideas (9). These topics have been studied by a succession of research students (10) and some of the work has yet to appear in the open literature.

Tucked away in the Proceedings of the Cambridge Philosophical Society of the late 40s is a series of papers on materials with a yield stress (11). These have stood the test of time remarkably well and are a model of lucid thought and analysis. Reading them again, it is hard to believe that they were written over thirty years ago.

I must finally make passing reference to Oldroyd’s papers on microrheology which complement his more extensive works on formulation principles (12). However, my abiding impression as I have attempted to precis my own reaction to Oldroyd’s work is of the extraordinary worth of his 1950 paper, which I view as a unique event in the same category as Beaman’s long jump in the 1968 Mexico Olympics. I am left with the question, “How can anyone possibly follow that?”.

References

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- 9 J. G. Oldroyd and B. R. Duffy, *J. Non-Newtonian Fluid Mechanics* 5 (1979) 141.
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**TO PROFESSOR JAMES G. OLDROYD
ON THE OCCASION OF HIS LXth BIRTHDAY**

by PROFESSOR BOB BIRD

*Chemical Engineering Department and Rheology Research Center
University of Wisconsin, Madison, Wisconsin 53706, U.S.A.*

As one of the many beneficiaries of Professor Oldroyd's scholarly contributions, I am delighted to have this opportunity to thank him for his leadership in the field of rheology and to wish him success in the future.

Professor Oldroyd's niche in the Rheological Hall of Fame was earned by the publication of a series of four articles¹⁻⁴ in the Proceedings of the Royal Society, in which he articulated clearly the principles of modern continuum mechanics. Anyone who wishes to embark on

the study of nonlinear elasticity or the fluid dynamics of viscoelastic fluids should study these seminal papers carefully, because they get to the fundamental ideas directly and accurately. In fact, the first twelve pages of the first paper¹ in the series contain the central core of knowledge needed for understanding the kinematics of flow and deformation, as well as the construction of valid rheological equations of state. Some of the ideas incorporated in these papers had been suggested or partially developed by earlier researchers, to be sure, but Professor Oldroyd's skilful organization enabled him in a mere twelve pages to capture and unify an entire field of science with clarity, style, and economy of words. In speaking of the first paper in the series, Professor Truesdell⁵ has remarked: "The paper of Oldroyd reaches a level of generality and grasp of the subject as a whole not to be shown by other workers until some five years later". Professor Lodge, who in 1951 already⁶ appreciated the relation between his own "body tensors" and Oldroyd's "convected components of space tensors", has referred⁷ to Oldroyd's first 1950 paper as being "of fundamental and far-reaching importance in polymer rheology". Lodge⁷ has also remarked that "it was Oldroyd who recognized the advantages in formulating constitutive equations for materials in general . . . and for viscoelastic materials . . . in particular", and further that "Oldroyd's . . . paper contains a properly invariant general theory applicable to finite deformations, which includes all Noll's 'simple fluids' . . . ". Professor Fredrickson in his textbook, intended for chemical engineering students, wrote in 1964 that the "significance of Oldroyd's pioneering work has largely been overlooked by American rheologists, and only in recent years does one begin to find references to his work in their writings"; Fredrickson's book, which was strongly influenced by Oldroyd's publications, helped considerably to draw attention to the importance and relevance of Professor Oldroyd's fine work.

If Professor Oldroyd had written only the four papers¹⁻⁴ discussed so far, his name would have gone down in the annals of rheological history as one of the pioneers of continuum physics. But he has done a great deal more. He had earlier published an impressive series⁹ of papers on Bingham and non-Bingham plastic solids; these publications extended enormously the range of problem-solving capability for materials with a yield stress by showing how to solve problems with more than one velocity component and more than one independent space variable. In addition he wrote the first paper¹⁰ on the viscoelasticity of emulsions, in which he showed how one can obtain the parameters in a nonlinear viscoelastic rheological equation of state in terms of the viscosities of the two liquid phases, the concentration of the suspended droplets, and the interfacial tension. He succeeded in showing that the zero-shear-rate viscosity of the suspension is independent of the droplet size and depends only on the volume concentration and on the viscosities of the fluids in the dispersed and

continuous phases. He further showed that the relaxation time and the retardation time should vary as the droplet diameter and inversely as the interfacial tension, and that they should also depend on the viscosities of the two fluid phases and the droplet volume fraction. This was accomplished by accounting explicitly for the distortion of the droplets in a flow field and the competing effects of surface tension, viscous forces, and bulk fluid rotation. In the same paper he also considered the effect of slip at the interface, which might be associated with a film of stabilizer.

Further ideas on composite materials were developed in two subsequent publications^{11,12}. Professor Oldroyd has thus been a contributor to the field of "microrheology" — the deduction of macroscopic mechanical behaviour from the details of the microscopic structure.

Several articles of Professor Oldroyd¹³⁻¹⁴ outlining his perception of the field in the early 1960s still bear rereading. He lists the four areas of (i) microrheology, (ii) experiment, (iii) formulation of rheological equations of state, and (iv) prediction of flow behaviour by simultaneous solution of the rheological equation of state and the equations of change as those subjects with which we must be concerned. He then states "these headings represent the stages in the cycle of operations which in practice have to be performed repeatedly in order to achieve a reasonably complete statement of the rheological behaviour of a real material". This remains an excellent statement of the program we are working on in rheology today! And, in fact, much of the activity in the past decade under item (iv) has involved the use of special cases of the "Oldroyd 8-constant model" set forth in his 1958 paper³.

And now to end on a personal note: My own thinking in the field of rheology has been greatly influenced by Professor Oldroyd's writings. My copies of his papers have been read and reread many times, and they are filled with marginal notes. I found his publications a joy to read because of their clarity and accuracy; it is evident he has taken enormous pains to check his manuscripts and printers' proofs so that the final publications are flawless. We have also found that all of our recent molecular theory work on dilute solutions¹⁵ and melts¹⁶ has led to rheological equations of state which are consistent with the invariance rules that he so clearly formulated in 1950. Let me express my own personal thanks to a great scientist for his towering contributions to scholarship.

He's really a "rheologiae rex"

Whose papers are free from defects.

We let the world know

That we wish JGO

Best wishes on his birthday LX!

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NOTICE OF THE ANNUAL GENERAL MEETING, 1981

The 41st Annual General Meeting of the British Society of Rheology will be held on Wednesday, 9th September, in the Castle Leazes Halls of Residence, Newcastle upon Tyne, commencing at 5.45 p.m.

Members are reminded that (Rule 7(b)) the business of the meeting includes

- (i) The election of officers and other members of Council,
- (ii) The receipt of a report and audited accounts from Council,
- (iii) Appointment of auditors and fixing of their remuneration (Rule 6),
- (iv) Dealing with matters raised by Council or by any member, and receiving suggestions from members for consideration by Council.

Nominations received to date are as follows:

<i>Secretary</i>	Dr. C. J. S. Petrie
<i>Treasurer</i>	Mr. T. A. Strivens
<i>Membership Secretary</i>	Dr. D. C.-H. Cheng
<i>Editor (Abstracts)</i>	Dr. D. R. Oliver
<i>Editor (Bulletin)</i>	Dr. C. R. Dimond
<i>Ordinary Members</i>	Mr. J. Astin
	Dr. H. A. Barnes
	Mr. A. Evans
	Dr. T. E. R. Jones
	Dr. M. R. Mackley
	Mr. B. Roberts

The President, Professor J. R. A. Pearson, holds office until 1982. Nominations for Council or for any office (other than that of President) should be sent to the Secretary (or may be made at the Annual General Meeting in accordance with Rule 5(b)).

The Secretary would be pleased to receive notice of any matters that any member wishes to raise.

C. J. S. PETRIE

April 1981

PERU — SEPTEMBER 1981

Correct your maps: Newcastle is Peru!

John Cleveland (1613-1658)

(Tony Harrison, 1969)

Members of the Society may well feel that your Secretary has been reading too much poetry lately. However, after John Cleveland's flight of fancy, any claims for Newcastle and Northumbria should appear to be sober unexaggerated fact. There are stately homes, ruined and inhabited castles, acres of moorland, miles of sandy beaches (perhaps chilled a little by the North Sea), galleries and museums of all sorts and, of course, the Roman Wall. This seems an appropriate setting for an attempt to entertain the Italian Society of Rheology, and it is hoped that we can welcome a few southerners as well.

Plans for the joint meeting of the British and Italian Societies are not yet finalised, a fact for which the excuse of an earthquake must be unique in the history of either society — and let us hope that it will remain so. We have not given up hope of a significant Italian participation, and shall inform enquirers and registrants of the final programme as soon as possible. The important decision to be taken

by each reader, after deciding how large a party to organise to bring to this event, is which excursion to book for the afternoon of Thursday, 10th September. There will be a visit to the Scottish and Newcastle brewery, home of Newcastle Brown Ale, and up to three other excursions may be organised, depending on interest shown. Please indicate preferences in numerical order in case your first choice is not available. The visit to the brewery is limited to 20 participants and places will be allocated on a first-come first-served basis, with some bias in favour of overseas visitors. Those who express a wish to go on the brewery trip are particularly urged to indicate their second choice of excursion.

The trips to the Roman Wall, to Cragside and to Beamish Open-Air Museum are limited only by the number and size of coaches hired. The Roman fort at Housesteads, where one of the best stretches of Hadrian's wall may be seen, and the Roman settlement at Vindolanda are on the itinerary for the first trip. Cragside is a fine late Victorian House built for Lord Armstrong which was the first house in the country to be lit by electric light. It is set in extensive and spectacular grounds (at their best in the spring) and the house has only been open to the public since 1979. The North of England Open-Air Museum at Beamish is the finest museum of industrial archaeology in the country, and among other items has a working tramway, a train under steam, farming and coal-mining buildings and displays illustrating town and country life in the past hundred years.

People are, of course, free to make their own arrangements, e.g. to golf, to play squash or to explore the city or the countryside.

Accommodation has been arranged in the University's Castle Leazes Halls of Residence, within easy walking distance of the city centre. Those who wish to make independent arrangements for accommodation may do so and the organisers will try to assist with any difficulties (but are not able to act as booking agents). The conference dinner will be held in the Halls of Residence on the evening of Thursday, 10th September. The conference will start at 9 a.m. on Wednesday, 9th September, with registration on the previous evening, when a meal is available in the Halls of Residence up to 7 p.m. The conference will finish some time after lunch on Friday, 11th September.

The scientific programme is described in a separate article, and there is a booking form in this issue of the Bulletin. We look forward to welcoming as many participants (and others) as possible to the North-East. As an extra incentive on top of northern hospitality, rail vouchers will be available from the organisers. A typical return fare with a voucher is £31.20 second class from London (King's Cross) to Newcastle, or £46.80 first class, to be compared with the standard second class return fare of £47.20. Please indicate on the booking form if you think you might wish to take advantage of this ridiculously generous offer.

See you in September.

CHRIS PETRIE

STRETCHING FLOWS AND GENERAL RHEOLOGY

Scientific programme for the joint meeting of the
British and Italian Societies of Rheology

8th - 11th September, 1981, Newcastle upon Tyne

Owing to difficulties which the Italian Society is believed to be having in Naples after the earthquake at the end of 1980, the programme is not yet finalised, and so far we have no details of contributions from Italy.

There are seventeen papers offered and accepted for presentation, together with a film (Non-Newtonian Fluid Mechanics — K. Walters).

The papers are

STRETCHING FLOWS

1. N. Checker (University of Sussex), M. R. Mackley and D. M. Mead (University of Cambridge) *On the flow of molten polymers into, within and out of ducts.*
2. J. Ferguson and K. Missaghi (University of Strathclyde) *Viscous and elastic effects in extensional flow.*
3. R. J. Gordon (University of Florida) *The role of extensional viscosity in drag reduction — a critical appraisal.*
4. W. M. Jones (University College of Wales, Aberystwyth) *"Stringiness" of dilute polymer solutions.*
5. J. Meissner, A. Demarmels and P. R. Portmann (Eidgenössische Technische Hochschule, Zürich) *Elongational flow behaviour, including planar extension, of polyisobutylene.*
6. J. Mewis and G. de Cleyne (Catholic University of Leuven) *Shear history effects in spinning.*
7. K. Missaghi and C. J. S. Petrie (University of Newcastle upon Tyne) *Stretching the Phan-Thien model: stress growth and creep.*
8. H. Munstedt (B.A.S.F., Ludwigshafen) *Elongational properties of the two low-density polyethylenes, IUPAC A and C.*
9. D. R. Oliver (University of Birmingham) *The first demonstration of squeeze film load enhancement by polymer additives in motor oils.*
10. J. R. A. Pearson (Imperial College, London) *"Inlet" boundary conditions for fibre spinning of viscoelastic fluids.*
11. T. Raible and M. H. Wagner (Eidgenössische Technische Hochschule, Zürich) *Constant force elongational flow of a low-density polyethylene melt — experiment and theory.*

GENERAL RHEOLOGY

12. A. Allen (University of Newcastle upon Tyne) *The structure and function of mucus.*
13. R. Buscall (I.C.I. Corporate Laboratory, Runcorn) *Phase transitions and dispersion rheology.*
14. A. Evans (University of Newcastle upon Tyne) *Limiting tensions in solutions of uranium salts.*
15. R. S. Lenk (Polytechnic of the South Bank, London) *Flow equations in dies of various geometries.*
16. W. C. MacSporran and R. P. Spiers (University of Bradford) *The dynamic performance of the Weissenberg Rheogoniometer — large amplitude oscillatory shearing.*
17. R. A. Worth and A. K. Wood (Manchester Polytechnic). *Capillary viscometer experiments with high-density polyethylene.*

In addition to these, and hoped-for contributions from Italy it is intended to hold a session of short papers on results of recent research. There are possible contributions here from the Universities of Aberystwyth, Bradford and Newcastle upon Tyne. *Any participants who would like to offer something for this session are invited to contact Dr. Petrie without delay.*

Depending on response to this invitation, and from Italy, the conference may consist of four or five sessions — the mornings of Wednesday 9th, Thursday 10th and Friday 11th, and the afternoon of Wednesday 9th September will be used, and the afternoon of Friday 11th September if necessary. The afternoon of Thursday 10th September is left free, with excursions on which places may be reserved — see separate item in this Bulletin.
(PERU — September 1981).

C. J. S. PETRIE

STRETCHING FLOWS AND GENERAL RHEOLOGY

Newcastle, 8th - 11th September, 1981

REGISTRATION FORM

Please complete and return this form, with payment*, as soon as possible, and no later than 12th August, 1981, to Dr. Petrie at the address below.

Please complete one form for each delegate; the form may be photocopied.

NAME

ADDRESS

.....

.....

Please tick

Member of the British Society of Rheology ☐

Member of the Società Italiana di Reologia ☐

Residential delegates

(Conference fee plus all meals,	(Member	£65	☐
accommodation, excusion and	(Non-member	£72	☐
conference dinner)	(Student	£60	☐

Non-residential delegates

(Conference fee plus lunches,	(Member	£32	☐
excursion and conference	(Non-member	£42	☐
dinner)	(Student	£30	☐

Students must provide a note from their supervisor or Head of Department and must be members of one of the societies to qualify for the reduced fee.

Persons accompanying delegates	(Residential	£60	☐
may register at the student rate.	(Non-residential	£30	☐

A separate form is not necessary

Excursion:

	(Scottish and Newcastle Brewery	☐
Please indicate	(Roman Wall	☐
preferences in	(Cragside	☐
numerical order	(Beamish Open-Air Museum	☐

* Please tick one:

Payment is enclosed (cheque payable to the British Society of Rheology) ☐

Payment has been sent direct to Lloyds Banks, Haymarket Branch, Newcastle upon Tyne, NE1 7PR, payable to BSR Conference Account No. 7037834 ☐

Date Signed

Please send completed form to:

Dr. C. J. S. Petrie
Department of Engineering Mathematics
University of Newcastle upon Tyne
Newcastle upon Tyne NE1 7RU, England

MEMBERSHIP NEWS

The following applications were approved by Council at its last meeting (March 1981):

CARTER E. J. Physics(Hons), Maths(Hons) ftsa G	Plymouth Polytechnic Dept. of Maths., Stats. and Computing Drake Circus Plymouth, PL4 8AA
JACKSON Kenneth Paul BSc F	University College of Wales Dept. of Applied Mathematics Penglais Aberystwyth, SY23 3BZ
LAVEN J. Drs fesa CDFGL	Unilever Research Laboratory Olivier van Noortlaan 120 Vlaardingen Netherlands
de BRUYNE D. W. Ir fetsa DFGHLN	Unilever Research Laboratory Olivier van Noortlaan 120 Vlaardingen Netherlands
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Resignations (March 1981)

R. B. McKay, Ciba-Geigy (UK) Ltd., Paisley.

Dr. J. Lowndes, Crewe.

Dr. W. Carr, Wilmslow.

D. M. Bancroft, Unilever Research Laboratory, Vlaardingen, Netherlands.

Dr. D. B. Holmes, Lexington, Mass., U.S.A.

Death

A. L. Deadman, Honorary Member, Streatham, S.W.2.

JOHN SNOWDON

An article appeared in the last issue of the Bulletin concerned with the award of the Acoustical Society of America's Trent-Crede Medal for 1980 to Dr. Snowdon, Professor of Engineering at the Pennsylvania State University. It is with great regret that I have been informed of the death of Dr. Snowdon, our sincere sympathy goes to his family, friends and colleagues.

CONFERENCES IN FRANCE AND BELGIUM, 1981

The sixteenth Annual Conference of Groupe Français de Rhéologie is to be held on 9th and 10th December, 1981. Its theme will be

The application of rheology to problems of industrial fabrication

Members of BSR wishing to contribute to the meeting, the proceedings of which will be in French, should contact M. E. Absi, CEBTP, 12 rue Brancion, 75737 Paris, Cedex 15, France, giving the title and a short resumé of the proposed talk.

L'Ecole Nationale des Travaux Publics de l'Etat is holding consecutive one day meetings that may be of interest to some members of BSR. On 2nd June the subject will be *the rheological behaviour of soils*, with the topics considered including rheological models, cyclic behaviour, fracture, and instability. On the following day the accent will be on *geotechnology*, with attention being paid to the determination of the rheological parameters of a soil with the aid of in-situ tests, foundations subjected to cyclic phenomena, and new techniques for inspecting soils. Further information from: Secrétariat de Géotechnique, ENTPE, rue Maurice Audin, 69120 Vaulx-en-Velin, France.

La Société de Biomécanique will hold a conference in Brussels on 17th and 18th September, 1981. The principal topics may include: shocks and vibrations; bone, articulation and muscle; movement; cardiac, circulatory and respiratory biomechanics; applications in education and sport; applications in re-education and its equipment. Talks will be 15 minutes in length and delivered in French. There will also be poster sessions. Further information from: Secrétariat du 6ème Congrès de Biomécanique, Lab. de l'Effort-CP168, Univ. libre, Ave. Paul Héger 28, B1050 Bruxelles, Belgium.

RESEARCH FELLOWSHIPS

Rheology in the Construction Industry

Applications are invited for two research posts for work on the following projects:

- (i) the application of rheological techniques to the control of concrete production.
- (ii) the effect of vibration on the rheological properties of fresh (i.e. unhardened) concrete.

The two posts, both of which are subject to a three year contract are

- | | |
|---------------------------------|--|
| (a) Research Assistant Grade 1A | Starting salary in range
£6,070 - £7,700 p.a. |
| (b) Technician Grade 4 | Starting salary in range
£4,870 - £5,156 p.a. |

Candidates for (a) should preferably already hold a Ph.D. or an equivalent amount of experience in research or industry after graduating with a good Hons. degree.

If the person appointed to (b) holds a degree he/she may be permitted to register for a Master's degree.

Further information from, and application to, Dr. G. H. Tattersall, Department of Building Science, University of Sheffield, Western Bank, Sheffield S10 2TN.

RESEARCH FELLOWSHIP IN OIL DRILLING TECHNOLOGY

Applications are invited for a Research Fellowship to undertake a theoretical and experimental study of the transport of solid particles in oil well drilling. This project is financed by the Marine Technology Directorate of the Science Research Council and part of this grant will be used to construct a variable angle oil drilling flow system. This project is to be carried out in close co-operation with International Drilling Fluids Ltd. and B.P. Ltd. There will be opportunity for the applicant to work in industry during the period of this research.

Applicants should possess or be about to obtain a Ph.D. or have equivalent qualifications in Mathematics, Physics or Engineering. A background in Rheology is desirable but not essential.

Salary will be in the range £6,450 - £7,200 according to age and experience. The appointment will commence on the 1st September, 1981, and will last for a period of three years.

Application forms together with further particulars may be obtained from Dr. T. E. R. Jones, Department of Mathematics, Statistics and Computing, Plymouth Polytechnic, Devon PL4 8AA.

FUTURE CONFERENCES

Clinical Haemorheology

The second European Conference on Clinical Haemorheology is to be held in London between the 30th September and 2nd October, 1981.

Further details can be obtained from:

Miss Barbara Komoniewska, B.A.
Conference Secretary
Royal Society of Medicine
1 Wimpole Street
London W1M 8AE 01-580 2070

53rd ANNUAL MEETING OF THE SOCIETY OF RHEOLOGY

OCTOBER 11th - 15th, 1981

LOUISVILLE INN (DOWNTOWN)

Louisville, Kentucky

L. R. Schmidt (Program Chairman)

General Electric Research and Development Center

P.O. Box 8

Schenectady, NY 12301

(518-385-8459)

C. E. Miller (Local Arrangements Chairman)

Department of Civil Engineering

University of Louisville

Louisville, KY 40208



CALL FOR PAPERS

Deadline for Abstracts: July 1st, 1981

An abstract of 250 words or less is required **NO LATER THAN JULY 1st, 1981**. Abstracts should be single-spaced, have 1½" margins, and be sent directly to the appropriate symposium chairman whose address is listed below:

BIORHEOLOGY

C. E. Miller, University of Louisville (502-588-6276)

NUMERICAL SIMULATION OF MATERIALS PROCESSES

B. Caswell, Division of Engineering, Brown University, Providence, RI 02912 (401-863-2654)

NON-TRADITIONAL EXPERIMENTAL TECHNIQUES FOR DETERMINING VISCOMETRIC FUNCTIONS

J. J. Ulbrecht, Department of Chemical Engineering, SUNY at Buffalo, Amherst, NY 14260 (716-636-2911)

NOVEL POLYMER PROCESSING TECHNIQUES:

SOLID PHASE PROCESSING, CO-INJECTION, CO-EXTRUSION

L. A. Utracki, NRC, 750 Bel-Air, Montreal, Canada, H4C 2K3 (514-935-8513)

M. R. Kamal, Department of Chemical Engineering, McGill University, Montreal PQ H3A 2A7 CANADA (514-392-5442)

RHEOLOGY OF SUSPENSIONS AND TWO-PHASE FLOWS

J. D. Goddard, Department of Chemical Engineering, University of Southern California, University Park, CA 90007 (213-743-7051)

RHEO-OPTICS

D. G. LeGrand, General Electric Company, Research and Development Center, P.O. Box 8, Schenectady, NY 12301 (518-385-8396)

GENERAL PAPERS SESSIONS

H. H. Winter, Department of Chemical Engineering, University of Massachusetts, Amherst, MA 01003 (413-545-0922)

RHEOLOGY AND MICROSTRUCTURE

Cambridge — 21st/24th September, 1982

A two/three day meeting on Rheology and Microstructure will be held at Trinity Hall, Cambridge, from 21st to 24th September, 1982, jointly organised by the British Society of Rheology and the Statistical Mechanics and Thermodynamics Group of the Faraday Division of the Chemical Society. It is hoped to bring together workers in the many apparently different physical, chemical and mathematical approaches to the subject.

The meeting will concentrate on the relationships between rheology and microstructure of liquid-like systems, particularly those exhibiting soft solid-like properties at low stress levels, such as concentrated disperse systems and pastes, liquid crystals, gels and other network structures in multiphase or composite systems. Experimental and theoretical studies of equilibrium structure, dynamics, steady-state deformation, transient effects (particularly return to equilibrium) and effects due to phase transitions (e.g. sol/gel) would all be of interest and importance, though it should be remembered that a statistical approach forms the connecting link between rheology and structure — the main interests of the sponsoring parties. The meeting will be a scientific one, rather than one concerned with applications or the solution of engineering problems; such latter topics may be included in the final session on day three run by the BS of R as part of their annual meeting.

Papers should be offered to Professor J. R. A. Pearson or Dr. H. A. Barnes by 31st December, 1981.

DIARY

1981

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

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

September 30 - October 2. 2nd European Conference on Clinical Haemorheology — London.

October 11 - 15. 53rd Annual Meeting of the Society of Rheology — Louisville, Kentucky.

1982

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.