

BULLETIN



BRITISH SOCIETY OF RHEOLOGY

1979, Vol. 22, No. 4

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Hon. Editor:

Dr. C. R. DIMOND,

Department of Building Science

University of Sheffield,

Sheffield S10 2TN.

FOREWORD

The B.S.R. conference at Aberystwyth included in its programme, not to be outdone by the political parties, an economic debate. The three-way discussion between a representative of S.R.C., industrial and academic personnel considered the financing of research and co-operation between the three bodies. An important point raised, stemming from the economic climate though not directly financial, is the shortage of research students. Many prospective students obtain employment directly after graduating for fear of the situation three years hence. Are we, I wonder, going to suffer from a shortage of staff with research experience; both in industry and academic establishments?

The A.G.M., also held in Aberystwyth, was poorly attended considering the number at the conference—perhaps the call of the Welsh hills was too strong or maybe people who have an interest in rheology are not yet members of the society.

Congratulations to John Hutton, a past editor of the Bulletin, on being the recipient of the 1979 Annual Award—the citation read out by the President appears in this issue.

Included in this issue is a programme, which has been drawn up by council, for the year 1979-1980. It is hoped that members will take note of these dates and communicate information to the editors of the Bulletin and Abstracts and to the Secretary so that deadlines can be kept to and information relayed as quickly as possible to members.

The deadline of 15th October has been met and I thank all the contributors for the effort they have made.

OFFICERS AND MEMBERS OF COUNCIL, 1979-1980

President: DR. W. M. JONES, Physics Department, U.C.W., Penglais, Aberystwyth.

Secretary: DR. C. J. S. PETRIE, Department of Engineering Mathematics, University of Newcastle upon Tyne, Newcastle upon Tyne, NE1 7RU.

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

Membership Secretary: DR. D. C-H. CHENG, Warren Spring Laboratory, Stevenage, Herts. SG1 2BX.

Abstracts Editor: MR. J. ASTIN, Department of Applied Mathematics, U.C.W., Penglais, Aberystwyth.

Bulletin Editor: DR. C. R. DIMOND, Department of Building Science, University of Sheffield, Sheffield, S10 2TN.

Ordinary Members:

DR. T. E. R. JONES, School of Mathematical Sciences, Plymuth Polytechnic, Plymouth.

DR. H. A. BARNES, Unilever Ltd., Port Sunlight, Cheshire.

DR. D. MARSHALL, Institute of Polymer Technology, Loughborough University of Technology, Loughborough, LE11 3TU.

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

MR. F. N. COGSWELL, I.C.I. Ltd., Plastic Division, Welwyn Garden City.

MR. M. CAMINA, Paint Research Association, Teddington, Middlesex.

ANNUAL AWARD—1979

The British Society of Rheology Annual Award for 1979 was presented to Mr. J. F. Hutton at the recent Aberystwyth conference dinner by our President. The citation read out by Dr. W. M. Jones was as follows:—

Mr. J. F. Hutton

John Hutton is a native of Gloucester and was educated at Sir Thomas Rich's School, Gloucester, where he was Head Boy for two years. From there he went to the University College of the South West, in Exeter, and graduated with an Honours Degree in Physics. In 1945 he entered the Research and Development Section of the Shell group of companies. He has remained with Shell since that time and is now at the Research Centre at Thornton. In the period 1953-73 he was Rheology group leader. Later, for a time, he was personal assistant to the Director of Research. For the last five years he has been leader of the Tribology group, studying basic research, business application and undertaking consultancy work.

John has supervised basic research in rheology. His work has led to the use of lithium hydroxystereate greases. He has developed methods to measure the yield stress and the viscosity of greases, and methods for estimating high-shear-rate properties of motor oils. Measurements have been made in high pressure conditions and the role of elasticoviscous forces in the movement of greases in rolling bearings has been identified. He has studied many effects influencing the rheology of materials such as the wall effect, surface tension effects, non-viscometric effects in jet-thrust measurements, effect of yield stress on normal stress measurements. Consequently, John has contributed widely to the literature, and has been concerned with contributions to three fundamental texts in those fields. His wide disciplinary interests are illustrated by his many and varied links with the Universities. He was at one time a Research Associate in the University of Glasgow and is presently an Honorary Fellow of the University College of Wales, Aberystwyth. He has supervised CASE students in the Department of Chemistry, Salford, the Department of Applied Mathematics in Aberystwyth and in the Department of Physics in Aston.

He served for fourteen years—a period of ten and a period of four years—on the Council of the British Society of Rheology and was Bulletin editor for four years.

So, it can be seen that John has contributed to *rheology in industry*, he has played an *active part in the Society of Rheology*, and he has *several contacts with the Universities*. It is for these reasons that the British Society of Rheology gives its Annual Award (1979) to John F. Hutton.

ANNUAL AWARD—1980

Members are reminded that nominations for this award should be made in writing to the Secretary. This year nominations are requested before Wednesday, 12th March, 1980, for consideration by Council in time for the 1980 Annual General Meeting. 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



Mr. J. F. Hutton (right) receiving the 1979 Annual Award from Dr. W. M. Jones.

THE BRITISH SOCIETY OF RHEOLOGY

Minutes of the 39th Annual General Meeting, held in the Common Room, Pantycelyn Hall of Residence, University College of Wales, Aberystwyth, on 13th September, 1979, beginning at 17.45. The President took the chair, and there were 22 members present.

1. *The Minutes of the 38th Annual General Meeting*, held in Plymouth on 7th September, 1978, had been published in the Bulletin (Volume 21, number 4, pages 51-55). These were adopted and signed as a correct record of that meeting.
2. *Arising from the minutes*, the Secretary reported that the motion of R. S. Lenk, which had been referred to Council, was held to be outside the scope of matters with which the Society might deal. This decision followed the taking of legal advice, and judged to be necessary in order to avoid imperilling the Society's status as a registered charity (which is of financial benefit to the Society). A note based on the legal advice had appeared in the Bulletin (Volume 22, number 1, pages 10-12).
3. *The Chairman* announced that the recipient of the Annual Award for 1979 would be J. F. Hutton, and that the presentation would be made at the Conference Dinner. He also remarked on his busy first year in office, with legal advice to be sought on two matters. He had represented the Society at the joint meeting with the Dutch and Italian Societies in Amsterdam and would do so at the Golden Jubilee meeting of the Society of Rheology in Boston at the end of October. He expressed his thanks to Council for their help.
4. *The Secretary* circulated a written report, of which an amended copy is appended to these minutes, and highlighted some activities. Discussion centred on progress towards closer collaboration with other European Societies. Dr. Tattersall welcomed the work towards closer relations with other societies, but expressed anxiety about the idea of a European Society. These feelings were echoed by Dr. Roscoe and others, and the clear wish of the meeting was to preserve the identity of this Society. The Secretary replied that this was the view taken by Council, and by the members of the Society in their response to the questionnaire in 1978. In fact, only one of the European Societies so far had expressed a desire for a European Society, and four others (including the British Society) were definitely against this. Mr. Davenport commented on the dangers of having too many meetings and Mr. Whorlow expressed the hope that a European programme would not take

people away from the Annual Meeting of the British Society. The idea that European meetings should be small but influential conferences on narrow, highly specialised topics was urged by Mr. Cogswell. Finally, the Secretary reported that the Australian Branch of the Society was happy to see closer collaboration in Europe, and offered words of warning against the dangers of creeping bureaucracy.

5. *The Treasurer* circulated copies of the audited accounts and gave orally the report which is appended to these minutes. In discussion Dr. Tattersall, from experience as a former Membership Secretary, urged that those who did not pay subscriptions be treated with the greatest severity allowed by the Constitution. This means that if membership is allowed to lapse the defaulter has to pay the entrance fee in order to rejoin. Since the entrance fee is fixed at £1 by the Constitution, Dr. Tattersall suggested that a change to allow its variation by the Annual General Meeting was desirable. Mr. Hutton pointed out that an increase in entrance fee affects new members as well as defaulters, and Dr. Marshall reminded the meeting that many new members are research students who are relatively impecunious. The matter was allowed to rest there, with the suggestion from the Treasurer that a financial incentive for payment by Bankers' Order might be the answer.

On the subject of the warning about an increase in subscription next year, Mr. Whorlow remarked that when he, as Treasurer, had proposed the last increase in subscription this had followed several years of more or less breaking even, and he left that one bad year did not justify such a measure. According to Mr. Cogswell, if the Society had used inflation accounting like many companies the accounts would show a loss of £2,000.

The accounts were adopted, *nem. con.*, on a motion proposed by Mr. Astin and seconded by Mr. Davenport. The auditors, Messrs. A. Simmons & Co. of Redhill, were re-appointed on a motion proposed by Mr. Whorlow and seconded by Mr. Astin.

6. In the absence of the *Membership Secretary*, it was agreed that his report be published in the Bulletin. (It is appended to these minutes.) The Secretary reported that Honorary Membership had been offered and accepted by C. C. Hill, A. H. Nissan, P. Merriman and A. E. Green.
7. The retiring *Editor of the Bulletin* thanked Council for its support during his term of office, and gave the floor to his expected successor, Dr. C. R. Dimond, who had edited the latest issue (Volume 22, number 3). Dr. Dimond reported that

this issue was due from the printers very soon, and should be mailed to members by the end of September. He made the traditional request of a new Editor for articles from the members. On behalf of the overseas members of the Society, Professor Rigbi thanked the Society for the Bulletin, which he enjoyed and looked forward to receiving. The Editor reminded members that technical queries are encouraged; they can lead to instructive articles of general interest.

8. The *Editor of Rheology Abstracts* reported on the healthy state of the journal. Volume 22, number 3, was at Pergamon and should reach members in October. It was expected that volume 22 would contain between 800 and 900 abstracts. The Editor would thank abstractors formally in the Bulletin. Mr. Hutton asked if coverage of journals was adequate. It was observed that the yield of abstracts in biorheology was somewhat low. Professor Rigbi suggested that members be encouraged to send in unsolicited abstracts, especially for rheological papers in unexpected journals. The Editor agreed that this was desirable, and a note would be published in the Bulletin.

9. There being no other nominations, the list of candidates for office and Council membership was declared elected.

Council for 1979-1980 consists of:

President (1978-1980), Dr. W. M. Jones;

Secretary, Dr. C. J. S. Petrie;

Treasurer, Mr. A. Evans;

Membership Secretary, Dr. D. C-H. Cheng;

Editor (Bulletin), Dr. C. R. Dimond;

Editor (Rheology Abstracts), Mr. J. Astin;

Dr. H. A. Barnes;

Mr. M. Camina;

Mr. F. N. Cogswell;

Dr. T. E. R. Jones;

Dr. D. E. Marshall;

Dr. D. R. Oliver.

10. The President thanked the retiring members of Council, Mr. Davenport who had served for four years and helped on the award sub-committee and Dr. Ferguson who had served for four years as Membership Secretary followed by four years as an ordinary member, during which time he had edited the 1978 Membership list and served two years as Chairman of Council (though this had not required any actual duties during the current President's term of office). Mr. M. Camina

and Dr. T. E. R. Jones had served as Bulletin Editor and Membership Secretary respectively for four years, but were not leaving Council. The President welcomed Dr. H. A. Barnes to Council, and welcomed back Dr. C.-H. Cheng. He offered the Society's congratulations to Dr. T. E. R. Jones on his appointment to the Readership in Rheology at Plymouth Polytechnic, and to Dr. H. A. Barnes on the award of an Industrial Fellowship from the Chemical Society.

There being no further business the meeting closed at 18.50.

Minutes submitted by C. J. S. PETRIE

SECRETARY'S REPORT

Following last year's annual conference in Plymouth, the Society has held a meeting in Amsterdam, jointly organised with the Dutch and Italian Societies, and the present meeting in Aberystwyth. The Plymouth conference, on "Rheology and rheometry in multiphase systems", attracted participants to hear 20 papers presented more or less conventionally as lectures and to see (?) a further five in a poster session. The conference was organised by Dr. T. E. R. Jones, assisted by Dr. K. M. Beazley, Mr. F. N. Cogswell and Dr. C. R. Dimond, and they are all to be thanked and congratulated.

The joint spring meeting in Amsterdam, on "The rheology of associating, structured and biological systems", was attended by about 33 Dutch, 18 British, 12 Italian and 17 other rheologists presenting (respectively) five, eight, ten and seven papers. In addition the Australian Branch of the Society held a highly successful first National Conference in Melbourne at the beginning of their winter, and plans to hold a second one in Sydney in 1981.

Plans for future conferences in Britain include a joint meeting with the Plastics and Rubber Institute on "Practical rheology in polymer processing" to be held in Loughborough on 26th-27th March, 1980, and a one-day scientific meeting in September 1980 which will precede the 40th Annual General Meeting, and to which Council hopes to attract some distinguished rheologists from abroad (on their way home from the VIIIth International Congress in Naples). In accordance with our practice, there will be no major autumn conference in the year of an International Congress.

Looking further ahead, we see the beginnings of plans for more conferences to be held jointly with other European societies of rheology. As a result of this activity, which has seen this Society hold joint meetings with the Italian and/or Dutch Societies in 1973, 1975, 1977 and 1979, discussions are under way among all

the European Societies concerning closer liaison. Ideas which have been raised include a European Conference or Congress every four years, to be held midway between International Congresses, a European Society, and a European liaison committee to co-ordinate meetings and to foster co-operation between the national societies. It is hoped that some progress in the right direction will be made in the next year. (Readers are referred to the discussion noted in the report on the Annual General Meeting, above.)

It is a pleasure to report that relations with our Australian Branch, in the words of their President, "have never been better". Your Secretary believes that relations with the Society of Rheology are also excellent. This Society will be represented by the President at the Golden Jubilee Meeting in Boston, and there is also a strong team from Council participating in the symposium on "Extensional flow studies" at that meeting. To conclude this happy report of international goodwill, the Secretary now receives copies of the Journal of the Society of Rheology of Japan which may be consulted by members. The abstracts appear in Rheology Abstracts.

This year sees the second Annual Award, about which members will hear from the President and read (elsewhere) in the Bulletin. Nominations for the Award may be made to the Secretary at any time, and it is clear that there is no shortage of worthy candidates.

The Society continues to be represented (by F. N. Cogswell and C. J. S. Petrie) on a sub-committee of the British Standards Institution dealing with "Plastics data—melt flow properties" chaired by D. E. Marshall. The sub-committee is producing draft documents for comment on "The measurement of apparent rheological properties by capillary methods" and "Thermal properties of melts" for eventual inclusion in BS 4618 (Presentation of plastics design data). In addition BS 2782:1970 (Methods of testing plastics) is being revised and the B.S.I. has invited the B.S.R. to help on a sub-committee dealing with "Rheological properties (plastics)". The Society has been represented on the British National Committee for Theoretical and Applied Mechanics by Professor K. Walters for six years and thanks are due to him for his service in this and in representing the Society on the International Committee on Rheology. He is replaced in the former role (since reappointment to National Committees is not permitted) by Dr. C. J. S. Petrie and in the latter role by Dr. W. M. Jones. The British National Committee for Theoretical and Applied Mechanics has recently approved the formation of a Fracture Sub-committee, on which this Society is only indirectly represented through its representative on the main committee. It is hoped that this arrangement will be satisfactory and interested members are invited to contact Dr. Petrie.

As members will see from their Bulletin, the Constitution has

been reprinted. There is no change in it, apart from the addition of two footnotes recording the date of printing and of last revision, and noting the Society's charitable status. Council has been considering the terms of office of its members and concluded that with one possible exception there was no need for change. The exception is that of the office of President, where there are conflicting arguments for and against increasing the term of office from two to three years. Council decided that the arguments for a longer period were not sufficiently compelling and that a suitable compromise would be to discuss the nomination well in advance so that a candidate (or candidates) for election as President could become familiar with Council business in advance of the election. This involves no departure from present practice, merely a change in the timing of actions.

On the domestic front, your Council appears to have been as busy as ever, though the Secretary has not weighed his incoming mail (Bulletin, 20(4), page 49 (1977)). There is a continuing battle to keep some order in the Society's records and possessions. In this respect the Secretary must, at the end of his first year in office, thank his predecessor, F. N. Cogswell, for his help and especially for his hard work in organising the several boxes of Secretarial files. Fortunately, he is capable of error and one has been found as a suitable memento of his four years in office, namely, that in the copy of the Minutes just signed by the President he (Mr. Cogswell) has recorded that last year's President "thanked Mr. Cogswell who had severed the Society as Secretary during the last four years". The present Secretary has already surpassed this, in getting a misspelling past the watchful eye of the Editor of the Bulletin, as those who have succeeded in finding the Annual General Meeting will know. Next time the Society is in Wales, it must ensure that it has a Welsh-speaking secretary, who knows the difference between a 'Pant' and a 'Pont' (Bulletin 22(2), p.21 (1979)).

C. J. S. PETRIE

7th September, 1979

TREASURER'S REPORT

The accounts for the year 1978-9 look rather different from those of last year, because expenditure is about twice as great whereas the income is down by a third. The net result is that this year the Society has made a small loss.

The increased expenditure is inevitable, though this year as well as the influence of inflation on council travel, bulletin printing and the other officers' activities we do have four items which were

absent from last year's accounts. Two of these—assistance to those travelling to conferences, and the Annual award—will be a permanent feature, though the cost of the membership list and binding of the Editors' sets of Abstracts and the Bulletin are exceptional items which we do not expect to recur for some time.

Income is rather lower than last year mainly because our share of the profits from "Rheology Abstracts" is more than £600 less than last year, and we do not have the benefit of last year's exceptionally high conference surplus. The net result is that over the year the Society has spent about £500 more than its income, though this is on a turnover of £4,000 and is no cause for immediate alarm. In fact, without the membership list we would have broken even, and the assets per member are still nearly £20 which leaves some room for manoeuvre.

I therefore propose that the subscription for 1979-80 should remain at £2. However, unless income from other sources increases dramatically I suspect that this will be the last year in which it will be possible to operate at this remarkably low level. In view of the trouble to all concerned in changing bankers' orders, I feel that any future increase should be adequate to last for a number of years, and consequently it is possible that next year I will be proposing an annual subscription of £5.

ANTHONY EVANS

10th September, 1979

BRITISH SOCIETY OF RHEOLOGY

BALANCE SHEET as at 30th June, 1979

ASSETS								£	£
<i>Investments</i>									
Wandsworth Borough Council	12 $\frac{5}{8}$ %	Bond	...	...	...	...	...		2,500
Redbridge	10%	Bond	...	...	...	...	...		2,500
Trustee Savings Account	...	...	...	...	...	...	...		1,500
									<u>6,500</u>
<i>Current Assets</i>									
Cash at Lloyds Bank:									
Deposit Account	...	...	...	...	...	...	...	1,380	
Current Account	...	...	...	...	...	...	...	1,667	
								<u>3,047</u>	
Sundry Debtors	...	...	...	...	...	...	...		214
									<u>9,761</u>
LIABILITIES									
<i>Current Liabilities</i>									
Sundry Creditors	...	...	...	...	...	...	...		54
									<u>£9,707</u>
NET ASSETS									
Represented by:									
<i>General Fund</i>									
As at 1st July, 1978	...	...	...	...	...	...	...		10,227
Less: Excess of Expenditure over Income for the year								(622)	
Add: Trustee Savings Bank Interest	...	...	...	...	...	...	...	102	
								<u>(520)</u>	
									<u>£9,707</u>

ANTHONY EVANS, *Hon Treasurer.*

We have examined the books of account of the British Society of Rheology and report to the best of our knowledge the above Balance Sheet and Revenue Account are in agreement therewith.

We have not inspected the Membership Records.

Alfred Simmons & Co., *Chartered Accountants.*
The Market Hall, Redhill, Surrey. 24th August, 1979.

BRITISH SOCIETY OF RHEOLOGY

REVENUE ACCOUNT for the year ended 30th June, 1979

1978								£
£								
	<i>Expenditure</i>							
800	Council Expenses (mainly travel)							1,233
765	Bulletin production costs							1,168
	Expenditure by officers							
45	Secretary						93	
2	Treasurer						18	
329	Membership Secretary and Circulation						413	
								524
36	Professionals Fees							68
20	Insurance							20
—	Conference travel							111
—	Membership List							562
—	Annual Awards							285
—	Binding Abstracts and Bulletin							116
1,997								£4,087
	<i>Income</i>							
1,166	Annual Subscriptions and Entrance Fees							1,072
1,989	Publisher—Rheology Abstracts							1,343
35	Bulletin Subscriptions							50
	Investment Income:							
30	Bank deposit account interest						76	
208	Wandsworth Bond						211	
55	Redbridge Bond						167	
253	Inland Revenue (Tax repayments)						187	
								641
1,352	Conferences—net surplus per account							309
—	Sale of members list							50
5,155								3,465
—3,158	Excess of Expenditure over income for the year ...							622
1,997								£4,087
	<i>Conference Account</i>							
	Surplus Plymouth less expenses							302
	Sale of Edinburgh Booklets							7
								£309

MEMBERSHIP SECRETARY'S REPORT

The membership now stands at 619 of which 393 are home members and 226 foreign. This represents an increase of 33 on last year. Forty-six new members have been elected of which 32 are home members and 14 foreign. Four members resigned and nine members were asked to terminate their membership due to non-payment of dues. Forty-one members are currently in arrears with this year's subscription.

T. E. R. JONES

APPLIED RHEOLOGY—CONFERENCE REPORT

The Autumn Conference on Applied Rheology was held this year at the University College of Wales, Aberystwyth. For four days we became "The Folk who live on the Hill", namely Penglais where, overlooking the town and the three bays, so much of the College by the Sea is now situated. The attendance was 76, including, as one would expect in Wales, some five Joneses, among them our President.

The Conference was opened on the Wednesday morning by Prof. Sir Granville Beynon, the Head of the Department of Physics. He welcomed us all to Aberystwyth, apologising for the poor weather which he attributed to all his experts on the Upper Atmosphere being on leave. However, they were obviously contacted by some means, for the weather improved remarkably during our stay.

The opening presidential lecture, entitled "Flow through porous media", set the scene for the first session. This excellent presentation led us gradually through the subject, from the simple case of gas flow, where the mean free path is less than the mean pore radius, through the flow of simple liquids obeying Darcy's law, to flows of complex fluids where adsorption takes place and where extensional viscosity is an important factor. The next paper, by Dr. R. A. Dawe, indicated just how complex these flows could be when studying the behaviour of a two-phase system in an oil reservoir. Here, in addition to a vast list of factors which complicate the flow, one is able only to measure the physical properties of the porous media at a few widely-scattered points. These complexities were further emphasised by Prof. Nutt in a paper on "Foam as an oil recovery agent", where he demonstrated that foam could be effective as an oil displacing agent, allowing the oil to be cleared at the same rate in a piston-like manner, through pores of varying diameter, thus avoiding the "fingering" which usually takes place. The mechanism of this action is not yet clearly understood.

In the next paper on Fluid behaviour at a solid/liquid/air interface, presented by Dr. Burley, we moved on to the problem which occurs when a continuous solid surface enters a quiescent liquid at speed. A film showed how firstly the capillary rise was cancelled, then, as the speed increased, the fluid surface was inverted, until, when the dynamic contact angle reached 180° , air was entrained. The final paper in the morning, by Dr. K. Te Nijenhuis, described dynamic mechanical studies on thermo-reversible ageing processes in gelatin gels. This interesting paper showed, among other things, that to produce a firm jelly it should be lightly set at ambient temperature before being put in the refrigerator.

After lunch, the conference turned its attention more to instrumentation and operational problems. When attempting to characterise lubricating oils under practical conditions, there is a need to measure viscosities at rates of shear of 10^6 S^{-1} ; at pressures of up to 1 Giga pascal (140,000 psi), and at temperatures between -30 and 200°C . Mr. Hutton described an elegant capillary viscometer, designed by Shell Research, to do just that. He also described the meticulous work needed to calibrate the instrument, to avoid errors due to end effects and temperature rise. Later in the afternoon, Mr. Wright described a Couette viscometer, also designed by Shell Research, which operated at up to 10^6 S^{-1} , with a gap of 2 microns. He gave a vivid picture of the heating problems by showing that at 10^6 S^{-1} with a viscosity of 10 cp, the heat produced was about 10 kw per cubic centimetre.

Dr. Oliver turned to the more complex problem of the squeeze-film motion of a lubricant film. He demonstrated how the load bearing is due to three components: fluid viscosity, fluid inertia, and normal stress. Experimental measurements showed how a highly elastic liquid gave much higher load-bearing characteristics than would a purely viscous liquid, but left us with the puzzle that the load enhancement was slightly greater than the normal stresses would imply.

Dr. Swerdlow described the problem of producing thin polyethylene sheets by the bubble process. The minimum thickness is limited by a critical rupture stress which experiments indicated was of the order of 10^6 Nm^2 . A very simplified analysis allowed these stresses to be estimated from the process variables.

The remaining paper, by Dr. Worth, discussed the problem of weld lines produced on extruded pipe by the separation of flow round the core of the die. Rotating the core of the die causes the weld line to spiral round the pipe, giving less chance of rupture. The form of the weld line was calculated theoretically and demonstrated by photographs of the constant velocity contours produced by carbon black injection. There was much discussion on how the carbon black knew on which contour to form.

The poster session held after the lectures was, on the whole, a little disappointing since there were not many displays and the time and space available were both rather limited.

On Thursday morning, medical and biological matters were discussed and we were shown how some of the afflictions of the human race can be eased by rheological measurement. Mr. Roberts described how the symptoms of dry mouth, caused by lack of saliva, are much more distressing than the transient effects which sometimes cause discomfort after a night's sleep. He demonstrated that saliva shows visco-elastic behaviour and that to obtain a satisfactory synthetic saliva, this behaviour needs to be closely matched.

The importance of the rheological properties of blood is much more obvious. Dr. R. D. Hutton showed how whole blood viscosity could be calculated from the haemoglobin concentration, red cell count and shear rate. This relationship allows the viscosity to be estimated quickly and accurately from simple physical properties, thus avoiding lengthy direct measurement. A patient's condition can thus be more quickly assessed.

The final paper before coffee by Dr. Van Zuilichem gave an interesting study of the rheology of starch and protein biopolymers, showing how the viscosity during extrusion is a complex function of temperature, shear rate and residence time.

The first paper after coffee was by Dr. Akay from Ankara who gave solutions of unsteady convective diffusion problems with chemical reactions. This gave good results for laminar flow in pipes and was applied to blood flow using a Casson model.

After this there were two papers by the home team showing how mathematicians and physicists can occasionally work together. Dr. A. R. Davies gave a paper on numerical solutions of rheological flows involving abrupt changes in geometry. This, to the reporter, complex mathematics was used to calculate the flow and vortex patterns in L-shaped flows and in flows through a contraction.

The next paper by Dr. Cochrane indicated how the technique of laser-doppler velocimetry could be applied to these flows of complex rheological materials past abrupt changes in geometry. He demonstrated how this technique could be used to investigate problems such as boundary conditions at re-entrant corners, which are difficult to solve mathematically. It is pleasant to see such dovetailing in the work of two departments.

In the afternoon a decision had to be made—whether to enjoy the thrill of British Rail's only steam service up the Rheidol Valley to Devil's Bridge, to maintain the technical tone by visiting the Centre for Alternative Technology at Machynlleth, or even to play a round of golf. In the latter game it is sad to record that the rest of the world defeated Aberystwyth. Your reporter eschewed

the pleasure of life and had an enjoyable coach ride to Machynlleth. The Centre of Alternative Technology showed mainly how alternative sources of energy, such as sun, wind and water, could be used in a small community. It was interesting, but seemed to lack the unbiased, scientific search for knowledge which we noted in the presentations at Aberystwyth. The people who sampled the old steam technology had an equally enjoyable time having their photographs taken many times by Professor Ito.

The Annual General Meeting will be reported separately. It is a pity that people take so little interest in the affairs of their Society; at one time there was a danger that we might not even have a quorum.

At night the conference dinner was held at Pantycelyn Hall which fully upheld the standards we have come to expect at BSR conferences. The food, the wine, and the company were all excellent. The President, Dr. Mervyn Jones, presented the second annual award to Sam Hutton, for his services to the BSR, to the growth of rheology in universities, and to the science of rheology.

The final morning was spent discussing the rheology of a wide assortment of materials. I find these sessions among the most interesting, since they show how similar techniques can be applied to the most diverse of materials. The first two papers described the flow behaviour of concrete. First Dr. Tattersall discussed the workability of concrete, a property about which everyone knows but which no-one apparently can define quantitatively. Dr. Tattersall showed how fresh concrete approximates to a Bingham body and demonstrated how these Bingham constants can be measured and used to obtain a clearer understanding of this elusive workability. Dr. Dimond then discussed how vibration is extensively used in the concrete industry to "liquefy" the concrete and to allow it to flow more easily into the form-work. Experiments showed how vibration tends to reduce the yield value without having a major effect on the Bingham viscosity. Care has to be taken to optimise the vibration since too little can cause honeycombing, due to air entrainment and too much can cause separation or cracking.

From concrete we moved to wheat flour dough and gluten with Dr. Carlson demonstrating that two relaxation processes play their part in forming the stress relaxation curve. Dr. Van den Tempel, in his presentation, discussed the importance of consistency in such materials as bread, butter, cheese, jelly and ice cream. Experiments giving stress relaxation spectra after small deformations do not help in determining customer requirements in such actions as cutting, spooning and chewing where large deformations are involved. He described these properties of consistency and texture in terms of a weak network structure, a theory which has applications with many other materials.

Dr. Janssen then described the thermodynamics of wall slip, postulating how the alignment and stretching of molecules in regions of high shear rate can result in the migration of molecules from the wall of a pipe in laminar flow, thus giving a decrease in viscosity and a yet higher wall shear rate. Such phenomena can have important effects in, for example, flow in porous media, a fact which took us back to our problems on the first day.

Finally from concrete and jelly we moved to soap, where Dr. Barnes gave us a fascinating account of the intricacies of the rheology and preparation of soap and how their simple and elongational properties can be measured.

The final programme in the afternoon was for essentially UK university consumption, when the problems of extracting money for research from the Science Research Council were discussed. Dr. Alisdair Rose gave an account of the workings of SRC. Mr. Davenport gave his viewpoint on industrial requirements, while Dr. Mervyn Jones showed that you couldn't win either way. Seriously, it was a pity that the session had to be ended to catch trains, since one felt that the discussion could have been usefully continued for many hours.

To sum up, another successful conference with a very satisfactory blend of academic theory and practical problems, and good indications of how each one needs the other. The organisers are to be congratulated on producing such a diverse programme and for looking after our creature comforts so well.

T.C.D.

NEWS FROM AUSTRALIA

Report on the First National Conference on Rheology in Australia May 30 to June 1, 1979, Monash University Melbourne, Victoria

The First National Conference on Rheology in Australia organised by the Australian Branch of the British Society of Rheology was held at Monash University on May 30 to June 1, 1979. Some 60 delegates from industry, universities and other research establishments attended.

There was no single theme for the conference. The aim was to bring together people, primarily those residing in Australia, who are interested or working in all branches of rheology to discuss their respective research programmes or problems. Judging from the background of those people who attended, and the diversity of papers presented, this goal was certainly achieved. The conference programme consisted of two plenary addresses, and 26 technical papers in nine sessions. The sessions were broadly divided into

various disciplines: polymer rheology, food and biorheology, flow of suspensions and mineral slurries, drag reduction, and mixing. The topics covered ranged widely from fundamental problems such as the formulation of constitutive equations, finite element solutions of rheological problems, measurement of rheological properties, influence of fluid elasticity on various flow fields, and blood rheology, to many specific applied areas including the characterisation of massecuite, starch paste, red mud, and brown coal, the setting of dental materials, and the bulk sea transportation of particulates.

The conference was officially opened by Professor Lance Endersbee, the Dean of Engineering, Monash University, and President-elect of I.E. Aust. Professor Endersbee stressed the importance of rheology to Australian industry, and encouraged a better communication between research establishments and industry. He strongly urged that a liaison be established between the British Society of Rheology (Australian Branch) and the Institution of Engineers, Australia, particularly in the organisation of future conferences. Co-operation between these two bodies is important because the latter body is much larger, better known and widely represented in Australia, and it also caters for more professional engineers in industry.

The first plenary address was delivered by Professor Roger Tanner of Sydney University on the "Interaction of Continuum Mechanics and Rheology". He emphasised that the terms "continuum mechanics" and "rheology" are not synonymous. The former deals with the conservation laws, and the stress-strain relationships of structureless bodies; while the latter, as defined by Bingham in 1929, is a study of flow and deformation of a structural body. Professor Tanner gave a vivid account of some significant historical developments in continuum mechanics as well as in rheology.

Dr. Leo Dintenfass, Director of the Haemorheology and Biorheology Department of the Kanematsu Memorial Institute, Sydney Hospital, gave the second keynote address on fundamental and clinical aspects of blood rheology. He showed that human blood should be regarded as a complex non-Newtonian suspension and/or emulsion, whose properties depend on the fluidity of red cells, concentration and aggregation of red cells, and on plasma viscosity. Measurement of blood viscosity could, some day, become a standard pathological test for cardiovascular disorders and many other diseases including cancer. Dr. Dintenfass also outlined his research project on the behaviour of blood under a zero gravity environment, as sponsored by NASA. This is the first NASA sponsored project awarded to a non-American under the space laboratory research programme.

In all, this has been a very successful conference. Plans have already been made to organise a second conference in Sydney in two years time. Abstracts of the conference papers will be published in the "Rheology Abstracts". The complete conference proceedings are now available at a cost of \$15 per copy plus postage from Dr. C. Tiu, Dept. of Chemical Engineering, Monash University, Clayton, Vic. 3168, Australia.

CARLOS TIU
Conference Secretary
June 21, 1979

PERSONAL NOTE

DR. D. C-H. CHENG

David Cheng has been engaged in rheological research at Warren Spring Laboratory since about 1963. The topics he has studied include non-Newtonian viscometry, thixotropy, rheology of suspensions and powders, quality and process control, pipeline design and fluid and paste mixing. Since 1975, he is project officer of a government-industry co-operative venture, the Rheological Research Project, which is currently studying flow instabilities (ribbing, filamentation, fly and air-entrainment) in roller transfer of materials and the rheology of suspensions at high solids content, and preparing a handbook of recommended practice in non-Newtonian viscometry and thixotropic measurement. He gained the 1972 Wolfe Award for his work in applied rheology and was promoted Senior Principal Scientific Officer on individual merit in 1976. He was a member of the SRC Non-Newtonian Flow Panel and serves on its Rheological Instruments Project sub-committee. He represents the Institution of Chemical Engineers on the EFCE Working Party on Non-Newtonian Fluid Processing. Over the years, he has lectured at many post-experience specialist courses. Since 1976, he has organised annual week-long Training Courses in Fluid Rheology at WSL for industrial personnel. Each course includes lectures on material science, measurement techniques and rheological application, and practical periods in viscometry. He joined the BSR in 1954 and served on Council from 1974 to 1978. He now returns to Council as Membership Secretary.

OBITUARY

John Broome

John Broome, who had been a member of the Society since 1962, died in June this year at the early age of 57 after an illness lasting about four months. He was a Senior Instrument Engineer at Ferranti and would be well known to those who have bought and used Ferranti viscometers.

John will be sadly missed by his many friends and those whom he willingly and cheerfully helped.

G.H.T.

LETTERS TO THE EDITOR

Department of Applied Mathematics,
University College of Wales,
Aberystwyth,
Wales.

Dear Editor,

Further to my report of the meeting on Chemical Engineering Rheology held at Aachen 5-7 March 1979 (see Bulletin Vol. 22, No. 2, 1979, pp.24-26), I have received two letters. The first, from Dr. D. C-H. Cheng, stated that his paper (Number 4 in the report) was more generally applicable than I had supposed. Anyone interested can obtain the full report from Dr. D. C-H. Cheng at the Warren Spring Laboratory, Stevenage, Herts.

The second letter was from Professor C. Wolff concerning paper Number 12 in the report, pointing out that birefringence techniques were used not to study sheet thickness but progressive degradation of the polyox which, as is clear from the title of the paper, was being used in drag reduction studies. Anyone interested can obtain a copy of the paper from Professor C. Wolff, Laboratoire de Mécanique et Rhéologie, Ecole Nationale Supérieure des Industries Textiles de Mulhouse (ENSITM), Université de Haute Alsace, France.

Yours sincerely,

J. ASTIN

The following letter concerns a review published in Rheology Abstracts 22(2) 1979, pp.141-144.

18 Maiden Erlegh Ave.,
Bexley, Kent.
DA5 3PD.
1st October, 1979.

To the Editor,

Having returned from an extended lecturing assignment as a visiting professor on the continent I am now catching up on my reading. Allow me to make a few remarks on C. J. S. Petrie's assessment of "Polymer Rheology" which appeared in the Abstracts and which differs from the many complimentary reviews which have appeared elsewhere.

There certainly are some printers' errors which should and will be eliminated as well as some desirable textual adjustments which will be made in any second edition. I make no apologies, however, for presenting established facts even if they are more than five years old. Neither am I the least bit repentant for extended quotations from some of Han's brilliant research papers.

As regards the undoubted importance of normal stress differences and stretching flows, however, I take the view that it is bad from a didactic viewpoint to confront the practical man with the full complexities of nonlinear viscoelastic behaviour of polymer melts at the outset. It is far more appropriate to confine oneself to the already complex nature of shear viscosity in the beginning and to introduce the concepts of tensile viscosity and normal stresses at a later point when the reader has become accustomed to the formulation of the problems and to the idiom of rheology.

There are several books which deal with "recent advances" in rheology; but what is most urgently needed is a practitioners' handbook rather than a treatise on the sophisticated mathematics of the theoretical puritan ensconced in his ivory tower. I do not wish to play down the undoubted and valuable contribution of the theoretician in any way—I merely wish to restate the need, as Dr. Challis says in his Foreword, for building a bridge which the industrial engineer can tread, for it is he who earns the keep of us all in the end.

It is much easier to snipe from the sidelines than to embark upon a great deal of work for a token financial reward and I cannot complain if people who are not prepared to undertake the labour indulge in the facile pastime of carping criticism. But, at the risk of sounding old-fashioned, I would have thought that the rude invective which often characterised differences in scientific opinion in the more distant past had been finally abandoned about the turn of the last century. I also resent the backhanded compliments and

the attempts of driving a wedge between the principal author and his guest writers which were not only ill-mannered but also in rank bad taste.

To cap it all, one can only gasp at the breathtaking arrogance and at the monumental impertinence of censuring the Director of the Polymer Engineering Directorate of the S.R.C., all the more so when it comes from the Hon. Secretary of our Society.

Yours faithfully,

R. S. LENK

FUTURE CONFERENCES

Practical rheology in polymer processing

Wednesday, Thursday, 26 and 27 March, 1980, at the University of Technology, Loughborough

The British Society of Rheology and the Processing and Engineering Group of the Plastics and Rubber Institute are jointly sponsoring this conference, which aims to review the practical application of polymer rheology in relation to processing and product performance, and to bring together practising rheologists, polymer engineers and industrial fabricators in an international forum to discuss how they may work together to solve problems of common interest.

Programme

26 March 1980

- | | | |
|------|---|---|
| 0900 | | Registration |
| 0925 | | Chairman's welcome and introduction |
| 0930 | 1 | An integrated approach to efficient polymer processing
G. P. COLBERT/J. D. BYAM (E. I. Du Pont de Nemours, USA) |
| 1000 | 2 | Simulation of injection moulding
J. R. A. PEARSON/S. M. RICHARDSON (Imperial College of Science and Technology) |
| 1030 | | Discussion |
| 1045 | | Coffee |
| 1115 | 3 | Three dimensional calculation of velocity fields in complex flow channels
U. MASBERG (Institut für Kunststoffverarbeitung, Aachen) |

- 1135 4 Control of wall thickness uniformity in non-circular blow mouldings using profiled dies
R. A. WORTH (UMIST)
- 1155 5 Prediction of wall thickness of blow moulded containers
C. J. S. PETRIE/K. ITO (University of Newcastle upon Tyne)
- 1215 Discussion
- 1230 LUNCH
- 1400 6 The effect of pressure and metal surface on the flow behaviour of rubber
D. M. TURNER/M. D. MOORE (Avon Rubber Company Ltd.)
- 1420 7 Determination of the rheological properties of rubber compounds—flow properties and wall slip
G. TARGIEL (Institut für Kunststoffverarbeitung Aachen)
- 1440 8 Rheological measurements—a versatile tool for the formulation and preparation of elastomeric sealants
R. J. LIPPE (Cabot Corporation, USA)
- 1500 9 Capillary rheometer: a practical tool to characterise carbon blacks
A. C. PATEL (Ashland Chemical Company, USA)
- 1520 Discussion
- 1540 Tea
- 1610 10 Rheology and the growth of strong polymer fibres
L. P. D. M. JANSSEN (University of Delft, Netherlands)
- 1640 Discussion
- 1645 11 Science Research Council (PED)
Sir G. ALLEN (Chairman, SRC)
- 1715 Open Discussion
CONFERENCE DINNER

27 March

- 0900 12 Characterisation of injection moulding
B. HAWORTH/G. J. SANDILANDS/J. R. WHITE (University of Newcastle upon Tyne)
- 0920 13 Orientation in injection mouldings
W. G. HARLAND/P. KANTAS/T. HABIKIS (UMIST)
- 0940 14 Factors influencing fibre orientation and mechanical properties in fibre reinforced thermoplastic injection mouldings
P. F. BRIGHT/M. W. DARLINGTON (Cranfield Institute of Technology)

- 1000 15 The influence of injection moulding conditions on the properties of thermoplastics
R. J. CRAWFORD (Queen's University, Belfast)
- 1020 Discussion
- 1040 Coffee
- 1110 16 Injection moulding (title to be advised)
D. E. MARSHALL (University of Technology, Loughborough)
- 1130 17 The influence of acrylic processing aids on the extensibility of PVC melts
F. N. COGSWELL/J. M. PLAYER/R. C. YOUNG (ICI Plastics Division)
- 1150 18 The effect of polymer rheology on product performance
T. CORNELIUSSEN/M. FLENSJO (Kema Nord AB, Sweden)
- 1210 Discussion
- 1230 LUNCH
- 1400 19 Screw design and melting performance in single screw extruders
J. F. INGEN HOUSZ/H. E. H. MEYER (Twente University, Netherlands)
- 1430 20 Flow of polymer melts in cooled flow channels—described by means of the dimensional analysis method
H. REICHSTEIN/R. SCHULZE—KADELBACH (Institut für Kunststoffverarbeitung, Aachen)
- 1450 21 Extrusion of pipes using a rotating die system
W. G. HARLAND/R. A. WORTH/H. EL SOBKY (UMIST)
- 1510 Discussion
- 1530 Tea
- 1600 22 Studies of rubber processability using a new automated capillary rheometer
J. L. LEBLANC (Monsanto Technical Centre, Belgium)
- 1620 23 The use of torque and capillary extrusion rheometers for process improvement and quality control
R. E. CARTER (Ministry of Defence, PERME)
- 1640 24 Instrumentational aspects of rheological measurement with respect to capillary and rotary rheometry
P. COOMBER (Instron Ltd.)
- 1700 Discussion
- 1715 Conclusion

Conference dinner

A conference dinner will be held on the evening of 26 March, to which all delegates are invited, and the price for which is included in the registration fees for both resident and non-resident delegates. Extra tickets for delegates' guests will be available for purchase at £10.00 each (plus £1.50 VAT).

Evening meal—25 March

Arrangements can be made for a buffet meal to be provided for delegates arriving on 25 March. This will be served from 1830 to 2000 at a charge of £4.00 (plus 60p VAT). Please indicate on the registration form if you require a meal to be provided.

Accommodation

A number of single-study bedrooms have been reserved on the University campus and delegates who wish to stay overnight at the University should indicate on the registration form which night(s) they wish to book a room at a cost of £5.00 (plus 75p VAT) per night (bed and breakfast).

Alternatively, delegates may wish to book their own accommodation at a convenient hotel of their choice.

Fees and registration

Use registration form 'B'—a separate form for each delegate please. (The form may be photocopied.)

PRI and BSR members: £42.50 (plus £6.38 VAT).

Non-members: £55.00 (plus £8.25 VAT).

Student members—rates available on request.

Non-member students will be required to register at ordinary non-member rate.

The above fees include attendance at the conference, lunch, coffee and tea on both days, the conference dinner, and a set of preprinted papers.

REGISTRATION FORM (B)

(a separate form for each delegate please)

To: The Plastics and Rubber Institute, 11 Hobart Place,
London SW1W 0HL

Meeting: Practical rheology in polymer processing

Ref.: C250/..... Date(s) 26 and 27 March, 1980

Name (CAPITALS) Position in company.....

Company affiliation Bus. Tel.....

Address

PRI member ☐ BSR member ☐ Non-member ☐ Student ☐Evening meal required on 25 March ☐Accommodation required at University: 25 March ☐ 26 March ☐

I enclose a remittance of £..... payable to the Plastics and Rubber Institute:

Signed Date

†STUDENTS must have the following declaration signed by a senior member of their college staff

I confirm that the above named person is a student at.....College

Signed Position Dept.

If VAT invoice required, Mark items* on invoice section

FOR OFFICE
USE ONLY

Total VAT
fees paid £..... Date Invoice No. C.../.....

INVOICE No. C250/Meeting: Practical rheology in
polymer processing

Dates: 26 and 27 March, 1980

Delegate's name (CAPITALS)

Address*

Fees paid—basic £.....

VAT rate% £.....

VAT amount £.....

Total £.....

Date

Sale—tax point is invoice date

VAT Reg. No. 240 0019 32

The Plastics and Rubber Institute
11 Hobart Place

London SW1W 0HL

Tel.: 01-245 9555

SYMPOSIUM ON LIQUID CRYSTAL POLYMERS

First Announcement and Call for Papers

The Macro Group (UK), formed by amalgamation of the UK Chemical Society Macromolecular Group and the UK Society of Chemical Industry Plastics and Polymer Group, is organising a major symposium on LIQUID CRYSTAL POLYMERS to be held at the University of Leeds, England, UK, on 16-17 July 1980. This Symposium will be concerned with all aspects of the field both for synthetic and natural liquid crystal polymers and also with applications for these polymers. The programme will include invited lecturers and contributed papers. Invited lecturers include Professors Guy C. Berry (Carnegie-Mellon University, Pittsburgh, USA), Robert W. Lenz (University of Massachusetts, USA), E. J. McIntyre (University of Leeds, UK) and H. Ringsdorf (University of Mainz, Germany).

For further information and application forms (available early in 1980) please contact: Dr. J. B. Rose, Research Department, ICI Plastics Division, PO Box 6, Welwyn Garden City, Hertfordshire, England.

Persons wishing to present a paper should send a title and brief synopsis (50-100) words by 30 November 1979 to Dr. Rose at the above address.

FUTURE MEETINGS

"The Science and Technology of Interfaces"

A Symposium to Commemorate the Life and Work of
Herbert Freundlich (1880-1941)

Monday, 28th January, 1980

Herbert Freundlich was among the earliest of the leading scientists in the colloid and interface field, and still remains widely quoted, a lifetime after his experimental research on adsorption, and the appearance of his standard work 'Colloid and Capillary Chemistry', dealing with the whole subject area known in his time. He came to England in 1933 from his Institute in Berlin, as an emigre from the regime in the Germany of those days, and re-established his research school at University College, London, finally leaving for the U.S.A. in 1938.

The centenary of his birth falls in 1980, and is being commemorated by a one-day Symposium on the birthday anniversary, 28th January, arranged in London by the Colloid and Surface

Group of the Society of Chemical Industry collaborating with the Colloid and Interface Science Group of the Chemical Society Faraday Division. The programme includes introduction and reviews by two of the last of Freundlich's postgraduate students in England, D. W. Gillings and W. A. Southorn, followed by papers on a small selection from among the many topics appearing in 'Colloid and Capillary Chemistry':

Adsorption: by Professor W. J. Thomas, Bath,

Colloid Stability: Professor R. H. Ottewill, Bristol,

Nucleation and Crystallisation: Professor J. W. Mullin, U.C.L.,

Surfactants: Professor Armin Weiss, The Kolloidgesellschaft.

After the day's programme, Dr. Clemens Bondy, one of the Continental members of the research school, who has continued his lines of work in industrial research since that time, will speak at the Commemoration Meeting of the Chemical and Physical Society of University College on

'Freundlich at the Interface: Colloids and Everyday Life'
followed by dinner in College.

Registration forms with details of the programme on application, from the Society of Chemical Industry, 14 Belgrave Square, London SW1X 8PS.

EUROMECH

The following Euromech meetings may of interest to members. Anyone interested in participating in a meeting should write to the appropriate chairman whose responsibility it is to select participants.

Euromech 127—Wave propagation in viscoelastic media, 14-18 April, 1980, Taormina, Italy. Chairman: Professor F. Mainardi, Istituto di Fisica, Università di Bologna, 40126, Bologna, Italy; and Prof. G. Pallotti, Bologna.

Euromech 128—Stability, buckling and postbuckling behaviour; foundations and analysis, 31 March-2 April, 1980, Delft, The Netherlands. Chairman: Professor dr. ir. P. Meijers, Laboratory of Engineering Mechanics, Delft University, Mekelweg , 2628 CD Delft, Netherlands; and Prof. W. T. Koiter, Delft.

Euromech 131—Identification problems in structural dynamics, 24-26 June, 1980, Besancon, France. Chairman: Professor R. Chaleat, Laboratoire de Mécanique Appliquée, University of Besancon, La Bouloie, Route de Gray, 25030 Besancon Cedex, France; and Dr. G. Lallement, Besancon.

Euromech 133—Statics and dynamics of granular materials, 14-17 July, 1980, Oxford, U.K. Chairman: Professor C. P. Wroth, Department of Engineering Science, Parks Road, Oxford OX1 3PJ, U.K.

Euromech 134—Design against failure in solids, 3-5 Sept., 1980, Lyngby, Denmark. Chairman: Professor Bent Hansen, Soil Mechanics Laboratory, Technical University of Denmark, Maglebjergvej 1, DK-2800 Lyngby, Denmark; and Mr. Krebs Ovesen, Lyngby.

Euromech 136—Local problems in plates and shells, 15-17 Sept., 1980, Jablonna, Poland. Professor dr. hab. S. Lukasiewicz, Politechnika Warszawska, ul. Nowowiejska 24, 00-665 Warsaw, Poland.

Other meetings on topics in classical hydrodynamics and aerodynamics have been arranged. The Secretary has a full list.

RHEOGONIOMETRY COURSE

14th to 16th May, 1980

The Third Ross Priory Course on Rheogoniometry, sponsored by Sangamo Weston Controls Ltd., manufacturers of the Weissenberg Rheogoniometer, will be held at the University of Strathclyde's Staff Educational and 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 Wednesday, 14th May, 1980, 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. Part of the building dates back to the 14th century. The facilities include a bar, squash court, six hole golf course and fishing on the Loch.

Accommodation is limited and those attending will be expected to share a room as all the bedrooms are double.

Lectures will be given by Professor K. Walters, Dr. J. Ferguson, Mr. J. Hutton and Dr. H. Barnes. Representatives of Sangamo Controls Ltd., Mr. K. Knowles and Mr. R. Spooner, will also be present.

The course will disperse after breakfast on Friday, 16th May, when members will be returned to Glasgow.

The course fee will be £80 including full board. Those wishing further details should complete the form below and return it to Dr. J. Ferguson, Department of Fibre Science and Textile Technology, University of Strathclyde, Glasgow, G1 1XW.

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

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

ADDRESS

.....

.....

POST CODE

*Delete whichever is inapplicable

RHEOLOGICAL INSTRUMENTS

Imass—

Two new instruments of interest to rheologists have just been announced by IMASS, Instruments for the Materials and Structural Sciences.

The Dynalyzer has been designed for analyzing dynamic mechanical behaviour of viscoelastic materials.

The Instrumentors Slip/Peel Tester is an instrument for measuring coefficients of friction of surfaces and peel strength of pressure sensitive adhesives.

Sangamo—

Sangamo Weston Controls Limited wish to make it known that they are now a subsidiary of Schlumberger Limited. The current Model R19 Weissenberg Rheogoniometer and its accessories will continue to be manufactured in Bognor Regis.

Future developments of the instrument will be considerably enhanced by this association as it brings Sangamo into a Group providing existing technologies which can be applied to the Rheogoniometer. Services to existing users will continue as before and for these we suggest contact be made with R. Spooner or R. Knowles.

NEW BOOKS

RHEOLOGICAL TECHNIQUES—R. W. Whorlow, University of Surrey.

Contents: Deformation and Stress; Tube Viscometers; Rotational Viscometers; Creep and Stress Relaxation; Dynamic Tests; Wave Propagation; Analysis of Viscoelasticity Measurements.

Readership: Postgraduate Scientists and Engineers in Advanced Teaching, Research and wide ranging industries, notably Plastics, Food, Paints, Petroleum, Printing, Rubber, Pharmaceuticals, Cosmetics, Civil and Chemical Engineering, Agriculture, and Medicine.

Published by Ellis Horwood Limited.

APPLICATIONS FOR MEMBERSHIP—September 1979

Jean Louis Doublier, Ph.D. f,et,sa,L.	Institut National de la Recherche Agronomique (INRA), Centre de Recherches Agro Alimentaires, La Gerandiere—44072 Nantes Cedex. France.
Richard David Hutton, Ph.D. f,et,sa,F,G,M.	Department of Haematology, Welsh National School of Medicine, Heath Park, Cardiff.
Prof. Katsuhiko Ito, Ph.D. f,et,a,B,C,D,G.	No. 3-7, 2-chome, Kajinocho, Koganei, Tokyo, Japan.
David Harvie Kirkwood, Ph.D., M.A. p,et,a,A.G.	Department of Metallurgy, St. George's Square, Sheffield University, Sheffield, S1 3JD.
Jacques Lefebvre, Ing. ENSIA, f,et,sa,L.	INRA-Laboratoire de Biochemie des Aliments, Chemin de la Gerandiere, 44072 Nantes Cedex, France.
David H. Trevena, Ph.D. p,e,sa,D,O.	Physics Dept., University College of Wales, Aberystwyth.
H. A. Watezman, B.Sc. f,et,sa,,D.F.G.O.	Dept. of Applied Physics, Twente University of Technology, P.O.B. 217 Enschede, Netherlands.
P. F. G. Banfill, B.Sc., Ph.D. f,e,sa,G.K.	Dept. of Building Engineering, University of Liverpool, Liverpool, L69 3BX.

RESEARCH VACANCIES

Research Studentships

Two vacancies exist in a research team working on the rheology of fresh concrete in all its aspects and both are for research on the effects of cement properties on the rheological properties of the concrete in which it is incorporated.

- 1) Blue Circle Scholarship sponsored by the Blue Circle Group of Cement Companies value approx. £2,700 p.a. plus fees. It is hoped the successful candidate would eventually join the Company's Research Station at Greenhithe.
- 2) CASE SRC studentship. Industrial sponsor Ribblesdale Cement Ltd. Value £2,550 p.a. plus fees.

Both studentships are for a period of three years and are expected to lead to the award of Ph.D. Candidates should hold a good Honours degree in Chemistry, Material Science, Physics or other appropriate discipline.

Further details from Dr. G. H. Tattersall, Department of Building Science, University of Sheffield, Sheffield S10 2TN.

Research Assistant

Applications are invited for the post of Senior Research Assistant in Cement Chemistry in the Department of Building Engineering. The project is financed by the S.R.C. for three years from 1st October, 1979. The successful candidate will study the changes in the rheology of cement-water pastes during hydration in the presence of adsorbed organic additives. Candidates should hold a degree in chemistry, ceramics, materials science or physics and have relevant postgraduate research experience.

The initial salary will be £4,333, £4,622 or £4,910 per annum according to qualifications and experience of the successful candidate.

The post is tenable in the Department of Building Engineering, University of Liverpool, and applications, together with the names of three referees, should be sent to the Registrar, The University, P.D. Box 147, Liverpool L69 3BX.

CALENDAR 1979-1980

Council meetings

Agenda mailing: Friday, 30th November; Meeting date: Friday, 14th December, 1979; Place of meeting: Sheffield.

Wednesday, 12th March; Tuesday, 25th March, 1980; Loughborough.*

Friday, 13th June; Friday, 4th July, 1980; Birmingham.

Friday, 15th August; in week Tuesday, 9th September, 1980, to Friday, 12th September, 1980; London.†

*Conference with PRI from 9 a.m., 26th March, to after 5 p.m. on 27th.

†Morning Council, afternoon scientific meeting and early evening A.G.M. suggested. Date to suit invited speakers. (Secretary to arrange.)

Bulletin

Issue: 22(3); Copy date: —; Expected date of mailing to members: mid-September, 1979; 22(4); Monday, 15th October; 26th November, 1979; 23(1); Monday, 14th January; 25th February, 1980; 23(2); Monday, 14th April; 26th May, 1980; 23(3); Monday, 14th July; 25th August, 1980; 23(4); Monday, 13th October; 24th November, 1980.

Abstracts

Issue 22(3): Abstracts to Editor: —; Copy to Pergamon: 17th September; Expected mailing to members: 25th October, 1979.

22(4); (22nd) October; 19th November; 30th December, 1979; 23(1); (21st) January; (18th) February; (1st) April, 1980; 23(2); (21st) April; (19th) May; (27th) June, 1980; 23(3) (11th) August; (15th) September; (23rd) October, 1980; 23(4) (20th) October; (17th) November; (30th) December, 1980.

(Dates in brackets are Secretary's estimates; Pergamon schedule not yet received.)

C. J. S. PETRIE

DIARY

1979

6th December. "Rheology of Thin Layers"—Paris.

14th December. B.S.R. Council Meeting—Sheffield.

1980

28th January. Commemorative Lecture—London.

26th-28th March. "Practical Rheology in Polymer Processing"—Loughborough.