

THE BRITISH SOCIETY OF RHEOLOGY

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THE BRITISH SOCIETY OF RHEOLOGY
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1992/93

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EDITORIAL

With this issue I am pleased to welcome our new President, Dr Ralph Oliver, who took over from David Cheng at the A. G. M. in September. Ralph will be well known to many members through his regular attendance at conferences and BSR meetings. He served on the Council from 1972 to 1989 including stretches as Treasurer and Bulletin Editor. Also elected at the A. G. M. was Dr Gerry Meeten and I hope to be able to include biographical notes on both of them in the next issue.

As foreshadowed in previous Bulletins there has been a rush of meetings recently and in this issue there are reports on the International Congress, the European School of Rheology and the Society's Autumn Conference. Also my good friend from Baker Street has been back on the trail of the missing industrialists. At the Autumn Conference the Society's Annual Award was made to Dr Chris Petrie, a richly deserved accolade.

As a result of all these reports there is not enough space to include a technical article in this issue but the next will have one on food texture assessment.

The Council continues to be concerned about the lack of interest in the Society's Scholarship and Travel Grants. There have been no nominations for either of the Scholarships. This is the Society's main way of encouraging young rheologists and I cannot believe that any student would knowingly pass up the chance of £500 a year. Research student supervisors stand condemned of dereliction of duty! Please encourage your students to apply or to be nominated.

Copy date for next issue December 15th 1992.



XITH INTERNATIONAL CONGRESS ON RHEOLOGY

The Eleventh International Congress on Rheology took place in Brussels, Belgium, over 17-21 August this year. I was fortunate to be able to attend and begin this report with some statistics.

The meeting was attended by nearly 600 delegates, together with more than 70 accompanying persons, from 38 countries all over the world. I counted 49 delegates from United Kingdom. The proceedings consisted of 4 plenary papers, 10 keynote papers, and 445 contributed papers which were given as oral communications or as posters. They are collected together in *Theoretical and Applied Rheology*, the two volume printed proceedings of 1020 + xlv pages, edited by P. Moldenaers and R. Keunings, and beautifully bound in hard covers by Elsevier of Amsterdam. However, they weighed a total of 7 pounds. Together with the trade brochures that I picked up at the exhibition (23 companies participated showing rheological instruments, scientific software and books), they increased the weight of my homeward bound luggage by about a third and made the return journey rather heavy on the shoulder muscles despite the fact that I have learned to travel light.

The plenary papers reviewed the state of rheology, covering the role of molecular modelling in polymer rheology (Marrucci), rheology, structure, boundary conditions and industrial applications (Metzner), rheology and computation (Tanner) and recent developments in rheometry (Walters).

The keynote papers covered measurement of velocity and stress fields in complex polymer flows (Armstrong *et al.*), viscoelastic flow instabilities (Beris *et al.*), the shear stress transducer (Dealy), surface-induced effects in polymer melt flow (Denn), rheology of a system with a mesoscopic domain structure (Doi), optical rheometry (Fuller), competition between inertial pressures and normal stresses in the flow-induced anisotropy of solid particles (Joseph *et al.*), texture of a liquid crystalline polymer during shear (Larson *et al.*) and the influence of interface and volume properties of polymer melts on their die flow stability (Piau *et al.*). The keynote paper entitled Colloidal dispersions: effects of attractions and association (Russel) was not included in the proceedings; interested persons have to refer to the speaker's recent book for details.

The contributed papers were divided into different groups: Molecular theories (4 oral communications and 1 poster, totalling 5 papers included in the proceedings), Constitutive equations (17), Theory (18), Fluid mechanics (37), Numerical simulation (33), Melts and polymer processing (62), Polymer solutions (30), Liquid crystals

(25), Suspensions (48), Foams and emulsions (12), Food rheology (18), Biorheology (16), Electrorheology (11), Rheology of solids (26), Composite materials (21), Rheometry and experimental methods (44) and Instrumentation (21).

As with previous Congresses, because of the large number of papers being presented, the Scientific Programme had to be run in 5 parallel sessions (6 on Tuesday and Wednesday). I found it impossible to attend all the lectures of interest to me. It was just as difficult to decide from the titles which ones to go to. At first I tried to consult the printed proceedings before making a choice, but I soon gave that up. The whole exercise is not helped by the poor presentations given by some speakers and the awful visual aids, such as small hand-writing or typescript copied without enlargement onto overhead transparency sheets and computer-produced slides, the blue background of which may be colourful but it was also very effective in obscuring data. It was a waste of time attending one of these. At the end, I made my choice of lectures according to the speaker. I went to those who were known to be good and from whom I could expect an entertaining talk. Even if the subjects were of no direct interest to me, they would make them informative as well. As to the papers of specific interest, I need to study the printed version anyway. (This is where I voice another complaint, namely that many speakers did not keep to the information published in the proceedings and introduced extraneous material. This was interesting of course but it was impossible to remember what was being said. It was difficult to take adequate notes and, without giving full references, the speakers might as well not have bothered.) Anyway, I attended a number of lectures on certain pet subjects and, supplemented by dipping into the proceedings, I learned about the latest developments.

The first of such subjects was yield stress. This is a perennial to stir discussion at any gathering of rheologists. It was given an added impetus at the IXth ICR in Acapulco when Barnes and Walters posed "The yield stress myth?" and concluded that "... there is no yield stress". After eight years of controversy, they revisited the subject at this congress (pp. 16 and 576 of the proceedings). Walters summarised the conclusions thus: (i) "the basic conclusion that all materials have a finite low-shear-rate viscosity is correct", but with the qualification that "for the majority of cases"; (ii) "it is conceded that in a limited number of cases, ... sound scientific arguments can be put forward to support the existence of a real yield stress"; and (iii) "the yield stress is an engineering reality". Barnes developed the scientific support for conclusion (ii) starting from the Krieger-Dougherty equation for viscosity as a function of suspension concentration. He allowed for the fact that the maximum phase volume,

at which the suspension viscosity becomes infinite, depends on shear stress and deduced that, under conditions when the solids concentration is high, a yield stress might be expected.

That the yield stress, myth or otherwise, is a reality seemed well established by the 34 other papers I have noted in the Congress. Apart from conventional measurement by extrapolation of the flow curve and by creep test, the vane method (p. 619) was further developed (935). Other methods, including some new ones, were described: using ramped shear rate (644) or ramped shear stress (687), conventional oscillatory testing (664) or oscillation under controlled strain (1003, yield stress is exceeded when the loss angle becomes greater than zero), initiation of pipe flow (975), and by rolling ball (588, for high temperature and high pressure application). By using the double-gap coaxial cylinder geometry, low stresses down to 1 mPa was measured (1017).

Yield stress values were obtained for a wide range of materials: PS latex (647), silica spheres stabilised with PBMA in m-xylene (641), electrically stabilized polymer dispersions (previous work referred to in 616, pH effect), clay suspensions and drilling muds (588, 654, 935, 664, 650; 649 studied the effect of mass fraction), metal oxide suspensions (619), mica in water suspensions (644), crushed sand in water or lubricants (640), electrorheological fluids (769), tetracalcium aluminoferrite paste (648, effect of hydration time), cement pastes and mortars (972, effect of composition), thixotropic gels for submarine optical telecommunication cables (887), filled polymer melts (923), filled PIB suspensions (previous work referred to in 610), yoghurt (693), molten chocolate (726), yeast suspensions (724), W/O emulsions from crude oils (975, effect of wax content) and waxy crude oils (976). Compressive yield stress (as distinct from shear yield) was also measured for flocculated particle suspensions (579, relating to consolidation during the sedimentation process). As noted, some of these papers specifically studied the effect of factors such as composition and pH. One paper calculated yield stress for PS latex from known interaction potentials (647).

A number of engineering papers discussed yield stress fluids in pipe flow (723), helical flow (896) and mixing (631). And there were several theoretical papers on squeezing flow of (242) and 3-D computation with the Bingham body (297), and the vibration of a sphere in a non-linear mechanical model of a yield stress fluid (243).

Returning to the question of whether yield stress is a myth or whether it is real, the last word has by no means been spoken. To be provocative, it might be pointed out that allowing a suspension to show infinite viscosity at maximum phase volumes could be

interpreted as an implied assumption that it has a yield stress. If one is inclined to consider yield stress a myth, one might consider this line of argument for the existence of yield stress not as robust as supposed. Of course there are simpler reasons for yield stress, exactly the same sort of reasons why a solid, in one piece or in the granular state, is said to show yield stress. Another feature of yield stress is the practical point that one has to observe flow over a period of time in order to decide if it has stopped or not; the result depends on this time. I tried to make this point in Acapulco and developed the idea more fully at a subsequent BSR conference, that because of this yield stress can be considered a function of time. Perhaps when one measures yield stress in the future, it should be determined as a yield stress versus time curve. One would expect it to tend to zero as time becomes infinite and perhaps this would resolve the question: yield stress myth or real?

The other subject I followed was flow-induced structure in suspensions. Again it was discussed at the IXth ICR in Acapulco, but it did not cause as much a stir as yield stress. Nevertheless much research has since been carried out and, as Metzner pointed out in his plenary paper (9), "extraordinarily impressive advances are being made in studying and advancing our knowledge of the structure of concentrated suspensions of particles . . .". This was clearly demonstrated at this congress. People elsewhere and at this meeting had commented on the dominance of polymer rheology in this branch of science. This situation was now being corrected, although the count of papers in the proceedings showed that suspension rheology has still some way to go to catch up. It was pointed out that polymer rheology may be said to be characterised by the time scale (hence the importance of the Deborah number), such that the length scale has been neglected. The importance of the latter in suspension rheology was stressed by many speakers, with the phase being in danger of becoming the latest "buzz word". Nevertheless, there was a lot to hear and read about at this congress concerning suspensions.

Suspensions typically show shear thinning behaviour at low shear rates, and become dilatant at high shear rates, the onset of dilatancy taking place at lower and lower shear rates as the solids concentration increases. At the lower concentrations the dilatancy is described as continuous, but as it approaches the maximum packing concentration, the dilatancy becomes discontinuous. All this was well illustrated by the many papers in this congress. What was less prominent was the observation that experimental reproducibility was poor, as was discussed in Acapulco. Only one speaker here specifically mentioned this and only as background to his paper on the extensional viscosity of

filled PIB suspensions (610); but this emphasised how widespread poor reproducibility was. Most of the other papers investigated and were aimed at the understanding of the structure behind the flow curve behaviour. Many techniques were used: video enhanced light microscopy and cryogenic scanning electron microscopy (625), light diffraction (607, 616), small angle neutron scattering (616, 645), nuclear magnetic resonance imaging (585), a rheo-optical method, namely conservative dichroism (595), and straightforward use of video camera (622, on rod-like particles). Computer simulation was also used to predict density distributions (582) and phase diagrams (637 and mentioned in the lecture by Russel). A mass of details was described. It was shown that shear thinning could be accompanied by structure having some hexagonal symmetry, which disappeared beyond the onset of shear thickening (616). The shear-thinning structure might have short range order also (616), such as strings and layers (576). One paper concluded that "the type of underlying structure in the different flow regimes is still not properly understood".

That the understanding of flow-induced structure was as yet incomplete was not surprising and clearly further research is to be encouraged. However, I am still concerned about how the understanding could be used to solve application problems. Will we foresee a day when one would use the techniques to probe structure as a matter of routine in the QC laboratory? How would we use the structural information in product development, engineering design and plant operation? I would like to see more research into these questions as well.

I must not leave the subject of suspensions without mentioning the papers dealing with the role of particle interactions. Those I particularly noted were by Buscall (591), de Rooij *et al.* (647), Woutersen *et al.* (637) and the keynote lecture of Russel. They discussed the quantitative derivation of rheological properties (viscosity, yield stress and complex modulus) from interparticle pair potentials, be they hard spheres, with or without surface adhesion, soft spheres or colloidal potentials. This forms the basis of our understanding of the chemistry of suspensions and eventually their design and quality control. I foretell many more of such papers at the next congress.

The closing session of the congress was a panel discussion on rheology in industry. Three prominent industrial rheologists, Dr K. F. Wissbrun formerly at Hoechst-Celanese, Dr H. M. Laun of BASF and Dr R. Buscall of ICI, described their work and experience in applying rheology in their companies and made suggestions for future research to meet industrial needs. It was a pity that their talks were not recorded in the proceedings.

Of course, the congress was not all work and no play. Without being accompanied this time, I did not partake in the programme for accompanying persons; but some delegates did. There was a full social programme for the delegates anyway, starting with welcome drinks at the Sunday registration. Those who arrived early were able to view the annual flower carpet consisting of 650,000 begonias covering the Grand' Place, in addition to paying respects to the Manneken-Pis. This year, on the occasion of the flower carpet display, he was dressed as Elvis Presley. On Monday evening, there was a reception at the Town Hall next to the Grand' Place. On Wednesday, there was an excursion to Antwerp, with guided city tour in the afternoon and dinner afloat on the river Scheldt. The banquet took place on Thursday at the Autoworld.

I am sure that all participants agree with me that we benefitted from the technical sessions and informal discussions, renewed friendships and generally enjoyed ourselves in Belgium. For this we have to thank the Organising Committee, co-chairmen Professors Marcel Crochet and Jan Mewis, secretary Dr Paula Moldenaers and their many helpers, in arranging everything and ensuring that all went smoothly before and during the week. At the congress, the International Committee on Rheology met and accepted the invitation of the Canadian Rheology Group to host the XIIth International Congress on Rheology, on August 18-23, 1996, in Quebec City. Dr Daniel de Kee, President of the Canadian Rheology Group, accepted the "torch" at the Banquet and at the Closing Ceremony invited all rheologists to gather again in Canada in 1996.

David Cheng



Carole Moules and Ralph Oliver in earnest discussion at the ICR in Brussels.

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THE CASE OF THE MISSING INDUSTRIALIST, PART 2: THE WATERLOO SYNDROME

While I usually defer to my eminent colleague in his analysis of the criminal mind, I really considered that, in his interpretation of "Elongational Flows and the Case of the Missing Industrialists" ¹, Holmes was altogether on the wrong track. Since the middle of the previous year, we had vainly been seeking conclusive evidence to justify his theory that industrialists were exploring some new field of rheological endeavour. We were still no further advanced. Our researches had lead us finally to the pleasant town of Brussels where, it was rumoured, three of that rare and endangered species, Rheologistus Industrialus, would be on display at the end of the XIth International Congress. Such an opportunity to confront these elusive characters was not to be missed.

Privately, I still adhered to my belief that there was a conspiracy by industrialists to frustrate the elegant researches of the academic fraternity. This amused Holmes, who conceded that I might indulge myself by attending the scientific sessions, while he pursued more important matters.

The great detective was obsessed by the idea that his arch enemy, Professor Moriarty, would do something to frustrate the denouement that he planned. In order to gain local knowledge he had consulted an up-and-coming young Belgian detective. This rather pompous little man had, as he put it, "exercised his little grey cells" and recommended that Holmes "*cherchez la femme*".

Thus it was that Holmes, suitably disguised, had joined the accompanying persons programme where a large number of eminently *cherchezable* femmes were to be found. Holmes even insisted that I join him on one particular tour. This was a trip down the river Scheldt

"Well, Watson," he enquired "tell me what you see on the banks."

I confess that I am not a particular follower of modern art. The sculptures, awe inspiring in their scale, did not fill my heart with joy, although they did arouse my professional medical interest.

"These works," I observed "must belong to some lost civilization. They remind me of nothing so much as the laid open viscera of the human body."

"Excellent!" declared Holmes "You have it in one, Watson. Those sculptures are none other than the chemical plants which provide the life blood of our modern society. What goes on in those drums and silos, pipes and cooling towers, is none other than the industrial rheology that we have come here to study. The organisers of the meeting are to be congratulated on so skilfully preparing our minds for what is to follow."

Each night we compared our notes. Holmes had made several possible sightings of Professor Moriarty, but had been unable to apprehend him. I remained unconvinced: indeed, from the many excellent lectures that had been given by professors, I began to wonder if we had not misjudged Moriarty.

"See here, Holmes," I ventured, "I have attended the scientific sessions paying special attention to those dealing with stretching flows — which, you will recall, initiated this enquiry. I have discovered fresh evidence of the perfidy of those industrialists that you seem to admire."

"Indeed Watson," replied my companion as he took out his pipe, "tell me more."

"Why," I continued "in the session on mixing flows we had a series of most clear expositions of the vital importance of stretching flows in achieving good mixing."

Holmes removed his pipe, thought deeply and observed "That is indeed of the utmost consequence. Was there any comment from anyone admitting to being an industrial rheologist?"

On this point I swiftly disabused him. "It has taken the most careful academic research to uncover that those rascals have, for decades, been employing flows in which the streamlines converge, diverge and become interrupted in order to achieve good mixing without telling anyone that these involved stretching flows. It really is despicable that those devils had not used simple laminar mixing until they were authorised by academic research to do otherwise."

"It seems to me, my dear Watson, that we have here a case of the Waterloo syndrome."

Just as I thought that I had made my point, Holmes introduced this seeming irrelevance.

"Really Holmes?" I enquired after rapidly leafing through my Filofax, "I do not recall the case."

Wryly, Holmes explained himself. "Today, my dear Watson, I, together with the accompanying persons, visited the scene of that epic conflict. Not unnaturally, I looked for some monument to the military genius of the Iron Duke and the stalwart loyalty of Field-Marshal Blucher. My guide, however, somewhat scathingly observed that this was a temple to the memory of Napoleon. Both the noble Duke and the aging Prussian had been disqualified. Blucher's sin was to have appeared at the wrong battlefield. He was supposed to be picking strawberries at Wavre. His absence had obliged the French to eat far too many of the fruit. That over-indulgence had made them very Grouchy so that they had been unable to march to the sound of the guns.

While some allowance could be made on account of his age — it was considered that his actions had not been deliberate, but that he had forgotten that he was supposed to be retreating — he really should have known better than to gate-crash a party without the invitation of all concerned. However, the sins of the Prussians paled into insignificance in comparison to British perfidy. The redcoats, it seemed, had all been equipped with Wellington boots. Since there had recently been heavy rain, this gave them a most unfair advantage over the French, who fought in their usual gallant fashion “sans coulottes”. Thus, Waterloo has become a French triumph, although there was an imposing monument to the Prince of Orange, who was the only one of the allied senior commanders to behave like a gentleman and get himself seriously injured.”

“By George, Holmes!” I proclaimed “What will they say of this in England.”

“But,” I continued, “I still do not see the connection with my conspiracy theory about mixing flows.”

“The connection, my dear Watson, is that if you wish hard enough to interpret the facts in a certain way, then a way will certainly suggest itself. In the quest for truth, it is necessary to examine all the facts and let those facts speak for themselves.”

“In the case of mixing flows,” he expounded “you have ignored the fact that, had industrial rheologists not empirically derived mixing flows that involved non-laminar flow fields, there would, almost certainly, not have been a subject for academics to study. The fact that they chose not to describe them in the modern language of rheology merely demonstrates that language is created after the event which it describes.”

At last, I began to see the way in which the mind of my colleague was working.

“You mean, Holmes,” I offered “that the critical industrial problems are those for which no academic language has been formulated.”

A rare smile crossed the brow of the scourge of the underworld.

“Indeed, Watson” he said “if you can keep that notion in mind, you may yet resolve the mystery.”

“Remember,” he continued, “Examine every possible explanation, and having discarded those which are impossible, whatever remains, no matter how improbable, must be the truth.”

The last day of the conference dawned. The atmosphere was electric as we awaited the pronouncements of the distinguished panel of industrial rheologists. Already heresies had been proclaimed in many of the plenary lectures: “too much work on polymers”. . . “there

are some problems that numerical analysis cannot address". . . "there are no significant experimental results on melt fracture that were not reported twenty or more years ago". We listened enthralled as each presenter reviewed his field and identified the key problems.

Although there were elegant variations, the theme was obvious. The issues currently preoccupying industrial rheologists are those where the structure of the material is changing simultaneously with the deformation. Eloquently we were urged to redirect some of our attention to the real world of "mud, sludge and custard".

Holmes had the solution at once. he wrote one word in his notebook, tore out the page and gave it to me. I could sense the relief that he felt that he would now be able to complete his self imposed task by proclaiming the new doctrine to the assembled throng.

As the applause for the speakers subsided, the Chairman stepped forward, and then looked in dismay at the official conference clock.

"That devil Moriarty!" hissed Holmes. "He has tampered with the frequency of this new-fangled electricity so that the official conference clocks have run fast."

Thus it was that the opportunity was lost. The chairman announced that there was no time for contributions from the floor. The conference passed at once to the business of deciding when and where it would meet again, before the delegates hastily dispersed to their different continents.

Back in Baker Street, Holmes had retreated into one of his musical reveries, to the considerable aural discomfort of the household and our immediate neighbours. To regain his attention I unfolded the paper and laid it on the table.

"Ha!" grunted Holmes, as he paused in the middle of a cadenzza of unusual ferocity. "You are wondering, my dear Watson, what progress we shall find in the field of morphorheology, when we go to Quebec in four years time."

I confessed this to be the case.

"Well," responded the great detective, laying aside his violin, there is cause for hope. If you study the history of your Society, you will find that it was precisely the issues of mud, sludge and custard which brought the founding fathers together under the kind auspices of the Institute of Physics."

"Gad Holmes!" I expostulated "You are right. So how did it come about that the vision was submerged?"

"That," observed my colleague, "is the Waterloo syndrome."

REFERENCE

¹ BSR Bulletin 34, 2, 47-50 (1991)

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THIRD EUROPEAN SCHOOL OF RHEOLOGY

In considering the importance in the political field of the Maastricht Treaty and a unified Europe, it was a privilege to attend the European School of Rheology at Strathclyde University in Glasgow. Attending were 53 delegates, representing 10 countries, all of whom had an interest in rheology. My own interest in rheology arises from my course of research in working for a PhD in the Department of Materials Technology at Brunel University. I am looking at methods of processing complex shaped ceramic bodies using polymer processing technology. Essentially, a high loading of ceramic powder is incorporated into a polymeric binder system which is subsequently shaped. An understanding of the shear and extensional flow behaviour of these polymer-ceramic suspensions is needed, and thus I investigate rheological phenomena.

On arrival in Glasgow, my first experience of fluid flow was the almost continuous downpour of rain from the grey clouds which dominated the skies. I was met by Dr Nick Hudson who assured me that the fun-packed schedule of lectures, seminars and demonstrations would more than adequately occupy my full attention on the real issues facing rheologists, rather than on the fluid dynamics of Scottish weather! He was right.

"Well, it's 2 o'clock and it's Monday 31st of August, which means it's time to start the third European School of Rheology" announced Professor Jim Ferguson in his opening speech. The hard work had now begun.

During the next 11 days, the vast subject of rheology was explored from mathematical models of simple fluids (far from simple, I thought!), Newtonian and non-Newtonian flow behaviour, viscoelasticity, yield stress phenomena, shear flows and elongational flows through to biological fluids, thixotropy, suspensions and emulsions, rheological measurement and industrial applications of rheology. The lectures were presented by leading rheologists in Europe, who were willing to share their experience and knowledge in answering specific questions during the course. The lectures were supported by comprehensive notes and references.

Various instrument manufacturers demonstrated their latest (and greatest) rheometers throughout the duration of the course. Intended as teaching demonstrations, the sales representatives of each company nevertheless tried their best to sell their wares. Did anyone tell them Professor Howard Barnes was lecturing on the course? "I'm here to tell you everything the instrument manufacturers don't" proclaimed Barnes in the opening of one of his lectures, and then proceeded, very fairly, to detail the limitations and weaknesses of some rheometers. The

demonstrations were a valuable and necessary part of the course, offering a practical and experimental insight into rheology. A range of demonstration samples was used, including paints, tomato ketchup, polymers, "Silly Putty" and an egg!

Talking of food, the restaurant at the Business School, where the course was held, offered a varied selection of meals at lunch and dinner times. The restaurant was the venue in which attendees discussed together the issues arising from their own understanding and experience in rheology. At last, someone gave me some much needed sympathy for attempting to build my own extensional rheometer. Meal times also provided for an opportunity to ask lecturers those questions which you were too embarrassed to ask in front of everyone else in the lecture theatre. At the end of each day, various groups of course delegates would adjourn to "alternative" venues to continue their rheological discussions (or talk about something completely different).

An enjoyable part of the course was the seminar presentations given by the enthusiastic rheologists attending the School. This allowed for the opportunity to find out what other people were doing in the field of rheology, what problems they were experiencing, what ambitions they had and how rheology was being applied as a scientific tool, unlocking some of the secrets found in engineering reality. Many conversations were nucleated at these seminars and it was encouraging to see so many people taking part.

All presentations were given in English, despite the European nature of the course. I wonder, if a united Europe becomes a reality, along with a European currency, whether there will be moves to establish a unified language - that is if it isn't already English! (This was written before the recent financial difficulties — *editor*)

I thoroughly enjoyed the European School, despite the hard work, and wish to express my sincere thanks to the British Society of Rheology for their generous financial gift, which contributed towards the cost of the accommodation.

It didn't always rain in Glasgow, but fortunately that didn't stop us from talking about fluid behaviour . . . and rheology.

James Greener.

SOJOURN WITH SIDNEY

The Society's Autumn Conference, joint with the Groupe Français de Rhéologie, was held in Sidney Sussex College, Cambridge, on the subject of Gels and Microstructured Fluids. 64 delegates gathered near the banks of the Cam to hear about such diverse materials as crushed tomatoes, cheese and cement and to carry out practical rheology investigations on things like crème brûlée (yield stress material with a brittle, glassy topping) and on the interaction between the quality of presentation (mental stimulus) and the yield behaviour of cartilage (physical stimulus).

The technical programme was held in the Chemical Engineering Department, a few minutes walk through the town from Sidney's and was as published in previous Bulletins with additional papers by Sherman and Meeten on ultrasonic propagation in viscoelastic materials and by Williams and Williams on rheological spectroscopy by wave interference technique. There was a small exhibition of equipment, with the ubiquitous Carrimed and a welcome newcomer in the form of Cheema Technology. Additionally the Society's stall had membership forms, lists for checking, back numbers of the Bulletin for inspection and ties and tie pins for sale.

The quality of the presentations varied, with some speakers hiding high quality research behind slides with too much detail and too small print. Of course, sitting on hard wooden benches with backache makes the critical faculty more critical! One presentation which does stick in the mind was that by Korolczuk who showed some slides with three dimensional plots in which the values of the dependent variables on the z axis (normally very difficult to display) were highlighted in rainbow coloured contours. A marvel of modern technology.

I would favour some kind of recognition of good quality and some kind of feedback to authors and speakers so that those who fall short can be encouraged to improve. A dictum I try to follow is that a lecture should be like a good swimsuit — neat, brief, appealing, covering all the essential parts, but hinting at further delights in store. At first I thought this was rather sexist, but then another delegate pointed out that you could easily imagine the Chippendales inside your swimsuit. I am not sure if that makes it better or worse. Seriously though, the poor speakers will always be with us and it is time we helped them.

Sidney herself was well and treated us most hospitably. I was very optimistic when we filed passed a veritable wall of wine cases to our first dinner, but sadly (for us) it was still there when we left, stocks laid in (or down?) for a Feast the following weekend. The sixteenth century ambience is most charming, but one begins to notice the lack of

ensuit facilities nowadays (is one growing older perhaps?) and it is always disconcerting to find that the shower ranges from too hot to scalding! The customary Conference Dinner was a great success, presided over by portraits of good Queen Bess and Sidney and Oliver Cromwell. The latter is fitted with curtains, so he can be hidden if need be. Ralph Oliver, our new President, welcomed our French colleagues and suprised many people by telling us un conte humoureux about himself *en français*. He looked forward to the two societies having a joint conference in France in the not too distant future. The main event of the evening was the presentation of the Annual Award to Chris Petrie. In his reply it was evident that plans by the Council to spring a "This is your life" suprise had failed, because the subject had noticed the temporary absence of his C. V.. We were delighted to have Ann with us as well.

Our thanks go to the organisers, Malcolm Mackley and Robert Marshall in Cambridge and Dick Buscall on the scientific side, who made us welcome and comfortable, gave us some good science and fitted a Council Meeting, the A. G. M. and some good weather into two days with Sidney.

Phil Banfill

ANNUAL AWARD 1992

The British Society of Rheology's Annual Award for 1992 goes to the distinguished theoretician and indefatigable conferencer, Dr Christopher James Stewart Petrie. Chris was born and spent his school days in Scotland. In 1957 he came south to Cambridge, to be an undergraduate of Trinity College. Here he prospered, and in due course was awarded a first class degree in Chemical Engineering. Chris stayed on, as Senior Scholar with support from Industry, to carry out research for a PhD under the supervision of past President Professor Anthony Pearson. For his thesis 'A theoretical approach to melt flow instability' he duly received his Doctorate in 1965.

He was then awarded a government Research Fellowship to enable him to conduct 'A theoretical analysis of film blowing', until his appointment in 1966 as lecturer in Engineering Mathematics at the newly formed University of Newcastle upon Tyne. Here, and on a Leverhulme Research Fellowship in Delaware for six months in 1974, he continued his rheological interests and steadily increased his output of published papers and contributions to conferences, often abroad. In 1981 Chris was promoted to Reader in Theoretical and Applied Rheology in Newcastle, a position which (apart from six months in the

Antipodes in 1988) he has fulfilled admirably ever since, including the supervision and teaching of four successful PhDs and innumerable MScs.

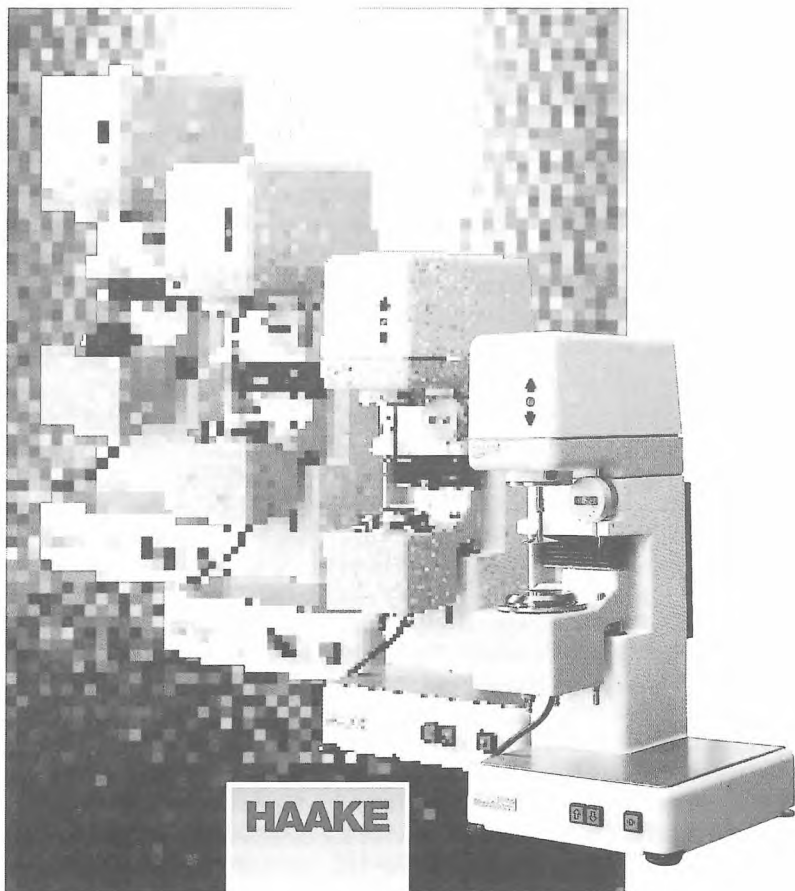
Throughout his writings Chris has always maintained the Pearson tradition of precise mathematical description of rheological events. His monograph 'Elongational Flows' which was published by Pitman in 1979 could be said to be ahead of its time in that he wrote with mathematical authority on a subject which during this period had been explored by few. In subsequent years Chris has continually striven to ensure that his work is of relevance to both polymer processing world and applied mathematicians.

Chris is now one of the select group of British rheologists who enjoy a truly international reputation. The academic thread of most of his work has been concerned with his interest in applied mathematics, rheology in general and extensional flow in particular. He also appears to have had a great respect for the work of Russian rheologists and has devoted much time to helping them. He is probably one of the very few European scientists who has followed the Russian and Eastern European literature over the last decade.

Chris, who had joined the Society in 1961, was elected to Council in 1977 during the B.S.R.'s very successful Edinburgh meeting on Stretching Flows which he had helped to organise, including editing the proceedings for a special issue of the new *Journal of Non-Newtonian Fluid Mechanics*. At the next A. G. M. he took over from Neil Cogswell as Secretary, and for the subsequent four years Council's affairs were never in better hands. It was during this period that Chris took on the additional role of Secretary to the European Delegates to the I. C. R., and he has continued to be, as he puts it, an 'intelligent letterbox' to this day.

In addition he found time to organise and edit the proceedings of the joint meeting with the Italian Society on Stretching Flows held in his home city in 1981, and subsequently to organise the joint meeting with the Belgian Society on Entry and Exit Flows held in Canterbury in 1987. He is most recently remembered for the substantial part he played, including editing papers for a special issue of *Rheologica Acta*, in the success of the Society's highly acclaimed Golden Jubilee Meeting (which was also the Third European Conference on Rheology) in Edinburgh just two years ago.

Chris's current involvement is the International Symposium on Viscoelastic Fluids to be held in Tobago, in January 1994. He is B. S. R. representative on the organising team.



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COMMENTARY ANNUAL GENERAL MEETING

It's 5. 32 and those suffering from backache have had a chance to stretch themselves after the end of the last paper of the day, presented in the elegant but uncomfortable surroundings of the Chemical Engineering lecture theatre. Whilst relaxing their synovial fluid they have been able to browse over Scott-Blair's medals and the various B. S. R. memorabilia thoughtfully brought along by the Secretary who avoided a Latin inscribed wheelclamp by parking in a multi-storey car park (£12 a day) but still, with others, suffered a break-in overnight.

David Cheng closes the door and there is a bit of a hush followed by a discussion about whether we should wait for anybody to walk from Sidney Sussex College. By popular request we start (nobody else came anyway). The 25 people present are ready for the 52nd A. G. M.. We note that the Agenda is a recycled version of last year's with only the dates changed. David gives his report, followed by Peter, the Treasurer. Only draft accounts are available this time, but someone asks if we could get better interest on our assets. Thoughts arise in members' minds about the Bank of Commerce and Credit International and Local Authority Bonds so we decide to stay with the sign of the Black Horse.

Now it is Doug's turn, and he tantalises us with the long awaited Membership List, possible now that his records are all sorted out. I say a few words about the Bulletin, to which Ralph comments about how much overseas members appreciate it. Geoff hopes to reach 1000 abstracts this year, but does an awful lot of work himself. Only 20% of the abstracts come from 60% of the 200 journals we cover. He pleads (again) for members to send him copies of their published papers.

Then, after Carole's report, it is election time and with two nominations to fill the vacancy created by Dick's retirement we appoint tellers. While they are out, Ralph Oliver accepts the chain of office from David Cheng and says a few words, looking forward to his term as President. The election result sees Gerry Meeten elected as a new Council Member.

Finally, two brief reports on the North Midlands Group (a return to the informal traditions of the British Rheologists' Club) and the Scott Blair Collection at Aberystwyth and we finish at 6. 30. There is just enough time to walk back to the college to change into something else for pre-dinner drinks in the Knox-Shaw room (and if you are not sure of the way . . .).

Phil Banfill

OFFICERS' REPORTS

This section contains the reports of the Officers of the Society presented to the A. G. M. held in Cambridge on September 15th, 1992

PRESIDENT

We have completed another year of activities. The taking stock since our Golden Jubilee has continued to some extent, but we have also continued with several new initiatives. It is a pleasure for me to review all this with you.

The main activity of the Society is of course the scientific meetings. The Annual Conference last September in Bristol, although billed as "Engineering Rheology", in fact covered a wide range of topics and this was much welcomed by the delegates. The Spring Meeting in London was held jointly with the Construction Materials Group of the Society of Chemical Industry. The subject was "The Rheology of Inorganic Building Materials". This was more down to earth, although some speakers from our Society tried to inject some science into the proceedings. Our North Midlands Group, with Dr Geoff Tattersall at the helm, has held four meetings since formation. The topics discussed were control of concrete production, metal slurries, and polymer melt rheology as design aids; the last meeting was to be a visit to an R & D laboratory. The big event during the year was the XIth International Congress on Rheology in Brussels. Some 50 delegates from Britain attended. Full reports of these meetings can be found in the Bulletin.

We are now in the middle of our Annual Conference this year. It is a joint meeting with Groupe Français Rhéologie. For the future, the Annual Conference next year, "Theoretical Rheology", will also be a joint one, with the Nederlandse Rheologische Vereniging. The Spring Meeting will be on "Experimental rheometrical measurements"; it will be held in tandem with a meeting of the Non-Newtonian Club, at which several members of the Society will speak. Looking further ahead, the 4th European Conference will be in Seville, Spain, in September 1994 and the XIIth International Congress on Rheology will be in Québec City, Canada, in August 1996. Full details of these and other rheological meetings at home and abroad can again be found in the Bulletin. Between them the Bulletin Editor, Dr Phil Banfill, and the Secretary to the committee of European delegates to the International Committee on Rheology, Dr Chris Petrie, keep track of these events and keep us informed. The idea is that any member travelling abroad on business or holiday may wish to plan the itinerary so that they can attend. If they do, Council would like them to convey the Society's greetings to the host Society; a small travel grant may be available. Please contact either the President or the Secretary if you are thinking of doing this.

While in Brussels for the XIth ICR, I represented the Society at the meeting of the International Committee on Rheology. This is composed of 22 member Societies, with a total membership of over 5000. The Soviet Society of Rheology (now under reorganisation) was admitted in 1991 and the Korean Society of Rheology, at the Brussels meeting. The Secretary's Report is published in "Theoretical and Applied Rheology", the Proceedings of the XIth ICR. He concluded that "the state of rheology worldwide is strong and healthy. Membership is growing, new Societies are being formed, meetings and publications are frequent, and more awards for achievement are being established."

Turning back to domestic activities, a Scott Blair Collection Working Group has been set up, with Chairman Dr Mervyn Jones and Secretary Mr Roy Carter. The terms of reference are "To oversee the day-to-day affairs and to promote the use of the Scott Blair Collection at UCW Aberystwyth as laid out in the bequest and as determined by the Council of the British Society of Rheology, eg. to decide on the purchase or alternative acquisition of new and interesting old books, periodicals and conference proceedings, and the deposit of archival materials pertaining to the British Society of Rheology". It meets every three months or so, starting in February 1992, and makes regular reports to Council. Many gifts of books and papers, and offers to the Collection have been received. A full list will be published in due course.

The other two Working Groups have also made progress. That on a Proposed Handbook on Rheology (Chairman Dr David Cheng), now tentatively called "Rheology A-Z", has defined the readership and scope, and has published a notice seeking the views of B. S. R. Membership and world rheologists. You are urged to give your comments and are invited to offer yourselves, or to nominate others, to contribute articles for the handbook or to act as referees. That on Transparency in Rheometer Operation and Computer Software (Chairman Dr Howard Barnes) has published a list of questions in a Rheometer Survey addressed to instrument manufacturers. Some responses have been received and are being studied. Again, both manufacturers and instrument users are invited to provide input to ensure the success of the exercise.

The questionnaire on the Society's activities covered a review of *Rheological Abstracts*, the Bulletin and the Society in general. Dr Geoff Brownsey has made a preliminary report on the responses in the Bulletin and thanked all those who returned the questionnaire. The responses will be closely studied by Council and will surely help in improving the services it renders to the membership.

Council has again decided not to make a Gold Medal Award this year. I think this is regrettable, but would leave it to the historians to

ponder on the significance. The Annual Award is made to Dr Chris Petrie for his contribution to research in extensional flows and for services to the Society. The presentation will take place at the Conference Dinner tonight according to the usual practice. The full citation will be published in the Bulletin.

It cannot be said too often that the vitality of our Society owes much to the dedication of the Officers and other Members of Council. The present economic and political climate has not been easy and has touched many of us personally. Several of us, Council Member or not, have changed our employment status, as you may have noticed in the fine print of the Bulletin. Others no doubt are in the throes of it, or have to adjust to new ways of working. But no Officer has neglected his/her duty to the Society. The Secretary keeps the paperwork tidy and makes sure that everyone turns up at the right place and at the right time for meetings. She has the added task of maintaining the Council Memoranda which record Council decisions for ready reference and ensure that the increasing numbers of Council jobs are not overlooked. The Treasurer more than just keeps our books in order; he exercises tight control on outgoings, prepares a balance sheet each quarter and has always forecast that our income exceed expenditure. The Membership Secretary has the unenviable task of pruning our membership in the preparation to publish the long awaited "List of Members". As I know from personal experience, every Membership Secretary tries to maintain and pass an error-free membership record to the next, but no one seems to have succeeded. Dr Doug Hourston has the job this time and he will leave us with a slimmer but stronger membership. I do not need to say any more about the Abstracts and Bulletin Editors except to point to the thick publications that come to each of us every quarter and, no doubt, eagerly devoured. As to the Ordinary Members of Council, they take turns to write the Commentary on council meetings for the Bulletin, volunteer to organise the Society's scientific meetings and serve on the working groups, too numerous to name individually. Once again, on your behalf I would like to say thank you to each and every one of them.

Lastly, I have to say that I am now coming to the end of my two year term. I remember accepting the honour with some trepidation of the responsibility, but with the support of Council I need not have worried. I hope I have done something to strengthen the Society. I particularly wish that two ideas that I have brought to Council, namely the handbook on rheology and the drive for transparency in rheometer operation and computer software, meet real needs of B. S. R. members and rheologists at large and will come to useful fruition in due course. In the meantime, I thank Council and all B. S. R. members for making my term as your President such an enjoyable one.

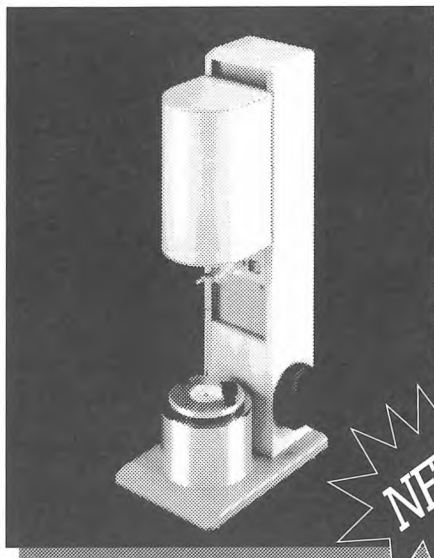
David Cheng



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SECRETARY

The past year has been an especially busy time for our Council, as well as a major 'rheological' year for all, highlighted by the XIth International Congress held in Brussels and the European School of Rheology recently held in the University of Strathclyde.

The outgoing President, Dr Cheng, who promoted two working parties which are actively pursuing their studies into the relevance of a 'Handbook of Terms' and 'Transparency in Rheometry and Computer Software' respectively, has ensured Council will not forget his 'reign'. It was nice working with you again.

The Membership Secretary, Dr Hourston has done stalwart work clarifying 'members' status and chasing unpaid fees. The new membership list will be out soon. He has also designed a new leaflet describing our Society, combined with an application form.

The *Bulletin* and *Rheology Abstracts* continue to thrive under the editorships of Dr Banfill and Dr Brownsey respectively.

I have revamped the Council memorandum to remind new Officers and Members of Council of past decisions.

Dr M. Jones chairs a working party which includes Dr A. Evans and Mr R.E. Carter. They are holding regular meetings to ensure the Scott Blair Collection continues to thrive.

There have been two successful meetings during the year, the A. G. M. and Conference on Engineering Rheology at Bristol a year ago, followed by a joint meeting with S. C. I. on Inorganic Building Materials in April. After this year's A. G. M. meeting on Gels, shared with the Groupe Français de Rhéologie, there are two others in the pipeline covering Experimental Rheometry and Theoretical Rheology. The former is running back to back with the Non-Newtonian Club's meeting on Rheology of Particulate Systems, and the latter is a joint conference with the Dutch Society.

We now have a thriving local group, the North Midlands Group, holding regular meetings, and a separate report is provided.

Grants have been awarded to 3 students during the year; two from Aberystwyth attended the Mechanics of non-Newtonian Fluids in Udine and James Greener from Brunel attended the European School.

A major disappointment is the lack of nominations for the Scott Blair Scholarship ie. Memorial and Biorheology — constant requests for potential scholars are placed in the Bulletin. I am sure there are many worthy graduates and we would like to hear from them and their supervisors.

There have been recognitions for Professors A. S. Lodge, J. D. Ferry and W. E. Stewart, elected to the National Academy of Engineering and most recently Dr Eirion Jones has been awarded a Chair at Plymouth.

I would like to offer my congratulations to Dr Petrie as recipient of the 1992 Annual Award. As Secretary of the European Societies he has kept me, and hence Council, updated on European events. He is well known within the International Rheological Societies and deserves this recognition.

Representatives of the B. S. R. include Dr Cheng on B. S. I. CIC/37/3 and ISO/TC134/WG2 (Fluid Fertilisers), Professor J. R. A. Pearson (Royal Society's British National Committee for Theoretical and Applied Mechanics) and Dr Petrie. Professor Pearson has confirmed that the Committee reached the end of its term in 1989 without having made any decisions of importance to our Society. Copies of correspondence and committee minutes are held by Council.

Unfortunately even the B. S. R. has been hit by the recession with the outgoing President, Treasurer and Secretary being made redundant in recent months. However it is apparent that rheology is alive and hopefully the livelihood of our members will thrive alongside it.

I look forward to working with the new President, Dr Ralph Oliver who is a personal friend, while wishing David Cheng a fond farewell. My best wishes also go to Dr R. Buscall who has helped to organise the current meeting and now retires from Council.

Carole Moules

MEMBERSHIP SECRETARY

Over the last twelve months most of my efforts have been directed towards two main goals. They were (a) to produce a new application form which also contains information about the Society and (b) to bring the Membership records fully up to date and produce a new Membership List to be sent to all members. I am pleased to report that both tasks are essentially complete. The Membership List, which now also contains a copy of the Constitution of the Society, will be forwarded to members before Christmas.

At the last A. G. M., I was unable to be precise about the number of active/paying members in the Society. All members whose records were incomplete have now received letters asking if they wish to retain their membership. A relatively small fraction responded positively, a few formally resigned and the vast majority did not reply.

I can now report that the Society has 531 *bonafide* members 375 (71%) from the U. K. and 156 (29%) from overseas. There are 46 (8.7%) Honorary members.

During the past year 35 U. K. and 10 overseas members joined the Society. 24 members submitted formal resignations during the year, apart from those who did not reply to my letters and will shortly be deemed to have resigned.

Doug Hourston

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NEW

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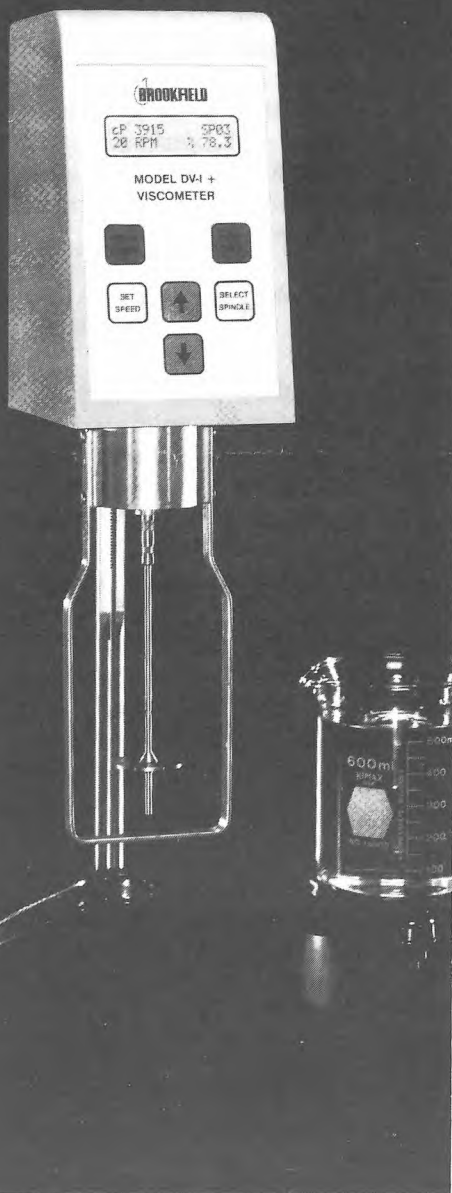
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RECENTLY PUBLISHED BOOKS

Information on recent books is given here for the benefit of members, but the Society cannot answer enquiries about the availability of particular titles. Place orders for books with publishers through booksellers and agents.

P. Moldenaers and R. Keunings (Eds.), *Theoretical and Applied Rheology*, Elsevier, 1992, two volumes xlv + 1020pp. ISBN 0-444-89007-6.

These are the proceedings volumes of the XIth International Congress on Rheology held in Brussels, August 1992. It consists of the 4 plenary papers, 10 keynote papers and 445 contributed papers, all prepared from camera ready manuscripts supplied by the authors and printed on high quality gloss paper. In addition to the papers there are Secretary's reports from the International Committee on Rheology for August 1988 and 1992.

D. N. Schultz, J. E. Glass (Eds.), *Polymers as Rheology Modifiers*, ACS Symposium Series No. 462, 358pp., American Chemical Society, Washington D. C., U. S. A. (1991). \$80.00.

This book contains 20 papers by well-known authors presented at an ASC symposium in 1989. There are papers on the fundamentals of the rheological characteristics of such substances and of their measurement, on gels and latices, and on special properties such as dilatancy of associating polymer systems. There is a contribution on the use of surfactants in combination with associative thickeners, and several deal with the modification of rheological properties as a result of polymer-polymer or polymer-solvent interactions.

J. M. Guenet, *Thermoreversible Gelation of Polymers and Biopolymers*, Academic Press, 1992, 296pp., ISBN 0-123005380-3, £40.00.

Thermoreversible gelation is a comparatively new and growing area of polymer science. It encompasses many different systems from synthetic polymers to biopolymers.

James F. Steffe, *Rheological Methods in Food Process Engineering*, Freeman Press, 1992, 240pp., ISBN 0-9632036-0-6.

This textbook provides an introduction to fluid rheology with the dominant focus on food and related biological materials. Engineers and scientists will find it a convenient reference for standard rheological methods and typical data, presenting the theory of rheological testing and it concentrates on the analytical tools needed to determine rheological properties of fluids from experimental data, methods typical in food industry applications.

MEMBERSHIP NEWS

The following applications for membership were approved at the Council Meeting, Sept. 14th, 1992.

Dr M. Jastrzebski,
Institute of Chemical and
Process Engineering,
Warynskiego 1,
00-645 Warsaw,
Poland.
(fetsa GM)

Mr J. H. Kelly,
Carri-med plc.,
Carri-med House,
Vincent Lane,
Dorking,
Surrey, RH4 3YX.
(ABCDEFGHIJKLMN)

Mr R. Rouse,
Redland Plasterboard Ltd.,
Pentlands, Marsh Lane,
Eastham-in-Gordano,
Bristol,
Avon.
(peta FGK)

Dr D. E. Smedt Stef,
Laboratory of General
Biochemistry and Physical
Pharmacy, Wolterslaan 16,
9000 Gent, Belgium.
(etsa DFGHLMO)

Mr B. L. Traherne,
Paar Scientific Ltd.,
594 Kingston Road,
Raynes Park,
London, SW20 8EN.
(pea)

Mr A. P. Wheakley,
Room 6/1210, Ford Motor
Company, Dagenham,
Essex,
RM9 6SA
(pea DO)

Professor Wronski,
Institute of Chemical and
Process Engineering
Warynskiego 1,
00-645 Warsaw,
Poland.
(fet GM)

Professor H. Kolsky, late of the Division of Applied Mathematics, Brown University, Providence, Rhode Island, U. S. A. and President 1959-60, has died.

Dr T. E. R. Jones has been promoted to Professor at Polytechnic Southwest, Plymouth.

SITUATION WANTED

S. M. Abu-Zour seeks a research position making use of his qualifications and experience: Ph.D. Applied Maths. (Rheology-Elongational Viscosity) —UMIST; M. Sc. Applied Maths. (Boundary Layer Theory and Heat Transfer) — Cairo; B. Sc. Mathematics with Distinction — Cairo, Teaching and Research experience. Full C. V. available. Contact address: 44 Winstor Avenue, Salford M7 0TG. Tel.: 061-792-5958

NORTH MIDLANDS GROUP

Unfortunately, we were forced to cancel the arrangements for a visit to the laboratories of British Gypsum, so the fourth meeting of the Group was held in the University of Sheffield and Dr M. S. Cheema gave a fascinating account of the Rheology of Lung Secretions.

The next meeting will also be held in the University of Sheffield, in the Department of Civil and Structural Engineering, on Thursday 7th January, 1993. Dr T. C. B. McLeish will talk about the Rheology of Entangled Polymers.

The present membership list contains 14 names and we should like to have more representatives from industry. All meetings are conducted very informally and all talks are at a level assuming no previous knowledge of the particular topic. It has been suggested that evening meetings might be more convenient to more people and the possibility of holding them in an even more informal atmosphere might be considered. Views from potential members are welcome. Contact Dr G. H. Tattersall, 174 Millhouses Lane, Sheffield S7 2HE (Tel. 0742-365144).

HAVE YOU HAD A PAPER PUBLISHED RECENTLY?

If so, send a copy of the abstract, including the full reference to the article to the Abstracts Editor, Dr G. J. Brownsey, AFRC Institute of Food Research, Colney Lane, Norwich NR4 7UA. By doing this you will short cut the abstracting process and get information to readers much more quickly.

SCHOLARSHIPS AND GRANTS

SCOTT BLAIR SCHOLARSHIP AND SCOTT BLAIR BIORHEOLOGY SCHOLARSHIP

In memory of the work and example of Dr G. W. Scott Blair, the Society and Pergamon Press make available a series of scholarships to encourage excellence in research. The Scott Blair Scholarship of the Society is for research in any field of rheology while the Scott Blair Biorheology Scholarship, funded by Pergamon Press, but administered by the Society, is for research in biorheology. The aim is to enable the scholars to undertake activities which would not normally be possible without such a grant, such as a period of work at an overseas University. Both scholarships are available for award.

PhD students, or equivalent, who are completing their first year of research, and are members of the British Society of Rheology, may apply to become a Scott Blair Scholar. PhD students, or equivalent, who are completing their first year of research in the field of biorheology, and are members of the British Society of Rheology, may apply to become a Scott Blair Biorheology Scholar.

The scholarships will have a value of £500 per annum (or such value as shall from time to time be decided by Council) to be used at the absolute discretion of the scholar. Subject to a satisfactory report from their supervisors, the scholarships will be renewable for a maximum of one more year. Thus they will usually be available during the second and third years of a normal PhD project.

In addition to the annual payment, Council will consider applications for additional funding to attend conferences. The scholars will be expected to present the results of their research at meetings of the Society, and to make occasional contributions to the Bulletin.

The Awardees of the Biorheology Scholarships will be expected to present the results of their research at meetings of the British Society of Rheology, and will be encouraged to publish them in the Journal "Biorheology" in accordance with its editorial policy.

The award of the Scholarships will be decided by Council who cannot enter into correspondence with unsuccessful applicants, and who reserve the right not to award a scholarship in any particular year.

Applications for the Scholarships should be sent to the Secretary of the British Society for Rheology as soon as possible. The application should be on no more than two sides of A4 paper and contain: personal details of the applicant, a description of the research, notes on any special uses envisaged for a proportion of the scholarship, and an endorsement from a person with supervisory responsibility for the research.

TRAVEL GRANTS FOR STUDENTS

The Society makes grants to students engaged in research in rheology to attend and present their work at meetings on rheology, both its own and those of other societies. Members of the Society, who are full-time students, may apply in writing to the Secretary to be considered for an award and that application should be supported by the student's supervisor. The application should give details of the proposed expenditure, the title and date of meeting and the title of the paper to be presented. They should be submitted in time for consideration at a Council meeting before the money is needed, i.e. by the beginning of March, June, September or December.

The amount and number of such awards will be at the discretion of Council.

CONFERENCE ANNOUNCEMENTS

EXPERIMENTAL RHEOMETRICAL MEASUREMENTS

A meeting to be held at the Manchester Conference Centre, UMIST,
Manchester, on March 31st-April 2nd 1993

This meeting is intended to place an emphasis on practical testing of industrial and biological materials. It aims to bring together product formulation chemists, quality control personnel, and production engineers, on the one hand, and research scientists, students and manufacturers of instruments, on the other. There will be an open session during the meeting for people to identify their application problems with feedback from an invited group of experts as well as the audience. A presentation of the preliminary findings of a study set up by the BSR to look at the transparency of rheometer operation and software analysis will be made. A special feature will be the discussion of a round-robin exercise involving tests on sample material, which has been organised. The results will be discussed at this meeting, with representatives of manufacturers present. To register please complete the accompanying form.

RHEOLOGY OF PARTICULATE SYSTEMS

The Non-Newtonian Club is holding a joint meeting with the Institute of Chemical Engineers, on the Rheology of Particulate Systems on March 30th, 1993, at the same venue as B. S. R.'s Experimental Rheological Measurements which starts the next day. Further details can be obtained from: Carole Moules, Camtel Sciences, 27, Alexander Road, Stotfold, Hitchin, Herts SG5 4NA Tel.: 0763 244280, Fax: 0763 244298, or Steve Beckett, Yorkreco, Nestec York Ltd., P. O. Box 204, York YO1 1XY, Tel.: 0904 602275, Fax: 0904 620439.

PRACTICAL APPLICATIONS OF RHEOLOGICAL MEASUREMENTS

A one day seminar concentrating on measurement techniques for commercial instruments combined with relating rheological data to product development, quality and control will be held in the Gardens Gallery, Plinston Hall, Letchworth, Herts on Wednesday November 25th, 1992. The speakers to date are Dr D. C.-H. Cheng, Mrs Carole Moules and Ms Lindsay Ray. Emphasis will be on applications and the programme includes rheological design for stability/solids suspension, use of particle size distribution to control viscosity and a suggestion to use zeta-potential and electrical conductivity measurement to relate to and modify slurry viscosity. For further details contact: Carole Moules, Camtel Sciences, 27 Alexandra Road, Stotfold, Hitchin, Herts., SG5 4NA Tel.:0763244280 Fax: 0763244298.

BRITISH SOCIETY OF RHEOLOGY
Experimental Rheological Measurements
at Manchester Conference Centre, March 31st — April 2nd, 1993

Please register me for the above meeting (BLOCK CAPITALS)

Name:

Affiliation:

Address to which correspondence should be sent

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.....
.....
Telephone Fax

		Please Tick your requirements		
Charges		Charge	VAT	Total
Conference fee, including: light refreshments, lunches and Conference Dinner on 1.4.93	BSR member	£75.00	£13.13	£88.13 ☐
	Non member	£90.00	£15.75	£105.75 ☐
Accommodation				
Bed & Breakfast 31.3 & 1.4.93		£70.00	£12.25	£82.25 ☐
inc. Dinner 31.3.93				
Exhibition Space		£200.00	£35.00	£235.00 ☐
inc. 1 full Conference Fee & accommodation				

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Please return as soon as possible to: Mrs Carole Moules, Camtel Sciences, 27 Alexandra Road, Stotfold, Hitchin, Herts., SG5 4NA. Tel.: 0763-244280. Photocopies Accepted

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THEORETICAL RHEOLOGY

A JOINT MEETING OF THE BRITISH AND DUTCH RHEOLOGY SOCIETIES
at Robinson College, University of Cambridge
September 22nd-24th 1993

A three day meeting on theoretical rheology will be held at Robinson College. It is proposed to cover topics on: Dilute and concentrated fluid behaviour, Pastes; Particles and Powders, Numerical Simulation

Robinson College is Cambridge's most recent College and participants will enjoy excellent conference and residential facilities. The College lecture theatre seats 240 people and it is hoped that the meeting will attract a wide and International participation.

Offers of theoretical papers and experimental work relating to theory should be sent to the address below, enclosing an abstract of the paper for consideration by the organising committee. If you would like to be put on the mailing list please indicate below.

Dr. M.R. Mackley, Department of Chemical Engineering, University of Cambridge, Pembroke Street, Cambridge, CB2 3RA.

I enclose an abstract for the Theoretical Rheology Meeting ☐

Please put me on the mailing list for the Theoretical Rheology Meeting ☐
(BLOCK CAPITALS)

NAME

ADDRESS

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KARL WEISSENBERG CENTENARY LECTURE AND DINNER

The Society proposes to hold this event in June 1993 at a venue to be decided. The format is expected to be a lecture by an eminent speaker followed by a dinner. For further information contact Mrs C. A. Moules, Camtel Sciences, 27 Alexandra Road, Stotfold, Hitchin, Herts., SG5 4NA

After leaving Germany in the 1930s, Weissenberg made his home in Britain and worked on crystallography and rheology and a book of essays by eminent authors celebrating his 80th birthday was edited by John Harris and published some years ago in East Africa, where John was working at the time.

INTERNATIONAL SYMPOSIUM ON VISCOELASTIC FLUIDS
TO BE HELD IN TOBAGO (TRINIDAD AND TOBAGO, WEST INDIES)
JANUARY 4-7TH 1994

CALL FOR PAPERS

Papers are invited on extensional flow, constitutive equations from a phenomenological (and mathematical) point of view, and microstructural modelling (leading to constitutive equations). other topics will be considered for inclusion in the programme.

It is hoped to attract rheologists in the forefront of international research and to have a meeting of a reasonably small size (no parallel sessions) in which informal discussions will be encouraged. Some rheologists from developing countries will be encouraged to attend.

Short abstracts of contributed papers and invited lectures will be available for participants and publication of the papers in a special issue of the *Journal of Non-Newtonian Fluid Mechanics* is planned following the Symposium.

Anyone interested in participating is encouraged to write to one of the Co-Chairmen of the Symposium, indicating the topic of their proposed paper: Dr H. Ramkisson, Department of Mathematics, University of the West Indies, St. Augustine, Trinidad, W. I., Telex: 24520 UWI/WG, Tel.: +1-809-6631559, Fax: +1-809-663-9684.

Dr C. J. S. Petrie, Department of Engineering Mathematics, Stephenson Building, University of Newcastle upon Tyne, Newcastle upon Tyne, NE1 7RU, U. K., Telex: 53654 UNINNEW G, Tel.: +44-91-222-6230, Fax: +44-91-261-0191, e-mail (Internet): Chris. Petrie @ Newcastle.ac.uk

CONFERENCE DIARY

DATE	PLACE	DETAILS
16/12/92	Sheffield U. K.	'Polymers in Motion', contact: Dr T. C. B. McLeish, Dept. of Physics, University of Sheffield, Sheffield S10 2UN. U. K..
7-11/2/93	Santa Barbara, California, U. S. A..	'64th Annual Meeting', Society of Rheology, contact: Dr A. M. Kraynik, Division 1511, Sandia National Laboratories, Albuquerque, New Mexico 87185, U. S. A..
8-10/3/93	Karlsruhe Germany	'Annual Meeting', Deutsche Rheologische Gesellschaft, contact: Prof. Dr K.-H. Habig, Bundesanstalt für Materialprüfung, Unter den Eichen 87, D-1000, Berlin 45, Germany

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

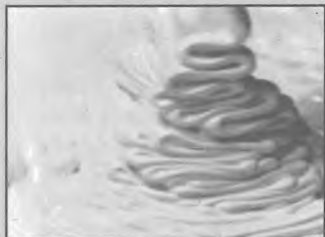
31/3-2/4/93	Manchester. U. K.	'Experimental rheometrical measurements', contact: Mrs C. A. Moules, Kruss UK Ltd., 5/6 Carrington House, 37 Upper King St., Royston, Herts. SG8 9AZ.
5-8/4/93	Manchester U. K.	'Ninth Annual Meeting', contact: Polymer Processing Society, 13400 A. David, St. Janvier de Mirabel, Québec, J0N 1L0, Canada .
20-22/4/93	Riga, Latvia	'8th International Conference on Mechanics of Composite Materials', contact: MCM-93, Institute of Polymer Mechanics, 23 Aizkraukles St., Riga 226006, Latvia.
26-28/5/93	Montreal, Quebec, Canada	'Recent Developments in Structured Continua III', contact: D. De Kee, Dept. of Chemical Engineering, University of Sherbrooke, Sherbrooke, Qué. J1K 2R1, Canada.
1/6-4/6/93	Ross Priors, U. K.	'Theoretical, Experimental and Industrial Aspects of Rheology', contact: Dr N. E. Hudson, Dept. of Pure and Applied Chemistry, University of Strathclyde, 295 Cathedral St., Glasgow G1 1XL Tel.: 041-552-5664 ext. 2162.
15-17/9/93	Reading U. K.	'Physical aspects of polymer science', contact: Prof. D. C. Bassett, J. J. Thomson Physical Laboratory, University of Reading, P. O. Box 220, Reading RG6 2AF.
22-24/9/93	Cambridge, U. K.	'Theoretical Rheology' contact: Dr M. R. Mackley, Dept. of Chemical Engineering, University of Cambridge, Pembroke St., Cambridge CB2 3RA.
17-21/10/93	Boston, Mass., U. S. A.	'65th Annual Meeting', Society of Rheology, contact: Dr A. M. Kraynik, Division 1511, Sandia National Laboratories, Albuquerque, New Mexico 87185, U. S. A..
4-7/1/94	Tobago West Indies	'International Symposium on Viscoelastic Fluids', contact: Dr H. Ramkissoon, University of the West Indies, Dept. of Mathematics, St. Augustine, Republic of Trinidad and Tobago.
4-9/9/94	Seville Spain.	'4th European Conference on Rheology', contact: Prof. C. Gallegos, Departamento de Ingeniería Química, Universidad de Sevilla, (Edificio de Química), 41071 Sevilla, Spain.
1995	Caracas, Venezuela.	'3rd Caribbean Conference on Fluid Dynamics', contact: Dr H. Ramkissoon, University of the West Indies, Dept. of Mathematics, St. Augustine, Republic of Trinidad and Tobago.

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

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