

BULLETIN



BRITISH SOCIETY OF RHEOLOGY

1973, Vol. 16, No. 3

CONTENTS

	Page
Foreword	i
Officers and Council 1972-73	ii
Australian Branch 1972-73 Council	ii
Come Together (Kurt Paulus)	35
Born Too Late	38
The Karl Weissenberg 80th Birthday Celebration Essays	39
Plastics Institute Publications and Courses:	
Plastics in Schools—Safety and Hazards	40
Principles of Extrusion Text	41
Fundamentals of Design in Plastics	41
Future Meetings:	
Plastics Packaging and our Society	41
Degradability of Polymers and Plastics	42
Gels and Gelling Processes	44
Engineering Design of Plastics Processing Machinery	46
C.N.R.S. International Conference on Polymers and Lubrication	47
Molecular and Convective Transport in Rheologically Complex Fluids	47
What's on at the Plastics Institute	48
Diary	49
News from Overseas	50
Computer Programme Abstract	51
Recent Elections	52

Hon. Editor:

Dr. J. M. HOBBS,
Properties of Fluids Division,
National Engineering Laboratory,
East Kilbride,
GLASGOW, G75 0QU.



FOREWORD

It is a strange thing in these days of rapidly advancing technology that communication is still a problem. Although man can send signals from Mars and colour television pictures from the moon, he often fails to keep in touch with colleagues in the same country or organization. He obviously could, as several means are available to him, but for some reason does not always do so.

There may be several reasons for this and a critical self-examination will possibly reveal a few. Some people may be too lazy to bother; others, busy at the time, fall victims to procrastination and forgetfulness. A few do not think it necessary and expect colleagues to have found out from someone else! No doubt numerous others exist.

Wherein lies the remedy? Is it all too easy to write a memo or lift a telephone? Would the use of more sophisticated methods overcome what is really a human failing? Probably not. As in so many more complex operations, the ultimate success of any communications network depends mainly upon the personal contributions of the individuals involved.

COUNCIL 1972-73

President: PROFESSOR P. FELTHAM, Department of Physics, Brunel University, London.

Hon. Secretary: DR. K. M. BEAZLEY, English China Clays, St. Austell.

Hon. Treasurer: MR. R. W. WHORLOW, Department of Physics, University of Surrey.

Membership Secretary: DR. J. FERGUSON, Department of Fibre Science, University of Strathclyde, Glasgow.

Abstracts Editor: MR. A. EVANS, Department of Surgery, University of Newcastle-upon-Tyne.

Bulletin Editor: DR. J. M. HOBBS, National Engineering Laboratory, East Kilbride, Glasgow.

Ordinary Members:

MR. F. N. COGSWELL, MR. J. F. HUTTON, DR. B. S. NEUMAN,
DR. D. R. OLIVER, DR. P. SHERMAN, DR. K. WALTERS.

AUSTRALIAN BRANCH 1972-73 COUNCIL

President: DR. P. U. A. GROSSMAN, C.S.I.R.O. Division of Building Research, Graham Road, Highett, Melbourne, Victoria.

Vice-President: MR. W. COPLEY, H. B. Selby & Co., 352 Ferntree Gully Road, Notting Hill, Melbourne, Victoria.

Secretary: DR. J. M. STEARNE, Footscray Institute of Technology, P.O. Box 64, Footscray, Melbourne, Victoria.

Treasurer: MR. G. GIBSON, Davis Fuller Adhesives, 98 Bromwell Road, Collingwood, Melbourne, Victoria.

Ordinary Members:

MR. N. CHILOV, I.C.I. (Australia) Research Department, Newson Street, Ascot Vale, Melbourne, Victoria.

DR. D. BOGER, Chemical Engineering Department, Monash University, Clayton, Melbourne, Victoria.

MR. R. VINEN, Footscray Institute of Technology, P.O. Box 64, Footscray, Melbourne, Victoria.

DR. R. FOX, I.C.I. (Australia) Research Department, Newson Street, Ascot Vale, Melbourne, Victoria.

MR. J. LUBBOCK, Dulux Australia, McNaughton Road, Clayton, Melbourne, Victoria.

The following article and letter appeared respectively in the February and April issues of *Physics Bulletin*. Although Council has no wish to sell the idea to BSR Members, it was considered to be of general interest. They are therefore reproduced here by kind permission of Dr. Paulus. — *Editor*.

COME TOGETHER?

By DR. KURT PAULUS

An exciting idea is currently circulating amongst at least some of the science and engineering institutions—to build a “science centre” in central London to serve as home and meeting place of some of the many learned and professional bodies in the United Kingdom.

The suggestion found a focus in a lecture facilitated by the Royal Society of Arts in London on December 5th, when J. E. Cummins (Governor of the Ian Clunies Ross Memorial Foundation, Australia) reported on the idea and development of a science centre in Melbourne. The history of that centre goes back some ten years when the Ian Clunies Ross Memorial Foundation initiated the project (Ross was Chairman of the Australian C.S.I.R.O.).

Physically, the centre is a building in Melbourne which provides office space, conference facilities and a social club for any of the scientific and engineering societies accredited to the centre that want to use these facilities. Not all societies have offices at the centre but may use it as a postal/telephone address. The membership of the centre now stands at over 80 institutions, a branch centre has been opened in Adelaide and a further one is being planned for Sydney.

Mr. Cummins was very persuasive about the success of the idea and of its practical development. It had brought, he claimed, a unity to Australian science and engineering and had resulted in much useful cross fertilization. Joint meetings were now being arranged by societies which previously did not even know of each others' existence. The very small societies which sprang up during the last 20 or 30 years as new subjects developed, found the centre particularly beneficial since they were able to use facilities which they could not afford themselves and were brought from isolation into the mainstream of science and engineering.

There are several compelling reasons for thinking seriously about a science centre in the United Kingdom, and Mr. Cummins's remarks struck a ready resonance in his audience, which was representative of a fair cross section of the institutions in this country.

(1) Accommodation in central London for the institutions' staffs is a very serious problem. The Institute of Physics, for example, may need to abandon its Belgrave Square office in 1984 when the lease falls due, as there is little likelihood that it will be able to renew it on terms

which it can afford. Already, several of the institutions which had offices in London have had to move outside; the Institute of Mathematics and its Applications is already in Southend. Even so, one or two societies now outside London would like to move in, such as the Textile Institute which is currently in Manchester.

(2) Very few of the London based societies have premises large enough to accommodate meetings and conferences, or even meetings of their own committees. When the Institute at Belgrave Square needs to hold four committee meetings a day it is more like a railway station than the headquarters of a professional institution. Many bodies therefore need to use the facilities of colleges and universities, and even Imperial College in London can only provide space for a limited number of meetings. A joint meetings centre would be a godsend. Facilities for exhibitions such as the Physics Exhibition would also be welcome.

(3) The small societies, with memberships of perhaps 200 to 1,000, are unable to afford proper office facilities of their own and need to rely on the voluntary efforts of their honorary officers. This may be a good principle, but it does not help the smooth running of a society's affairs and is hard on its officers. Some help is being given by the larger societies: The Institute of Physics provides headquarters facilities to several "daughter societies" and the Institution of Mechanical Engineers, for example, helps in a similar way. Most of the small societies, though, are still out in the cold.

Given that the Australian science centre is an eminent success, can the idea be made to work in the U.K.? The basic motivation is not the same in both cases, and the scale considered is certainly vastly different: the total membership of all the Australian institutions is less than 100,000, while that of the chemists and physicists' institutions alone in the U.K. is almost that number and the combined membership of the engineering institutions runs into several hundred thousands. Their combined permanent staffs will be nearer 2,000 than 1,000 and the office space required is formidable, as is the demand for small and large, modern meetings facilities. Add to that the fact that a building of the size required, in central London, would be of the scale of at least Centre Point (so why not Centre Point?), and the whole idea seems preposterous.

But the advice Mr. Cummins gave to his audience was: Think Big! The Australian centre's success, in spite of predicted difficulties, demonstrated the kind of benefits to be gained: all scientists and engineers had a meeting place, both social and formal; small societies had a permanent home and were able to contribute to "mainline" science; joint meetings increased useful cross fertilization; costs were reduced by pooling of facilities; and science as a whole was pulled together in the face of increasing specialization. Although in the U.K. there are already trends in this direction (daughter societies, joint

meetings through the C.E.I. and C.S.T.I. etc.), these could go a lot further and the benefits for everyone would be considerable.

So what can be done to reduce the proposition to manageable proportions? The first thing is a common approach by the larger institutions (not all of which of course will want to move all their staffs into a joint building) to hammer out what is required and to generate the necessary momentum for a second step. This will be to persuade the government to provide generous assistance for setting up the centre. A third step will be to think about rationalization of the societies' activities, many of which duplicate each other at the moment, through the creation of a joint meetings and conference organization, joint computerization of at least some of the societies' records, joint purchasing of supplies, paper, print, joint library facilities and similar steps. And fourth, but not least, there will be the need to pull in the smaller bodies, which will have to be thought about right from the start.

If the suggestion of pooling of resources and some operations seems far out to some of the more insular societies it must be remembered that the benefits of working jointly, if only in cash terms, would be considerable and would enable the societies to do more than their resources allow them now. In addition, the social and political weight of the scientists and engineers represented through a science centre would be vastly greater. "Thinking big", in these days of "big science", should not be left to the Americans or even the Australians.

It may be of interest that the idea of a science centre is not new even in this country. Back in 1947, the Royal Society, that forum for so many interesting activities, created an advisory committee to look at this possibility. At the time about 15 scientific societies were involved, including The Physical Society but excluding the engineering bodies, and the scheme for a science centre had similar objectives as those being thought about today. Even then the amount of space considered necessary was as much as 300,000ft. for just those institutions (including the very considerable requirements of the Royal Society). Negotiations proceeded well, if a little slowly, and by 1952 the government had agreed to build a science centre, along with accommodation for the Patent Office and the National Reference Library of Science and Invention, on the South Bank close to the present site of the Royal Festival Hall. Alas, difficult economic circumstances intervened and in 1958 the government decided against support of a science centre. The Royal Society's committee, accordingly, was wound up in October 1958.

It is clear from this that financial support for the scheme may be a major obstacle. But the question which the science/engineering institutions, and their members, must face is whether they should let themselves be carried away by events until they find that their activities are being seriously hampered by lack of suitable places to meet and

carry out their work, or whether they should be courageous now and push forward with an imaginative project for which their successors will thank them. If the difficulties loom large, then the answer is to come together and overcome them by concerted action.

One thing is certain, that unless interested societies and institutions are prepared to act to help themselves, and to demonstrate such preparedness, they cannot expect the necessary government assistance to be thrust upon them. The first move towards an objective which sooner or later will become necessary for all of them, except possibly the most fortunately endowed, must be made by the societies themselves.

BORN TOO LATE

By R. PRESS, Hon. Secretary

Dr. Paulus's article, "Come Together", in the February issue of *Physics Bulletin*, reported some developing interest in re-examining the idea of a "science centre" in central London, to serve as a home and meeting place for some of the many learned and professional bodies in the United Kingdom. As he pointed out, the idea is not a new one in this country; there have been several attempts to establish such a centre in London, with headquarters for various national scientific bodies but they have all fallen through and usually for lack of government support in an unfavourable economic situation.

Dr. Paulus referred to an address which had shown how some dedicated and determined people in Australia had created, by private enterprise and subscription, a very worthy centre for the scientific and technological societies of Australia. While the circumstances and requirements in this country differ in important respects from those in Australia, the success of the idea there has stirred renewed interest in similar possibilities here. These are currently being examined by a small working party which is under the chairmanship of Dr. Payne, Director of the Shoe and Allied Trades Research Association, and on which The Institute of Physics is represented. This examination parallels but does not supersede the attention already being given by the Institute to its own needs, as reported for discussion at our Annual Representatives' Meeting in May.

Whether the Australian success can be repeated in Britain, tailored to British circumstances and requirements, will depend on a number of factors not least of which will be the collective strength and will of those "born too late", that is later than the middle of the last century. Prior to that date a number of bodies who might otherwise now be facing accommodation problems received what is commonly known as "Grace and Favour" accommodation. These include the Royal Society (1660), with its elegant and spacious accommodation in Carlton Terrace; also the Royal Academy (1768), (exceptionally) the

British Academy (1901), the Chemical Society (1841), the Society of Antiquarians (1717), the Royal Astronomical Society (1820), the Geological Society (1807) and the Linnean Society (1788), which all now enjoy rent free accommodation in Burlington House which they cannot be expected to forego. The Physical Society (1874) and The Institute of Physics (1918) were among those born too late, although The Physical Society did profit from obtaining accommodation in Lowther Gardens, from the 1851 Royal Commissioners. The Institute of Physics was granted a lease of its present headquarters through the generosity of one of its Fellows, Lord Mount Edgcumbe, but this will terminate in 1982 when the Institute, like other scientific and technical bodies, will be faced with a severe accommodation problem. Perhaps the time is ripe for at least all those born too late to "come together" and follow the quotation, which inspired the Australian venture:

"Make no little plans.

"They have no magic to stir Men's blood and probably themselves will not be realized.

"Make big plans. Aim high in hope and work, remembering that a noble diagram, once recorded, will be a living thing, asserting itself with ever growing insistency."

THE KARL WEISSENBERG 80th BIRTHDAY CELEBRATION ESSAYS

A number of well-known authors, most of whom have worked directly with Weissenberg, have contributed a series of essays to mark his 80th birthday. X-ray crystallography and rheology are both fields in which Weissenberg worked and this volume will mark out his special contributions in each field and it should therefore be an important and authoritative historical and scientific record of a man who has made significant contributions in two distinctly different fields of work.

The contents of the volume include:

Biographical Notes by Dr. H. B. Seebohm.

A complete list of publications by Karl Weissenberg.

"Weissenberg's Influence on Crystallography". Prof. H. Lipson, F.R.S., U.M.I.S.T., Manchester, U.K.

"Karl Weissenberg's Influence on the course of X-ray Crystallography". Prof. M. J. Buerger, M.I.T., U.S.A.

"The Isolation of, and the Initial Measurements of the Weissenberg Effect". Dr. R. J. Russell, B.P. Sunbury, U.K.

"The Role of Similitude in Continuum Mechanics". Dr. P. U. A. Grossman, C.S.I.R.O., Melbourne, Australia.

- "The Effect of Molecular weight and Concentration of Polymers in Solutions on the Normal Stress Coefficient". Prof. G. V. Vinogradov and A. Ya. Malkin, I.P.S., U.S.S.R. Academy of Sciences, Moscow.
- "Elasticity in Incompressible Liquids". Prof. A. S. Lodge, University of Wisconsin, U.S.A.
- "The Physical Meaning of Weissenberg's Hypothesis with Regard to the Second Normal-Stress Difference". Prof. Dr. H. Giesekus, Universitat Dortmund, Germany.
- "A study of Weissenberg's Holistic Approach to Biorheology". Dr. G. W. Scott-Blair, Grist Cottage, Oxford.
- "The Weissenberg Rheogoniometer Adapted for Biorheological Studies". Prof. A. L. Copley and Mr. R. G. King, New York Medical College, U.S.A.
- Shorter contributions:
- "Weissenberg's Contributions to Rheology". Prof. W. Philippoff, Newark College of Eng., U.S.A.
- "The Early Development of the Rheogoniometer". Mr. J. E. Roberts, Defence Research and Dev. Staff, Washington, U.S.A.
- Publication is expected in September 1973. Further information may be obtained from Prof. J. Harris, Dept. of Mechanical Engineering, University of Nairobi, P.O. Box 30197, Nairobi, Kenya.

PLASTICS INSTITUTE PUBLICATIONS AND COURSES

PLASTICS IN SCHOOLS—SAFETY AND HAZARDS

Continuing its policy of publishing material on all aspects of plastics in relation to schools, the Plastics Institute Advisory Service for Schools has now issued a booklet entitled "Plastics in schools—safety and hazards".

This booklet contains advice on the handling of some of the solvents and other chemicals that are likely to be encountered during the study of plastics in schools. It also contains suggestions which it is hoped will assist in the safe and smooth operation of work areas in which plastics are used. The publication is not claimed to be a complete treatise on the handling of dangerous chemicals.

The booklet has been so designed so that, by utilizing two copies, it may be used as a wall-chart.

Copies may be obtained, price 10p each, from the Education Officer, The Plastics Institute, 11 Hobart Place, London SW1W 0HL (telephone 01-245 9555).

PRINCIPLES OF EXTRUSION TEXT

Because of a production error by Applied Science Publishers Ltd., reference to the Plastics Institute's involvement in the publication of the learning programme, "Principles of plastics extrusion", has not been made clear.

Steps have been taken to correct the error but unfortunately this has caused some delay in distribution.

The correct situation is that the text was prepared for the Plastics Institute by J. A. Brydson and D. G. Peacock; production was handled by Applied Science Publishers Ltd.

Copies are now available, price £2.00 each, from the Plastics Institute.

FUNDAMENTALS OF DESIGN IN PLASTICS

Modules 2 and 3 of the five one-week courses initiated by the Plastics Institute in association with four educational establishments have been fully subscribed. The full details of the courses still to be held are as follows:

31 December, 1973–4 January, 1974. 4 Industrial Design. Royal College of Art.

March 1974. 5 Economics, Marketing and Management. Cranfield Institute of Technology.

Full details and registration forms may be obtained direct from the colleges concerned.

FUTURE MEETINGS

PLASTICS PACKAGING AND OUR SOCIETY

October 23rd–24th, 1973. Bloomsbury Centre Hotel, London WC1

Packaging and its growing impact on the world in which we live will be the subject of a two-day Plastics Institute conference "Plastics packaging and our society", to be held at the Bloomsbury Centre Hotel, London WC1, on Tuesday and Wednesday, October 23rd and 24th, 1973.

The conference (running concurrently with the Foodpack Exhibition at Olympia) will enable all those concerned with packaging—the raw material suppliers, the packagers, the product marketing people and the consumers—to hear and discuss all points of view on a subject that has created much controversy over the past two or three years.

In particular, consumer organizations will be expressing opinions on this important aspect of modern living which will include those of the housewife, the disabled and elderly, and the traveller as well as the users of packaged foods in big institutions such as hospitals and hotels.

Speakers in the final session on "Society and the future of plastics in Packaging" will include Mrs. Roy Jenkins, Chairman of the Consumers' Association, a leading ecologist and a representative of the British Plastics Federation.

The conference fee, including a set of the papers, refreshments, lunches and the cocktail reception, is £26.00 + 10% V.A.T. (£20.00 + 10% V.A.T. for members of the Plastics Institute and the Institute of Packaging). Registration forms and additional information can be obtained from Mr. D. H. Cohen, Assistant Secretary, The Plastics Institute, 11 Hobart Place, London SW1W 0HL (telephone 01-245 9555).

DEGRADABILITY OF POLYMERS AND PLASTICS

November 27th and 28th, 1973. Institution of Electrical Engineers,
London WC2

PROGRAMME

TUESDAY, NOVEMBER 27TH, 1973

Chairman: W. F. Watson, Director of Research, Rubber and Plastics Research Association.

- 0.900 Introduction: Sir Harry Melville, K.C.B., F.R.S., President of the Plastics Institute.
- 09.10 1 Fundamental aspects of polymer photodegradation. A. W. Birley and D. S. Brackman, Imperial Chemical Industries Ltd. Plastics Division.
- 09.30 2 The photodegradation of some fibre-forming polymers. D. M. Wiles, National Research Council of Canada.
- 0.950 3 Photochemically-induced modifications in polymer structures (polyethylene, polystyrene and polyvinyl chloride). R. Ranby, Z. Joffe and J. Rabek, Royal Institute of Technology, Sweden.
- 10.10 Discussion.
- 10.40 Coffee.
- 11.10 4 Polymers with controlled lifetimes. J. Guillet, University of Toronto.
- 11.30 5 Control of the photodegradation process for some polymers bearing ketone groups. M. Kato, Research Institute for Polymers and Textiles, Japan, and M. Yamazaki, Japanese Zeon Co.
- 11.50 Discussion.
- 12.30 Lunch.

Chairman: P. J. Bakker, Director, Plastics and Research Institute TNO, Holland.

- 14.15 6 Controlled autoxidation of plastics. G. Scott, University of Aston.
- 14.35 7 The photodegradation of certain photosensitized hydrocarbon-plastics. C. E. Swanholm and R. G. Caldwell, Biodegradable Plastics Inc., U.S.A.

- 14.55 8 Acceleration of photo-oxidative degradation of polymers by various kinds of additive. V. T. Kagiya, Kyoto University, Japan.
- 9 Photo-Degradable 1,2 polybutadiene. Y. Takeuchi, Y. Harita and A. Sekimoto, Japan Synthetic Rubber Co. (This paper will be considered for publication only; it will not be presented at the meeting.)
- 15.15 Discussion.
- 15.45 Coffee.
- 16.15 10 The relative rates of degradability of paper-based and synthetic packaging materials. C. S. Hocking, The Swedish Packaging Research Institute.
- 16.35 Discussion.
- 17.00 Closure.

WEDNESDAY, NOVEMBER 28TH, 1973

Chairman: H. O. W. Eggins, Head of Biodeterioration Information Centre, University of Aston.

- 0.900 11 The nature of biodegradation of materials with special reference to polymers. H. J. Hueck, TNO, Holland.
- 09.20 12 The effect of chemical structure on the biodegradability of plastics. J. E. Potts, R. A. Clendinning and W. B. Ackart, Union Carbide Corporation, U.S.A.
- 09.40 Discussion.
- 10.00 13 Biodegradation of plastics. D. E. Hughes, University College, Cardiff.
- 10.20 14 Biodegradation of synthetic organic polymers and plastics. H. E. Worne, Enzymes Inc., U.S.A.
- 10.40 Discussion.
- 11.00 Coffee.
- 11.30 15 Low-cost degradable plastics. G. J. Griffin, Brunel University.
- 11.45 16 Studies on microbial degradation of plastics film. E. Kuster and A. Azadi-Bakhsh, Department of Agricultural Microbiology, University of Giessen, W. Germany.
- 12.00 17 Degradation of polymers and plastics under natural conditions. K. H. Wallhäusser, Hoechst, W. Germany.
- 12.15 Discussion.
- 12.45 Lunch.

Chairman: Prof. D. W. Saunders, Professor of Polymer Physics and Engineering and Head of Department of Materials, Cranfield Institute of Technology.

- 14.15 Summary of proceedings during first three sessions, followed by a review of the social, economic and environmental implications of degradable polymers and plastics. P. J. Bakker, Plastics and Rubber Research Institute, TNO.
- 15.00 Discussion.
- 15.45 Tea.

Further details and registration form from The Plastics Institute. The Chemical Society, Faraday Division (in Association with the Industrial Division)

GENERAL DISCUSSION ON GELS AND GELLING PROCESSES

To be held at The University of Essex, Colchester.

Tuesday, Wednesday and Thursday, April 9th, 10th and 11th, 1974

PRELIMINARY PROGRAMME

Introductory Talk: P. J. Flory, Stanford University, U.S.A.

- 1 New Crosslinking Processes. G. Beinert, J. Herz, G. Hild and P. Rempp, CNRS, Strasbourg, France.
- 2 The Critically-Branched State in a Covalent Synthetic System and in the Reversible Gelation of Gelatin. C. P. Covas, S. B. Dev, M. Gordon, M. Judd and K. Kajiwara, University of Essex.
- 3 The Formation of Mucous Gel from the High Molecular Weight Mucoprotein of Gastric Mucus. A. Allen, R. H. Pain and D. Snary, University of Newcastle-upon-Tyne.
- 4 The Formation and Structure of Gelatin Gels. I. Tomka, CIBA-GEIGY Photochemie AG, Fribourg, Switzerland.
- 5 Molecular Weight and Conformation of Branched Vinylpolymers, Chain Transfer with the Polymer and Chain Transfer with a Polyfunctional Chain Transfer Agent. W. Burchard, B. Ullisch and Ch. Wolf, University of Freiburg, Germany.
- 6 The Dependence of the Gel Point on Molecular Structure and Reaction Conditions. W. Hopkins, R. S. Smith and R. F. T. Stepto, UMIST.
- 7 Thermoreversible Gelation in Polymer Systems III. The Gel/Sol Transition in Vinylidene Chloride/Methyl Acrylate Copolymer Gels. M. A. Harrison, P. H. Morgan and G. S. Park, UWIST, Cardiff.
- 8 Gelation of Globular Proteins. M. P. Tombs, Unilever Research Laboratory, Sharnbrook.
- 9 Polystyrene Gels. G. Allen, University of Manchester.
- 10 The Helix-Coil Transition in Gelling Polysaccharides. D. S. Reid, D. A. Rees and T. A. Bryce, Unilever Research Laboratory, Sharnbrook.

- 11 Parameters of the Swelling Equation and Network Structure. K. Dusek, Czechoslovak Academy of Science, Prague.
- 12 The Dynamics of Gel Networks. S. F. Edwards, University of Cambridge.
- 13 Triple Helix Formation and Gelation in Aqueous Solutions in a Salt Free Single Strand α -Gelatin. D. Eagland, G. Pilling and R. G. Wheeler, University of Bradford, and E. G. Finer, F. Franks, M. C. Phillips and A. Suggett, Unilever Research Laboratory, Sharnbrook.
- 14 N.M.R. in Agarose Gels. W. Derbyshire and I. D. Duff, University of Nottingham.
- 15 Inelastic Neutron Scattering from Molecular Diffusion in Oriented Fluorocarboxylate/Water Mesophases. J. W. White, University of Oxford.
- 16 Laser Light Scattering by Polymer Gels. K. L. Wun, G. Feke and W. Prins, Syracuse University, New York, U.S.A.
- 17 Interparticle Forces in Montmorillonite Gels. I. C. Callaghan and R. H. Ottewill, University of Bristol.
- 18 Order-Disorder Effects in the Sol-Gel Transition for Polysaccharide Systems, and their Characterization by Chiroptical Methods. E. R. Morris, D. A. Rees, P. J. C. Smith and D. Thom, Unilever Research Laboratory, Sharnbrook.
- 19 Rheological and Swelling Properties of Alginate Gels. A. J. M. Segerin, J. V. Boskamp and M. van den Tempel, Unilever Research Laboratory, Vlaardingen, The Netherlands.
- 20 The Molecular Basis for Some Physical Properties of Alginates in the Gel State. O. Smidsrod, Institute of Marine Biochemistry, Trondheim, Norway.
- 21 The Rheological Monitoring of the Formation of Polyvinyl-alcohol-Congo Red Gels. H. Beltman and J. Lyklema, The Agricultural University, Wageningen, The Netherlands.

The papers will be issued as preprints approximately three weeks before the meeting, and will be available to both Fellows and Non-Fellows of the Chemical Society. An application form will accompany the final programme. (Please note that preprints should be ordered on the official application form, and not on the slip attached to the programme.)

Please address any enquiries to The Assistant Secretary, Faraday Division, The Chemical Society, Burlington House, Piccadilly, London W1V 0BN.

Accommodation will be available in the University Halls of Residence.

Joint I.Mech.E./B.P.F./Bradford University Conference
ENGINEERING DESIGN OF PLASTICS PROCESSING
MACHINERY

April 17th and 18th, 1974

CALL FOR PAPERS

Papers are invited from engineers involved in design, specification, development and maintenance and from research engineers on the following general topic areas related to injection moulding machines, extruders and other important plastics processing machinery:

General machine design.

Machine operation and control, including the implications for design and instrumentation.

Heating and cooling systems.

Heat transfer, stress analysis, polymer flow, computer aided design.

Hydraulics, pneumatics, fluid logic controls, electrical systems.

Novel machine designs and performance data.

Design of ancilliary equipment, e.g. raw materials and product handling machinery.

Performance data measurements.

Machinery manufacturing techniques and data on materials of construction.

Implications of mould and die design in relation to machine characteristics.

The following aspects are emphasized:

- (a) It is anticipated that all papers will include a strong quantitative element and that where possible theoretical aspects will be supported by experimental data.
- (b) Attempts to use a conference paper for substantial advertising of products are to be discouraged.
- (c) Papers describing collaborative projects between universities, research institutes and industry are particularly welcome.

Prospective authors should submit a title and brief synopsis for consideration before October 15th, 1973. Papers accepted will be required in their final form by February 1st, 1974. It is intended that preprints of papers will be issued to delegates prior to the conference and details of the format requirements will be forwarded for intending authors.

Address for all correspondence: Plastics Machinery Design Conference, Schools of Mechanical Engineering, University of Bradford, BD7 1DP. Detailed enquiries to Dr. J. Parnaby, telephone Bradford 33466, ext. 526.

C.N.R.S. INTERNATIONAL CONFERENCE ON POLYMERS AND LUBRICATION

This conference will be held at Brest (France), May 20th–23rd, 1974, on three themes:

Polymers as additives in lubricants.

Polymers and the drag reduction in turbulent flow.

Self-lubricant solid polymers.

Participants (polymer physicists and chemists, mechanical engineers) will be invited by the French "Centre National de la Recherche Scientifique" (C.N.R.S.).

Write: Pr. C. Wolff, Faculté des Sciences, 29283 Brest Cédex (France) before November 30th, 1973.

CONFERENCE ON "MOLECULAR AND CONVECTIVE TRANSPORT IN RHEOLOGICALLY COMPLEX FLUIDS"

To be held in Salford (U.K.) in September 1974

Within the past decade or so the rheological behaviour of a large number of anomalous fluids has been acceptably interpreted and, understandably, more and more interest has been recently paid to the characterization of transport processes taking place in rheologically complex fluids. It seems to us that a meeting of all those who have worked in this field within the past two or three years would be of mutual benefit and therefore the Department of Chemical Engineering, University of Salford, in co-operation with the Institut für Verfahrenstechnik, Technische Hochschule in Aachen, will organize an International Conference on "Molecular and Convective Transport in Rheologically Complex Fluids", to be held in Salford in September 1974, in sequence with the Conference on "Theoretical Rheology", organized by the British Society of Rheology in London. At the moment we have a number of tentative promises and in order to assess the potential size of the conference we would like to inquire whether you will be willing to accept our invitation to present a lecture.

At this stage we do not want to specify the content of the conference too narrowly but we envisage that the following topics should be included: mixing and blending of miscible non-Newtonian fluids, axial and radial dispersion of miscible non-Newtonian fluids in the channel flow, dispersion of solid particles in non-Newtonian fluids, dispersion and coalescence of immiscible fluids and gases in non-Newtonian fluids, molecular diffusion coefficients of gaseous, liquid and solid solutes in rheologically complex fluids, mass transfer across the interphase and through membranes with at least one non-Newtonian fluid, heat transfer in non-Newtonian fluids with and without scraped walls, thermal conductivity of rheologically complex systems, momen-

tum transport with particular emphasis upon the interaction of turbulence and viscoelasticity.

This should not be a complete list of topics and all further suggestions will be considered.

It is envisaged that the language of the conference will be English but the presence of an international community might make it possible to lead the discussion also in other languages.

WHAT'S ON AT THE PLASTICS INSTITUTE

11 Hobart Place, London SW1W 0HL. Telephone 01-245 9555

Full-day and in London unless otherwise stated:

1973

- | | |
|-----------------|--|
| 18 October. | Symposium: Structural foams expanded.
Birmingham, Midlands. |
| 18-19 October. | Short course: Plastics machinery instrumentation.
Stroud, Western. |
| 23-24 October. | Conference: Plastics packaging and our society.
H.Q.—Packaging Group. |
| 1 November. | Symposium: Modern toolmaking methods.
Solihull. H.Q.—Design Committee. |
| 6 November. | Symposium: Failure mechanisms.
H.Q.—Polymer Properties Group. |
| 13 November. | Symposium: Advances in vulcanization.
Liverpool, Merseyside. |
| 14 November. | Joint meeting with the Institute of Purchasing and
Supply: Plastics and the Purchasing Officer.
H.Q.—Commercial Group. |
| 15 November. | Interbuild conference: Flat roofs—design, main-
tenance and the use of plastics.
H.Q.—Building and Construction Group. |
| 27-28 November. | Conference: Degradability of polymers and
plastics.
H.Q.—Meetings Committee. |
| 29 November. | Joint symposium with the I.R.I.: Technological
forecasting by the Delphi method.
Glasgow, Scottish. |
| 29 November. | Young people's lecture.
Birmingham, Midlands. |
| 12 December. | Seminar (p.m.): Deformation and fracture.
Cardiff, South Wales. |

- 1974
- 16 January. Seminar: Polymers in the packaging of carbonated drinks.
H.Q.—Packaging Group.
- 7 February. Symposium: The moulding shop — injection moulding machinery.
Solihull, Midlands.
- 19–20 February. 2nd International conference: Carbon fibres—their place in modern technology.
H.Q.—Reinforced Plastics Group.
- 20 February. Meeting (p.m.): Developments in blow moulding.
Dover, London.
- 27 February. Symposium (p.m.): Plastics and paper in packaging.
Leatherhead, London.
- 27–28 February. Conference: Structural plastic foams.
Bradford, Yorkshire.
- 5–6 March. Symposium: Plastics in Europe.
Hayes. H.Q.—Commercial Group.
- 26–27 March. Conference: Plastics in agriculture and horticulture.
Wye College, Kent, London.
-

DIARY

1973

- 23–24 October.** Plastics Packaging and our Society. Bloomsbury Centre Hotel, London WC1.
- 28–31 October.** Society of Rheology. Annual Meeting. Montreal.
- 27–28 November.** Degradability of Polymers and Plastics. Institution of Electrical Engineers. London WC2.
- 29 November.** Fourth Professor Moore Memorial Lecture. “Polymer Pioneers of the Northern Counties” by Professor R. J. W. Reynolds. University of Bradford, 6.30 p.m.
- 31 December–4 January, 1974.** Industrial Design. Royal College of Art, London.
- March.** Economics, Marketing and Management. Cranfield Institute of Technology.
- 9–11 April.** General Discussion—Gels and Gelling Processes. University of Essex, Colchester.
- 17–18 April.** Engineering Design of Plastics, Processing Machinery. University of Bradford.

NEWS FROM OVERSEAS

Prof. Tamamushi writes from Tokyo, Japan:

"On the 25th of May, 1973, the Japanese Society of Rheology was established by the amalgamation of the two preceding committees on rheology, the one belonging to the Polymer Society and the other to the Society of Material Science of Japan.

"Since 1951 the national annual symposium on rheology has been held under the planning of the above two committees, and the Fifth International Congress on Rheology was held in Japan through the working of the organizing committee, with co-chairmen, M. Horio and B. Tamamushi, elected in the aforesaid two committees.

"Meanwhile the time has become ripe for establishing a society by the amalgamation of the two committees and henceforth the new society will hold the proper membership in the International Committee on Rheology according to its bye-laws.

"The officers and address of the society are as follows:

President: M. Horio (Kyoto).

Vice-President: Y. Mori (Tokyo).

Secretaries: H. Kambe (Tokyo), K. Nagamatsu (Tokyo),
S. Onogi (Kyoto), K. Umeya (Sendai).

Address: 1-101 Yoshida-Izumidono, Sakyo-ku, Kyoto
(Japan)".

In another letter from Australia, Dr. Stearne tells us:

"We are currently planning for a National Symposium to be held in 1974, the theme for which will be 'Bridging the Gap'. I will forward more details when they are at hand in case any of your members are planning to be in Australia between May and September next year.

"We have had two general meetings this year. The first in April, when we held a joint meeting with the Australian Paper Institute people, and Dr. Bengt Leopold, Director of the Pulp and Paper Research Centre at Syracuse University, New York State, gave a very interesting talk on the 'aims and objectives of the Research Centre'.

"Recently Dr. Paul Lesse, C.S.I.R.O., was our guest speaker at the June meeting and delivered a most eloquent dissertation on the 'Design of Rheological Relationships'.

"I would also like to mention that we have made Mr. R. S. T. Kingston an Honorary Member of the Australian Branch. Mr. Kingston was the first President of the Victorian Branch from 1960 to 1961, and has just recently retired from the C.S.I.R.O.".

BRITISH SOCIETY OF RHEOLOGY

COMPUTER PROGRAM CATLOGUE PUBLICATION ABSTRACT

- | | |
|---------------------------------|--|
| 1 Author. | J. Nebrensky. |
| 2 Establishment. | Chemical Engineering Department,
University College of Swansea, Swansea
SA2 8PP. Tel. No. (0792) 25678. |
| 3 Program Abstract. | The finite element method is used to calculate the velocity distribution and the flow rate in the metering section of a screw extruder, assuming a very slow, isothermal flow of the power-law fluid. |
| Input Data:
(cards) | screw and metering zone geometry, fluid properties, screw speed, inlet and outlet pressure, barrel temperature as the program is to be extended to solve non-isothermal problems, the data include also temperature of the flights and of the screw root; for the same reason, the fluid's apparent viscosity is required at three temperatures at least |
| Output:
(line printer) | radial, circumferencial and axial velocity components at selected points, coefficients for interpolation the velocity distribution by a polynomial, integral mean values of the second invariant of the shear rate over each finite element, flow rate. |
| Backing data
(magnetic tape) | Intermediate results which are common to all problems involving the same geometry and the same grid of finite elements, are stored in the binary mode. |
| 4 Program Date | June 1972. |
| 5 Language. | ALGOL (ICL 1900 series). |
| 6 Computer Requirements | depending on the fineness of the grid used, up to 40 K core store, 2 mag. tape decks, card reader, line printer. |
| 7 see 3 | |

8 References.

J. Nebrensky, J. F. T. Pittman, J. M. Smith, Polymer Engineering and Science—to appear shortly.
J. Nebrensky, J. F. T. Pittman, J. M. Smith. Reports to SRC—copies available upon request from Prof. J. M. Smith, Laboratorium voor Fysische Technologie, Prins Bernhardlaan 6, Delft, The Netherlands.

9 Related Programs

for naming the magnetic tapes, copying, plotting the down-channel and transverse velocity components.

10 Available for data processing.

RECENT ELECTIONS

The following applications have been received and approved:

Mr. Roger George Cooper, B.Sc.,
Department of Geography,
The University of Hull,
Cottingham Road,
Hull HU6 7RX.

Maria Dagraca Vieira de Faria,
Graduate in Pharmacie,
Lab. Sanitas,
Rua D. Yoão V,
24 Lisboa,
Portugal.

William John Ferguson, B.Sc.,
Department of Fibre Science,
University of Strathclyde,
George Street,
Glasgow G1 1XW.

Dr. Nicholas Edward Hudson,
B.Sc., Ph.D.,

Department of Mathematics,
University of Strathclyde,
George Street,
Glasgow G1 1XW.

Prof. Dr. Kurt Kirschke, Dr.,
Bundesanstalt für Materialprüfung
(Federal Institute for Testing
Materials),
1 Berlin 45,
Mutter den Eichen 87.

Dr. Norman Laws, B.Sc., Ph.D.,
Department of Mathematics,
Cranfield Institute of Technology,
Cranfield, Bedford.

Dr. Klaus Lederer, Ph.D.,
Inst. f. Makromolekulare Chemie
Th-Darmstadt,
D-61 Darmstadt,
Alexander Str. 24.

Robert Bruce McKay, B.Sc., Ph.D.,
A.R.I.C.,
Research Department,
C.I.B.A.-Geigy (U.K.) Ltd.,
Pigments Division,
Hairhead Road,
Paisley.

Dr. Raghunath Anant Mashelkar,
B.Chem.Eng., Ph.D.,
Department of Chemical Engin.,
University of Salford,
Salford 5,
Lancs.

Dr. Antonio Pedro De Gois Lupi
Nogueira,
Doctor in Pharmacy,
Lab. Sanitas,
R.D. Foao V No. 27,
Lisboa,
Portugal.

Zoran Petrovic, B.Sc., M.Sc.,
Department of Fibre Science,
University of Strathclyde,
George Street,
Glasgow G1 1XW.

J. N. McCullough,
Building Science Department,
University of Sheffield.

WE WOULD LIKE TO HEAR FROM YOU

B.S.R. members are reminded that the Editor of the *Bulletin* is always interested in receiving informative articles, comments, news and other material which would help to make the *Bulletin* one of the more welcome sights in the flood of reading matter to which most of us are accustomed and resigned.

Suggestions of possible improvements in the *Bulletin* would also be welcome. So if you have a thought and a minute to put pen to paper why not let us hear about it?