

BULLETIN



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GUEST FOREWORD BY THE SECRETARY

Future Developments in Rheology

The Autumn Meeting looks to the future to investigate the changes that are likely to occur in our science. Forewarned by such a meeting the members of this Society may like to consider how the Society should change itself to meet these new challenges. If change is appropriate then so too is maintenance, and we should consider how to maintain those spirits of informality and purpose which are amongst the traditions and strengths of our Society.

Two factors for change could be the Science Research Council and the high cost of the modern generation of rheometers. The Science Research Council sponsors the great majority of university research in the United Kingdom. It may also be argued that university research represents an increasing proportion of research in rheology. How then should the Society conduct itself with respect to the Science Research Council? Of course, members of the Society have always participated in the activities of the Council's various panels, but has the time come for a more formal relationship? Turning to rheometers we see a new generation of instruments capable of measuring, with fine accuracy, a range of parameters describing the rheological response of materials, but, at a cost. Of course, it is not necessary to use a radio telescope to look at the sky, and the subject and the Society will continue to attract workers with "string and sealing wax" as long as one phenomenon remains unexplained, nevertheless an increasingly important aspect of rheology may be the exact measurement of narrowly defined parameters by a small number of well equipped "central" laboratories. Naturally we would hope that the workers at such laboratories would wish to be members of our Society—but is this enough? Should we perhaps be sponsoring such a laboratory?

These are changes which the Society may face in the next few years. Do we need to change to meet these possibilities? While there is no merit in change for its own sake there need be no disadvantage in initiating a change which we consider will forward the objectives of our Society.

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A BRIEF HISTORY OF THE INTERNATIONAL COMMITTEE ON RHEOLOGY

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ABSTRACT

The formal recognition of rheology as a separate branch of science occurred in 1929 with the formation of the Society of Rheology in the United States. During the next eleven years rheological activities continued to grow, and new organizations were formed in Holland and in Great Britain. Immediately after the Second World War the International Council of Scientific Unions formed a Joint Committee on Rheology which evolved in 1953 into our present International Committee on Rheology. At the same time rheologists in Holland and Great Britain initiated the series of International Congresses which has continued to the present. The International Committee has now grown to include eleven member organizations and has been granted affiliate status by the International Unions of Pure and Applied Chemistry and of Theoretical and Applied Mechanics.

1. INTRODUCTION

The origins of rheology have been traced to Newton and Hooke in the 17th century,¹ to Deborah,² and to the Egyptians in the 16th century B.C.³ However, its emergence as a separate field occurred only in the 1920's when the mechanical behavior of materials like rubber, clays, paints, and many biological fluids began to attract increasing attention in the fields of physics, mechanics, and mathematics, in addition to the traditional interest in colloid chemistry. Also, more interest was being shown in a number of problems connected with the accurate measurement of the viscosity of even Newtonian fluids.

No one of the scientific societies existing at that time provided a forum which brought together all those concerned with these problems, and by 1928 a number of prominent workers in both Europe and the United States agreed on the need for a new interdisciplinary organization and journal. The formation of the Society of Rheology in 1929 marks the start of international organizations in this newly recognized field. It is the history of such organizations that I wish to sketch in this paper.

2. NATIONAL ORGANIZATIONS

2.1 *The Society of Rheology*

The decision to form a new organization and journal was reached at the third in a series of Plasticity Symposia sponsored by the American Chemical Society in December 1928. The first issue of the *Journal of Rheology* was dated October 1929, and the initial meeting of the Society was held in December 1929.^{4, 5} Although this Society is now an organization representing primarily rheologists in the United States, it was considered an international body at the time of its formation. Eugene C. Bingham (U.S.A.) and Marcus Reiner (Israel) appear most often in the accounts of its formation; other Europeans on both the Organizing Committee and the initial Editorial Board of the Journal were M. Brillouin, H. Freundlich, E. Hauser, H. R. Kruyt, Wolfgang Ostwald, J. Kendall, J. Timmermans, O. Scarpa, L. Prandtl, and A. van Rossem. The first President was W. P. Davey.

The *Journal of Rheology* provided an important medium of international communication between rheologists for three years, with articles, communications, and abstracts covering activities throughout the world. J. M. Burgers (Introduction, ref. 6) credits Bingham and the Journal with giving a great impetus to the study of viscosity, and the Society for stimulating a considerable amount of research. After 1933 the Society was unable to continue a separate publication for several years, and its papers appeared in special issues of other journals until the present *Transactions* was established in 1957.

2.2 *Netherlands Society of Rheology*

The next organized group concerned with rheology was the Committee on Viscosity of the Academy of Sciences at Amsterdam. This was started in 1932, following a suggestion from the International Council on Scientific Unions (I.C.S.U.), which established "... a Committee for 'instruments and methods of research,' with the purpose of accumulating data on the use of instruments and methods developed in special branches of science, in order to make them known also in other branches ..." and also "... stimulated the formation of national committees which should adhere to the international committee ..." (Preface ref. 6).

I have found no further reference to the I.C.S.U. Committee, but the Dutch Committee on Viscosity remained active until succeeded by the Netherlands Society of Rheology in 1950. Its "First⁶ (and Second⁷) Report on Viscosity and Plasticity" provide a monograph covering phenomenological and molecular theories, and measurements covering ordinary liquids, colloids, metals, and protoplasm. A later report (in Dutch) on "Principles of Nomenclature of Deformations"⁸ provided a starting point for several later sets of recommendations.

The Chairman of the Dutch Committee was H. R. Kruyt. The Secretary, and author of a major portion of its reports, was J. M. Burgers, who was also the first President of the Netherlands Society of Rheology. R. Houwink and R. N. J. Saal, who was the first Secretary of the Netherlands Society, also contributed to the Second Report.⁷

2.3 *The British Society of Rheology*⁹

The origin of the British Rheologists' Club, as it was called until 1950, has been attributed to a meeting between G. W. Scott Blair and V. G. W. Harrison in the Summer of 1940. This meeting was arranged by H. R. Lang, Secretary of the Institute of Physics, who recognized common measurement problems in their work with secretions from the uterine cervix of the cow and with printing inks. These three and a few others from industries concerned with paints, oil and tar, and other rheologically-complex materials began to meet occasionally in a very informal discussion group which soon led to the founding of the British Rheologists' Club with G. I. Taylor as the first President. The inaugural meeting was held on November 16, 1940, at the University of Reading.

From the start the Club has provided an abstracting service; 30 abstracts appeared in its first *Bulletin* dated January 1941. They continued to dominate the *Bulletin* until the present *Rheology Abstracts* was initiated in 1958. A continuing interest in nomenclature and in surveying the fields of interests of its members also started in the early days of the Club.

2.4 *Other National Organizations*

Space precludes my giving a detailed account of the formation of the other national societies. A list of those which are presently members of the International Committee on Rheology is given in Table 1. Most, like the first three, started either as a branch of or with the assistance of an established organization. All those listed here, except Czechoslovakia and Italy, were members of I.C.R. when its present By-Laws were adopted in 1969. Czechoslovakia and Italy became members in 1970 and 1971 respectively.

TABLE 1

Members (National Organizations) of the International Committee on Rheology, and Dates of Organization	<i>Organized</i>
UNITED STATES OF AMERICA Society of Rheology	1929

GREAT BRITAIN	
British Rheologists' Club	1940
Renamed British Society of Rheology, 1950	
NETHERLANDS	
Nederlandse Reologische Vereniging	
Predecessor Organization: Committee on Viscosity of the Royal Netherlands Academy of Sciences at Amsterdam	1932
GERMANY	
Deutsche Rheologische Gesellschaft	1952
Deutsche Rheologen Vereinigung	1953
Combined with DRG in 1975	
FRANCE	
French Group of Rheology	1954
Renamed le Groupe Français de Rhéologie, 1964	
JAPAN	
Committee on Rheology of Society of Polymer Science, Japan	1954
Committee on Rheology of Japan Society for Testing Materials	1959
I.C.R. membership assumed by Society of Rheology, Japan, organized in 1972	
SWEDEN	
Reologisektionen of Swedish National Committee for Mechanics	1956
AUSTRALIA	
British Society of Rheology, New South Wales Branch	1959
British Society of Rheology, Victorian Branch	1960
Successor organization, British Society of Rheology in Australia, formed 1972	
AUSTRIA	
Sektion Rheologie, Verein Österreichischer Chimiker	1964
Renamed Arbeitsgruppe Rheologie im V.O.C., 1974	
CZECHOSLOVAKIA	
Group of Rheology of the Czechoslovakian Chemical Society	1968
ITALY	
Italian Society of Rheology	1970

3. INTERNATIONAL ORGANIZATIONS

In 1945 rheologists throughout the world were anxious to resume the contacts which had been interrupted by World War II, and to learn what had transpired in other countries during that period. Those in Great Britain and Holland undertook the task of starting the series of International Congresses which have continued with so much success. At the same time they and their colleagues from other countries began to consider the formation of an international organi-

zation with rather ambitious goals. By 1953 it was clear the existing national organizations were not in a position to support activities on this scale, and our present more modest Committee was established.

3.1 *The Joint Committee on Rheology*¹⁰

In December 1945 the International Council of Scientific Unions (I.C.S.U.) formed a Joint Committee on Rheology, with representatives from the International Unions of Physics, Chemistry, Biological Sciences, Geodesy and Geophysics, and (later) Theoretical and Applied Mechanics. At its first meeting in 1947 the members were Th. von Karman (Chairman), Mme. A. Dobry-Ducleaux (Vice-Chairman), J. M. Burgers (Secretary), P. Eggleton, H. Eyring, A. Frey-Wyssling, G. van Iterson, Jr., G. W. Scott Blair, R. Signer, and Geoffrey Taylor. Their initial plans envisioned projects on nomenclature, abstracting, and standards of very high viscosity, in addition to the general objective of promoting contacts between individuals and societies concerned with rheology.

In the area of nomenclature, Burgers and Scott Blair prepared a "Report on the Principles of Rheological Nomenclature," based on the 1941 Dutch report,⁸ which was presented at the First International Congress on Rheology.¹¹ The Committee developed plans for an international abstracts journal as an expansion of the *Bulletin* of the British Rheologists' Club, with V. G. W. Harrison as Chief Editor. It is not clear just what they sought regarding standards of high viscosity. The January 17, 1948, *Nature* note mentions collection of information on "... materials suitable as standards of viscosity of the order of 10^6 poise and more." The 1949 I.C.S.U. report notes that "... Professor Sadron gave an exposition on the requirements to be fulfilled by a laboratory for this purpose, the necessary staff and the costs involved." In any event the Committee decided in 1949 to postpone further consideration of this topic.

The life of an I.C.S.U. Commission or Joint Committee was limited, as was its ability to raise funds. To overcome these limitations the Committee established a provisional International Union on Rheology in 1949, with J. M. Burgers as President and G. W. Scott Blair as Secretary. Their hope was that the three existing organizations, plus others whose formation was thought imminent, would adhere to the Union, which would then seek admission to I.C.S.U.

This effort was not successful. The new Dutch Society agreed to join but both the British and U.S. organizations were hesitant—largely, it appears, because of the undetermined financial commitment involved. Various other forms of organization were discussed during 1950 and 1951, including an Association which would affiliate with one of the larger Unions. There was some disagreement about which Union would be most appropriate (the same issue arose in 1968 and 1972), there was still concern about the costs of such an organiza-

tion, and eventually it was decided to postpone the formation of a new international organization until the Second International Congress at Oxford in 1953, and to disband the Joint Committee at that time.

The Joint Committee was the sponsor of the first two International Congresses on Rheology. Planning for the first, held at Scheveningen, Holland, in September 1948, was initially suggested by the Secretary of the British Rheologists' Club to R. Houwink early in 1947. The initial plans, developed by Houwink and J. M. Burgers were approved by the Committee on Viscosity of the Netherlands Academy, and sponsorship of the Congress was accepted by the Joint Committee at its first meeting. Burgers as Chairman, Houwink as First Secretary, and G. E. Rotgans as Assistant Secretary, appear to have been primarily responsible for organizing the Congress and production of its *Proceedings*.¹¹ Nine general lectures were included to summarize the status of different areas of rheology after the interruption of normal contacts during the war years. In addition, 38 contributed papers were given in sections covering theoretical, experimental, and industrial developments. There were about 250 participants (130 from Holland, 80 from Great Britain, and 40 from other countries), and its success ensured that a Second Congress would be held.^{11,12}

This Second Congress took place at Oxford in July 1953, with the British Society of Rheology as host organization. G. W. Scott Blair, as Secretary, carried the major responsibility for its organization. Sir Geoffrey Taylor was President and the opening speaker, V. G. W. Harrison was Editor, and E. W. Geidt was responsible for local arrangements. Six invited and 49 contributed papers were presented. Nearly half the contributed papers covered studies on polymers, thus first showing a trend which has continued until now.¹³

Between these two Congresses the Joint Committee itself organized an International Colloquium on Rheological Problems in Biology at Lund, Sweden, July 26-28, 1950. Thus, although it did not realize its ambitious goal of an International Union, the Joint Committee did succeed in its chief objective of promoting effective international communication among rheologists.

<i>Number/Date/Location</i>	<i>Host Organization</i>
First Congress September 21-24, 1948 Scheveningen, Holland	Committee for the Study of Viscosity of the Royal Netherlands Academy of Sciences at Amsterdam
Second Congress July 26-31, 1953 Oxford, England	British Society of Rheology
Third Congress September 23-30, 1958 Bad Oeynhausen Federal Republic of Germany	Deutsche Rheologen Vereinigung e.V. Deutsche Rheologische Gesellschaft

Fourth Congress
August 26–30, 1963
Brown University
Providence, Rhode Island,
U.S.A.

Fifth Congress
October 7–11, 1968
Kyoto, Japan

Sixth Congress
September 4–8, 1972
University Claude-Bernard
Lyon, France

Seventh Congress
August 23–27, 1976
Chalmers University of
Technology
Gothenburg, Sweden

Society of Rheology

The Society of Materials Science,
Japan
The Society of Polymer Science,
Japan

La Fondation Scientifique de Lyon
et du Sud-Est
Le Groupe Français de Rhéologie
L'Association Rhône-Alpes pour le
développement de la Rhéologie

Swedish Society of Rheology of the
Swedish National Committee for
Mechanics

3.2 *The International Committee on Rheology (I.C.R.).*^{13, 14}

During the Oxford Congress a special evening meeting was held to discuss the form of the organization which would succeed the Joint Committee. In Scott Blair's review of the Congress,¹³ we read that "It was decided to form an International Committee on Rheology consisting initially of one representative each from all national groups devoted solely to the study of rheology, with power to co-opt individual rheologists from countries where no such groups as yet exist." The initial delegates to I.C.R. are listed in the minutes of its first meeting, which are reproduced in Appendix 1. R. N. J. Saal was selected as temporary secretary. These minutes comprised the only written charter for the new Committee until the adoption of its present By-Laws in 1969.

From 1953 through the Third Congress in 1958, Dr. Saal continued to serve as both Secretary and *de facto* Chairman. In addition to supervising the selection of a site for the Third Congress, he attempted to form a Subcommittee on Nomenclature.¹⁵ In compliance with a request made at the Second Congress, this group would have attempted to "... collect and compare authoritative lists of symbols and definitions bearing upon rheological concepts and nomenclature. . . ." No formal subcommittee was established, but a number of national societies did publish their own recommendations on nomenclature during this period. Also, M. Reiner prepared *A Dictionary of Terms in Rheology* (in six languages) which Saal forwarded to members in December 1955.¹⁶ Though it has never attempted to adopt any particular nomenclature proposals, I.C.R.

has certainly helped to achieve some degree of uniformity in this field. Parenthetically, we are currently helping in the review of nomenclature proposals by the Colloids Division of the International Union of Pure and Applied Chemistry, and I believe we will have a substantial impact on their final document.

One other achievement which Dr. Saal attributed to I.C.R. was a paper on "Classification of Lubricating Oils According to their Viscosity-Temperature Relation," which he prepared at the request of the organizers of the Fifth World Petroleum Congress and circulated to the Delegates before its presentation and publication.¹⁷

4. INTERNATIONAL AFFILIATIONS

The goal of some type of affiliation with the International Council of Scientific Unions (I.C.S.U.) or one of its Scientific Unions which had been pursued by the Joint Committee was not forgotten. The original hope of raising substantial funds was no longer emphasized, but it was expected that such affiliation would result in a greater recognition of rheology within the related fields of mechanics, chemistry, and physics. At the Committee meetings during the Fourth Congress in 1963, chaired by F. H. Müller, Reiner again raised this question, and the new officers were requested to explore the possibilities of affiliation with I.C.S.U.

It soon became evident that I.C.R. could probably not gain admission as a separate Union of I.C.S.U., both because of its size and because rheology could reasonably be considered as represented by one or more of the existing Scientific Unions. However, it was discovered that several of the existing Unions were considering the admission of affiliates like I.C.R.

It was clear that I.C.R. would require a somewhat more formal charter to gain any type of international recognition. Also, by this time, the Committee had grown enough to need some established procedure for admission of new members and naming of delegates. And by 1963 organizations from eight countries were members, and it was no longer necessary to continue individual voting members to achieve adequate international representation on the Committee. Thus, Chairman J. D. Ferry decided to consider first adoption of a set of rules which would establish the membership and operation of the Committee, and second the affiliation with one of the Scientific Unions of I.C.S.U.

At the Fifth Congress in Kyoto in 1968, the delegates agreed on a set of By-Laws which were submitted to the member organizations for ratification in March of 1969 and became effective on approval by eight societies in May 1969. Shortly thereafter they were approved by the remaining groups represented at Kyoto with the exception of the U.S.S.R. which has still not ratified the By-Laws and accepted its

membership. The major change introduced by these By-Laws, reproduced here as Appendix 2, was that limiting voting membership in I.C.R. to various national societies or group of rheology. Individuals from countries without an organized group have continued to participate in meetings of I.C.R., and since all decisions reached have in practice been virtually unanimous, their non-voting status has not seriously limited their influence.

At the Kyoto meeting there was also an extended discussion of the possible affiliation of I.C.R. with one of the International Unions of I.C.S.U. All were in favor of some such affiliation, but no consensus was reached on one particular Union, some favouring Theoretical and Applied Mechanics (I.U.T.A.M.), some Pure and Applied Chemistry (I.U.P.A.C.), and one or two Pure and Applied Physics.

By the time the new By-Laws had been adopted, I.U.T.A.M. had adopted a provision admitting affiliates like I.C.R. without requiring any financial contribution, but requiring recognition of a voting delegate appointed by I.U.T.A.M. This latter condition required a By-Law amendment, for which a favorable vote of a majority of the delegates followed by a favorable vote of two-thirds of the member organizations is needed. On the initial vote, held early in 1972, a substantial majority favored both affiliation and the amendment, but two members had strong reservations, believing that affiliation with I.U.P.A.C. would be more useful. Since the Sixth Congress and the next meeting of I.C.R. were imminent, Chairman M. Horio decided to postpone the final vote to permit further discussion at that time.

In seeking a resolution of this disagreement, it was found that I.U.P.A.C. was also prepared to admit affiliate organizations, and that neither Union would object to the affiliation of I.C.R. with both. Thus, at the Sixth Congress in 1972, the Committee voted unanimously to seek affiliation with both I.U.T.A.M. and I.U.P.A.C. and to recommend adoption of the required By-Law amendment. The amendment was formally adopted by all members early in 1973, and the formal applications for affiliation submitted. Both Unions accepted I.C.R. as an affiliate, I.U.P.A.C. in August 1973 and I.U.T.A.M. in September 1974.

5. SUMMARY AND FUTURE PROSPECTS

Our present national and international organizations in the field of rheology have been built by the efforts of many individuals, only a few of whom are mentioned in this brief account. I may have inadvertently slighted some whose contributions were not stressed in the rather sketchy accounts I have found covering the period up to 1958. But three names stand out clearly during this period: Marcus Reiner, J. M. Burgers, and G. W. Scott Blair. Each was a dominant figure in the founding and early activities of one of the first three

societies. Burgers and Scott Blair were the leading figures on the Joint Committee. Burgers was the principal organizer of the First Congress, Scott Blair of the Second, and Reiner an important contributor to both. Reiner continued as an active delegate on I.C.R. through 1963.

Since 1963 I.C.R. has continued to grow and to encourage the formation of new national societies. Most countries with substantial activity in rheology have now formed organizations which have joined I.C.R. Two exceptions are the U.S.S.R. which, for some reason not clear to me, has never formally accepted its membership under the 1969 By-Laws, and India. The Indian Society for Theoretical and Applied Mechanics applied for membership at one time, but the Committee concluded that an organization covering all of mechanics would not be an appropriate member. As this paper is being written, the recently formed Belgian Group of Rheology has requested admission to I.C.R., and a group in Spain is planning the formation of a new organization with the intention of applying for membership also.

I.C.R. has successfully carried out the mandates set forth in the 1953 minutes. It has sponsored a series of highly successful International Congresses. Its membership has continued to increase, and new national organizations are still being formed. It has gained international recognition through affiliation with I.U.P.A.C. and I.U.T.A.M.

The Committee could become more active in a number of areas, and with the questions of organization and affiliation now resolved this seems a logical time to give careful thought to its future. The Newsletter started by Dr. Vallet could serve as a medium for more effective communication between member organizations if they wish to use it in this fashion. The members should consider whether and how they wish to utilize it, realizing that financial constraints will limit its distribution to the few copies the current Secretary can prepare and distribute without reimbursement.

The definition of rheological terms has been a matter of continuing interest to I.C.R. and several of its member organizations. A number of lists of definitions have been published which are in many respects superior to some currently being considered by other organizations. The Committee might consider formal adoption of a set of recommendations. I am not sure this is feasible at present; but if agreement could be reached, such recommendations should have a significant impact on international usage.

These are but two of several possible areas of increased activity for I.C.R. Some might require financial commitments which we cannot make under our By-Laws. Most would require a substantial commitment of time on the part of a number of individuals. We should make sure that any additional activities we undertake will have the support needed for their successful completion.

NOTE ADDED IN PROOF: The Belgium Group of Rheology was admitted to membership in I.C.R. in May 1976.

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APPENDIX 1

INTERNATIONAL COMMITTEE ON RHEOLOGY

Minutes of Meeting, July 29th, 1953, 3.50 p.m. in the Music Room, Oxford.
Present

Prof. F. H. Müller (Germany)
Dr. R. N. J. Saal (Netherlands)
Dr. R. S. Spencer (U.S.A.)
Mr. A. G. Ward (Great Britain)
Prof. H. Weiss (France)

In the first meeting of the International Committee on Rheology, under Chairmanship of Mr. A. G. Ward, the mandate of the Committee was accepted to be as follows:

1. to be a permanent body for organising future International Congresses on Rheology
2. to encourage new national organisations for the study of rheology
3. to act as co-ordinating body in other international co-operations in the field of rheology.

Further it was decided:

1. that Dr. R. N. J. Saal should act as temporary secretary
2. that no chairman would be nominated before the members of the committee had been definitely nominated by the national organisations
3. to invite the Japan Rheological Society to nominate a member,
4. to invite as members from countries without national organisations:
Prof. B. Gross (Brazil),
Prof. A. Peterlin (Jugoslavia),
Prof. M. Reiner (Israel).
5. to invite rheologists from Scandinavia* and from India to nominate a member.

The name of the Committee was decided to be:

"International Committee on Rheology".

(signed) R. N. J. Saal

Royal Dutch/Shell Laboratories,
Amsterdam, Netherlands.

*Mr. E. Forslind, (Sweden) designated.

APPENDIX 2

INTERNATIONAL COMMITTEE ON RHEOLOGY BY-LAWS

As amended to March 1976.

I. PURPOSE.

The purpose of the I.C.R. is to represent the interests of organised groups of rheologists and of individual rheologists throughout the world with respect to the international aspects of exchange of information, dissemination of knowledge, and the development of the science of rheology. In pursuit of this goal it will:

- A. Decide on the location and approximate time for periodic International Congresses on Rheology and special international meetings between such Congresses.
- B. Entertain invitations from groups or individuals to host such Congresses or meetings, and decide in each case which invitation to accept.
- C. Assist the host group in the planning and organization to such Congresses or meetings by providing information, assistance on publicity, etc.
- D. Undertake such activities concerned with nomenclature, standards, documentation, etc., as may be deemed necessary from time to time.
- E. When appropriate, encourage the formation of national societies or groups concerned with rheology by providing interested individuals with information and contacts.
- F. Undertake to establish and maintain contact with other international bodies as needed to further the interests of rheologists and the science of rheology.

II. MEMBERS

A. The members of the I.C.R. shall be the societies and groups listed here, plus additional societies and groups admitted as provided in IIB below:*

* The Scientific Council for Physical Chemical Mechanics of the Academy of Sciences of the U.S.S.R. was included in the original list of members, but has not yet ratified these By-laws and accepted its membership.

Society of Rheology (U.S.A.)
 Groupe Français de Rhéologie (France).
 British Society of Rheology (U.K.).
 Deutsche Rheologische Gesellschaft (W. Germany).
 Deutsche Rheologen-Vereinigung (W. Germany).
 [combined with D.R.G., April 28, 1975.]
 Committee on Rheology of the Society of Polymer Science (Japan).
 Committee on Rheology of the Society of Material Science (Japan).
 [membership assumed by Society of Rheology, Japan May 21, 1973.]
 Sektion Rheologie, Verein Österreichischer Chemiker (Austria).
 [name changed to Arbeitsgruppe Rheologie im V.O.C. 1974].
 British Society of Rheology in Australia (Australia).
 Reologisektionen inom Svenska Nationalkommittén för Mekanik (Sweden).

B. Other societies or groups may be admitted by a favorable vote of two-thirds of the Delegates defined in III. The criterion used in judging the suitability of a group for membership shall be a membership large and active enough to make it reasonable for the group to host an international congress or meeting on rheology.

C. The most recent Past Chairman living shall be an ex-officio member of the I.C.R. without vote.

D. Associate Members (without vote) may be elected at any time by the Committee. Such Associate Members shall be individuals resident in a country without a member organisation of I.C.R. who will contribute to achieving the objectives of I.C.R. The term of each Associate Member shall be established by the Committee at the time of his election.

E. Observers may be invited to any meetings of the I.C.R. by the Chairman.

III. DELEGATES AND VOTING.

Each member society or group shall be represented by a single Delegate, EXCEPT THAT there shall be no more than one delegate to I.C.R. from any one country. In case two or more groups in a single country are members, they shall jointly designate a single Delegate. Delegates shall be certified to the Secretary of I.C.R. by the Secretary or other appropriate officer of the member group. The term of each Delegate shall commence on receipt of such certification by the Secretary, and continue until a successor is certified in the same manner.

[The Bureau of the International Union of Theoretical and Applied Mechanics shall be entitled to name a representative to I.C.R. who will have the same voting privileges as a Delegate of a member of I.C.R. (Amendment adopted by all eleven members, November 1972-March 1973. Effective upon Affiliation with I.U.P.A.C., September 10th, 1974.)]

All questions except admission of new members or amendment of these By-laws shall be decided by a majority of the Delegates present at a meeting of I.C.R. called by the Chairman provided a quorum of two-thirds of the Delegates is present, OR by a mail ballot, in which case a majority of all Delegates shall be required. A Delegate may designate an alternate for any given meeting by written notice delivered to the Secretary at or before the meeting UNLESS his organization has specifically reserved to itself the power to appoint his alternate.

IV. OFFICERS.

The officers of I.C.R. shall be a Chairman and a Secretary elected by the

Delegates at the time of each periodic Congress to serve from the conclusion of that Congress until the conclusion of the next succeeding Congress.

The Chairman shall, at the time of his election, be a member of one of the member groups of I.C.R. The Secretary need not be a member of a member group or a Delegate or an Associate Member. The Chairman and Secretary may, at the option of their respective member groups, also serve as the Delegates of those groups during their terms. If not so selected, they shall not have a vote except that the Chairman shall resolve any tie vote.

In case of the disability or death of the Chairman, the most recent Past Chairman living (an ex-officio member) shall assume the duties of Chairman until the Chairman can resume his duties or the Delegates select his successor. In case of the disability of the Secretary, the Chairman shall name a successor to serve until the Secretary can resume his duties or the end of his term.

V. DUES.

No dues or assessments shall be levied by I.C.R. on its member groups or Associate Members, and I.C.R. shall not make any commitments which would imply such liability.

VI. AMENDMENTS.

Amendments to these By-laws may be proposed by any Delegate or Associate Member by submitting the proposed amendment in writing to the Secretary. The Secretary shall transmit copies of the proposed amendment to all Delegates, with information copies to Associate Members. Delegates shall vote, within three months, on the question of a formal submission of the proposed amendment to the member groups. If a majority of Delegates approve such submission, the proposal shall be submitted to the member groups through their Delegates. A two-thirds vote of the member groups, transmitted to the Secretary by their Delegates, shall be required for adoption of the amendment. In case two or more groups in a single country are members, they shall jointly cast a single vote and shall be counted as a single member in calculating the number of votes required for a two-thirds majority.

VII. ADOPTION OF THESE BY-LAWS.

These By-Laws shall be deemed adopted and in effect on receipt by the Secretary of the affirmative vote of two-thirds of the member groups as listed in IIA, EXCEPT THAT no group in this list which has not voted to accept these By-Laws shall be deemed a member unless and until it has signified to the Secretary that it will accept such membership.

Submitted for approval to organisations listed in IIA March 1969.

Effective on approval by eight societies, May 23, 1969.

ADDITIONAL MEMBERS ACCEPTED per II B.

Group of Rheology of the Czechoslovak Chemical Society. November 1970
Società Italiana di Reologia. May 1971.

INTERNATIONAL RUBBER CONFERENCE COMMITTEE

The Secretariat of the International Rubber Conference Committee is now held by the Plastics and Rubber Institute and the next meeting of the committee will be in San Francisco during the period of Rubbercon '76 October 5-8, 1976. This meeting will be in association with the 110th meeting of the Rubber Division of the American Chemical Society.

The present intentions are that the P.R.I. Secretary-General, Mr. J. N. Ratcliffe, will attend this meeting as Secretary of I.R.C.C., on which representatives from the following countries also serve: Czechoslovakia, France, Italy, Japan, Malaysia, Netherlands, Spain, Sweden, U.S.A., U.S.S.R., West Germany.

AUSTRALIA: NEWS OF MEETINGS

The Australian Branch of the British Rheological Society has recently held two meetings in Melbourne.

On June 9 Professor Morton W. Denn of the University of Delaware gave an informative talk entitled "Modelling of the Melt Spinning Process." One of the important questions in polymer rheology has been the extent to which measurements made in conventional shear and oscillatory rheometers could be used to predict behaviour in flows with an important extensional component. Professor Denn has been particularly successful in his modelling of area profiles and tension in laboratory experiments of steady spinning of polyethylene and polystyrene melts using only shear data. His talk reviewed his general approach to the problem of describing the spinning process and his results to date.

On July 7 a small group gathered to hear Professor D. H. Morton of the University of New South Wales speak on the subject "The Rheology of Protective Packaging Materials." In this talk Professor Morton discussed the physics of deformation of fibreboard cartons under compressive loading. Theoretical considerations have extended Euler beam theory to buckling of plane surfaces and good agreement between theory and practice has been obtained. Problems have included the calculation of bending rigidity of corrugated cardboard and the definition of comprehensive yield stress in fibreboards which are particularly time-dependent. Also discussed in this talk was the energy absorption by cushioning materials intended to protect the contents of a package by progressive failure.

Both talks were well received, results in lively discussion and closed with acclamation for the speakers.

FUTURE MEETING

WORKSHOP ON FLOCCULENTS

To be held on Thursday, November 4, in the Department of Industrial Science, University of Melbourne, Parkville, Melbourne, Australia. Further details from Mr. O. Delatycki of that address.

JOHN G. WILLIAMS

Honorary Secretary, Aust. Branch B.R.S.

RHEOLOGY IN FRANCE

The Council of G.F.R. have adopted the definitions which are translated below. Any comments should be sent to Dr. J. D. Weber, Faculté des Sciences, Université de Metz, Ile du Saulcy, 57000 Metz, France.

Definitions of 98 terms used in rheology have now been translated into English (Rheol. Acta. 14, 1099-1109, 1975). Reprints may be obtained either from Dr. Weber, or from Dr. D. W. Hadley, J. J. Thomson Physical Laboratory, Whiteknights, Reading RG6 2AF.

The Annual Conference of G.F.R. will be held on December 9, 1976, on the subject of "The rheology of foams, emulsions and suspensions. Further details from E. Absi, C.E.B.T.P., 12 rue Brancion, 75737 Paris, Cedex 15, France.

Modèle rhéologique (rheological model). An idealised representation of rheological behaviour. The system is related to external influences only through its two ends whose relative displacement represents strain, and which are the points of application of collinear equal and opposite forces representing stress.

Electrical analogues are equally valid representations of rheological models.

Grouperment de modèles rheologique (combination of rheological models). The formation of a rheological model from simpler rheological models, oriented in the same direction, coupled through rigid links at their ends.

Grouperment en série (series combination). Rheological models are said to be combined in series when they are joined end to end. Their external ends are then the ends of the combination. In such a combination the stress remains unaltered from one component to another. The total strain is the sum of the strains of the components. As a result the retardation function of the combination is the sum of the retardation functions of the components.

Grouperment en parallele (parallel combination). Rheological models placed side by side are said to be grouped in parallel when equivalent ends of the component models are linked rigidly together.

The ends of the new model so formed are situated on the two rigid links. The components and the combination show identical strains. The stress of the combination is the sum of the stresses of the components. As a result the relaxation function of the combination is the sum of those of the components.

D. W. HADLEY

CO-OPERATIVE RESEARCH

New Attack on Problem Materials

A new co-operative research venture, involving both Industry and the Department as partners, is planned to study materials with non-Newtonian or otherwise difficult or anomalous flow properties has started at the Warren Spring Laboratory.

Known as the Rheological Research Service, it will throw more light on some long-standing industrial problems and will initially include studies on the transfer of materials between rollers and surfaces, the study of the underlying phenomena involved in spreading, frowelling, extrusion, etc., and also the kinetics of thixotropic build-up and breakdown and of gelation and ageing. Studies and comparisons will also be made of commercial viscometers in relation to materials having non-Newtonian flow properties.

The Service will operate for three years and the first year's budget is for £30,000. This, and future work, will be available to participants for an annual fee of £2,000 (plus VAT). The founder Industrial members are B.P. Trading, Imperial Chemical Industries and Pafra, whose representatives selected the work programme from a very full list of topics. The Department of Industry contribution is provided by the Chemical and Minerals Requirements Board, and the Laboratory is confident that the work is sufficiently important to attract other members from industry as work proceeds.

Warren Spring Laboratory is an Industrial Research Establishment of the Department of Industry at Stevenage and works on a very wide range of industrially important subjects. This project is a multi-client "Club" type venture and is similar to several others which have been very successful in recent years. The recently completed project on Powder Mixing was described by one industrial participant as "a very cost-effective means of acquiring expert knowledge."

This Service is being managed by Dr. C-H. Cheng, who welcomes enquiries about work, at Rheological Research Service, Warren Spring Laboratory, Department of Industry, Gunnels Wood Road, Stevenage, Hertfordshire SG1 2BX.

LETTER

Dear Sir,

Your foreword in the recent issue of the *Bulletin* is indeed timely. The provision of appropriate financial support for research units has apparently never received serious consideration by those who saw the proliferating Universities as mere first-degree factories. The result is an unedifying scramble for students whose ability and whose motivation are not infrequently low, whilst at the same time postgraduate and postdoctoral research activities are strangled. A doctrinaire and

often militant "antiéliteism" has succeeded in placing mediocrity on a pedestal of excellence and so creating a memorial to incompetence with which its architects can joyfully identify and to which they can make devout obeisance. No wonder so many good scientists seek escape down the brain drain in despair!

The very mechanism of applying for research grants is time consuming and humiliating. It is clearly designed to daunt all but the most persistent, knowing (as they do) that global funding is so derisory that the award of a research grant has become a mere lottery. Although lip service is paid to "encouraging" research in the polytechnics, especially in applied science and technology, there is nothing left once the Universities have had a bite at the shrivelled cherry.

The "commanding heights" and even the lesser hillocks are crowded with procrastinating committee lions devouring research grant application forms in pentadecuplicate! Hardly a country fit for scientists to work in!

Yours faithfully,

R.S.Lenk, B.Sc., Ph.D., F.R.I.C., F.P.R.I.,

Senior Lecturer in Polymer Technology.

CALLS FOR PAPERS

DYNAMIC PROPERTIES AND ENERGY DISSIPATION IN PLASTICS AND RUBBERS (PRI)

Tuesday, April 19, 1977

- 1 *General* The Institute's Polymer Properties Group has established the practice of holding an annual research meeting, and since 1972 has discussed: The effect of structure on fracture; High temperature materials; Polymer processing and product properties; Structure and properties of heterophase and blended polymers and Characterization and utilization of orientation in polymeric products.
- 2 *Purpose* The aim of the meetings is to bring together research and development scientists and engineers from industry, Government departments, and research and educational establishments, to present and discuss current research projects and activities.
The emphasis is on *work in progress* (not yet published) rather than completed research projects. The programme is designed to encourage younger scientists to make contributions, and the general atmosphere of the meeting will be informal.
- 3 *The sixth research meeting* will be held at the University of Technology, Loughborough on April 19, 1977, when the subject for discussion will be:—

DYNAMIC PROPERTIES AND ENERGY DISSIPATION IN PLASTICS AND RUBBERS

Papers are invited on current research in the following suggested subjects:

(a) *Dynamic properties*

To include visco-elastic properties, fatigue, and other effects of cyclic loading, e.g. strain softening and basic morphological changes.

(b) *Energy dissipation*

To cover applications of energy dissipation, e.g. ultrasonic welding, fragment stopping, packaging, sound absorption, impact energy absorption and vibration isolation.

Contributions of varying length will be acceptable, and synopses of 100–200 words are initially requested. Longer abstracts will be required for circulation to delegates in advance of the meeting. Approximately 10/15 minutes presentation time will be given to each paper in the programme.

THE 80's CAR—WHAT FUTURE FOR PLASTICS? (PRI)

May 1977, in the Midlands

OBJECTIVE—To examine and assess the application potential for and the economic viability of polymeric materials in the next generation of European cars. To identify the problem areas and the ways in which polymers can be used to advantage by the car designer and production and development engineers.

SCOPE—Relevant to the whole of Europe's automotive industry, including component manufacturers and suppliers.

AUDIENCE—Designers and production/development engineers from the auto building and component supply industry and engineers, designers from the plastics manufacturing and processing industries.

PROGRAMME

SESSION 1—BUILDING THE ECONOMIC CAR OF THE 80'S

- (a) The car industry in the 1980's
- (b) Changing consumer requirements
- (c) The economics of plastics

SESSION 2—DESIGN AND PERFORMANCE REQUIREMENTS

- (a) Design methods and data
- (b) Designing for economy and performance
- (c) Designing for comfort and safety

SESSION 3—MANUFACTURING TECHNOLOGY

- (a) Improvements in processing technology
- (b) Reduced manufacturing cost
- (c) Under-the-bonnet applications

European Conference

THE PROCESSING OF PVC (PRI)

Spring 1978

The Processing and Engineering Group of the Plastics and Rubber Institute is planning a major European Conference on "The Processing of PVC" to take place in the London area during Spring 1978. This conference will be of particular interest to the Processor and to those involved in the compounding and conversion of PVC.

Offers of papers are invited from those interested in this field. Preference will be given to papers that highlight trends and developments rather than general review papers.

Programme

It is hoped to include papers under the following headings:—

1. The influence on processing and properties of PVC polymer and formulation ingredients.
2. Compound preparation.
3. Testing (with an emphasis on tests relevant to processing, such as melt rheology, measurement of fusion, prediction of processing performance).
4. Extrusion.
5. Moulding.
6. Calendering and paste processing.
7. Novel techniques for processing.

Papers of general interest will be presented to plenary sessions. Group sessions on Extrusion, Moulding and Calendering and paste processing will run simultaneously.

It is planned to issue accepted papers in bound book form to delegates prior to the conference. It is likely that the final papers will

not be required before late 1977 in order that the contents can be brought up to date.

However, potential authors are being asked to give an early commitment to assist efficient planning of the conference.

FUTURE MEETINGS

INJECTION MACHINERY—DESIGN, SELECTION AND PERFORMANCE (PRI)

October 12th, 1976, Hotel Leofric, Coventry

The Institute's Processing and Engineering Group is organising the above meeting to give leading machinery manufacturers and users, both in the U.K. and throughout Europe, the opportunity of discussing in an informal setting injection mould machinery, design parameters, means of selection and performance.

Mr. J. B. Smith (Dupont (U.K.) Ltd.) has agreed to chair the meeting, and the following companies have agreed to participate in the programme: Mortimer Plastics Machinery Ltd., Netstal Ltd., Unimachine Sales Ltd., Demag Hamilton Plastics Machinery Ltd., Buhler Miag Ltd., BIPEL, Dennis Leader (Machinery) Ltd., GKN Windsor Ltd., Bone Cravens Ltd., Stork Reed Ltd., Ritter Plastics Machinery Ltd., and Klockner Ferromatic Ltd.,

The meeting will last from 1030 to 1700 approximately, and small items of equipment may be on display to demonstrate particular design features. Attendance is limited to 60 maximum.

PRI/SIRA Seminar PLASTICS IN LIGHT ENGINEERING

October 27th, 1976, Civic Hall, Solihull

Following the successful seminar in London last year on the use of plastics in the light engineering industries, Sira Institute and the Plastics and Rubber Institute have again combined to organise a similar seminar, in Solihull, at which more emphasis will be placed on practical aspects of the subject.

Purpose

The proliferation in the application of plastics to a wide variety of products ranging from very small components to larger household machines is well known. Concerned mainly with products in the light engineering industries, this seminar programme is designed as a guide to plastics materials; how they differ from traditional materials, their key properties, the basic principles in selecting appropriate

materials for particular applications, the various processing methods and their suitability for short or long run production, and evaluation of the design and construction of the finished product. The emphasis throughout is on practical applications of plastics and illustration of the points made in the previous tutorial papers. The programme will aim to cover the theme in depth, and ample time will be given for discussion.

Audience

Designers, engineers and materials scientists involved in production of: instruments, control equipment, electrical and electronic components, precision engineered components, electrical and electronic goods of all kinds.

Exhibition

A small ancillary exhibition illustrating the use of plastics in light engineering is being organised. Potential exhibitors should please contact W. A. Seatherton at SIRA.

Registration and fees

Fees £30.24 inc. V.A.T. (PRI and SIRA members); £41.04 inc. V.A.T. (non-members). Special rates available for accredited students.

The fee covers preprints of papers, notes of case histories, lunch, light refreshments and access to the exhibition.

Further information available on request from Mrs. R. G. Keiller, Sira Institute Ltd., South Hill, Chislehurst, Kent BR7 5EH. Telephone: 01-467 2636.

PRI Packaging Group 11th Discussion Meeting RECENT ADVANCES IN POLYMERIC ADHESIVES FOR PACKAGING

**Thursday November 25th, 1976, at the Plastics and Rubber
Institute, 11 Hobart Place, London**

The meeting will discuss various types of polymeric adhesives, and the arguments for and against using these adhesives in packaging applications for bonding plastics to plastics, and plastics to other materials.

Packaging machinery, with particular emphasis on its use for continuous packaging, and the behaviour of adhesives on that machinery will also be highlighted.

The meeting will be of particular interest to plastics technologists, adhesive manufacturers, packaging machinery manufacturers and all those involved with the use of polymeric adhesives for packaging.

**ATTENDANCE IS LIMITED TO 40 PERSONS SO EARLY
REGISTRATION IS ADVISED**

Further details from Miss P. C. Durston (PRI Meetings Assistant),
The Plastics and Rubber Institute, 11 Hobart Place, London, SW1W
OHL. Telephone: 01-245 9555.

Symposium

MOULD MAKING '77 (PRI)

January 27th, 1977, Civic Centre, Solihull

This, the third annual symposium organized by the Mould Design and Manufacturing Subcommittee (P & E Group) aims to convey the up-to-date position of most aspects of the mould making industry.

A number of development projects, originated with the help of mouldmakers are being undertaken at universities and other institutions. Some of the processes are already in use, while others are available but largely unknown to industry. It is hoped that two papers will give the current position and indicate advances that will be coming forward in the next two or three years.

Other papers will cover advances made in the last few years in such subjects as the machining of cavities and precision casting, while another contribution will give details of a new finishing process by local deposition.

International coverage is planned by papers on aspects of tool-making in Europe and the U.S.A.

Conference

LARGE PLASTICS COMPONENTS (PRI)

February 15th-16th, 1977

The Processing and Engineering Group and the Reinforced Plastics Group of the Plastics and Rubber Institute are co-sponsors of a 2-day conference entitled 'Large plastics components' to be held in the Avon Suite at the Wembley Conference Centre on February 15th and 16th, 1977.

Purpose

- (a) To increase market penetration by providing manufacturers, designers, users and potential users of large components, in plastics or more traditional materials, with a critical review of the current state of thermoplastics and GRP technology and of future trends.
- (b) To provide a forum of international status within which the largely complementary merits of thermoplastics and GRP may be widely appreciated.

- (c) To provide an opportunity for those primarily engaged in any one section of the plastics industry, be it as a supplier, equipment manufacturer or fabricator, to enlarge their technical horizons in the field of large components as well as their range of personal contacts.

Programme

A comprehensive programme of speakers from the U.K., Europe and the U.S.A. has been planned.

The first session will discuss future trends in materials and fabrication methods, and the importance of good design in plastics.

In session two, Advances in technology, papers will feature SMC/DMC equipment, blow moulding, sandwich moulding and pultrusion.

Contributions on applications in the construction industry, tanks and both GRP and thermoplastic pipes will be presented in session three, Present position and future possibilities, together with papers on air, sea and land transport applications.

The final session will examine case histories related to injection molding, structural foams, tanks and drums, GRP naval minesweeper and GRP transformer case.

The Conference will be opened by B. Parkyn, Principal of the Glacier Institute of Management, and D. A. A. L. Challis, Director of the Science Research Council's Polymer Engineering Directorate, has kindly agreed to be the guest speaker at the Conference Dinner.

POLYMER PROCESSING AND RHEOMETRY

Joint Meeting of the British, Netherlands and Italian Societies of Rheology Pisa, Italy, April 13th-15th, 1977

General Information

The meeting will take place at the Engineering College, Palazzo del Biennio, via Diotisalvi, Pisa.

The meeting will include the following events:

April 12—Welcome party in the former Abbey of Saint Zeno at 6.30 p.m.

April 13—Opening of the meeting at 9 a.m. in the Engineering College. Morning and afternoon sessions. Evening concert.

April 14—Morning session at 9 a.m. Excursion to Lucca and Ville Lucchesi starting at 2 p.m.

April 15—Morning and afternoon sessions. Social dinner.

A detailed programme will be issued after October 31.

Scientific Contributions

The submission of contributed papers (title and 1-page abstract only) is open to members and non-members of the 3 Societies. The time allotted for presentation is 20–25 minutes. The abstracts should be sent to one of the scientific secretaries of the 3 Societies within *October 31st, 1976*. The total number of contributions will be somewhat limited so as to avoid, if possible, parallel sessions. Suggested subjects for the sessions up to now include:

1. Influence of processing on structure in polymers;
2. Mechanical properties and their measurement.

The use of English as the meeting language is recommended. The addresses of the scientific secretaries are:

UNITED KINGDOM—F. N. Cogswell, 67 Daniells, Welwyn Garden City, Hertfordshire AL7 1QT.

THE NETHERLANDS—H. C. Booij, D.S.M. Research and Patents, P.O. Box 18, Geleen.

ITALY—D. Acierno, Istituto di Ingegneria Chimica—viale delle Scienze I-90128 Palermo.

Registration Fee

The registration fee has been fixed at 25.000 lire for members and 30.000 lire for non-members of the Societies. Registrations made after *October 31st, 1976* must include an extra charge of 5.000 lire. The fee is payable to Società Italiana di Reologia on account No. 14530/00 under the name of "Congresso di Reologia" c/o Credito Italiano (bank), Pisa.

PILGRIMAGE TO PISA?

It is easy for we spoon fed apprentice rheologists of the twentieth century to take everything for granted. Perhaps the most universally applied concept is that of stress—I don't think that I know a modern rheologist who does not use it—but who was the giant who gave us that concept?

Professor Truesdell supplies us with an answer. He states that 'In Galileo's consideration of the rupture of cylindrical beams in tension, he asserts that the force required is as the base area, "since so many more are the fibres, the filaments, or the tenacious parts that hold together the parts of the solid"'. (Essays in the History of Mechanics, Springer Verlag 1968).

Here then is an additional reason to join the joint Italian, Dutch and British meeting at Pisa next Easter. If the concept of stress doesn't interest you, you could always take your least favourite rheometer with you and drop it from a certain notable building.

Neil Cogswell

APPLICATION FOR MEMBERSHIP—JUNE 1976

Dr. Ian Bridgeman, C.Chem., M.R.I.C., Ph.D. p,et,a,G,O.	Ciba-Geigy (U.K.) Ltd., Roundthorn Estate, Wythenshawe, Manchester.
Dr. Ian Roger Cameron, B.Sc.(Hons.), Ph.D. f,e,a,sa,D,E,F,G,H.	Nobel's Explosives Co. Ltd., Stevenston, Ayrshire.
Mr. Roger John Crownson, B.Sc., M.Sc. f,et,sa,B,D,G.	Dept. of Materials, Cranfield, Bedford MK43.
Mr. Robert Antony Dove, M.A.(Cantab.) f,et,a,C.	Avon Rubber Co. Ltd., Melksham, Wilts.
Dr. Ronald J. Gordon, Ph.D. f,et,C,D,M.	Dept. of Chemical Engineering, University of Florida, Caines, Florida 32611, U.S.A.
Lars Ole Kornum, M.Sc. f,e,F,G,M.	Scandinavian Paint & Printing, Ink Research Institute, Odensegade 14, DK 2100 Copenhagen, Denmark.
Dr. Luigi Nicolais, M.Sc., Ph.D. f,et,sa,B,C,G.	Istituto Di Principi di Ingegneria Chimica, University of Naples, 80125 Naples, Italy.
Mr. Terence Keith O'Brien, H.N.C. (Chemistry), f,et,sa,D,F,G.	Pafra Ltd., Bentalls, Basildon, Essex.
Mr. Graham Vivian Walters, H.N.C.Metallurgy, M.I.Q., et,sa,A,K.	E.C.C. Quarries Ltd., Rockbeare Quarry, Honiton-Clyst, Nr. Exeter.
Mr. Leonard John Williamson, A.R.I.C., F.R.I.C. p,et,a,G.	Burrell & Co. Ltd., Colour Works, Newbridge Lane, Stockport.

RESIGNATIONS

Mr. P. J. Huck,
1 Lillian Road,
London, S.W.13.

OBITUARY

Markus Reiner 1886–1976

Professor Markus Reiner, well known to all rheologists, passed away about three months after celebrating his ninetieth birthday. Fortunately, he was in good enough health to be present and to appreciate a ceremony held a few weeks before his death. This was honoured by the presence of the President of the State of Israel, and at it there was founded a "Markus Reiner Chair of Rheology" to be located in the Department of Engineering in Haifa. But not long after this Ceremony, he had a stroke and began to weaken. He was moved to a hospital, where he died peacefully, his life-work finished.

To celebrate his 80th birthday, a book was written in his honour, edited by Dr. David Abir, to which many prominent rheologists and engineers contributed.* Since the present writer had known Markus Reiner well since 1931, he was asked to write the biographical chapter, Reiner himself supplying the information about his earlier years.

He was born on the 5th of January, 1886, of Jewish parents, in Czernowitz, then within the Austro-Hungarian Empire. Following his schooling in his native town he went to study Civil Engineering in the famous Technische Hochschule in Vienna. After obtaining his degree in engineering, he moved, for a time to Berlin and later to Essen. Later, he returned to Czernowitz and, during the First World War, he was engaged in reconstructing damaged bridges etc., in the Balkans.

After the war, he found that his native born town had become part of Rumania. He was not altogether happy there and he had also become a convinced Zionist, so he emigrated to Palestine, starting, as did many other European scholars, by doing hard manual labour. But the British Mandate Government soon discovered he was a well-qualified engineer and so, until the ending of the Mandate in 1948, he worked for them. He had various interesting assignments, including shoring up the Church of the Holy Sepulchre, in Jerusalem.

Together with his friends Buber and Magnes and others, he worked very hard indeed to establish a single Jewish-Arab Palestine and always believed that Arabs and Jews could work peacefully together—but it was not to be.

In 1927 he was in Easton(Pa) with the late Prof. B. C. Bingham and they decided that if a chemist and an engineer had so many problems in common a special branch of science should be founded, with its own name, Journal and if possible, International Society.

Following some preparatory work, a conference was called for December 1929. Unfortunately, Reiner had to be in Palestine at the time and it seems likely that the present writer is the only

rheologist still living who was present. An unfortunately short-lived journal was started and the name "Rheology" was officially accepted for "The Science of the Deformation and Flow of Matter".

A Society of Rheology was founded, originally intended to be International but later becoming the American Society.

Before 1929, Reiner, as an engineer, had worked on a number of projects now considered rheological. He developed "the Reiner Rivlin Equation"—his colleague Mrs. Rivlin was killed in a road accident. Her nephew, R. S. Rivlin (now spelt with a "V") is a well known American Rheologist.

Reiner's other discoveries are too well-known to be described here in detail. His famous "Teapot Effect" and his rotating disk experiments on the interpretation of which his good friend and contemporary, the late Prof. Sir G. I. Taylor never quite reached agreement, I believe.

Reiner also pointed out that if one waits for long enough most systems will be found to flow. The Prophetess Deborah said,

"The Mountains flowed before the Lord"

so Reiner defined the "Deborah Number" to relate the relaxation time of a system to the experimental time.

After the ending of the Mandate Markus became Professor at the Technical University (Technion) in Haifa.

Markus' second wife, Rivka Schoenfeldt-Roinern, was a Colloid Chemist. She and her husband were partners in the laboratory as well as in the home, and her comparatively early death was a great shock from which he never quite recovered.

He wrote a number of excellent books on Rheology as well as very many scientific papers. His most influential papers were bound together in book form not long before his death.[†] His books were translated into several languages.

Any account of Markus Réiner would be incomplete without some mention of his delightful sense of humour and fund of good stories—a characteristic of so many Israelis.

This review could well end with the words that I added (actually in Hebrew) to his 80th birthday tribute,

"And may such men multiply in the land of Israel".

George W. Scott-Blair

* "Contributions to Mechanics." Pergamon Press, 1969.

† "Selected Papers on Rheology." M. Reiner, Elsevier, 1975.

DIARY

1976

1 October. "Future Developments in Rheology", B.S.R. Autumn Meeting, A.G.M. and Dinner, London.

29 September–1 October. "The Technology of Plastics and Rubber Interface", Brussels.

12 October. "Injection Machinery—Design, Selection and Performance".

27 October. "Plastics in Light Engineering".

25 November. "Recent Advances in Polymeric Adhesives for Packaging".

1977

27 January. "Mould Making 77".

15–16 February. "Large Plastic Components".

13–15 April. "Polymer Processing and Rheometry".