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# RHEOLOGY BULLETIN

Publication of the Society of Rheology

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## BETWEEN MEETINGS

By any standards, the 1954 Annual Meeting of our Society was a big success. It was the biggest meeting to date, attendance-wise and by number of the papers presented.

Success, of course, does not consist of numbers alone. The Arrangements Committee under Dr. R. S. Marvin had done an outstanding job. So had the Program Committee and, last not least, the participants. The papers were well selected and well presented, of high quality, and there was a great deal of stimulated discussion from the floor and in the lobbies.

As a result, more people than ever before realized that they either were rheologists, or had a stake in rheology. We increased our membership by about 7% during and since the Meeting, so that our Society has passed the 450 mark.

## THE ROLE OF THE GOVERNMENT IN RESEARCH

There is a lot of talk about Research and how it should be financed, but what is done about it? Fundamental Research assisted by private or University funds, once the main form of Research, is at present dwarfed by Industrial Research which, in turn, is at least 50 percent below the volume of Government-sponsored Research for defense needs. This development is of equally vital concern to scientists as to every citizen, since the balance between spontaneous and directed Research, and between fundamental and applied Research, is going to shape our future. We are, therefore, very glad to present a brief summary of the address by Dr. A. Waterman, Director of the National Science Foundation, to the members and guests of our Society at the social evening of our Annual Meeting.

"The legitimate object of government is to do for a community of people whatever they need to have done, but cannot do at all, or cannot so well do for themselves . . . in their separate and individual capacities". This policy pronounced by Abraham Lincoln and reiterated by President Eisenhower is particularly applicable to scientific research which is needed to sustain the defense and the atomic energy program, and on a lesser scale progress in agriculture, in health and welfare, in the establishment and maintenance of standards, in the conservation and proper exploitation of natural resources, in weather forecasting, and in other fields which relate to the common good and cannot be readily taken care of by private agencies.

In pursuit of this policy, the Federal Government has become the source of more than half of all the funds expended on research and development in the United States. In the current fiscal year, research and development for national security account for about 85 per cent of federal science expenditures, and the remaining 15 per cent is divided among all other functions of government including agriculture, health, welfare, transportation, communications, and development of natural resources. Eighty-seven cents of each dollar obligated by the Federal Government for scientific research and development goes to the physical sciences; 11 cents to the life sciences; and 2 cents to the social sciences. About 93 per cent of the total funds in fiscal years '53, '54 and '55 are for applied research and development and only about 7 per cent are for basic research.

The field of rheology, which one might say "flows" across so many fields of science is represented in the research program of almost every government agency. Those supported by the National Science Foundation are essentially basic in nature and include studies in such areas as: plastic deformation, fatigue of concrete, the rolling textures of metals, and fluid flows occurring in chemical engineering processes. Other lines of research pursued are the flow of water on the surface and subterranean, by the TVA, the Geological Survey, and the Department of Agriculture; the behavior of mortar and concrete, rubber, paints, oils and inks, ceramics, and the classical rheology of metallurgy in studies of fatigue, heat, and pressure, by the Bureau of Standards and the Bureau of Mines; hydraulics and hydrology, harbor flushing, glacier flow, atmospheric jet streams, standing waves induced by mountain ridges, by the Geophysical Sciences, while the Department of Defense occupies itself with aerodynamics, hydromechanics, cavitation phenomena, plastic flow of materials, heat flow and transfer of matter.

Noting the need for able researchers in an expanding program, the shortage of teachers, particularly at the secondary school level, is an important area requiring improvement. While skirting the delicate problem of direct and indirect influence of Government needs of defense and security on the research policies of the Universities, Dr. Waterman pointed to the vicious circle by which high industrial wages tend to attract qualified scientists away from the teaching profession and impede the training of more scientists thus further raising the industrial pay level. Finally, educating the public to cope with the social consequences of the findings of research is also an inseparable necessity for any broad basic program of research.

**RHEOLOGY BULLETIN**  
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Brooklyn 1, N. Y.

**INTERIM REPORT OF  
SECRETARY-TREASURER**

**FINANCIAL STATEMENT:**

The financial statement for January 1 - October 1, 1954 is given below. Our account is being kept, and all monies received and disbursed, by the American Institute of Physics. Quarterly statements are submitted regularly. The final statement for 1954 will appear in the Spring Issue, 1955. The proposed budget for 1955 is also appended.

**OFFICERS, COMMITTEES, REPRESENTATIVES:**

Officers and Committee members, as well as Representatives to other Societies, appeared in the Spring Bulletin, 1954 (Vol. 23 No. 1); these will remain in office until after the election in the Fall of 1955.

**CONSTITUTION AND BY-LAWS OF THE  
SOCIETY OF RHEOLOGY:**

Copies of the Constitution and By-Laws of our Society are again available, as stated in the last Bulletin, and will be sent to any members on request. Unfortunately a minor error occurred in By-Laws Article V — Representatives, Section 1. The first paragraph of this article is correct, namely calling for nomination to the AIP Board by the Member Society, but the next two paragraphs are inaccurate. The Member Societies do not "elect" their representatives on the Board, but nominate in any manner they care to, with the final election being made by AIP and not by the Member societies. This will be borne in mind when the Constitution is re-set for reprinting.

**RELATIONS WITH THE AMERICAN INSTITUTE OF  
PHYSICS:**

**CONTRACT** — The new contract with the A.I.P. was signed on July 23, 1954. Copies are available for examination, on request.

**NEW COMBINED BILL FORM** — This was approved and will be used by A.I.P. in all its billings to Member Society membership.

**MEETINGS** — The past and present Secretary-Treasurers were proxies to the Annual Meeting of the American Institute of Physics on February 20, 1954. The President as a member of the Governing Board of A.I.P. has attended meetings of the Board. The American Association of Physics Teachers suggested we send a representative to the AAPT Committee on Physics in Engineering Education held at A.I.P. Headquarters, September 18, but after a discussion between the President and Secretary-Treasurer it was decided unnecessary and A.I.P. Headquarters was so advised.

**MINUTES**

**Business Meeting of the Society of Rheology**

Lecture Hall, East Building, National Bureau of Standards  
Washington, D. C.  
November 5, 1954

The meeting was called to order by President Markwood at 4:45 P.M.

The actions taken at the last business meeting as reported in the Spring Bulletin were approved.

The Secretary-Treasurer presented his interim report. Abridged financial statements and the proposed budget for 1955 are appended to these Minutes. (Details are on file with the Secretary-Treasurer's reports). It has been decided that there should be carried sufficient "available cash balance" so that the Society could operate for at least one year and preferably two years even if all income were cut off. The estimated cash balance on January 1, 1955 will be \$1470 so we are operating within reasonably safe limits.

The interim report of the Secretary-Treasurer was accepted, after brief explanations to questions from the floor.

The Secretary-Treasurer reported that the Executive Committee had approved the establishment of a second standard of viscosity in accordance with the recommendation of the pertinent committee of which Dr. A. Bestul is chairman. The recommendation reads as follows:

"The Society of Rheology is in favor of the establishment of a second compound, in addition to water, as a standard of viscosity. It is recommended that such a standard have a viscosity several times that of water, and a surface tension appreciably lower than that of water; being in the range of those for lubricating oils. We feel that the absolute viscosity of such a standard should be based on the accepted absolute viscosity determination for water, and that any batch of the second standard prepared and purified according to specifications developed should be accepted as having a predetermined viscosity at a given temperature. As developed any such new second standard will be submitted to the Society of Rheology through the appropriate committee for approval".

It was pointed out that such a standard would be a "second" standard in addition to water and not a "secondary" standard in reference to water. As a compound for possible establishment of such a second standard n-hexadecane was noted as having a viscosity and surface tension within the specified limits; this compound was also readily obtainable in adequate quantity of sufficient purity and had a very low solubility in water.

The business meeting affirmed the approval of the Executive Committee. It was also urged that other parties interested (for example the American Society for Testing Materials, the American Standards Association, ISO/TC66, National Bureau of Standards and others) should consult together to select such a material and a procedure for its establishment as a second standard.

On notice from the floor attention was directed to a proposal by the Bingham Award Committee to the Executive Committee to extend the scope of potential recipients, which at present is limited to "a resident of North America or a United States possession", so that the recipient might be a distinguished foreign rheologist. This proposal to extend the scope was overruled by the Executive Committee on the grounds that the original rules for the Bingham Award had been written with geographical considerations in mind, that there were numerous foreign societies which could grant similar awards as they saw fit, and that granting the award to a non-resident of North America or a United States possession might involve questions of protocol and diplomacy which were best avoided.

The business meeting was advised that membership continues to increase and that some 25 new members had joined up to November 1 and that 24 new members joined during this Annual Meeting, bringing the total membership (all classifications) to approximately 445. It is proposed to distribute a membership roster as soon as possible for the exclusive and restricted use of the members.

The Secretary-Treasurer noted that the Society would co-sponsor a symposium on Rheology with Sub-Committee 9 of Committee E-1 of ASTM at the Annual Meeting of the ASTM in June, 1955.

It has been decided that the Society will not hold its annual meeting at the time of the Joint AIP meeting in 1956 since this joint meeting will be held early in the year and would upset the regular schedule of annual meeting dates of the Society of Rheology. However, an attempt will be made to co-sponsor meetings with the proper groups on high polymers and solid state.

The possibility of holding a joint symposium with the American Society of Lubricating Engineers (ASLE) on the rheology of lubricants and lubrication at our next annual meeting has been proposed and will be investigated.

The business meeting was advised that the Executive Committee had set the date for next year's meeting as November 2nd, 3rd and 4th in New York City. There will be two and a half days of technical sessions with four papers to each session.

The meeting was adjourned at 5:30 P.M.

Respectfully submitted,  
William R. Willets  
Secretary-Treasurer

## SOCIETY OF CHEMICAL INDUSTRY

As readers might recall, the Society of Chemical Industry, London, has been collecting the Proceedings of its Plastic and Polymer Group in a series of volumes. Volume V, 1953 has just appeared and contains papers published between 1951 and 1953, partly in the Journal of Applied Chemistry and partly in Chemistry and Industry. It is a very handy volume containing 21 papers of rheological interest and can be obtained at the price of £2.10.0 from the Secretary of the Society, 56 Victoria Street, London, S. W. 1.

## SOCIETY OF RHEOLOGY Abridged Financial Statements and Budget 1954-55

### FINANCIAL STATEMENT — TO OCTOBER 1, 1954

Total Cash on Hand, January 1, 1954	3584.47
Income to October 1, 1954	482.46
Total	\$4066.93
Disbursements to October 1, 1954	893.21
Cash Balance October 1, 1954	\$3173.72
Estimated Expenses Oct. 1 - Dec. 31, 1954	505.16
Estimated Balance — January 1, 1955	\$2668.56
Less Special Funds	
Bingham Fund — Cash	\$ 128.95
Rheological Memoir Fund	81.21    210.16

### BUDGET — 1955

Estimated Cash on Hand	
(exclusive of special funds)	\$2458.40
Income including 1955 dues	1650.00
Total Income 1955 (estimated)	\$4108.40

### EXPENSES (estimated)

AIP Assessment	\$ 170.00
AIP Service Charge	110.00
AIP Misc. Charges	50.00
Publication Costs — JAP	500.00
Membership Committee Expenses	100.00
Rheology Bulletin	300.00
Misc. Printing and Duplicating	100.00
Misc. Secretary expenses incl. mailing	70.00
Meeting Expenses	70.00
Total Expenses	\$1470.00
Estimated Available cash balance Jan. 1, 1956	\$2638.40
Bingham Fund (incl. \$700 G Bonds)	846.45
Rheological Memoir Fund	81.21
Total Estimated Assets January 1, 1956	\$3566.06

## TWO RHEOLOGY ISSUES?

One of the most gratifying feature of the 1954 Meeting was the readiness of the authors to reserve their papers for the publication media of the Society. It is expected that about 20 of the 29 papers given will appear in the Rheology Issue of 1955.

Far from being a mere ambition, the Society's efforts to obtain a good cross-section of papers for its Annual Meetings, and to channel these papers into its own publication organ, are believed to be a service to its membership who thereby receive yearly a collection of valuable publications in convenient form. Further, the more papers we can bring together and the more representative our Issues become, the easier will it be for non-members to acquaint themselves with our Society and its activities and to learn of the value of Rheology for their own work.

At the same time, an increased publication activity means an increased financial burden. Even for the past three years it was possible only to carry our policy into effect by means of the generous cooperation first of the Journal of Colloid Science, and since of the Journal of Applied Physics. Right now, we are negotiating with the Society of Plastics Engineers Journal for additional space to accommodate this year's crop of papers. If successful, our membership can look forward to receiving two Rheology Issues in the late Spring of 1955, one in the JAP and the other in the SPEJ.

## THE FIRST AND SECOND VISCOSITIES OF FLUIDS

Under the above title, a discussion was arranged on behalf of the Royal Society by Professor L. Rosenhead on April 29, 1954. The papers quoted below have been published in the Proceedings of the Royal Society, Series A, October, 1954. Anyone interested in obtaining a copy for the price of 18/- should write to D. C. Martin, Assistant Secretary, The Royal Society, Burlington House, London, W. 1. Papers contained in this volume are:

Relations Between Relaxation and Transport-Phenomena  
H. O. Kneser.

On the Thermodynamic Theory of the Second Viscosity  
J. Meixner.

Acoustic Experiments Relating to the Coefficients of Viscosity of various liquids  
E. G. Richardson.

The Two Coefficients of Viscosity for an Incompressible Fluid Containing Air Bubbles  
Sir Geoffrey Taylor, F.R.S.

The Present Status of the Controversy Regarding the Bulk Viscosity of Fluids  
C. Truesdell.

Review of the Discussion  
E. N. da C. Andrade, F.R.S.

## U.S. GOVERNMENT RESEARCH REPORTS

In a recent letter to members of Engineering Societies, groups, and associations, Orville T. Colby, Chief of the Technology Division, Department of Commerce urges that more use be made of the growing stockpile of research reports released by the Federal Government through the Office of Technical Services of the United States Department of Commerce.

These reports refer to scientific and technical research which the Government is conducting or sponsoring at the current rate of two billion a year, mostly for defense purposes. However, the largest share represents applied and developmental research, much of a non-confidential nature, the information on which is available to researchers and business men alike who are interested in developing new processes, in making technological improvements, and in avoiding duplication of research.

The research fields covered include almost all scientific and industrial activities, such as general chemistry and the production of chemicals, plastics, paints, electrical machinery and electronics, foods, fuels and lubricants, instrumentation, leather, lumber, metals, minerals, paper, ordnance, physics, rubber, textiles, aeronautics, transportation, water supply, and others.

Some 530 such reports are described each month in U.S. Government Research Reports (formerly "Bibliography of Technical Reports") which are available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., or any of the U.S. Department of Commerce Field Offices at \$6 a year.

## INTERNATIONAL COMMITTEE ON RHEOLOGY

As Members will remember, such a Committee was formed at the occasion of the Second International Congress on Rheology in Oxford, in 1953. All the delegates from the various countries have since been nominated to this Committee. Their names are given below, since they should be useful for contacts in the respective countries:

B. Gross (Brazil), L. R. G. Treloar (England), H. Weiss (France), F. H. Muller (Germany), M. Reiner (Israel), R. N. J. Saal (Netherlands), E. Forslind (Sweden), R. S. Spencer (U. S. A.), A. Peterlin (Yugoslavia).

The International Committee is setting up a Subcommittee on Nomenclature which will prepare a summary of present usage (terms, definitions, symbols) to be referred to the various rheological societies for discussion. Eventually, a more definite report will be prepared for consideration at the Third International Congress on Rheology.

## BUILDING MATERIALS

### Their Elasticity and Inelasticity

Edited by M. REINER and A. G. WARD  
560 pages, 180 illustrations — \$12.25  
Interscience Publishers, New York, 1954

"If there were any doubts of the importance to building science and technology of the branch of physical science that has received the convenient designation of Rheology, this volume will remove them".

This claim, contained in the opening sentence of the book, is very well substantiated. The whole gamut of Building Materials from steel to paint, and from plaster to asphalt, is discussed by experts with respect to their mechanical properties. Special emphasis is placed on the difference between the static or idealized behavior, and the real behavior under working conditions, including the frequently encountered subsequent changes in properties.

The twelve chapters are well coordinated with respect to their approach, but are rather independent in view of the different subject matters treated; they are equally informative, and are well written. The book can be recommended both as an important addition to the rheological literature, and as a landmark in the Building Sciences.