

RHEOLOGY BULLETIN

Publication of The Society of Rheology, Inc.

Volume 36 No. 3



September, 1967

38th ANNUAL MEETING THE SOCIETY OF RHEOLOGY, INC.

SHERATON PARK HOTEL
WASHINGTON, D. C.

OCTOBER 23-25, 1967

Accommodations

Accompanying this issue of the Rheology Bulletin are a pre-registration form for the meeting and a reservation request card for the hotel. You are urged to pre-register in order that the meeting can be as accurately planned as possible and therefore proceed as smoothly as possible. The block of hotel rooms set aside for our meeting will be held, and reservations made from it, until October 8. At that time it will be released to the general public and reservation requests received thereafter will be in competition with those of the general public. People who are interested in the lower priced rooms are reminded that the earlier they send in their reservation request cards the more likely they are to get those rooms.

Special features of this meeting will include: (1) two experimental sessions on Monday evening, October 23, for informal small-group discussion of selected topics of special interest, (2) morning and afternoon sessions at the new National Bureau of Standards laboratories in nearby Gaithersburg, Maryland, on Tuesday, October 24, and (3) a traditional Society of Rheology Smoker on Tuesday evening.

The discussion sessions on Monday evening, October 23, are intended for people who are actively interested in the announced discussion topics and who are prepared to participate in the discussions. No arrangements exist for auditors at these sessions.

The program at the National Bureau of Standards on Tuesday, October 24, offers a certain amount of individual choice and includes the presentation of technical papers, the presentation of the Bingham Medal, the Society's annual business meeting, opportunities for continuation of Monday night's discussion sessions if desired, and opportunities for informal laboratory visits or

for formal tours of the new National Bureau of Standards laboratories. Participation in these tours is limited and preference will be given to people who sign up for them at the Society registration desk on Sunday or Monday.

Transportation to and from the National Bureau of Standards is by charter bus, the cost of which is included in the meeting registration fee. Most of the busses will leave the hotel at 8:30 in the morning, and will leave the National Bureau of Standards at 5:30 in the afternoon. The scheduled duration of the one-way trip is 35 minutes. If sufficient demand is indicated by people signing up appropriately at the Society registration desk on Sunday or Monday, arrangements will be made for extra busses to leave the hotel at 1:30 p.m. (arriving at the National Bureau of Standards in time for the Bingham Medal presentation), and to leave the National Bureau of Standards at 3:30 p.m. (after the Bingham Medal presentation).

Normal arrival at the hotel on returning from the National Bureau of Standards is scheduled for shortly after 6:00 p.m. This will allow ample time for relaxation and dinner before the smoker that evening. The smoker will feature a delightfully instructive briefing by R. B. Bird which may be especially helpful in connection with the Fifth International Congress on Rheology to be held in Japan in October 1968.

Facilities

Speakers will be provided with a blackboard and 2 inch by 2 inch and 3¼ inch by 4¼ inch slide projectors. If other facilities are required for the presentation, the Local Arrangements Chairman, A. B. Bestul, Polymer Division, National Bureau of Standards, Washington, D. C. 20234, should be contacted as soon as possible.

Program Committee

A. Peterlin (Chairman), Camille Dreyfus Laboratory, Research Triangle Institute, Post Office Box 490, Durham, North Carolina 27702.

M. H. Birnboim, 4350 Lydia Street, Pittsburgh, Pennsylvania 15207.

A. C. Pipkin, Division of Applied Mathematics, 182 George Street, Brown University, Providence, Rhode Island 02912.

RHEOLOGY BULLETIN

Raymond R. Myers, Editor
Department of Chemistry
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Kent, Ohio, 44240

NOTICE OF WINTER MEETING

February 5-8, 1968, Vacation Village Hotel, Mission Bay, San Diego, California 92109. Local arrangements are being handled by Mr. Rex Gosnell, NARMCO Division of the Whittaker Corp., 3540 Aero Court, San Diego, Calif. 92123. Requests for room reservations should be sent to Vacation Village Hotel, with the statement that the person will be attending the meeting of the Society of Rheology.

Deadline for abstracts of papers for the Winter Meeting is November 20, 1967. Please confine abstracts to 400 words and send to the Chairman of the Program Committee:

Julian Johnson (Chairman), Chevron Research Company, Room 1127-A, 576 Standard Avenue, Richmond, California 94802.

M. Goldstein, 1222 Kensington Road, Teaneck, New Jersey 07666.

M. C. Shen, North American Aviation Science Center, 1049 Camino Dos Rios, Thousand Oaks, California 91360.

THE BINGHAM MEDAL, 1967

Nomination of Dr. Hershel Markovitz, The Mellon Institute, Pittsburgh, Pennsylvania, as the Recipient of the Bingham Medal of the Society of Rheology, Inc., for 1967.

Dr. Markovitz's work has been characterized by an almost unique mixture of experimental and theoretical activities. He was one of the first to attempt to use the ideas and concepts developed in recent theories of nonlinear continuum mechanics in his experimental work, and his background of experimental work enabled him to contribute to the formulation of these theories and to influence the work of other theoreticians. It is reasonable to claim that Dr. Markovitz is today the best known member of the small group of basically experimental rheologists who are attempting to test the theoretical concepts used in modern nonlinear continuum mechanics with the aim of arriving at useful and general constitutive equations.

Dr. Markovitz's work in rheology started more than seventeen years ago. In 1957 he published a classic paper in rheology, one which has had a widespread influence. In this paper he presented a critical analysis and comparison of the various rheological theories of fluids then extant, and in particular pointed out the critical

experiments needed to distinguish between them. Dr. Markovitz observed that these critical experiments would not be easy to do, and that great accuracy would be required. He then embarked on this tedious task, rather than leaving it for others, culminating in the publication of data on normal stresses which is undoubtedly the most accurate and reliable available even today. (It is remarkable that as early as 1957 he had data indicating the failure of the Weissenberg conjecture on the equality of normal stresses.)

Dr. Markovitz's distinguished career in rheology has been characterized by careful precise experiments and incisive critical analysis. His influence on the field of rheology has been strong and continuous and his contributions to the Society of Rheology, Inc. have been considerable, as evidenced by the number of important positions, both appointed and elective, he has held in the Society.

SOCIETY OF RHEOLOGY FIFTH CONGRESS CHARTER FLIGHT

The Society of Rheology, Inc. announces a charter flight program to and from Japan for the Fifth International Congress on Rheology. The Congress will be held in Kyoto, Japan, Monday, October 7, to Friday, October 11, 1968. Any Society member may participate in this charter as may members of his family living in his household.

The flight will leave New York on or about September 28, 1968, and return to New York arriving on or about October 20, 1968. One West Coast stop will be made with the possibility of another stop at a midwest location, if needed.

The round trip cost is the same for any city used for implaning or deplaning—\$495*. Infants who are carried (that is, do not occupy a seat) are free. Children who occupy a seat pay the regular \$495 fare.

The charter will be a jet flight of a regularly scheduled airline. Special flight bags, first-class meals, cocktails and champagne are all included plus tourist guide information.

Those wishing to participate should send a deposit of \$175 per seat payable to Society of Rheology Fifth Congress Flight. The check should be mailed to Robert E. Coulehan, 13 Allen Street, Dobbs Ferry, New York 10522 as soon as possible to insure a reservation. All funds are returnable until June 15, 1968, for those who are forced to cancel.

* Based on 153 passengers.

ANNOUNCEMENTS

1. The next Branch meeting of the British Society of Rheology will be held on Wednesday, March 1, 1968 at 7:30 p.m. in the Middle Theatre, New Arts Building, Melbourne University. The speaker will be D. H. Morton of Australian Paper Manufacturers Limited who will talk on "Structure, Composition and Rheology of Regenerated Cellulose Films." Visitors are welcome.

Members are invited to join the speaker and branch committee for dinner beforehand. The dinner will be held at University House, Melbourne University Grounds at 5:45 p.m. The cost will be approximately \$1.40. Parking at the University will be allowed if the notice is shown to the gatekeeper.

Those members who would like to attend should contact J. C. Godfrey, Honorary Secretary, Division of Chemical Engineering, Box 4331, G.P.O., Melbourne before February 27, 1968.

2. The Bundesanstalt für Materialprüfung in Berlin-Dahlem has set up a documentation system concentrated on wear, friction, and lubrication. The first four volumes, primarily devoted to pertinent literature of the last two decades and containing some 10,000 references, have been published (Jahrgang 1967, Nos. 1-4).

It is estimated that the price would be \$5.00 per year approximately; there may be some additional cost for the first four volumes.

3. The 12th International Congress of Applied Mechanics will be held at Stanford University, Stanford, California August 26, 1968 to August 31, 1968. There will be five general lectures for which the speakers will be invited by the International Program Committee. Not more than 300 contributed research papers will be presented.

The Proceedings of the Congress will contain a short description of the Congress, with a list of participants, a complete list of the titles and authors of the papers presented, and the complete text of the general and sectional lectures (which are defined below). Participants in the Congress other than the general and sectional lecturers are encouraged to publish their research contributions in engineering and science journals.

The registration fee will be \$20. Accommodations for participants in the Congress and their families (excluding children below 12 years of age) will be available at Stanford University at the rate of \$6.00 a night for a single room and \$4.00 per person per night if a room is shared with another person. The cost of three meals per day will be \$5.00 per day per person. Motels and hotels are also available. Further information will be sent to all those who apply for advance registration to the 12th International Congress of Applied Mechanics, Post Office Box 5789, Stanford, California 94305, U.S.A.

Those who wish to present papers should send 500-word summaries plus 100- to 150-word abstracts, both in triplicate, to the address given, no later than February 2, 1968. The abstracts of papers accepted for presentation will be printed in a booklet which will be made available to the participants before the opening of the Congress. The decision regarding acceptance will be made by the International Papers Committee on the basis of the summaries. A number of papers that appear particularly interesting because

of their subject matter, method of treatment of the problem and results obtained will be designated as sectional lectures. Thirty minutes will be allotted to the sectional lecturers for presentation and ten minutes for discussion, while the remaining contributed papers on the program will be presented in 15 minutes with 5 minutes of discussion. The General Secretary of the Congress will notify the authors of the decision regarding their papers by May 17, 1968.

Limited funds will be available for distribution to persons who cannot attend the Congress without financial help. Applications should be sent to the Stanford address not later than February 2, 1968. The possibility of a charter flight from Europe to San Francisco is being explored by the Congress Committee of IUTAM. The cost of the round trip will not exceed \$400.00, and may be considerably less, depending on the availability of financial support for the Congress. Those who are interested in such transportation at reduced cost are requested to write to Professor W. Koiter, Secretary of the Congress Committee of IUTAM, Mekelweg 2, Delft, Netherlands, before October 15, 1967.

PROGRAM

38th ANNUAL MEETING THE SOCIETY OF RHEOLOGY, INC.

October 23-25, 1967

(Asterisks indicate invited papers)

MONDAY, OCTOBER 23

SESSION A—Monday Morning VISCOELASTIC THEORY

Chairman: A. C. PIPKIN, Applied Math Division, Brown University, Providence, Rhode Island

A-1

9:30 a.m. K. C. Valanis and T. J. Peng, Iowa State University, Ames, Iowa, "*Thermodynamics of Viscoelastic Materials with Couple-Stress.*"

A-2

10:00 a.m. N. W. TSCHOGEL, California Institute of Technology, Pasadena, Calif., "*Approximation Methods for the Determination of the Relaxation Spectrum from the Storage Modulus.*"

A-3

10:30 a.m. W. PHILIPPOFF, Esso Research and Engineering Company, Linden, New Jersey, "*Angular Relationship in Rheology.*"

11:00 a.m. Break

A-4

11:15 a.m. S. HAVRILIAK and S. Negami, Rohm and Haas Company, Bristol, Pa., "Complex Plane Analysis of Dielectric and Mechanical Dispersions in Some Polymers."

A-5

11:45 a.m. R. F. Fedors and R. F. Landel, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, "A Test of the Predictability of the Properties of Filled Systems."

A-6

12:15 p.m. J. F. Clauser and W. G. KNAUSS, California Institute of Technology, Pasadena, Calif., "On The Numerical Determination of Relaxation and Retardation Spectra for Linearly Viscoelastic Materials."

SESSION B—Monday Afternoon
VISCOELASTIC EXPERIMENTAL

Chairman: T. LITOVITZ

B-1

2:30 p.m. *B. N. BROCKHOUSE, McMasters University, Hamilton, Ontario, "The Phonon Spectra of Crystals and Their Relation to Mechanical and Thermal Properties."

B-2

3:30 p.m. J. D. FERRY, N. R. Langley, J. J. Sanders, R. G. Mancke, and R. H. Valentine, University of Wisconsin, Madison, Wisconsin, "Viscoelastic Properties of Rubbery Polymers."

4:00 p.m. Break

B-3

4:15 p.m. R. S. MOORE, H. J. McSkimin, C. Gieniewski, and P. Andreatch, Jr., Bell Telephone Laboratories, Inc., Murray Hill, New Jersey, "Dynamic Mechanical Properties of Concentrated Polystyrene Solutions and Chlorinated Biphenyls at 40 MHz."

B-4

4:45 p.m. A. F. LEWIS, American Cyanamid Company, Stamford, Connecticut, "Classification of Dynamic Loss Peaks in Polymers and Metals."

B-5

5:15 p.m. B. D. Marsh and R. B. Bird, University of Wisconsin, Madison, Wisconsin, "Viscoelastic Hysteresis."

SPECIAL TOPIC DISCUSSIONS—Monday Evening

C-1

8:00 p.m. Topic: "The Significance of the $\partial W / \partial I_2$ Term for Amorphous Polymers."

Moderator: F. Eirich, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Reviewer: R. F. Landel, California Institute of Technology, Pasadena, Calif.

C-2

8:00 p.m. Topic: "The Molecular Mechanisms for the α and γ Loss Peaks in Crystalline Polyethylene." Moderator: R. S. Stein, University of Massachusetts, Amherst, Mass.

Reviewer: K. M. Sinnott

TUESDAY, OCTOBER 24

Sessions D and G will be held at the National Bureau of Standards. Tours will be announced.

8:30 a.m. Busses will depart the hotel at 8:30 a.m. for the Bureau.

SESSION D—Tuesday Morning
NON-LINEAR EFFECTS IN FLUIDS

Chairman: J. ERICKSEN

9:15 a.m. Welcome by the NBS Director

D-1

9:30 a.m. R. I. TANNER and J. H. Simmons, University of Sidney, Sidney, Australia, "Combined Simple and Sinusoidal Shearing in Elastic Liquids."

D-2

10:00 a.m. R. B. Bird, P. J. Carreau, E. K. Harris, and I. F. Macdonald, University of Wisconsin, Madison, Wisconsin, "Formulation and Application of a Non-linear Model for Elasticoviscous Fluids."

D-3

10:30 a.m. E. ASHARE, University of Wisconsin, Madison, Wisconsin, "Rheological Study of Polystyrene Solutions."

11:00 a.m. Break

D-4

11:15 a.m. C. W. McGuirt and G. Lianis, Purdue University, Lafayette, Indiana, "Constitutive Equations for Viscoelastic Solids Under Finite Uniaxial and Biaxial Deformations."

D-5

11:45 a.m. T. ARIMAN and A. S. Cakmak, University of Notre Dame, Notre Dame, Indiana, "Polar Fluids."

12:15 p.m. Society of Rheology Business Meeting

Tuesday Afternoon

2:15 p.m. Presentation of Bingham Medal

3:20 p.m. Break

SESSION E
NORMAL STRESS EXPERIMENTS

Chairman: E. KEARSLEY

E-1

3:45 p.m. L. J. ZAPAS and J. C. Phillips, National Bureau of Standards, Washington, D. C., "The Limiting Value of Normal Stresses in PIB Solutions at Low Rates of Shear."

E-2
4:15 p.m. W. J. GRAESSLEY and L. Segal, Northwestern University, Evanston, Illinois, "Viscosity and Normal Stresses in Concentrated Polystyrene Solutions."

E-3
4:45 p.m. R. I. TANNER, Brown University, Providence, R. I., "Annular Flows for Measuring the Second Normal Stress Difference."

5:20 p.m. Busses return to hotel

Tuesday Evening
8:30 p.m. Smoker

WEDNESDAY, OCTOBER 25

SESSION F1—Wednesday Morning RHEOPTICS BEHAVIOR

Chairman: R. S. MOORE

F1-1
9:00 a.m. Y. Shindo, B. E. Read, and R. S. STEIN, University of Massachusetts, Amherst, Mass., "The Study of the Orientation and Relaxation of Polyvinyl Films by Means of Infrared and Visible and Ultraviolet Dichroism and Birefringence."

F1-2
9:30 a.m. J. Blok and D. C. LEGRAND, General Electric Research and Development Center, Schenectady, New York, "Rheo-Optical Studies of Polymers XIV. Stress Induced Birefringence in Polymers During Short Time Electrical Stressing."

F1-3
10:00 a.m. A. PETERLIN, Camille Dreyfus Laboratory, Research Triangle Institute, Research Triangle Park, N. C., "Gradient and Frequency Dependence of Intrinsic Viscosity and Birefringence of Polymer Solutions."

10:30 a.m. Break

F1-4
10:45 a.m. W. PHILIPPOFF, Esso Research and Engineering Company, Linden, New Jersey, "The Rheo-Optical Properties of Liquid Silicones."

F1-5
11:15 a.m. T. R. Fields, Jr. and D. C. Bogue, University of Tennessee, Knoxville, Tennessee, "Stress-Birefringent Patterns of a Viscoelastic Fluid at a Sharp-Edged Entrance."

F1-6
11:45 a.m. J. R. WAGNER, Philadelphia College of Textiles and Science, Philadelphia, Pa., "Photoelastic Study of Stresses in Fabrics and Fabric-Like Structures."

SESSION F2—Wednesday Morning STEADY STATE FLOWS

Chairman: D. J. PLAZEK

F2-1
9:00 a.m. I. M. KRIEGER, Case Western Reserve University, Cleveland, Ohio, "Shear Rate in the Couette Viscometer."

F2-2
9:30 a.m. J. G. BRODNYAN, The Rohm and Haas Research Laboratories, Spring House, Pa., "The Dependence of Synthetic Latex Viscosity on Particle Size and Size Distribution."

F2-3
10:00 a.m. A. EISENBERG, McGill University, Montreal, Canada, "The Viscosity of Liquid Sulfur—A Mechanistic Reinterpretation."

10:30 a.m. Break

F2-4
10:45 a.m. I. Zandi and V. R. Krishna Murthy, ??
"A Theory of Viscous Interaction in Turbulent Fields."

F2-5
11:15 a.m. G. M. YANSIZESKI and G. Bugliarello, Carnegie-Mellon University, Pittsburgh, Pa., "Phenomena in the Laminar Inertial Flow of Neutrally Buoyant Spheres in a Rectangular Channel of High Aspect Ratio."

F2-6
11:45 a.m. A. G. FABULA, Naval Undersea Warfare Center, Pasadena, California, "Nonsteady Elongational Flow Experiments with Polymer Solutions."

SESSION G—Wednesday Afternoon NORMAL STRESS AND FLOW

Chairman: L. ZAPAS

2:00 p.m. *W. MacKnight, University of Massachusetts, Amherst, Mass., "Dynamic Mechanical and Infrared Studies of Ethyl Methacrylate Copolymers and Their Salts."

G-2
3:00 p.m. B. BERNSTEIN, Illinois Institute of Technology, Chicago, Illinois, "Steady Flows of Memory Fluids."

G-3
3:30 p.m. L. L. BLYLER, JR., Bell Telephone Laboratories, Inc., Murray Hill, New Jersey, "Normal Stress Behavior of Linear Polyethylene Melts in a Rotational Parallel Plate Rheometer."

G-4
4:00 p.m. T. W. HUSEBY, L. L. Blyler, Jr., and E. Scalco, Bell Telephone Laboratories, Inc., Murray Hill, New Jersey, "Dynamic and Steady Flow Behavior of ABS Polymer Melts."

G-5
4:30 p.m. N. NAKAJIMA, Allied Chemical Corporation, Morris Township, New Jersey, "Quantitative Relationship Between Steady-State Flow Curve and Molecular Weight Distribution of Polyethylene."

AMERICAN INSTITUTE OF PHYSICS, INCORPORATED
FOR
SOCIETY OF RHEOLOGY, INC.

Statement of Receipts and Disbursements
At March 31, 1967

BALANCE IN ACCOUNT — JANUARY 1, 1967		\$14,264.04
RECEIPTS (JANUARY 1 - MARCH 31, 1967)		
Dues Collections:		
1967 Dues		1,298.03
Income from Winter Meetings:		
Registration of New Members	\$ 215.00	
Registration of Regular Members	290.00	
Registration of Non Members	110.00	
Sale of 55 Banquet Tickets	330.00	
Gratuity from Instron Corporation	200.00	
TOTAL RECEIPTS		1,145.00
		<u>\$16,707.07</u>
DISBURSEMENTS (JANUARY 1 - MARCH 31, 1967)		
Charge for Dues Billing and Collection	\$ 71.96	
Charge for Maintenance of Society List	144.46	
Contribution for Support of AIP—1967 (Three Months)	183.17	
		\$ 399.59
Winter Bulletin	\$ 339.23	
Winter Meeting	\$1,132.38	
		1,471.61
Editorial Expenses—R. R. Myers:		
Secretarial Services	\$ 127.50	
Office Expense	17.50	
		145.00
Secretarial Duties—E. Wolf:		
Miscellaneous Correspondence		20.38
Membership Roster:		
7 Reams of Paper	\$ 16.66	
Offsetting, Stuffing, and Mailing	36.69	
Postage	31.01	
		84.36
Other:		
Addressing for Transactions VIO Part 2	\$ 2.50	
Addressing Galley and Mailing to Coulehan	2.66	
Telephone and Telegraph	6.61	
		11.77
TOTAL DISBURSEMENTS		\$ 2,132.71
		<u>\$14,574.36</u>
BALANCE IN ACCOUNT, MARCH 31, 1967		<u>\$14,574.36</u>

