

RHEOLOGY BULLETIN

Publication of the Society of Rheology

Volume 28, No. 2

Summer, 1959

NOVEMBER ANNUAL MEETING

Less than two months now remain until our Thirtieth Anniversary Meeting, to be held at Lehigh University, in Bethlehem, Pennsylvania, on Wednesday, Thursday and Friday, November 4, 5 and 6.

A full three-day program has been organized by the Program Committee, under the chairmanship of James T. Bergen, Research Laboratories, Armstrong Cork Co., Lancaster, Pa. A total of 36 papers are on the program, and two Symposia (one on Adhesion, and another on Mechanics of Continua) are included. A resumé of the program, giving papers by title and author only, is included in the present issue of the Bulletin. Abstracts of the papers will be given in a more extended version of the program to be included in the next issue of the Bulletin, which will be sent out very soon.

In addition to the formal program of technical papers, there will be a Cocktail Party late Wednesday afternoon, and a Smoker that evening. The Society Banquet will be held on Thursday evening at the University Center, where the presentation of the Bingham Medal will take place. A meeting of the Executive Committee of the Society is planned for Tuesday evening.

A block of rooms has been reserved for the Society at the Hotel Bethlehem, and bus service will be provided between the hotel and the Lehigh campus. Reservation cards have been enclosed in the present mailing, together with some informative brochures on Lehigh University and the Bethlehem area. It is suggested that these reservation cards be returned to the Hotel Bethlehem as promptly as possible.

An extensive Ladies' Program has been planned, which will include a visit to a Moravian holiday bazaar and lunch there, a tour of the University campus, the Cocktail Party, the Banquet, a shopping trip to the Hess Brothers Department Store in Allentown with lunch in the patio, and the Lehigh-VMI football game on Saturday (which is one of the best of the season). Local arrangements are being handled by a committee under the chairmanship of Raymond R. Myers, Research Associate Professor of Chemistry, Lehigh University, Bethlehem, Pa. Assisting Professor Myers are Charles Moravec, Director of Public Information at Lehigh, and Raymond D. Hoffman of the Lehigh Chemistry Department. The local committee is very anxious to know in advance how many wives will be coming; this can be indicated either on the hotel reservation card, or by a note directly to Professor Myers. The local committee will also be glad to obtain tickets for the football game in advance, if notified by mail.

PROGRAM RESUME

Wednesday morning, Nov. 4

"Rheological Measurements with the Brabender Plastograph"

C. C. McCabe

"The Influence of Viscômeter Design on non-Newtonian Measurements"

R. McKennell

"Flow Down an Inclined Plane"

Ray D. Hoffman and Raymond R. Myers

"Remarks on Rheology in Europe"

J. D. Ferry

Wednesday afternoon, Nov. 4

"The Rheology of Asphalt: II. Flow Characteristics of Asphalt"

F. H. Gaskins, J. G. Brodnyan, W. Philippoff, and E. Thelen

"The Rheology of Asphalt: III. Dynamic Mechanical Properties of Asphalt"

J. G. Brodnyan, F. H. Gaskins, W. Philippoff, and E. Thelen

"Stress-Optical Properties of Silicones"

W. Philippoff

"Flow Properties of Lithium Stearate—Oil Dispersions"

W. H. Bauer, D. O. Shuster and S. E. Wiberly

"Rheology and Dental Materials"

R. H. Roydhouse

"On Anomalies in the Measurement of the Complex Modulus"

S. H. Bodner

Thursday morning, Nov. 5

"Dynamic Compressibility of Natural Rubber-Sulfur as a Function of Pressure, Temperature and Frequency"

J. E. McKinney

"Concentration Dependence of the Stress-Optical Coefficient in Dilute Solution"

W. Philippoff

"Thermodynamics of Stretching of Nylon Fibers"

M. L. Williams

"Rupture of Rubber"

L. Mullins

"Dynamics of Frictional Compressible Fluids—Application to Plastico-Dynamics"

C. Torre

"Thermodynamics' Relationship to Rheology"

H. Hull

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R. D. Andrews, Jr., Editor

Plastics Research Laboratory

Room 7-006, M.I.T.

Cambridge 39, Mass.

Thursday afternoon, Nov. 5

Symposium on Mechanics of Continua

"Modern Theories of Materials"

C. Truesdell

"Stress Analysis for Viscoelastic Bodies Subject to Temperature Variation"

L. W. Morland and E. H. Lee

"Hypo-Elasticity and Elasticity"

B. Bernstein

"Theory of Anisotropic Fluids"

J. L. Ericksen

"On the Concepts of Equilibrium in Continua. Part I"

B. D. Coleman and W. Noll

"On the Concepts of Equilibrium in Continua. Part II"

B. D. Coleman and W. Noll

Friday morning, Nov. 6

"Rheological Properties of Molecules in Fibers"

F. H. Ree, S. Chang, T. Ree and H. Eyring

"The Significance of Rheology in the Making and Using of Paper"

A. H. Nissan, H. G. Higgins and A. Lagani, Jr.

"A Re-Interpretation of the Rouse-Bueche Theory of Viscoelastic Behavior"

R. S. Marvin

"Rheology in Search of Structures. Part II"

A. Voet and W. N. Whitten, Jr.

"The Behavior of Particles in Laminar Shear"

S. G. Mason

"Heat Transfer to non-Newtonian Fluids Under Laminar Flow Conditions"

A. B. Metzner and D. F. Gluck

Friday afternoon, Nov. 6

Symposium on Adhesion

"Mechanism of Peeling"

Y. Inoue and Y. Kobatake

"Theory and Analysis of Peel Adhesion: Bond Stresses and Distribution"

D. H. Kaelble

"Experiments on Peeling"

J. J. Bikerman

"The Peeling Force of Adhesive Joints"

F. S. Chang

"The Tensile Strength and Tacky Behavior of Polymeric Liquids"

R. A. Erb and R. S. Hanson

(End of Symposium)

"Fluid Mixing in Agitated Vessels"

A. B. Metzner, K. W. Norwood, and J. S. Taylor

BRITISH SOCIETY OF RHEOLOGY

A conference on "Flow, Fatigue, and Failure" was held at the University of Leeds on January 8-9, 1959. Papers presented included the following:

"Kinematic features of the brittle fracture phenomenon."

J. Leeuwrik (T.N.O. Delft).

"Fatigue surface patterns on isotropic substances."

P. U. A. Grossman (Cambridge University).

"Fatigue of bituminous road mixes."

R. N. J. Saal (Amsterdam) and P. S. Pell (Nottingham University).

"The development of micro-cracks in concrete."

R. Jones (Road Research Laboratory, D.S.I.R.).

"Rupture of rubber."

A. G. Thomas (British Rubber Producers' Research Association).

"Torsional fatigue of fibres."

A. K. van der Vegt (T.N.O. Delft).

"Skeleton strength and critical porosity of set sulphate plasters."

K. Schiller (British Plaster Board (Holdings) Ltd.).

"High temperature creep fracture in metals."

P. Feltham and J. D. Meakin (Leeds University).

"The sensitivity of micro-creep to fatigue damage in metals."

A. J. Kennedy (College of Aeronautics, Cranfield).

"The geometry of the plastic deformation of polycrystalline aggregates."

T. Ll. Richards (I.C.I. (Metals) Ltd.).

"Fracture as the limit of flow."

A. Graham (National Gas Turbine Establishment, M.o.S.).

Abstracts of these papers have been published in *Rheology Abstracts 1*, No. 4, pp. 34-45 (1958), and *ibid 2*, No. 1, pp. 44-47 (1959).



A conference on "The Rheology of the Glassy State" was held in the Department of Glass Technology of the University of Sheffield on April 15-17, 1959. The meeting was devoted to the mechanical and optical properties of inorganic and organic glasses, and of high polymers in the glassy state.



A joint Autumn Meeting of the British Society of Rheology and the Acoustics Group of the Physical Society has just been held, on September 14-15, 1959, in the Department of Physics, Imperial College, London. The program of the meeting was the following:

Mon., Sept. 14:

DYNAMIC FLOW PROPERTIES OF LIQUIDS

"Aspects of the Rheology of Liquids"

Presidential Address by E. G. Richardson (Univ. of Durham)

"Measurements of Shear Elasticity and Viscosity of Polymer Liquids and Solutions which show Violations of the Tobolsky-Leaderman-Ferry Reduction Formula at High Frequency"

W. P. Mason (Bell Telephone Labs., N. J.)

"Large Amplitude Propagation in Liquids"

P. Westervelt (Brown Univ., R.I.)

"Some Aspects of Cavitation"

H. G. Flynn (Harvard Univ.)

"Cavitation and Sonoluminescence"

P. Jarman (Imperial College)

"Fluctuations in Liquids"

R. Furth (Birkbeck College)

Tues., Sept. 15:

THE GLASSY STATE

"Sources of Delayed Elasticity in Glass"

R. W. Douglas (Dept. of Glass Technology, Sheffield Univ.)

"Dynamic Mechanical Properties of Associated Liquids in the Liquid and Glassy States"

T. A. Litowitz (Dept. of Physics, Catholic Univ. of America)

"Movement of Cyclohexyl Groups in Glassy Polymers"

T. Heijboer (Central Lab. T.N.O., Delft)

"Time-dependent Physical Properties of Rigid P.V.C. After Quenching"

D. R. Reid, R. A. Horsley and R. F. Eagling (B.X. Plastics, Ltd.)

"The Interpretation of Transition Phenomena in Polymethylene Terephthalate and Related Polymers"

G. Farrow, J. McIntosh, and I. M. Ward (I.C.I. Fibres, Harrogate)



A joint Informal Discussion on FLOW PROPERTIES OF BLOOD AND OTHER BIOLOGICAL SYSTEMS is being arranged by the British Society of Rheology and the Faraday Society (Colloid and Biophysics Committee). The meeting will be held on September 23-24 in the University Laboratory of Physiology, Oxford.

The first day's discussion will be on the subject of "Viscous and Elastic Properties of Systems of Animal Origin, other than Blood" (e.g., bronchial mucus, cervical mucus, interstitial fluids, synovial fluids, protoplasm, milk, muscle, connective tissue). The second day's discussion will be on the subject of "The Flow and Clotting of Blood." Some 22 short (15 min.) papers are scheduled, with at least an equal amount of time allowed for discussion.



A General Meeting is also being planned for April, 1960 where the following topics will be specially considered:

- 1) The Theory and Measurement of Normal Stresses
- 2) Lubrication
- 3) The Methods and Concepts of Rheology
- 4) The Rheology of Suspensions

RHEOLOGY IN FRANCE

The French rheology society has recently begun publication of a journal, "Cahier du Groupe Français d'Etudes de Rhéologie", sponsored by the French government research organization (C.N.R.S.), and edited by M. P. Thirion and Professor H. Weiss. The journal appears in four issues per year, and purchase or subscription can be obtained from the Service des Publications du Centre National de la Recherche Scientifique, 13 Quai Anatole-France, Paris VII.

Contents of the first three issues of Vol. 3 (1958) are as follows:

Number 1

"The Life of the Group"

P. Thirion (French Rubber Institute)

"An Example of a non-Newtonian Liquid, the Dilute Suspension of Rigid Aniso-diametric Particles"

C. Sadron (Center of Macromolecule Research and Faculty of Science, University of Strasbourg)

"Rheology in the Glass Industry"

P. Acloque (Research Center, Saint-Gobain)

"Some Rheological Problems Posed by Blood"

A. Dognon and P. Suquet (Laboratory of Medical Physics of the Faculty of Medicine of Paris)

"Measurement of the Spreading Ability of Butter"

Mme. S. Kuzdzal-Savoie and J. Verge (Center of Microbiology and Milk Research)

Number 2

"Introduction to the Article by M. J. Huet"

J. Bonitzer (Central Laboratory of Bridges and Highways, Paris)

"Rheological and Physio-chemical Properties of Bitumens"

J. Huet (Center for Road Research, Brussels)

"Thermodynamics of Rubber in Extension: Study of the Relation between Tension and Temperature at Equilibrium. Part I. Reversibility and Method of Analysis."

P. Thirion and R. Chasset (French Rubber Institute, Paris)

Number 3

"The Life of the Group"

P. Thirion (French Rubber Institute, Paris)

"The Third International Congress of Rheology, Bad Oeynhausen, September 23-30, 1958":

1. "Organization and Spirit of the Congress"

Prof. H. Weiss

2. "Remarks on the Papers Concerning Liquid Systems"

M. Joly

3. "Various Questions on Theoretical Rheology Raised at the Congress—Remarks on the Two Systems of Classification Presented"

R. Buvet

"Plastic Deformation and Dislocations"

J. Friedel (Physics of Solids, Sorbonne)

"Rheology at the Fall 1957 Meeting of the French Society of Metallurgy"

A. Constant (Institute of Smelting Research, Saint-Germain-en-Laye)

"The Rheology of Asphalt: Properties of Bituminous Mixtures, and a few Examples of Applications in the Highway and Mine-Shaft Fields"

L. W. Nijboer (Laboratory of Royal Dutch Shell, Amsterdam)

This journal also publishes news of rheological meetings around the world, book reviews, and abstracts.

RHEOLOGY IN GERMANY

The German Rheological Society (Deutschen Rheologischen Gesellschaft) held a Colloquium on May 11-13, 1959 at the Bundesanstalt für Materialprüfung in Berlin-Dahlem. The program of papers presented was as follows:

Monday, May 11

"The Bonding of Metals. Important Factors in the Adhesion Strength"

H. Schwarz (Central Institute for Soldering Technique, Halle/Saale)

"Relaxation Measurements on Peat Balls"

D. Schüring (Peat Institute, Hannover)

"Soil Mechanics and Rheology"

H. L. Jessberger (Institute for Earth Structure and Soil Mechanics, Munich)

"Profitable Applications of Hydrodynamic Lubrication Theory to Mass-produced Built-in Journal Bearings"

O. Gersdorfer (Caro Works, Vienna)

Tuesday, May 12

"Transition Phenomena Between the Regions of Linear-Elastic and Plastic Deformation"

M. Matchinski (French Society of Geochemistry, Paris)

"On the Theory of Transport Processes in Liquids"

R. Eisenschitz (Queen Mary College, London)

"The State of Aggregation of High-polymeric Materials in the Light of their Mechanical Behavior"

F. R. Schwarzl (Central Laboratory of the T.N.O., Delft)

"A Similarity Law in the Relaxation Behavior of Solid Materials"

J. Kubát (Swedish Wood Research Institute, Stockholm)

"Activation Energies in the Streaming of Polyelectrolyte Solutions"

D. Bourgoin (Pasteur Institute, Paris)

"On the Proof of the St. Venant Principle"

M. Matschinski (French Society of Geochemistry, Paris)

"A Method for Measuring the Complex Shear Modulus of Viscoelastic Materials in the Form of Thin Sheets"

W. Pechold, A. Engel and G. Ammon (Physical Institute of the Technische Hochschule, Stuttgart)

"On the Validity of Casson's Flow Law for Suspensions of Paint Components"

W. Heinz (Haake Bros., K. G., Berlin and Düsseldorf)

"On the Deformation Behavior during Drawing and Rolling of Test Samples with Solid and Perforated Cross-section"

M. Vater (Technical University, Berlin)

"The Calibration of Rotation Viscometers"

K. Edelmann (Institute for Textile Research, Teltow-Seehof)

"On the Foamability of Solutions"

K. Kirschke (Center for Material Testing, Berlin-Dahlem)

Wednesday, May 13

"Friction and Lubrication in Machine Construction, in Particular by the Application of Colloidal Graphite"

I. U. Augustin (Technical University, Berlin)

"Fine Structure of the "oiliness"—Carriers in Lubrication Oils, with Particular Regard to the Solid Lubricant Molybdenum Sulfide"

A. Bartel (Molykote K. G., Munich)

"Research on Surface Seizure and Rheology"

G. Salomon (Central Laboratory T.N.O., Delft)

"On the Viscosity-Pressure Behavior of Lubricating Oils"

E. Kuss (Institute for Petroleum Research, Hannover)

"Laboratory Test Methods for High-Grade Lubricants"

Maria Tillwich (Sindelfingen)

"Some Studies of Lubrication Problems in Bearings"

R. Bosma (Thornton Research Center, Shell, London)

"A Contribution to the Problem of Plug Flow in Lubrication Fats"

W. H. Kara (German Shell A.G., Hamburg)

RHEOLOGY IN JAPAN

A communication has been received from Dr. B. Tamamushi of the Chemical Society of Japan, and Japanese representative on the International Committee on Rheology, notifying us that the Eighth Annual Japanese Rheology Symposium will be held in Fukuoka (Kyushu) on October 14-16, 1959, under the joint auspices of the Japanese Chemical Society, Physical Society, High-Polymer Society and Society for Testing Materials.

Twenty-six papers will be presented, half of which concern the main subject of discussion—the rheology of high polymers—and the others rheology in general. Two general lectures will be given: (1) "Rheology from the Viewpoint of Electric Circuit Theory" by Mr. Irie (Kyushu Univ.), and (2) "Rheological Problems in the Viscose Industry" by Mr. Wakasa (Asahi Kasei Co.). The papers (including English abstracts) will appear in one of the journals of the sponsoring societies.