

RHEOLOGY BULLETIN

Publication of The Society of Rheology, Inc.

Volume 37 No. 1



January, 1968

FIFTH WINTER MEETING THE SOCIETY OF RHEOLOGY, INC.

VACATION VILLAGE HOTEL
MISSION BAY
SAN DIEGO, CALIFORNIA
FEBRUARY 5-7, 1968

Accommodations

Reservations for rooms should be made by contacting Vacation Village Hotel. A block of rooms has been reserved for attendees until January 20, 1968; a form which may be mailed to Vacation Village Hotel is printed as part of this Bulletin.

Preregistration

Attendees can preregister by mailing the form printed in this Bulletin to Rex Gosnell, Narmco Division, Whittaker Corporation, 3540 Aero Court, San Diego, California 92123. (Membership card and information on Society will be sent to applicant.)

Technical Program

The program, which consists of three special invited lectures and contributed papers, is listed in this Bulletin. Abstracts of papers will be printed separately and mailed to Society members prior to the meeting.

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 should be contacted as soon as possible.

Publication

Authors are urged, but not required, to publish their papers presented at the meeting in the Transactions of the Society of Rheology. Manuscripts should be submitted to the editor: R. R. Myers, Chemistry Department, Kent State University, Kent, Ohio 44240. Acceptance for publication will be decided by the editor, in consultation with referees appointed by him for each manuscript.

Other Activities

A cocktail party sponsored by Instron Corporation will be held on Tuesday evening, February 6.

The Gordon Research Conference on Polymers will be held at the Miramar Hotel-Motel, Santa Barbara, California from January 29 to February 2. The program is given in the November 24 issue of Science. Requests to attend should be sent to W. George Parks, Gordon Research Conferences, University of Rhode Island, Kingston, Rhode Island 02881.

On February 8 and 9, a colloquium on "Interdisciplinary Approach to Fracture" will be held at the California Institute of Technology, Pasadena, California. For information, write W. G. Knauss or N. W. Tschoegl at Cal Tech.

Program Committee

Julian Johnson (*Chairman*), Chevron Research Company, Richmond, California 94802.

Martin Goldstein, Yeshiva University, New York, New York.

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

Rex Gosnell, (*Local Arrangements Chairman*), Narmco Division, Whittaker Corporation, 3540 Aero Court, San Diego, California 92123.

RHEOLOGY BULLETIN

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

PROGRAM

FIFTH WINTER MEETING THE SOCIETY OF RHEOLOGY, INC.

February 5-7, 1968

MONDAY, FEBRUARY 5, 1968

SESSION A

Chairman—N. W. Tschoegl, California Institute of Technology, Pasadena, California

9:00 a.m. Invited Lecture, *The Significance of Invariance Principles in Continuum Mechanics*, K. C. Valanis, Iowa State University, Ames, Iowa

10:00 a.m. Break

10:15 a.m. *On the Thermoelastic Behavior of Rubber-like Materials*, Paul J. Blatz and Mitchel Shen, Science Center/Aerospace and Systems Group, North American Rockwell Corporation, Thousand Oaks, California

10:45 a.m. *Propagation of Coupled Thermo-Viscoelastic Waves*, R. M. Christensen, Shell Development, Emeryville, California

11:15 a.m. *Biaxial Stress Relaxation of Natural Rubber Under Combined Torsion and Tension*, R. F. Landel, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California

SESSION B

Chairman—R. F. Landel, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California

2:00 p.m. *On the Formulation of Constitutive Equations for Living Soft Tissues*, William Prager, University of California, San Diego, California

2:30 p.m. *The Dependence of the Elasticity of a Living Tissue (The Mesentery) on The Stress History*, Y. C. B. Fung, University of California, San Diego, California

3:00 p.m. *Transients in Model Viscoelastic Materials*, I. J. Gruntfest and G. E. Mueller, General Electric Company, Valley Forge Space Technology Center, Pennsylvania

3:30 p.m. Break

3:45 p.m. *Pressure and Temperature Dependence of Non-Newtonian Viscosity*, Ray D. Hoffman and S. Y. Choi, Allied Chemical Corporation, Morristown, New Jersey

4:15 p.m. *On the Beta Transition Mechanism for Some Epoxy Resins*, E. Cuddihy and J. Moacanin, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California

4:45 p.m. *A Two-Dimensional Study in Dense Packing of Filler Particles*, H. H. Kausch von Schmeling, California Institute of Technology, Pasadena, California

SESSION C

TUESDAY, FEBRUARY 6, 1968

Chairman—M. C. Shen, North American Rockwell Corporation, Thousand Oaks, California

9:00 a.m. Invited Lecture, *Rheo-Optical Properties and Solid State Structure of Polymers*, R. D. Andrews, Stevens Institute of Technology, Hoboken, New Jersey

10:00 a.m. Break

10:15 a.m. *Flex Life and Long-Term Strength of Composite Materials*, Glenn E. Fulmer and James L. Guthrie, W. R. Grace and Company, Clarksville, Maryland

10:45 a.m. *Rotational Stability and Measurement of Normal Stress Functions in Dilute Polymer Systems*, M. M. Denn and J. J. Roisman, University of Delaware, Newark, Delaware

11:15 a.m. *Effects of Macromolecules on Cavitation Inception*, Albert T. Ellis, University of California, San Diego, California

SESSION D

Chairman—T. L. Smith, Stanford Research Institute, Menlo Park, California

2:00 p.m. *Viscosity of Dispersed and Aggregated Suspensions of Spheres*, T. B. Lewis and L. E. Nielsen, Monsanto Company, St. Louis, Missouri

2:30 p.m. *Approximation Methods for the Determination of the Spectral Distribution Functions from Experimental Response Functions*, N. W. Tschoegl, California Institute of Technology, Pasadena, California

3:00 p.m. *Rheological Properties of Molten Polymers I Viscoelastic Properties*, Henry J. Karem, Dow Chemical Company, Midland, Michigan

3:30 p.m. Break

3:45 p.m. *Rheological Properties of Molten Polymers II Shear Dependent Melt Viscosity*, Kun Sup Hyun, Dow Chemical Company, Midland, Michigan

4:15 p.m. *On the Flow of Branched Polyethylene Melts*, Roger S. Porter, University of Massachusetts, Amherst, Massachusetts; Jack R. Knox, Avision Corporation, Marcus Hook, Pennsylvania; and Julian F. Johnson, Chevron Research Company, Richmond, California

4:45 p.m. *A Comparison Between Rheological Data for Polymer Melts and the Spriggs Four-Constant Viscoelastic Model*, C. D. Denson, W. M. Priest, Jr. and J. M. O'Reilly, General Electric Research and Development Center, Schenectady, New York

6:00 p.m. Cocktail Hour—Courtesy of the Instron Company

WEDNESDAY, FEBRUARY 7, 1968

SESSION E

Chairman—J. F. Johnson, Chevron Research Company, Richmond, California

9:00 a.m. Invited Lecture, *Crack Propagation in Viscoelastic Materials*, W. G. Knauss, California Institute of Technology, Pasadena, California

10:00 a.m. Break

10:15 a.m. *Observations on the Fatigue of Viscoelastic Materials*, J. C. Halpin, Air Force Materials Laboratory, Wright Patterson Air Force Base, Dayton, Ohio

11:00 a.m. *Strength and Extensibility of a Styrene-Butadiene Vulcanizate in Equal Biaxial Tension*, R. A. Dickie and T. L. Smith, Stanford Research Institute, Menlo Park, California

11:30 a.m. *Design Considerations for a Dynamic Rheometer for Very Soft Solids*, R. C. Alverson and J. R. Smith, Stanford Research Institute, Menlo Park, California, and N. W. Tschoegl, California Institute of Technology, Pasadena, California

REPORT OF 1967 BINGHAM AWARD COMMITTEE

The Bingham Award Committee for 1967 was requested to examine the rules for selecting the Bingham Medalist, in addition to selecting the 1967 Medalist. Their report, which contains the report of the First Bingham Award Committee, is presented below.

The Bingham Award Committee unanimously selected Hershel Markovitz to receive the Bingham Medal at the 1967 Fall Meeting of the Society.

The Committee also reviewed the rules for selecting the Bingham Medalist and is submitting, as part of this report, two statements: (1) Rules to Govern the Bingham Medal Award; and (2) Comments on the

Bingham Medal Award. In addition, the report of the first Award Committee (1948) is included. Their report is of interest as it contains a statement on the manner in which the Bingham Medal Award was established and a proposed set of rules to govern the award.

The "Rules to Govern the Bingham Medal Award" herein presented are rather similar to those proposed by the original Committee, except for a minor change in emphasis on two items and for a procedural change.

These are:

1. The award shall be made for contributions to The Society of Rheology, Inc., only in exceptional instances.
2. In special circumstances, the basis for the award may be contributions made more than ten years preceding the award.
3. The Bingham Award Committee shall submit the name of their candidate for the award to the Executive Committee for ratification.

The "Comments on the Bingham Medal Award" give some views on the rules and also some thoughts on what constitutes an important contribution to the science of rheology. These comments were prepared primarily for consideration by future Bingham Award Committees.

In regard to the Bingham Committee, we recommend that tenure of members be formalized to guarantee continuity, thus promoting a more equitable appraisal each year of qualified candidates. While various methods for implementing this recommendation have not been explored, one possibility is that two new Committee members be appointed each year for a three-year term. Such a Committee composed of six members would no doubt be able to meet annually, facilitating communication among members.

Submitted by

BINGHAM MEDAL AWARD COMMITTEE

T. L. Smith, Chairman

J. H. Elliott

J. D. Ferry

L. E. Nielsen

L. P. Zapas

RULES TO GOVERN THE BINGHAM MEDAL AWARD

(Prepared by 1967 Bingham Award Committee)

The E. C. Bingham Medal shall be awarded, usually annually but in any event not oftener, at the Fall Meeting of The Society of Rheology, Inc. The medal may be awarded to any individual who has made outstanding contributions to the science of rheology or in exceptional instances to The Society of Rheology, Inc., provided that he has not previously received the award and that he is a resident of North America or of a United

States Possession. Except in special circumstances, the contributions for which the award is granted shall have been made during the ten years preceding the award. It is not necessary that the recipient be a citizen of his country of residence or a member of The Society of Rheology, Inc. There is no restriction as to the age of the recipient.

The Bingham Medalist shall be chosen in the following manner. A candidate for the award shall be selected by the Bingham Medal Award Committee, appointed by the President in conformity with rules adopted by the Executive Committee of the Society. The Award Committee shall consider, in whatever manner it may decide for itself, nominations made by members of either the Award Committee or the Executive Committee of the Society. At a designated time, usually three months prior to the Fall Meeting, the Chairman of the Award Committee shall convey its decision to the President or to the Secretary of the Society, who in turn shall submit the name of the candidate to the Executive Committee for ratification. The official announcement of the award shall be made by the Secretary in advance of the actual presentation.

COMMENTS ON THE BINGHAM MEDAL AWARD

(Prepared by 1967 Bingham Award Committee)

The report of the first Bingham Award Committee, appointed in 1948, contains a statement on the manner in which the E. C. Bingham Medal Award was established as well as proposed rules to govern the award. Since then, these rules have been the guidelines for Award Committees. In 1967 the Award Committee was requested to examine the award criteria and to consider whether revised rules and operational procedures are now desirable. As a result, the Committee proposed minor modifications in the Rules to Govern the Bingham Medal Award. Also, the Committee decided that some general comments on the award might be useful as supplementary guidelines for future Bingham Award Committees. Toward this end, the present comments were prepared.

The Bingham Award is to honor individuals who have made outstanding scientific contributions to rheology. Although the award may be given for service to the Society, it is the view that such should be done rarely and then only in recognition of some truly exceptional contribution that advances in a real sense the science of rheology. Contributions to both the science of rheology and to The Society of Rheology, Inc. should not be jointly considered. The basis for the award, particularly when given for service to the Society, should be explicitly stated in the award citation.

The intent of the award is to honor recent contributions. As stated in the Rules to Govern the Bingham Medal Award, the contributions for which the award

is given should preferably have been made within the preceding ten years. It is realized, however, that the impact of a single contribution, or contributions made continuously over a long period, may occasionally not be recognized until somewhat more than ten years have elapsed. Thus, the Award Committee may justifiably propose a candidate whose most significant work was done more than ten years preceding the award date.

As rheology is hard to define precisely, it is difficult to obtain general agreement on what constitutes an important scientific contribution. To some extent, the problem arises because rheological work is usually linked directly with another scientific field, rheological theories and techniques commonly being employed as research tools. In evaluating a research contribution, it is desirable to consider whether the work involved largely the application of well-established rheological principles or whether the work led to new or improved rheological concepts or techniques. Admittedly, outstanding research commonly advances both rheology and another scientific area. However, it is quite possible for an outstanding scientific advance in a certain field to result from the application of rheological principles and approaches, without any contribution to the science of rheology itself. The award should be given for work, either experimental or theoretical, that has a continuing influence on the development of the science of rheology.

The following is a copy of the report of the first Bingham Award Committee, prepared in 1948.

To: The Executive Committee of the Society of Rheology
Gentlemen:

The first E. C. Bingham Medal Award Committee desires to report as follows:

1. *The E. C. Bingham Medal*

The Committee wishes to place on record the manner in which the E. C. Bingham Medal came to be established. R. B. Dow, former Secretary of the Society, has provided the following statement for this purpose:

The death of Eugene Cook Bingham on November 6, 1945 brought to a close a period which might logically be called the first quarter century of rheology as a science. Its history is practically synonymous with the activity of that later part of Bingham's life. Initially, 1922 marked the beginning with the publication of "Fluidity and Plasticity." Seven years later, on April 29, 1929, the Society of Rheology was founded at Columbus, Ohio. During the following years the Society became a Founder Member of the American Institute of Physics, in 1931, and assisted indirectly in the founding of the British Rheologists' Club. Finally, on October 26, 1945, just eleven days before his death, the Society passed its first milestone by assuming increased responsibility for publication and further consolidating its position within the newly reorganized framework of the Institute. During all of this progress

Bingham was intimately associated with each event and in most cases was instrumental in setting up the course of action. It was fitting, therefore, that The Society of Rheology should sponsor the first memorial meeting for its greatest benefactor, namely the "Bingham Memorial Symposium on Rheology" which was held at the Annual Meeting on November 1, 1946, at which time Mrs. Bingham was the guest of honor. While it was realized at that time that the Society would eventually sponsor a more substantial type of memorial, no plans actually developed until, on accepting a gift from Mrs. Bingham in behalf of her husband, the Executive Committee of the Society recommended that the gift could be appropriately used as the initial contribution to a fund to provide a suitable award for outstanding achievement in rheology. The society immediately authorized, at the same meeting on November 1, 1946, the establishment of the "E. C. Bingham Award in Rheology" and the solicitation of additional funds to provide for an annual award of a suitably inscribed medal. The Bingham Medal Award Committee was set up to draft rules for the Award and to choose the recipient; the membership comprises: T. Alfrey, H. A. Barton (Chairman), J. H. Dillon, R. B. Dow, H. M. Spurlin, and R. N. Traxler. The purpose of the Award, which will be known as the E. C. Bingham Medal, is to recognize outstanding contributions to the science of rheology or to The Society of Rheology, and to foster and encourage such contributions on the part of others interested in this field or in the Society. The fund now totals \$1,445.00 which has been received from the following eighteen contributors:

Mrs. E. C. Bingham
Barrett Division, Allied Chemical and Dye Corp.
Bristol-Meyers Company
Carbide and Carbon Chemicals Corp.
Celanese Corporation
Corning Glass Company
Gulf Oil Company
Hercules Powder Company
Interchemical Corporation
Johns-Manville Company
Koppers Company
A. D. Little Company
Monsanto Chemical Company
Standard Oil Company of New Jersey
Swan-Finch Oil Corporation
The Texas Company
United Sanitary Corporation
United States Industrial Chemicals, Inc.

At the 1946 meeting, Bingham suggested that

a smoker at the Annual Meetings would be an ideal way for members of the Society to become mutually acquainted and although only two have been held to date, they appear to have become a custom. Consequently, the Award Committee has considered that the medal could be appropriately awarded in the friendly and informal atmosphere of the smoker.

2. *Proposed Rules to Govern the Award*

The Committee was asked to consider what rules should be provided for its own guidance and that of future committees in selecting suitable recipients for the Medal. With valuable suggestions from W. F. Fair, Jr., President of the Society, the following has been drafted and is recommended for adoption:

The E. C. Bingham Medal shall be awarded, usually annually but in any case not oftener, at the time of the Fall Meeting of the Society of Rheology. The medal may be awarded to any individual who has made outstanding contributions to the science of rheology or to the Society of Rheology within the ten years preceding the date of the award, provided that he has not previously received the award and that he is a resident of North America or a United States Possession. It shall not be necessary that he be a citizen of his country of residence or a member of The Society of Rheology. There shall be no restriction as to the age of the recipient. The person to receive the award shall be chosen in the following manner. At the time of the Fall Meeting one year preceding the date of the award, the President shall appoint a Bingham Medal Award Committee to consider nominations made by members either of the Award Committee or of the Executive Committee of the Society. The Award Committee shall consider these nominations in whatever manner it may decide for itself and its decision as to the recipient shall be final. The name of the recipient shall be conveyed to the Secretary of the Society not less than one month prior to the date of the award. The official announcement of the award shall be made by the Secretary in advance of the actual presentation.

Unanimously adopted

BINGHAM MEDAL AWARD COMMITTEE

T. Alfrey

J. H. Dillon

R. B. Dow

H. M. Spurlin

R. N. Traxler

Henry A. Barton, Chairman

ANNOUNCEMENTS

1. In preparation for travel in Japan in connection with the Fifth International Congress on Rheology, the following general reading has been recommended by members of the Society who have already visited Japan:

Guide Books

Japan—The Official Guide, Japan Travel Bureau, 1014 pp., \$7.50.

Japan (and Hongkong) on Five Dollars a Day, by John Wilcock, 1965, Arthur Frammer, Inc. (paperback), \$1.95.

General Background

Twelve Doors to Japan, by John W. Hall and Richard K. Beardsley, 1965, McGraw-Hill, 649 pp.

The Makioka Sisters, by Junichiro Tanizaki, 1957, Knopf, 530 pp., (fictional).

The Chrysanthemum and the Sword, by Ruth Benedict, 1946, Charles E. Tuttle Co. (paperback), \$2.00.

History

Japan Past and Present, by E. O. Reischauer, 1946, Alfred A. Knopf, revised 1964.

East Asia: The Great Tradition, by E. O. Reischauer and J. K. Fairbank, 1958, Houghton-Mifflin.

East Asia: The Modern Transformation, by J. K. Fairbank, E. O. Reischauer, and A. M. Craig, 1965, Houghton-Mifflin.

Japanese Inn, by Oliver Statler, 1961, Pyramid (paperback), \$0.95 (partly fictional).

Art

The Enduring Art of Japan, by Langdon Warner, 1952, Grove Press (paperback), \$1.95.

Language

Easy Japanese, by S. E. Martin, 1957, Charles E. Tuttle Co., \$1.50.

Essential Japanese, by S. E. Martin, 3rd Ed. Charles E. Tuttle Co.

Teach Yourself Japanese, by C. J. Dunn and S. Yamada, 1958, English Universities Press.

Scientific Education and Research

Chemical Education in Japan, by Robert C. West, Chemical and Engineering News, Jan. 31, 1966, p. 63.

Opportunities for Postdoctoral Research in Japan, Chemical and Engineering News, Aug. 17, 1964, p. 56.

The Society of Rheology, Inc. has chartered a flight to the Fifth Congress on Rheology.

The flight will depart from New York City late afternoon on October 5, 1968. There will be stops in Chicago and Seattle. We will arrive in Tokyo on October 6, 1968. We will also arrive in Osaka on October 6, 1968.

The return from Tokyo will be on October 26, 1968. Again, there will be stops in Seattle and Chicago. We will arrive in New York City on October 26.

The price per reservation* is \$495.00. The deposit per reservation is \$175.00. The airline is Northwest Orient. Reservations are open to The Society of Rheology, Inc. members and members of their immediate families. Children *NOT* occupying a seat are free. All others are full fare. Service will be first class.

* Based on 153 passengers.

2. Reservations have been made for the 1969 January meeting at Williamsburg for January 13-15, 1969.
3. There will be a joint all-day meeting of the British Society of Rheology and the British Microcirculation Society for the purpose of a symposium on Haemorrheology and the Microcirculation at The Royal College of Surgeons, Lincoln's Inn Fields, London, W. C. 2 on February 10, 1968.
4. A three-day symposium entitled "Polymers in Space Research," sponsored by the Polymer Group of the Southern California Section of American Chemical Society and the Jet Propulsion Laboratory of California Institute of Technology, will be held Monday through Wednesday, July 15, 16, and 17, 1968 in Pasadena, California. Attendance will be limited to approximately 200. Preregistration should be accomplished prior to July 1, 1968. The registration fee will be \$5.00.

One day will be devoted to each of the following topics:

- 1) Recent Developments in Thermally Stable and Ablative Polymers
- 2) Properties of Polymers at Cryogenic Temperatures
- 3) Solid Propellants.

Please submit abstracts of 750 to 1000 words by April 15, 1968. Papers will be selected on the basis of quality and pertinence to the symposium. Full papers are due on July 1, 1968. For further information write to: Alan Rembaum, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, California 91103.

THE SOCIETY OF RHEOLOGY, INC.
TREASURER'S REPORT - OCTOBER 1967

I. SUMMARY OF ACCOUNT

Balance in account January 1, 1966	\$ 8,127.42
Balance in account January 1, 1967	14,264.04
Balance in account July 1, 1967	13,689.38

II. ESTIMATE OF REMAINING EXPENSES IN 1967

Transactions Vol. 10 Part 1	\$3,382.50
Transactions Vol. 10 Part 2	1,862.00
Fall Bulletin and Abstracts	535.24
Editorial Expenses	186.62
Legal Fee (Incorporation)	103.00
TOTAL	<u>6,069.36</u>

III. PROJECTED BALANCE IN ACCOUNT JANUARY, 1, 1968 \$7,620.02

IV. ESTIMATE OF RECEIPTS AND EXPENSES 1968

PROJECTED RECEIPTS

Dues	\$9,200.00
Meeting Income	500.00
Savings bond interest	40.00
Page charge receipts (600 pages at \$15.00; 80% honoring)	7,200.00
TOTAL	<u>\$16,940.00</u>

PROJECTED EXPENSES

Transactions (600 pages)	
Per page charge	\$3,600.00
Subscription charge	1,368.00
Bulletins and abstracts	1,500.00
Editorial expenses	800.00
AIP expenses	1,900.00
Miscellaneous expenses	100.00
TOTAL	<u>\$9,268.00</u>

V. PROJECTED BALANCE IN ACCOUNT JANUARY 1, 1969 \$15,292.02

Respectfully submitted: Armand F. Lewis

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

Statement of Receipts and Disbursements
At June 30, 1967

BALANCE IN ACCOUNT — JANUARY 1, 1967		\$14,264.04
RECEIPTS (JANUARY 1 - JUNE 30, 1967)		
Dues Collections:		
1967 Dues		1,497.63
Income from Winter Meeting:		
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	1,145.00
Interest on U. S. Government Bond*		19.37
TOTAL RECEIPTS		<u>\$16,926.04</u>
DISBURSEMENTS (JANUARY 1 - JUNE 30, 1967)		
Charge for Dues Billing and Collection	\$ 136.71	
Charge for Maintenance of Society List	279.08	
Contribution for Support of AIP - 1967 (Six Months)	366.34	
	<u>\$ 782.13</u>	
Winter Bulletin	\$ 339.23	
Winter Meeting	\$1,137.88	
		\$1,477.11
Spring Bulletin	233.97	
Transactions V10 Part 2	105.66	
Editorial Expenses - R. R. Myers	408.17	
Secretarial Duties - E. Wolf	21.27	
Membership Roster	84.36	
New York Incorporation Expense	103.00	
Other	20.99	
TOTAL DISBURSEMENTS		<u>\$ 3,236.66</u>
BALANCE IN ACCOUNT, JUNE 30, 1967		<u><u>\$13,689.38</u></u>

*Bingham Fund: \$1,000.00 U.S. Government Bond 3 $\frac{7}{8}$ %—Due May 15, 1968