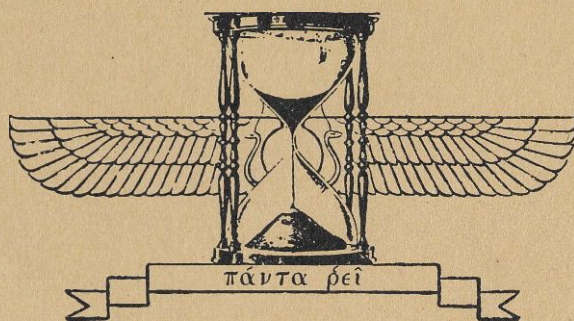


# RHEOLOGY BULLETIN



E. C. BINGHAM  
MEMORIAL EDITION

PUBLICATION OF THE  
SOCIETY OF RHEOLOGY

VOLUME 17, NO. 1

MAY, 1946



# RHEOLOGY BULLETIN

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## TABLE OF CONTENTS

Message from the President.....	1
Professor Eugene Cook Bingham.....	2
Works of Eugene Cook Bingham.....	4
Expressions from the Society.....	6
Tributes.....	6
Annual Meeting—1945.....	10
Post-Meeting Note on Publication.....	11
Correspondence Concerning Publication.....	11
Summary on Publication.....	13
Financial Statement—1945.....	14
Constitution and By-Laws.....	15
Ballot.....	17

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Published for the

## Society of Rheology

by

The American Institute of Physics  
57 East 55 Street  
New York 22, New York

**T**HE Society of Rheology is one of the five founder societies of the American Institute of Physics and is dedicated to the development of the science of the deformation and flow of matter.

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# Rheology Bulletin

Publication of the Society of Rheology

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Vol. 17, No. 1

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## Message from the President

PROFESSOR BINGHAM'S consuming interest in rheology and his efforts to increase the growth and influence of the Society of Rheology are well known to all of us. Our loss is a very real one because of his nearness to the heart of the Society since its founding in 1929.

The coming of our misfortune at its particular time is all the more emphasized by his recent extremely active participation in the Society's affairs, especially during his last months with us. Some of his last correspondence dealt with his hopes for the Society and excerpts from it are reprinted in this issue.

I think this is an appropriate occasion to call upon all members of the Society of Rheology to consider seriously Professor Bingham's proposals and to carry out his suggested courses of action in a forthright manner. I sincerely believe that as individuals and as an organization we can express our esteem and our gratitude for Professor Bingham and his work in no better way than by furthering the interests of the Society to which he was so devoted.

W. F. FAIR, JR.





Blackstone Studios

Eugene Cook Bingham



## Eugene Cook Bingham

By J. HUNT WILSON, *Department of Chemistry, Lafayette College, Easton, Pennsylvania*

EUGENE COOK BINGHAM was born in Cornwall, Vermont, December 8, 1878. He graduated from Middlebury College, Vermont, in June, 1899, with the degree of A.B. In 1905 he received the Ph.D. degree from Johns Hopkins University. His graduate work was carried out in collaboration with the late Professor Harry E. Jones, and dealt with the relationship between conductivities and fluidities in solutions of electrolytes. During the year 1905-06 he studied at the Universities of Leipzig, Berlin, and Cambridge. He was Professor of Chemistry at Richmond College, Virginia, from 1906 to 1915; and from 1915 to 1916, Assistant Physicist at the National Bureau of Standards, working on the problem of viscous flow.

In 1916 Professor Bingham was appointed Professor of Chemistry at Lafayette College, succeeding the late Edward Hart as Head of the Department. Before coming to Lafayette, Professor Bingham had been greatly interested in problems of viscous and plastic flow; and during his 29 years of service at Lafayette his interest in this field never flagged. In 1915 he devised an instrument for the precise measurement of plastic flow. This was followed by a series of papers dealing with researches using this device. It was shown that apparently viscous liquids, such as paint and glue; are really plastic solids; whereas solid substances like glass or pitch are actually viscous liquids. It was found that solids require a certain shearing stress (the yield value) to deform them continuously. The original type of plastometer, modified in certain respects, is now used in many laboratories.

His contagious enthusiasm for research prompted students of ability to engage in graduate work in chemistry and obtain advanced degrees. Through his efforts a sum of \$10,000 was raised for the founding of the Edward Hart fellowship, the income of which enabled a student to pursue graduate work under his direction. He was largely instrumental in founding the Society of Rheology and maintained an active interest in the affairs of that organization until the time of his death.

He was active in the affairs of the Lehigh Valley Section of the American Chemical Society, and his continued enthusiasm undoubtedly contributed to the increased interest and growth of membership of the Section during the last 25 years. It was owing to his efforts that the Chemical Department of Lafayette College organized the first chapter of the Student Affiliates of the American Chemical Society.

During the last few years of his life Professor Bingham became greatly interested in a method of improving the lighting of highways, and up to the time of his last illness was in active correspondence with a number of highway authorities in reference to the installation of his service for highways.

Dr. Bingham was always greatly interested in weights and measures. For many years he was active in advocating the more general adoption of the metric system in commerce and industry. He carried on an extensive correspondence on the subject, addressed many meetings and wrote numerous articles showing the advantages of such a system over the complicated and illogical systems in common use.

Dr. Bingham's interests and enthusiasms were not confined to the fields of chemistry and physics. For a number of years he was active in the work of the Blue Mountain Club which was engaged in pushing through a sector of the Appalachian Trail along the ridge of the Blue Mountains. He also was deeply interested in the history of the Bingham family and organized the Bingham Association which has for its object the preservation of memorabilia of the family. He was secretary of the Association and editor of a voluminous work on the genealogy of the family.

His activities were not confined to problems of Science. He had a keen interest in foreign and domestic problems and enjoyed discussing such questions with his friends and associates.

A distinguished investigator, a stimulating teacher, a genial companion, his presence will be greatly missed by his friends and associates.



## The Works of Eugene Cook Bingham

By H. K. NASON, *Central Research Department, Monsanto Chemical Company*

IN any discussion of the scientific works of Dr. Bingham, a great many fields of endeavor must be explored, for Bingham was a man of varied interests and enthusiasms. Although physical chemistry was his first medium, such widely divergent interests as physiology, chemical education, semantics, mensuration, and the rheological definition of industrial materials were to claim his attention and a share of his genius.

The work on properties of salt solutions, for which Bingham received his doctorate from Johns Hopkins in 1905, marked the beginning of an interest in the relation between viscosity and other properties of electrolyte solutions which was to continue throughout his life, and our knowledge of this field was enriched by a steady flow of contributions by him and his co-workers from that early date through 1943. All of this work was characterized by unusual clarity of perception of the problems involved and by a very high order of precision in experimental technique and of thinking. Contributions on solubility and miscibility, on the relation between vapor pressure and chemical constitution, between fluidity and vapor pressure, between fluidity and hydration, and between fluidity and composition mark the earlier active years. The extension of this work to organic compounds, and to solutions and mixtures of these, was a natural development, and important contributions, particularly in determination of association and in establishing the additivity of fluidity, resulted.

Through his studies of solutions and mixtures, Bingham soon realized the paucity of knowledge as to the basic principles of viscosity and of flow processes. His first discussion of "Viscosity and Fluidity" was published in 1906, and this was followed by a steady stream of contributions on the nature of flow processes, on precision methods for measuring viscosity, fluidity, plasticity, and related characteristics, and on the definition of fundamental properties. By his book on *Fluidity and Plasticity*, published in 1922, Bingham consolidated and unified the knowledge of flow phenomena into a single coherent science, to

which he gave the name "rheology." The basic characteristics of the various types of flow processes were described and defined, fundamental principles were collated, and instrumentation was rationalized. Bingham proposed the term "poise" as the basic unit of viscosity, and this is now accepted generally. Subsequently he suggested that the unit of fluidity be called the "rhe," and this proposal is finding favor although it is not yet used universally.

To the new science of rheology Bingham gave unstintingly of his energy and enthusiasm. The formation of the Society of Rheology was catalyzed by him, and its early growth was largely due to hard work by him and a small band of collaborators. Recognizing the necessity for a common outlet for publications and discussions on all phases of the new science, this group established the *Journal of Rheology* in 1929. The publishing activity of this journal since has been absorbed by the *Journal of Applied Physics*, and the *Rheology Bulletin* carries on as a medium for discussions, abstracts, and news about the Society's affairs.

Bingham's interest in the Society of Rheology and in the science of rheology, for both of which he was so largely responsible, continued at a high pitch throughout his life, and he maintained a steady flow of contributions to both. However, his interest in rheology was not confined to theoretical and academic phases. On the contrary, he was deeply concerned with the application of rheological principles to problems of a very practical type. Studies were published by him and his co-workers to describe the rheological behavior of emulsions, suspensions, clays, plastics, paints, nitrocellulose solutions, petroleum oils, resins and pitches, and blood, in addition to a large variety of organic and inorganic liquids. A number of instruments for the rheological evaluation of technical materials were developed in the course of these studies and were in every case described completely and made available freely for the use of all workers in the field.

Some of Bingham's finest and most precise



work was concerned with determining the absolute values for viscosity and fluidity of pure substances and with the establishment of reliable reference standards. In this connection he also served as chairman of the committee on reference standards of the Society of Rheology. His work on precise evaluation of the absolute viscosity of water is well known. His recommendation that the viscosity of water at 20°C be taken as the primary base reference point has been received favorably, and a great deal of attention has been devoted to the exact definition of this value.

Dr. Bingham's inquiring mind and keen perception could not be confined to the fields for which he was internationally respected. Such diverse subjects as the use of sulfite waste liquor as a protective colloid, the development of a new reflectometer, and the improvement of laboratory hoods claimed his attention upon occasion. He proposed the establishment of a logarithmic scale, analogous to the  $pH$  scale, for expressing measurements of length, time, etc., so that such different measurements as molecular dimensions and interstellar distances could be handled conveniently as small numbers.

He was also keenly aware of the professional obligations of the scientist, and served ably in many capacities. As chairman of the committee on metric standardization of the American Chemical Society, he ardently promoted the general adaptation of this system for general use in industry, and his enthusiasm for this was typical of his approach to all projects in which he believed sincerely. His over-all publications numbered approximately one hundred.

A teacher as well as a scientist, Dr. Bingham's influence on chemical education may be followed

readily in his published works. A laboratory manual of inorganic chemistry, written in 1911 in collaboration with G. F. White, reveals more than passing interest in this field. Discussions of chemical engineering education at Lafayette College, of laboratory devices, and of novel systems of terminology and classification reveal an unexpected breadth of interest. Finally, and probably of most importance, the list of those in collaboration with whom (some 42 in all) his most important works were done discloses the scope and extent of his educational influence at Richmond College, the National Bureau of Standards, and, finally, Lafayette College. His encouragement of the efforts of beginners, with friendly criticism and advice freely dispensed, provided an invaluable initiation to the science for many and served to orient a number of excellent workers toward accomplishments of real importance.

Bingham was convinced of the importance of rheology, and by his contagious enthusiasm infected others with this conviction. The respected position of the science today is due in large measure to his efforts. Bingham also was determined that rheology should work to live and that its practical application should be spread to all branches of industry and technology. Much has been accomplished along these lines but much more remains to be done. To those of us who inherit the fruits of his pioneering efforts, Dr. Bingham also leaves a solemn obligation. In the further development of theory and practical applications, in the continuance and strengthening of the Society of Rheology, and in the consolidation of the relations between all who are interested in rheology, there is work enough for all of us to do.



## Expressions from the Society

AS an expression of our deep feeling and attachment for Dr. Bingham, the following letters were written for us by our secretary, Dr. Dow:

November 20, 1945

Mrs. Eugene C. Bingham  
Lafayette College  
Easton, Pennsylvania

Dear Mrs. Bingham,

It is my unhappy but esteemed privilege to convey to you on behalf of the Society of Rheology, its President, Executive Committee and members as a whole, our deep sympathy in the passing of Professor Bingham.

The news of his death was a shock to all of us, as only recently he was in New York to participate at the Annual Meeting of the Society. We all know how much the Society meant to him because he literally fathered it and continued to give to it unsparingly throughout his life.

While words are inadequate to express our loss, we realize that yours is infinitely greater, and we can only express the wish that you may continue to regard the Society of Rheology as one of his achievements which continued to go on as he would wish it.

Yours sincerely,  
R. B. Dow, *Secretary-Treasurer*

November 21, 1945

Office of the President  
Lafayette College  
Easton, Pennsylvania

Dear Sir,

On behalf of the President, the Executive Committee, and the Society of Rheology as a whole, I write to express our great loss in the untimely death of Dr. Eugene C. Bingham.

His passing is a great shock to the Society as only last month he attended the Annual Meeting in New York City where he participated with his usual enthusiasm and vigor.

American science and Lafayette College suffer a common loss as his heart, as well as his professional interests, was with both. The Society of Rheology was founded largely through his efforts which were given unsparingly. It is to be hoped that the continuing growth and activity of the Society may ever remain as a living memorial to Professor Bingham who was known internationally for his many contributions to rheology.

Yours very truly,  
R. B. Dow, *Secretary-Treasurer*

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## Tributes

### Lafayette College Memorial Address

BY BEVERLY W. KUNKEL  
*Department of Biology, Lafayette College*

*College Chapel, November 7, 1945*

OVER the entrance of a great anatomical laboratory where it was my privilege many years ago to study was the inscription, "Mortui Docent Vivos." In English that means the dead teach the living. We are gathered here to honor one whose body died early yesterday morning, but whose spirit still pervades this campus and will continue to teach by influencing the lives of future generations of Lafayette students.

Professor Bingham came to Lafayette twenty-nine years ago and for twenty-three years was head of the Department of Chemistry. During the past six years, because of failing health, he has done no teaching but has been a research professor and has worked up to the very limits of his strength, and as many of his friends

thought, beyond his strength. Only a few days before he went to the hospital he was searching for a means of preventing the growth of mold on the books in the College Library. Up to the very last he had an insatiable curiosity and thirst for knowledge.

In the death of Professor Bingham, the College has lost one of its most distinguished teachers. He achieved much in the various fields in which he was especially interested. He published many papers which spread the name of the College over this country and Europe, and invented several devices which have been widely recognized in the scientific and industrial world. He has sent forth from the College a large number of able young investigators who were attracted to his laboratory by his reputation and the facilities which he afforded them for carrying on their research projects.

His special field of scientific interest was rather beyond the knowledge of most of us. Until he



invented the term "rheology," or the science of flow, we had little idea that there was anything to flowing than simply running. We had little idea that it mattered much whether it was possible to measure the flowing qualities of limpid fluids like alcohol and water and thick, sticky materials like tar and the proverbial molasses in January. But Professor Bingham's heart was so full of rheology that from the abundance of his heart his mouth spoke to his associates so that they soon came to realize that the famous aphorism of Heraclitus that everything flows was a reality. His enthusiasm for plastic flow was contagious and I am sure that his associates were awakened to the importance of this phenomenon and their minds were enriched by the application of this conception.

He was most ingenious and was never happier than when he was experimenting. In 1921, he was awarded a certificate of merit by the Franklin Institute of Philadelphia for a device to measure the rate of plastic flow under conditions of varying conditions or pressure. During the past few years many of us have seen Professor Bingham laboriously carrying heavy metal strips about and have seen strips with various surfaces imbedded in the roads about the campus and elsewhere. These were samples of road surfaces with which he was experimenting for the purpose of making night driving on the highways safer. He has patented his method of improving the lighting of the highways and up to the time of his last illness was in active correspondence with a number of highway authorities in reference to the installation of his surfaces for highways. I know no one who has exemplified more completely than Doctor Bingham the idea so ably expressed in that marvellous essay of Robert Louis Stevenson, "Aes Triplex." Doctor Bingham's chest was girt with triple brass which gave him an indomitable courage in the face of declining health to keep up his work, to go as far as he could regardless of the impending end. I am sure that we are all made more courageous by his example of perseverance and faith in the day's work.

Doctor Bingham, like all good chemists, was always interested in weights and measures. For many years he was extremely interested in the

more general adoption of the metric system in commerce and industry. He carried on an extensive correspondence on the subject, addressed many meetings and wrote many articles showing the economy of such a system over the complicated and illogical, more antiquated systems. At another time he became deeply interested in a logarithmic scale by means of which he could express sizes all the way from the diameter of an electron to the diameter of the known universe, in the same scale.

The researches and the publications of Doctor Bingham during the period he was identified with Lafayette College have made this college known to a body of scientists and intellectual leaders over the length and the breadth of the land. Lafayette has lost one of her most valuable scientific experts in a field which has been especially developed here over a long period of years.

Doctor Bingham's interests and enthusiasms were not confined to the fields of chemistry and physics. He worked with the zest of a Boy Scout for several years in pushing through a sector of the Appalachian Trail along the Blue Mountain from Wind Gap to Water Gap, and for this purpose he organized a number of groups which spent hours together on the mountain blazing and cutting trails so that hiking would be encouraged and a thoroughly wholesome form of physical activity might be made available for a larger number of young people. At another time he delved deeply into the history of the Bingham family and organized the "Bingham Association" which has for its object the preservation of memorabilia of the family. He was secretary of the Association and editor of a voluminous work on the genealogy of the family. It was this perennial youth and enthusiasm which made him such a unique personality. While he was absorbed in a subject all other interests were suppressed and he worked tirelessly and effectively on the project in question. This made him an exceedingly stimulating companion. One could hardly talk with him for five minutes without getting some interesting bit of information or without learning of some new association of ideas which was novel and enriching. He was an omnivorous reader of good literature and was deeply interested in the large



questions of internationalism and racial discrimination and the larger problems of religious beliefs.

His mind was exceedingly active so that even when ill he listened literally by the hour with intelligence to his wife's reading aloud, and on the day before his death, when his heart was scarcely beating, and he was unable to keep any food on his stomach, and he was under an oxygen tent in the hospital, he referred to the marvellous fact that it was just 170 years ago that Priestley discovered the element oxygen and here he was being kept alive by inhaling that same gas.

Let us keep our motto "Aes Triplex," and keep at our appointed jobs with boundless courage as did Professor Bingham. I am sure Doctor Bingham would not want us to mourn on this occasion. I am sure he wants us to carry on. He wants us to advance scientific knowledge, to live with zest and intensity, to find the truth and to enjoy that freedom which only truth can give us.

We have lost his physical presence on the campus. Let us here firmly resolve that we will keep alive his spirit of curiosity for scientific truth, his enthusiasm and his zest for living. In the face of our sorrow, that is the idea which I would leave with you to the glory of our departed friend and colleague.

#### American Institute of Physics

THE story of Dr. Eugene C. Bingham's contributions to science and the organizations of science in America would be most incomplete if it did not include at least a brief reference to what he did in connection with the American Institute of Physics. The record shows that he was one of the group which originally planned the Institute and on May 3, 1931 he was designated a member of the Institute's Board of Directors representing the Society of Rheology. This date precedes by five months the actual opening of the Institute's first office and the beginning of its operation.

On May 20, 1932, Dr. Bingham was one of the original signers of the Certificate of Incorporation of the American Institute of Physics. Thereafter he remained continually a member of the Board of Directors until February 1937. These, as will be readily understood, were the formative years of the Institute. It was during that time that the Institute chose its course and developed the concept it has held ever since of its proper scope and activity.

I remember numerous occasions in which the spirit of the Institute Board was dominated by Dr. Bingham's endless enthusiasm and optimism.

Until the time of his death Dr. Bingham was in frequent consultation with the officers of the Institute on problems concerned with the advancement of physics and particularly that part of science which has come under the purview of the Society of Rheology.

It is a privilege to join in a justly earned tribute to him.

HENRY A. BARTON, *Director*

#### American Chemical Society

DR. BINGHAM wrote so many fine tributes to others that it is a privilege to reflect on some of his activities in the Lehigh Valley. He easily merits a place among the pioneer chemists of the Section because he was a positive catalyst in so many fine experiments. The success of most of these undertakings was due largely to his contagious enthusiasm and ability to organize work for others to continue.

The successor of Dr. Edward Hart at Lafayette College had no mean task if he were to rise above the versatile heights attained by fifty years of solid chemical education, publication, and industrial chemistry. But the young Vermonter (Middlebury, A.B. '99) with a Hopkins doctorate ('05) and nine years experience at Richmond College, brought a new spirit of research to the lecture hall and laboratory. This fire and zeal resulted in publication of more than one hundred papers during Dr. Bingham's thirty years search into the secrets of fluidity. Much of this work was done in collaboration, which often means the assistant carries the load. But it was Bingham's spade work, although he would gladly give credit to his partners in written acknowledgments. His monumental achievements could not have been accomplished without the help of a carefully selected departmental staff, whose members shielded him from many of the chores which so frequently bog down department heads.

Dr. H. M. Ullmann, Emeritus Professor at the rival institution of Lehigh University says that Eugene Bingham did more for the Lehigh Valley Section of the American Chemical Society than any other individual. This is no mean tribute from one who himself has been Chairman of the Section for seven years. But it was well earned, since Dr. Bingham practically reorganized the groups about 1918. It was then that he saw the need for a local publication and promptly started a modest, but challenging, little four-page leaflet which he named The Octagon. The name was derived from the eight-sided silhouette of a Bessemer converter, then a dominating feature of the industrial landscape in the region. Twice he was Chairman of the Section, in 1918 and 1923, and served three terms as Councilor.

Dr. Bingham's presence at meetings assured interest and good spirit. He liked to talk, and did it well—whether around the dinner table or on the lecture platform. He actively championed the metric system and urged its universal adoption. He organized and initiated chapters of Tau Beta Pi, honorary engineering society, and the A.C.S. Student Affiliate group at Lafayette. When he was not sponsoring a colloid symposium on his own campus, he



was probably attending one elsewhere. The Society of Rheology is one of his brain children.

A man who could be equally at ease cutting trail with a brush axe on Blue Mountain, or leading an international conference (Chairman of Viscosity Section, World Petroleum Congress, London, 1933); author and biographer; inventor of novelties as remote as laboratory hoods and methods for highway illumination; member of a half-dozen scientific societies and an equal number of clubs and fraternities; but with all a modest, cheerful personality whose influence reached far beyond the valley in which he did most of his work.

R. D. BILLINGER, *Editor*  
*Lehigh Valley Section*

### American Society for Testing Materials

IN the death on November 6, 1945, of Dr. Eugene Cook Bingham, Committee E-1 on Methods of Testing, of the American Society for Testing Materials, lost one of its most active and cherished members. Dr. Bingham was an authority and pioneer in the science of rheology.

A member of the A.S.T.M. since 1917, he rendered notable service to Committee E-1 as the chairman for the past twenty years of the Technical Committee on Consistency, Plasticity, and Related Properties.

As research professor and former head of the Chemistry Department at Lafayette College, the work of Dr. Bingham on the subject of rheology was world-wide. He served as the representative of the A.S.T.M. on the Study Committee on Viscosity of the International Association for Testing Materials.

His knowledge and keen interest in the fundamental measurement of viscosity and plasticity furthered the development of instruments for precise measurements in absolute units. For his development of the variable pressure viscosimeter, he was awarded in 1921 the Certificate of Merit by the Franklin Institute.

Professor Bingham's death is a severe loss to Committee E-1 and those of his associates with whom he worked so closely. His many friends will miss his pleasant personality and friendly spirit.

Committee E-1 pays homage to him as an outstanding scientist and now records its appreciation for his extensive and long-time service in its behalf.

W. H. FULWEILER, *Chairman*  
P. J. SMITH, *Secretary*

*Committee E-1*

### National Bureau of Standards

PROFESSOR BINGHAM was a member of the staff of the National Bureau of Standards during 1915-16. His work led to an outstanding paper entitled "An investigation of the laws of plastic flow," which laid the foundation for present-day concepts of the subject. Bingham found that plastic flow can be sharply differentiated from viscous flow by the "friction" that must be overcome to start plastic flow. This friction is a linear function of the volume concentration. It is independent of the length or diameter of the capillary as well as the temperature of the medium.

My most vivid recollection of Professor Bingham pictures him in front of a large lathe, eyes twinkling, sleeves rolled up, hands covered with grease, chips flying. He had just returned to the Bureau during World War I to carry on his studies of cutting fluids. Even at that time his forehead was becoming unmistakably "high." He was an indefatigable worker and could be found at the Bureau at all hours.

Professor Bingham was long troubled by the fact that the viscosity of water in absolute measure had never been accurately determined and in consequence the viscosity of other liquids had to be expressed in terms of that of water instead of in absolute units. His deep interest and activity in this matter resulted finally in a grant to the Society of Rheology for the purpose of determining the absolute viscosity of water. The undertaking was intrusted to the National Bureau of Standards and an elaborate investigation was made by Coe and Godfrey, extending over a number of years. Unhappily the war interrupted the completion of the work, but provisional results were published in the *Journal of Applied Physics* in 1944.

LYMAN J. BRIGGS, *Director Emeritus*



## Annual Meeting—1945

THE annual meeting of the Society of Rheology was held on Friday, October 26, 1945 at the Hotel Pennsylvania in New York City. The meeting was called to order by Dr. Mark who announced that Dr. Dow, Secretary of the Society, was absent because of illness and hence the customary Secretary's report could not be submitted. Dr. Mark was authorized by the Society to send a telegram to Dr. Dow, expressing the membership's wishes for quick recovery. Dr. Wakefield then presented a summary of our financial status; briefly, the Society currently has a surplus of about \$400.00.

Dr. Mark then asked Dr. Prager to announce the results of the balloting for the Society's offices, and also the results of the questionnaire. Dr. Prager and Mr. Markwood who had previously been appointed by Dr. Mark for this task, reported that the officers as nominated had been elected. The officers for the next two years, therefore, will be, *President*, W. F. FAIR, JR.; *First Vice President*, J. W. MCBAIN; *Second Vice President*, HENRY EYRING; *Secretary-Treasurer*, R. B. DOW; *Editor*, W. H. MARKWOOD; and *Publishing Editor*, TURNER ALFREY, JR. Dr. Prager also announced that the indications given in the questionnaire were affirmative on all three questions, and he also gave a summary on the relative amount of space desired for the various topics in a journal, if we should ever have a journal.

The questions and results are given in the following tabulation:

1. Shall the present Rheology Bulletin be continued after the war?			
Yes	66	No	32
Qualified	8	Non-Voting	8
2. Shall a monthly rheological journal be published at an increased cost to the membership?			
Yes	76	No	27
	Non-Voting	No	11
3. Shall the Society request the American Institute of Physics to publish the Society's bulletin or journal?			
Yes	85	No	12
Qualified	5	Non-Voting	11

These results led the former officers of the Society and the newly elected officers to no definite conclusion since it is hardly likely that we need or desire to have both a bulletin and a journal. Probably the members did not realize that alternate suggestions were really intended by the questions submitted.

A long discussion on the subject of publication of either bulletin or journal then followed. Dr. Bingham reviewed some of the past history of publication by the Society. Additional points were mentioned by Dr. Wakefield in connection with earlier publication of the Bulletin. Dr. Proskauer, of Interscience Press, reminded the meeting that his company would be interested in having our papers published in the *Journal of Polymer Research*, which his company will begin publishing in January. As a stop-gap Interscience published our Bulletin during the last year, but feel that they can no longer do so since it is now published at a loss, or at least at no significant return to the publisher. The Interscience Press, therefore, wants to stop publishing the Bulletin. Mr. Bikerman, representing the Academic Press which will publish the *Journal of*

*Colloid Science*, said that his company would be willing to publish our material in the new Journal. He quoted Mr. Jacoby of the Academic Press to the effect that they do not care for the inclusion of abstracts.

Dr. Mooney inquired as to the editorial and acceptance policy of the *Journal of Colloid Science*. Mr. Bikerman said that editorial acceptance depended upon two different individual approvals. This means that a paper approved by our Society might be vetoed by some other member of their editorial staff which, incidentally, includes several members of our Society.

Mr. Markwood wanted to know how any such proposed agreements might affect our status with the Institute of Physics. It was generally agreed that any changes on our part should first have the approval of the Institute of Physics. Dr. Taylor said that he thought the *Rheology Bulletin* was not of sufficient value to be continued, that to be of value the abstract content should be improved and that he thought this was not possible under our purely voluntary abstracting system.

Mr. Bikerman then said he and Mr. Jacoby thought that *Journal of Colloid Science* might print all the papers given at the Rheology Society's annual meeting, and the discussions pertinent thereto, in one issue of their Journal, that issue only being available to members of our Society at the price of a single issue. Dr. Taylor moved a proposal to cancel publication of the *Rheology Bulletin* for one year be submitted to letter ballot. Dr. Taylor accepted an amendment suggested by Dr. Mooney that an explanatory letter for this action be submitted with the letter ballot to the membership, and that a deadline for return of the ballot be stated. In discussion, Mr. Markwood pointed out that there would be no official means of getting notes or announcements to the membership if this measure were carried. Dr. Proskauer said that the *Journal of Polymer Research* would be willing to give us space for such journal announcements and news of interest to the Society, and it was also pointed out that similar space could probably be granted in publications of the Institute of Physics.

The motion as amended was then carried.

Dr. Taylor then moved that the meeting go on record for purposes of advising the membership on the above question, that those present were in favor of suspending publication of the Bulletin. This motion was carried.

Dr. Bingham then inquired whether the *Journal of Colloid Science* could include membership fees of the Society of Rheology in the annual subscription. Mr. Jacoby said that the *Journal of Colloid Science* intended for publication at a ten-dollar annual subscription, could be offered to the members of the Society of Rheology at a 20 percent discount—this discount, therefore, amounting to the annual regular membership dues of the Society. It should be noted in these discussions that if any question of publication should arise, the individual authors would still be free to publish elsewhere if they so elected.

Mr. Jacoby then suggested an alternate proposal to the above annual subscription at a discount. The second



proposal was that the *Journal of Colloid Science* publish the papers given at our annual meeting, with comments, in one issue subsequent to the annual meeting, this issue to be available at a regular price of about \$2.00, but available to members of our Society at approximately \$1.50.

Dr. Mooney said that the Society should acknowledge the kind cooperation and suggestions made by Messrs. Proskauer and Jacoby, their interest in our behalf, and their offer to publish our announcements in their publications in case our *Bulletin* were suspended. Dr. Mooney moved that the meeting recommend to members that a preference be made by letter questionnaire to the whole

membership on the two alternate proposals of Mr. Jacoby, as described above. This motion was carried.

It was decided that the Executive Committee select the most suitable time and place for the 1946 meeting. Unless future events cause changes, the 1946 meeting will probably be held again in New York City because of the large number of rheologists in the metropolitan New York area.

At the end of the meeting the undersigned was authorized to write a letter of thanks to Dr. Mark, his colleagues and assistants, for their untiring and efficient work in taking care of the physical arrangements for our annual meetings during the past few years.

W. F. FAIR, JR., *President*

## Post-Meeting Note on Publication

**I**N the above minutes it will be noted that the Officers of the Society are directed to inform the members of the proposal to submit to letter ballot the question of discontinuing the publication of the *Rheology Bulletin* for one year and to instruct the membership that those attending the 1945 annual business meeting (about 25 persons) favored suspension of the *Rheology Bulletin*. The officers are also required to poll the membership on the alternate proposals offered by Mr. Jacoby.

It is believed that the above statement, the 1945 minutes, and the ballot enclosed in this issue of the *Rheology Bulletin*, fulfills the Officers' direct obligations. However it was thought best to get additional explicit statements concerning some of the questions and proposals mentioned in the minutes of the 1945 meeting. Copies of pertinent correspondence are presented below to inform the membership further upon these questions. *It should be noted that alternative policies which were unknown at the time of the 1945 meeting may now be considered.*

October 29, 1945

. . . The motion of Dr. Taylor to abandon the *Bulletin* now in its fifteenth year, and for which we have struggled so hard, is inexplicable unless by implication he thought a better plan would inevitably follow. However, in view of what transpired later, it appears that we may be without any Society publication after January first, although the Society has elected two editors and by letter ballot expressed a preference for a separate publication through the American Institute of Physics. This is very confusing. . . .

. . . In discussing the affairs of the SR with other members certain ideas have come out which I am going to

pass on, for you to use or not as you please. First in importance is the fact that even if Rheology is a science, there still are no Rheologists. Would it not be a good idea to have a smoker on Friday evening of our next meeting so as to get better acquainted? There might be an introductory talk by the President as to how to build up the *esprit de corps* of our Society followed by informal talks. Second, how would it do to have a larger Membership Committee appointed on the basis of the different industries. Each man would presumably know the other likely candidates in his industry or find it to his advantage to know them. If each member were set the task of doubling the number of members in the SR in his industry, he could write to his friends asking for help in not letting that industry down. We have 215 and the British Rheologists' Club have over 300, so we could and certainly should beat them. Third, we worked very hard to start the *Bulletin*. Let us not stop it until we actually have something better in sight. . . . I have said right along that we can go out and get some advertising from our friends if we need the money for our work. Fourth, Dr. J. J. Bikerman told me that he approved of the idea of the Rheology Index and that the *Journal of Colloid Science* would be glad to publish that as a contributed article. I should like to get help in preparing that if there are others who are willing to help. I feel that the more persons that we can enlist in the work of the SR, the better. I have a pretty definite feeling that even an editor without a journal might not prove fruitless. I have an idea that we need a sort of mimeographed bulletin of what is going on and what our plans are for the future. Next year is entirely too far off. Letter ballots, information, news of Committees and what they are doing, reports from the AIP, from the British Club, any information from Moscow would be material that we can get in no other way. These ideas of mine are very off-hand, but younger members could give many more and those would stimulate others. . . .

. . . *To have a new subject presented and decided in the brief time that we had on Saturday was assuming that Rheologists were even more profound thinkers than I have thought them to be! Even if they all reached a conclusion in the few minutes available, how could we be sure that those*



conclusions would be identical. Our views might be discussed in a mimeographed bulletin. . . .

EUGENE C. BINGHAM

November 1, 1945

IT is evident that our letters crossed. I will write to the Academic Press at once to get the exact terms of their offers. At the same time I will write to Doctor Barton to find out whether the Governing Board will consider the preference of our members to have formed a *Journal of Rheology*, in view of the immediate prospect of two other journals, viz., the *Journal of Polymer Research* and the *Journal of Colloid Science*, covering much the same field, not to mention older journals such as the *Journal of Physical Chemistry* which has been publishing numerous papers on Rheology.

EUGENE C. BINGHAM

November 6, 1945

DR. BINGHAM has asked us to submit to you the wording for the two propositions which were made during the recent meeting of the Society of Rheology in New York.

First we wish to affirm that we are very much in favor of an alliance between the Society and the *Journal of Colloid Science*, and in particular, we suggested that one issue each year could be reserved for the papers read in the meeting of the Society.

The list price of each issue will be \$2.00. However, the issue containing these papers would be available to the members at \$1.50. Each number will comprise approximately 100 pages. We are willing to provide an annual subscription to the Journal for \$8.00 instead of \$10.00, under the same conditions that one issue would contain the meeting papers.

We think that the personal items of the Society could be included, and that a pertinent note indicating the relation between the Society of Rheology and the *Journal of Colloid Science* could be printed on the second cover page.

If any suggestions occur to you regarding this matter we should appreciate it if you would write us.

ACADEMIC PRESS, INC.

November 7, 1945

FOLLOWING up our letter written yesterday and dealing with the future relations between the Society of Rheology and *Journal of Colloid Science*, we wish to point out more specifically that:

(1) The authors submitting papers to the Annual Meeting of the Society will be free to publish them in any journal of their choice. If a paper is read at the meeting and not offered to the *Journal of Colloid Science*, only an abstract of it will be published in the Rheology number of the Journal, and, if possible, mention will be made of the periodical in which the complete paper will appear.

(2) In exceptional cases, when an author submits a paper to the *Journal of Colloid Science*, the contents of which do not fit into the journal, the paper will be returned to the author with a suggestion of some other periodical

to which it more properly belongs—again only an abstract will be published in the Rheology number.

(3) It is our confident hope that the exceptions mentioned under (1) and (2) will however be rare indeed, and that the Rheology number of the J.C.S. will give a true representation of the Annual Meeting.

We hope sincerely that we have conveyed a clear impression of what we propose, and we look forward to an early understanding on all issues involved in this merger. In a few days we shall send you a proof of the folder we are preparing for the Journal. Please give us the benefit of any thoughts which you may have in this connection.

ACADEMIC PRESS, INC.

January 9, 1946

WE are in agreement with you that a contract between the Society of Rheology and the publishers of the *Journal of Colloid Science* should be terminable, say at the end of a calendar year with three months' notice.

As you probably know, Dr. Victor K. LaMer has accepted the post of editor-in-chief of this Journal and we have informed him about our deliberations. Professor LaMer is in favor of a tentative agreement and it is understood that articles to be published in a Special Issue of the Journal should be accepted by the responsible editor. It is also understood that papers which are not publishable in full length would however appear as brief abstracts.

We are convinced that some agreement of this kind will work out to our mutual advantage and we look forward to hearing from you.

ACADEMIC PRESS INC.

December 17, 1945

THIS is in reply to your letter of November 9th, the subject of which was considered in your presence by the Executive Committee of the Institute at its meeting on November 29th. You asked the Institute to consider (1) whether it could assist the Society of Rheology in the publication of its bulletin or journal, and (2) what the Institute's attitude would be in connection with the proposal of the Society to publish papers presented at its meetings in the *Journal of Colloid Science*.

In reply to the first point, our position is that little if any advantages of economy can be achieved by publishing a journal through the Institute unless it is a regular printed journal conforming to the style, format, and other standards of the present eight journals published through the Institute. It appears that as yet the membership of the Society is not large enough to support such a journal. The Institute would, however, hope that in any action the Society may take the future possibility of publishing such a journal through the Institute be kept alive. As regards a bulletin the possibilities are somewhat better. The Institute now publishes various meeting programs for the Member Societies and stands ready to try to work out together with the officers of the Society a plan for a bulletin to carry news of the Society which would be within the available means. You are aware that we have plans, far from the state of crystallization, for a possible



journal to convey physics news and other items to physicists generally. If, in the future, we find such plans are feasible and start the publication of such a journal, its columns would obviously be suitable for carrying news of the Society of Rheology. Whether or not this would obviate the necessity for a bulletin it is too soon to say, but the possibility should be kept in mind.

In regard to the second point, namely the possibility of publishing technical papers in the *Journal of Colloid Science*, we see no way in which such a procedure would interfere with policies as they stand between the Member Societies and this institute. It is our opinion, therefore, that lacking some procedure which would be more completely under the Society's control, the alternative of publishing through the journal named might well be accepted. Again we would hope that the relationship with the journal would be terminable when and if an arrangement by the Society itself for such publication becomes feasible.

I hope this reply meets your present purposes in assisting the membership to arrive at definite conclusions in the matter of publication.

Assuring you of our desire to cooperate with you in every possible way, I am,

HENRY A. BARTON, *Director*

#### Editor's Note—Journal of Colloid Science

THE announcement of the *Journal of Colloid Science* contains the following information which should be of interest to the members of the Society of Rheology:

It is the first journal on colloid science in the English language. Universities and colleges as well as American and foreign industrial laboratories have shown much interest in the journal.

The journal is devoted to scientific, technological and biological aspects of colloid science. The diversity of subjects covered in this field ranges from the physics and chemistry of colloids and surface phenomena to the technology of emulsions, ore flotation, plastics, textiles, the dyeing industry, detergents, photography, etc. This is especially noteworthy in regard to the rapidly expanding field of the synthetic high polymers and their industrial applications.

The *Journal of Colloid Science* intends to cover colloid aspects of the following industries, products and methods:

Adhesives—Agriculture—Asphalt and bitumens—Cement—Ceramics—Coatings—Diary industry—Detergents—Electrical insulation—Flotation—Food—Glass—Glue—Ink—Lacquers and varnishes—Laundries—Leather—Lubricants—Metals—Ore dressing—Paints—Paper—Petroleum—Photography—Plastics—Rayon—Rubber—Soap—Solvent recovery—Starch—Sugar—Tanning—Textiles—Water-treatment—Wood.

The Board of Editors will include:

VICTOR K. LAMER, *Columbia University*  
T. R. BOLAM, *Edinburgh University*  
E. F. BURTON, *University of Toronto*  
R. M. FUOSS, *Yale University*  
K. R. KRUYT, *Utrecht University*  
J. W. MCBAIN, *Stanford University*  
E. K. RIDEAL, *Cambridge University*  
WILLIAM SEIFRIZ, *University of Pennsylvania*  
A. W. THOMAS, *Columbia University*  
ARNE TISELIUS, *Uppsala University*  
HARRY B. WEISER, *Rice Institute*

#### Summary on Publication

THE Executive Committee believes that the present time is inappropriate for the cessation of publication of the Bulletin for the following reasons:

The present constitution requires a publication and the by-laws provide for more than one type of membership, necessitating a publication. There is a possibility that the Institute of Physics will sponsor a new news publication in which the Society of Rheology, as well as the other founder societies, will have a space whose function can be that of a society bulletin and it is believed that contact with our members should be maintained at least until that time. Cessation of publication would leave us with no direct continuity of succession in the field of providing informative notices, communications, official news, ballots, or meeting programs.

Although the results of the 1945 letter ballot cannot be interpreted as being conclusive, it is believed the membership intended to express a desire for the continuation of a Society publication, preferably a Journal, otherwise the Bulletin. The motion to ballot the membership in a manner completely contrary to the last ballot seems unusual but is within the proper rights of those attending the business meeting and **such a ballot is included in this issue.** Apparently this motion arose from beliefs that (1) we could not obtain a publisher, (2) we could not afford a publication, (3) the membership would not cooperate by supplying material.

After several consultations with members of the staff of the American Institute of Physics, an arrangement has recently been made with the Institute to publish the Bulletin within our means. Such a Bulletin would be of the page size of this issue and would be eight to twelve pages in length. Although it would not be so long as preceding issues it would serve the very important function of acting as a unifying force within the Society.

Although it is agreed that a Journal is not feasible at the present time because our small circulation (approximately 275) would be unattractive to advertisers, it is believed that our publication facilities can be further enhanced by acceptance of the Academic Press offer to devote



one issue annually to our Society. It should be recognized that such a contract with Academic Press will be of advantage to both parties and any contract may be readily terminated by either, as set forth in the above correspondence.

The policies presented in this issue are of serious importance to the Society and each member is asked to judge them carefully and express his opinions in the following ballot.

**Society of Rheology**  
**Financial Statement—1945**

Balance on hand Dec. 31, 1944 . . . . . \$209.41

1945

INCOME

Membership dues . . . . .	\$511.50	
Back dues . . . . .	14.00	
	\$525.50	
Subscriptions . . . . .	63.00	
Back sales of Bulletin . . . . .	159.94	
	222.94	

Registration (net), Annual		
Meeting . . . . .	39.30	39.30
Interest on bank deposit . . . . .	2.56	2.56
		\$790.30

EXPENSE

Bulletin:		
March issue . . . . .	\$ 65.00	
June issue . . . . .	65.00	
Sept. issue . . . . .	65.00	
Dec. issue . . . . .	65.00	
	\$260.00	

A. I. P.

Overhead, mailing, miscellaneous current, etc.

First quarter . . . . .	27.11	
Second quarter . . . . .	47.34	
Third quarter . . . . .	24.88	
Fourth quarter . . . . .	35.95	
	135.28	
½ yr. Bull. cancelled . . . . .	1.00	
Assessment (1944) . . . . .	47.85	
Mailing of ballot . . . . .	14.27	
Flowers (Dr. Bingham) . . . . .	10.50	
	\$468.90	

Total . . . . .	\$468.90	
1945 Net Balance . . . . .		\$321.40



# The Society of Rheology

## Constitution and By-Laws

(Fully Amended as of October 1, 1941)

### CONSTITUTION

#### Article I

The name of this organization shall be the Society of Rheology.

#### Article II

The object of this Society shall be the advancement of Rheology and its applications. Rheology is here defined as the science of the deformation and flow of matter. The objects shall be promoted (a) by meetings, (b) by the publication of a journal designed to increase and disseminate knowledge of rheology, and (c) by other appropriate means.

#### Article III

Any person or institution interested in the objects of the Society may apply to the secretary for membership provided an application, made out in due form, is submitted with the endorsement of two active members. The Secretary shall refer the applications to the Membership Committee as hereinafter provided for in Article II of the By-Laws.

#### Article IV

*Section 1*—Adopted Pittsburgh, December 27, 1933.

The officers shall consist of a President, two Vice

Presidents, Secretary, Editor, and Publishing Editor, elected by the membership. The Secretary and the Treasurer may be the same person if at any election of officers the Society so desires.

#### *Section 2.*

The officers and the immediate past president shall constitute the Executive Committee which shall transact the business of the Society not otherwise specifically provided for.

#### *Section 3.*

The officers shall be nominated by a nominating committee as hereinafter provided. They shall be elected by a majority vote determined by a letter ballot from the membership. The term of office shall be two years.

#### Article V

Amendments to this constitution may be made by a two-thirds vote of those voting in a letter ballot submitted to the membership. Said amendments, if approved, shall become effective after ninety days from the date of amendment. Votes on the amendments shall be canvassed within ninety days after their origin.

### BY-LAWS

#### Article I

##### *Section 1*

The Executive Committee may grant the right to form local sections of this Society within designated boundaries. A refund may be made to the local sections as determined by the Executive Committee.

#### Article II

##### *Section 1*

Subscribing members shall pay dues of seven dollars per year, payable in advance, if resident in the United States, or seven dollars and seventy cents if resident elsewhere. Each subscribing member shall receive all issues of the *Journal of Applied Physics* and the *Rheology Bulletin*.

Subscribing membership shall be open to individuals and to corporations and other organizations. A corporate member may appoint a representative to act for it at meetings.

##### *Section 2*

Regular members shall pay dues of two dollars per year, payable in advance, if resident in the United States, or two dollars and fifty cents if resident elsewhere. Each regular member shall receive all issues of the *Rheology Bulletin*.

##### *Section 3*

Sustaining members shall pay dues of twenty-five dollars minimum, payable in advance. Each sustaining member shall receive all issues of the *Journal of Applied Physics*, *The Review of Scientific Instruments* and the *Rheology Bulletin*. A sustaining member may appoint a representative to act for it at meetings.

##### *Section 3-A*

Accepted applications for membership in the Society received prior to September 1 shall be considered as for the coming year and back numbers of the current volume of the Journals will be furnished to said members. Applications accepted for membership after September 1 shall be applied to the following year and Journals will start with the first issue of the following year unless applicants specifically request the application to be applied to the current year.

##### *Section 4*

There shall be a standing membership committee of three members appointed by the President. The membership committee shall receive and pass upon all applications for membership and notify the Secretary of their action.



#### Section 5

There shall be a nominating committee consisting of three members appointed by the President. The Nominating Committee shall nominate for all offices and publish all nominations at least nine months prior to the next bi-annual election. Nominations will be received upon the petition by three active members up to six months before the bi-annual election.

Printed ballots containing the names of all nominees shall be mailed in individual envelopes by the Secretary three months prior to the election to all members of the Society. These ballots shall be accompanied by a stamped return envelope addressed to the Secretary. Space shall be provided on the ballots for additional nominees. In order to be counted, ballots must be mailed to the Secretary so as to reach him not later than two weeks before the meeting which ends the biennial.

The Secretary shall deliver the ballots returned to him unopened to an Election Committee appointed by the President at the opening of the annual meeting. This Committee shall count the ballots and announce the results at a subsequent session during the annual meeting.

#### Section 6

The Representative of the Society of Rheology to the Governing Board of the American Institute of Physics shall be the President, the Editor-in-Chief, and the Secretary of the Society. Should any future elections bring about a complete change in the personnel of the above-mentioned offices, the subject of the representation of the Society of Rheology in the Governing Board of the American Institute of Physics shall be constituted as new business at that time.

#### Section 7

In the event that an officer of the Society dies or resigns before the completion of his term of office the Executive Committee shall appoint a successor to complete his unexpired term.

### Article III

#### Section 1

Technical papers presented to the Society of Rheology which are approved by the editor of the Society shall be submitted for publication among the Contributed Papers published in the *Journal of Applied Physics*.

#### Section 2

News of the Society and other matters of rheological interest shall be published in the *Rheology Bulletin*, which shall be issued quarterly.

#### Section 3

The editor may appoint assisting editors and contributing editors to be responsible for the development of the different aspects of the subject. Such contributing editors shall be appointed for a period of two years.

### Article IV

#### Section 1

The Executive Committee shall be empowered to make working rules of order for the control and operation of the Society. All rules and regulations so made shall terminate four years from their inception.

#### Section 2

The By-Laws may be amended by majority vote at any regular meeting of the Society.



## BALLOT

Please return to Dr. W. F. Fair, Jr.

**Mellon Institute of Industrial Research, Pittsburgh 13, Pennsylvania,  
BEFORE JUNE 15, 1946**

- |   | Yes                      | No                       |  | Yes                      | No                       |
|---|--------------------------|--------------------------|--|--------------------------|--------------------------|
| 1. Will you permit the Executive Committee to decide on Bulletin publication policy between now and the appearance of the proposed new A.I.P. news journal? | <input type="checkbox"/> | <input type="checkbox"/> | 4. If (3) above was answered affirmatively will you subscribe to the J. Coll. Sci. at the special S. of R. rate of \$8.00 per year (does not include S. of R. dues)? | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Do you favor amendment of the Constitution of the Society of Rheology to permit cessation of publication of the Rheology Bulletin for one year?          | <input type="checkbox"/> | <input type="checkbox"/> | 5. If (4) above was answered negatively will you subscribe to a single, annual Rheology number of the J. Coll. Sci. at \$1.50 per copy?                              | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Do you favor annual publication of a collection of contributed papers in a special Society of Rheology number of the Journal of Colloid Science?         | <input type="checkbox"/> | <input type="checkbox"/> | 6. Do you favor having a "smoker" or Society social evening between the two days of the 1946 annual meeting to strengthen our acquaintanceships?                     | <input type="checkbox"/> | <input type="checkbox"/> |

Tear along this line

## APPLICATION FOR MEMBERSHIP

R. B. DOW, Secretary-Treasurer  
Ballistics Research Laboratory  
Aberdeen Proving Ground, Maryland.

I hereby apply for membership in the Society of Rheology commencing January 1  
..... as follows:

- Sustaining membership** (including subscription to Rheology Bulletin, Journal of Applied Physics, and Review of Scientific Instruments.) \$25.00 or more.
- Subscribing membership** (including subscription to Rheology Bulletin and Journal of Applied Physics.) \$7.00 (foreign, \$7.70)
- Membership** (including subscription to Rheology Bulletin.) \$2.00 (foreign, \$2.50)

Please also enter my subscription for the following additional periodicals published by the American Institute of Physics, at the rates available to members of the five founder societies:

Review of Modern Physics.....	\$3.00 (foreign, \$3.40)
Review of Scientific Instruments.....	\$3.00 (foreign, \$3.50)
Journal of Chemical Physics.....	\$10.00 (foreign, \$11.00)

I enclose \$..... to cover the above.

Name.....  
(Please print) Title

.....  
Corporation or School

.....  
No. Street City State

Tear along this line



















