

Reflections on the 75th Anniversary of the Founding of THE SOCIETY OF RHEOLOGY

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The Editor of the Bulletin, perhaps under the mistaken impression that I was present at the founding, has asked me to write some personal reflections on The Society of Rheology on the occasion of the upcoming 75th Anniversary of The Society. The obvious questions are “What has changed? What has remained constant?, both quantitatively and qualitatively”. There is not sufficient space here to review year by year the history of The Society, so I have chosen to consider four years of particular significance, as follows:

- 1929 the year of the founding, and of the publication of the original *Journal of Rheology*
- 1957 the year that I joined The Society and attended my first meeting, and of the publication of Volume 1 of the *Transactions of the Society of Rheology*, the predecessor of our present Journal
- 1990 the year that The Society took over the publication of the *Journal of Rheology* from the commercial publisher
- 2003 the present

I begin with the quantitative aspects, which are based on available data, and are easiest to assess objectively. The statistics in Table 1 show that the Society has grown significantly from its modest beginnings to the present day.

Three obvious measures of that growth are the number of members, the number of journal pages, and the financial assets of the Society [Rows 1, 8, 17].

The growth of the assets is directly related to the success of the Journal, whose modern history, from its beginning as the *Transactions of the Society of Rheology* in 1957, is shown in Figure 1. The Journal grew slowly but steadily until 1988. In the next two years a large jump of the page count precipitated a crisis, because the agreement with the then publisher required the Society to make substantial payments for pages in excess of a fixed limit. The choice under that agreement was then to

limit the pages published or to increase the dues significantly to pay for the excess pages. Under the leadership of President John Dealy, and with the assistance and encouragement of AIP, the Society took what many felt to be a bold leap into the unknown by taking over the publication. The record since shows that this move has been an unalloyed success. The number of pages has increased dramatically, and there is no financial constraint on the Editor to limit publication.

The financial success of the publication came as a pleasant surprise. It was evident in the first year of the take-over. The Society’s assets of \$147,000, slowly and painstakingly amassed by the diligent stewardship of Treasurer Ed Collins and his predecessors, more than doubled in the first year of the Society becoming the publisher. The financial success has been of great benefit to the members in numerous ways. Dues have not been required to increase, and the Journal no longer demands page charges for publication. The Publication Reserve fund enabled us to take the financial risk of creating the CD-ROM of Vols. 1-41 of the Journal, which is now also available on-line to Nonmember subscribers. And although the Nonmember subscription price has been increased, the cost per page has actually decreased, and there is no additional charge for on-line access to the Journal. The magnitude of the financial assets of the Society has provoked considerable, and sometimes heated, discussion among the membership. President Russel addressed the issue in the previous issue of the *Bulletin*, and I will add some comments further on.

Now I address the qualitative aspects of constancy and change of the Society. First and foremost is of course the mission of the Society. A good place to start is perhaps Article II (OBJECT) of the original Constitution of the Society. This was published in the 1929 Vol. 1, No. 1 of the original *Journal of Rheology*, which was reprinted and distributed to the attendees of the 50th Annual Meeting. For the benefit of those not present there I copy it here:

The objects of this SOCIETY shall be the advancement of fundamental and practical

knowledge concerning the deformation or flow of matter, hereafter designated as rheology, and its connection with various other properties or applications of properties to industry. The objects shall be promoted (a) by meetings at a

special time and place, the time and place to be determined at least one year in advance by vote of the Executive Committee, the meeting places not to be determined by national boundaries; (b) by the publication of a journal designed to

Table 1

Row	Year(s)	1929-31	1957	1990	2002
1	No. of Members	78-204 ¹	~400 ²	1,086 ³	1,619 ⁴
2	Fraction Indust. & Research Institutions ⁵		0.65 0.12	0.41 0.08	0.36 0.08
3	Fraction Foreign Members ⁵		0.09	0.23	0.38
4	Fraction ⁶ Ind.& Inst. Journal Papers	0.19 0.13	0.27 0.37	0.13 0.20	0.11 0.12
5	Fraction Foreign Authors ⁶	0.29	0.02	0.30	0.54
6	Meeting Attendance	80	93 ⁷	~300	~350
7	No. of Papers	26	28	174	203
8	Journal Pages	375 ⁸	222	1,310	2,298 ⁹
9	No. of Journal Papers	68 ⁸	16	61	74
10	Nonmember Subscribers			~600 ¹⁰	~375 ¹⁰
11	Annual Dues	\$3 ⁸	\$4 ¹¹	\$40	\$40
12	Nonmember Subscription	\$5 ⁸	\$6	\$290	\$550
13	Cost per Page ¹²	\$0.078	\$0.096	\$0.169	\$0.133
14	Registration Cost	\$2 ¹³	?	\$80	\$120
15	Income	\$6,239 ¹⁴	\$1,600 ¹⁵	\$280,000	\$341,000 ¹⁶
16	Expense	\$6,016	\$2,370 ¹⁵	\$84,000	\$327,000 ¹⁶
17	Assets	—	\$2,520 ¹⁵	\$311,000 ¹⁷	\$853,000 ¹⁶

Notes:

- 1) Range from 1932-1944 [Survey by R.B. Dow, Sec'y.-Treas., in AIP archive]
- 2) August 1958 roster [AIP archive]
- 3) 1989 Membership Directory
- 4) Victoria Gentile, AIP, via Faith Morrison
- 5) Estimated from 60-70% of membership with institutional affiliation identified
- 6) Vols. 1-3 (1929-31), 68 papers; Vols. 1-3 (1957-59), 41 papers; Vol. 34 (1990), 61 papers; Vol. 46 (2002), 74 papers
- 7) 1956 Meeting [*Rheology Bulletin*, Vol. 26, No. 1, Jan. 1957]
- 8) *Journal of Rheology*, Vols. 1-3 (1929-31)
- 9) Actual pages 1487, but for comparison with earlier issues normalized by factor of 1.545 to account for larger print area introduced with Vol. 37
- 10) Monty Shaw
- 11) Estimated from number of members and estimated 1957 income [*Rheology Bulletin*, Vol. 26, No. 1, January 1957]
- 12) Normalized for page size AND Consumer Price Index [1929: 17.1; 1957: 28.1; 1990: 130.7; 2002: 179.9]
- 13) Program of 3rd Annual Meeting, 1931 [AIP Archive]
- 14) Includes \$4,400 contribution from The Chemical Foundation
- 15) Estimates in *Rheology Bulletin*, Vol. 26, No. 1, Jan. 1957
- 16) Projections, *Rheology Bulletin*, Vol. 72, No. 1, Jan. 2003
- 17) Compared to \$147,000 at end of 1989 [*Rheology Bulletin*, Vol. 59, No.1, Jan. 1990, Vol. 61, No. 1, 1992]

increase and disseminate knowledge of Rheology and to promote its application; and (c) by other appropriate means.

How successfully has the Society met its objects? In Table 2 I have I have tabulated an analysis of the subjects of papers published in the Journal in the four “significant” years and one additional. (The classification used in this analysis forces each paper into a single category, and is intended to capture gross trends; a more detailed analysis should be multidimensional, perhaps relying on AIP’s “Physics and Astronomy Classification Scheme” [PACS]). The papers concerned with “rheometry” and with “theory” clearly address the

point of fundamental knowledge of rheology. Understandably, rheometry in particular was the subject of much of the research in the early years of the Society, but it has remained a significant, if not dominant, interest throughout the history of the Society. Considering the materials that have been studied, it is clear that “solids” (including granular material, crosslinked rubber, etc.) were studied in the earlier years, but have now virtually disappeared from the Journal. “Flow”, not “deformation” appears to be the principal theme of Rheology; perhaps this situation is prefigured by the motto “παντα ρει” which appears on the cover of the 1929 Journal.

Figure 1

Normalized Pages of JoR

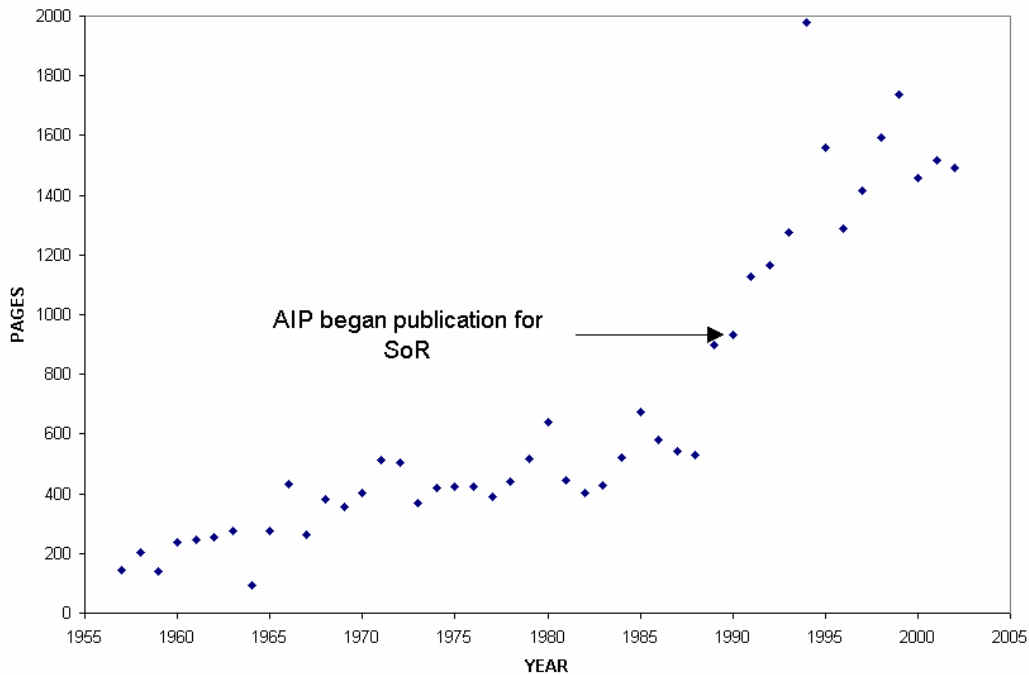


Table 2

Year(s)	1929/31	1957/59	1972	1990	2002
Rheometry	0.29	0.14	0.12	0.12	0.09
Theory	0.28	0.32	0.19	0.21	0.11
Fluids	0.30	0.16	0.05	0.24	0.31
Polymers	0.02	0.32	0.60	0.44	0.46
Solids	0.11	0.07	0.05	0	0.03

Vols. 1-3 (1929-310, 68 papers; Vols. 1-3 (1957-59), 41 papers; Vol. 16 (1972), 43 papers; Vol. 34 (1990), 61 papers; Vol. 46 (2002), 74 papers

The titles of many of the papers in the 1929-31 Journal clearly indicate the interest in practical knowledge and industrial applications indicated in the Constitution. Soil pastes, paper coatings, greases and oils, pastes and doughs, protective coatings, protoplasm, silver foil, and wiping solders were among the materials studied. The classification of Technical Abstracts, which were also published in the Journal at that time, were "Asphalt, Pitch; Ceramic Materials, Lime, Cement; Lubricants; Paints, Oils, Varnish, Lacquers and Plastics; Rubber", clearly also another indication of interest in applications of rheology. Another indication of strong industrial participation in Society activities are the large proportion of papers originating from industrial and research institution laboratories (0.19 and 0.13, respectively); the relatively high fraction from academic institutions is biased perhaps by the large number of papers from Bingham and his colleagues. Also, only three of the 14 Associate and Assistant Editors of the Journal had academic affiliations. And, of the 10 Presidents of the Society from 1929 to 1957 only two came from academia.

In 1957 the industrial component of the Society was still of major significance. 77% of the members were affiliated with industry or with non-academic research institutions (e.g., NBS, Franklin Institute, etc.), and 64% of the publications in 1957-59 came from those sources. By 1990 those percentages had dropped to 49% and 33%, respectively, and by 2002 had decreased even further to 44% and 23%. The reason for these trends is, I believe, to be related to the variation in the number of papers on the rheology of polymers. The growth of the synthetic polymer industry from the 1930's on led to a need for rheological information, for molecular characterization, for process control, for processing behavior, and for end-use property determination. Industrial scientists and engineers concerned with these needs turned to, and found, in the Society a place to learn from and teach to their colleagues the many new discoveries in experimental polymer rheology. At the same time, I believe, their needs inspired the tremendous advance in the understanding developed largely by academic rheologists that has led us to where we are today, with a sophisticated ability to predict the effects of molecular weight distribution and of long-chain branching, and even to incorporate the predictions in process simulations.

However, this golden age of polymer rheology research may be coming to an end. The fraction of polymer-related articles in the Journal probably went

through a maximum some time in the 1970's; I have chosen 1972, when this fraction was 60%, as a year to sample this trend. There are various possible reasons for the decline from the maximum. One is that as fundamental problems were solved, papers on applications such as to processing, found homes in publications of other societies, such as the Society of Plastics Engineers and the Polymer Processing Society. A more worrisome reason, one beyond the control of the Society, is the maturation of the synthetic polymer industry and the decline of industrial research. The decreased fraction of industrial membership is most likely caused by this decline.

The decrease in the fraction of polymer related papers has been compensated for by an increase in the fraction of papers dealing with inhomogeneous and complex fluids, such as suspensions, foods, and biological materials. In a sense this trend brings the subject materials of rheological interest closer back to those of the start of the Society in 1929. This renewed interest in complex fluids is encouraging for the future of the Society. Nevertheless, I am concerned with the relative decline of industrial participation. The founders of the Society felt strongly enough about the industrial application of rheology to stress it in the above-quoted Article II of the Constitution. My own experience, some thirty years later, confirmed their wisdom, at least in the direction of the utility of rheological understanding to industry. The theoretical developments of which we are justly proud would largely not have been initiated, I believe, without the interaction in the Society, of the theoreticians with the problems brought to their attention by their industrial colleagues. And this model, so fruitful for polymer rheology, should be equally applicable to that of other materials.

The Society has no control over the future of industrial polymer research. It does have, however, the ability to attract the interest of other technologies in the application of rheology to their problems, and to learn about new problems to tackle. I don't know which these technologies may be, and whether buzzwords like microfluidics or nanotechnology are relevant in this context. It should also not be forgotten that older technologies, such as foods or oil recovery, still have unsolved rheological problems. One positive step that the Society can take to attracting new industrial interest in rheology is by inviting speakers from these industries to give plenary talks or to organize symposia at our annual meetings, where they can reach a wide audience. Invited review papers for the Journal may be another

mechanism to introduce new problem areas to our members.

Another significant aspect of the Society's history is its international character. The very name, The Society of Rheology, without any national characterization, is significant. The Organizing Committee consisted of 23 members, of whom 12 were European, including such well-known names as Brillouin, Ostwald, Prandtl, and Reiner. Twenty-nine percent of the papers in the Journal of 1929-31 had "foreign" (short for non-North American) authors. And Article II of the Constitution explicitly states the "meeting places not to be determined by national boundaries". The international flavor evidently diminished over the years, with only 9% foreign membership in 1958. However, it has had a strong resurgence — in 2002 it constituted 38% of the membership and contributed to 54% of the publications. The recent adoption of a new Constitution erased the one residual vestige of nationalism, the restriction of the Bingham Medal to those from North America. And we have had our first member of the Executive Committee from other than North America. These observations reinforce the appropriateness of the designation "The Society". I hope that the internationalization continues, especially with regard to having more participation by our overseas membership in the governance of the Society.

Perhaps the most important aspect of the character of the Society is that it is, and always has been, a volunteer organization, run by the members, without a paid staff. And evidently there has never been a shortage of volunteers, not only to serve as Officers or members of the Executive Committee, but also to serve on the various committees needed to organize meetings and short courses, to select medallists, to deal with membership and constitution issues, to edit the Journal and the Bulletin, and to referee papers and advise the Editor. This is not only a tribute to the members but also an indication of the worth of the Society's activities to the members. (It must be pointed out that in part we have been able to function as such a volunteer organization because we can rely on AIP for many necessary functions, in addition to its invaluable role in publishing the Journal.)

On the other hand, our status as a volunteer organization limits the number of the Society's activities. For instance, to organize more meetings, regional, topical, or joint with other societies, on an ongoing basis would probably require the existence of a

permanent staff. Other projects that have been suggested over the years, such as production of educational or historical videos, also would take more time and effort than could be expected from a volunteer organization. Although this circumstance has been frustrating at times, it is probably consonant on the whole with the desires of the members. The membership is content with a society that has one excellent meeting a year, at a very reasonable price, produces an outstanding journal and an informative bulletin, and offers a well-attended short course. The underlying reason for this circumstance became clear to me when I was active in the governance of the Society; I was interested and amused to find it expressed very well in a typescript "A Brief Survey of Membership", written in 1944 by R.B. Dow, then the secretary-Treasurer of the Society, that I became aware of while preparing this article. I quote:

"From the beginning the position of the Society among other scientific societies has been unique in that the membership includes many distinguished scientists and engineers who are also active in other societies more closely related to their professions, or which represent the branches of science in which they took their academic degrees."

(Dow also makes a case in this article for the Society to pay attention to the dissemination of rheological principles and applications to other technologies.)

Finally, I wish to express briefly my personal views on the present state and future of the Society's financial assets. Although the present fund appears large, I believe that it is no more than a prudent reserve to cushion the Society against dramatic changes in the finances of scientific publishing; the bankruptcy of several subscription agencies is a sobering reminder of the need for a cushion. It should ensure that we will be able to continue publishing all high quality submissions to the Journal, without constraining the Editor's decision by financial considerations, and that we will be able to continue producing a refereed archival product. We should be prepared to maintain the nonmember subscription price at its present low cost/page, and to absorb additional costs by a modest increase of the dues if necessary. The reserve funds are also useful safeguards against financial problems that could occur in uncertain times, such as external events causing cancellation of a meeting. And, as mentioned above, they can permit the risk of desirable new ventures, such as we took in producing the CD-ROM, and of increased

travel costs for overseas Officers and Executive Committee members.

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