RHEOLOGY BULLETIN

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THE SOCIETY OF RHEOLOGY EXECUTIVE COMMITTEE - 1999-2001

COMMITTEES

72nd ANNUAL MEETING HILTON HEAD, SC FEBRUARY 11 - 15, 2001

The venue for the 72nd annual meeting is the Westin Resort on Hilton Head, SC. The meeting will start on Sunday evening, February 11 and end at noon on Thursday, February 15. The Westin Resort is accessible via air through Savannah International Airport (45 minutes by car) or Hilton Head Island Airport (5 minutes). February is the start of the spring season and temperatures in the 60's (F) can usually be expected. The hotel is located on the Atlantic Ocean with 12 miles of oceanfront accessible for walking, running, and bicycling. There are three 18-hole PGA championship courses, 16 tennis courts, 3 swimming pools (one indoor), restaurants, lounges, and a full health club on the property. Hilton Head is known for its many golf courses, excellent restaurants, beautiful waterways and island views, and ecocultural activities within an unspoiled semitropical setting. The room rate is $135 (single or multiple occupancy) plus taxes. The meeting organizers are:

Technical Program Chairs:

Saad A. Khan
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Local Arrangements Chair:

Donald G. Baird
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The technical program will feature approximately 10 mini-symposia covering the full spectrum of current rheological activity. In addition to the Bingham lecture, there will be plenary lectures; these will be given by Professors Ludwig Liebler (Joint Research Laboratory of CNRS/Elf-Autochem, France) and Robert K. Prud'homme (Princeton University).

Given the dates of the International Congress this year and the improved efficiency provided by web-based abstract submissions, a full Call for Papers will not be published till the July 2000 issue of the Rheology Bulletin. The program organizers anticipate that web-based abstract submissions will be activated from September 1, with a final submission deadline of October 27, 2000.

RHEOLOGY BULLETIN
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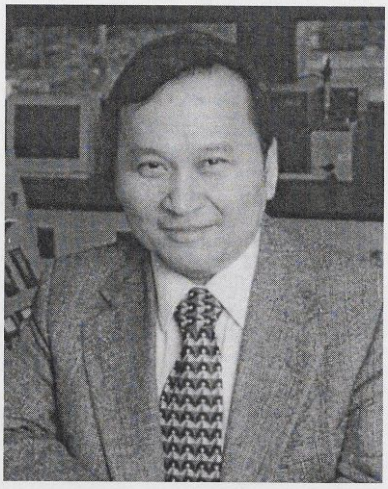
Visit the Society of Rheology on the web at
http://www.rheology.org/

WEBMASTER ALBERT CO RECEIVES DISTINGUISHED SERVICE AWARD

www.rheology.org

Albert Co received the Distinguished Service Award of The Society of Rheology at the 71st Annual Meeting in Madison. He is the fifth recipient of this honor, which is given infrequently at the discretion of the Executive Committee for exceptional service to the Society.

The subtitle of this announcement would have had little meaning less than a decade ago. In his "Comments from the President" that appeared in the January 1995 Rheology Bulletin, Bob Armstrong requested a volunteer to create and maintain the Society of Rheology Home Page on the World Wide Web. He went on to explain "... that this would be an excellent means for us to disseminate information to members in a timely way, and also to reach others interested in rheology and let them know about the activities of the society." Albert responded to this highly understated request and became our first and only Webmaster. With equally understated style and single-minded dedication, Albert Co has provided our society and the field of rheology with an extraordinary resource.



Professor Albert Co

Less than five years later, glowing testimony to the impact of Albert's stewardship comes from every corner of the Society, especially meeting organizers. "Serving as program chair with Albert as Webmaster is one or two orders of magnitude less work than it was 10 years ago." Always generous when it comes to sharing credit, Albert notes that Bob Powell, as Technical Program Chair for the Columbus Meeting, was instrumental in establishing abstract submission over the Web because he was willing to accept the risk of the new technology.

Albert has recently secured the new base URL "www.rheology.org" (alternative: "www.societyofrheology.org") and taken yet another important step toward making our website a natural portal for rheology information on the internet. The original URL "www.umche.maine.edu/sor/" still works and serves to remind us all of the generous support the Society has received from the Chemical Engineering Department at the University of Maine since the inception of our e-endeavor.

Albert Co received a B.S. from the University of the Philippines in 1972 and a Ph.D. from the University of Wisconsin - Madison in 1979. He then joined the faculty in Chemical Engineering at the University of Maine in Orono where he is currently Associate Professor. Albert's research interests center around polymer processing, non-Newtonian fluid dynamics, and transport phenomena.

The Society of Rheology is certainly very much in debt to Albert Co, the "cheerful perfectionist."

Andrew Kraynik

MINUTES OF THE BUSINESS MEETING
October 19, 1999

The meeting was called to order at 5:30 p.m. in the Monona Terrace Conference Center, Madison, Wisconsin. The minutes of the October 6, 1998 Business Meeting, which appeared in the January 1999 issue of the Rheology Bulletin, were approved as read.

President Ron Larson announced that the next meeting of the Society would be held in Hilton Head, SC, February 11-15, 2001. Don Baird is in charge of local arrangements and Saad Khan and Gareth McKinley will organize the technical program.

The Secretary, Andy Kraynik, announced the newly elected officers of the Society: President, Gerry Fuller; Vice President, Bill Russel; Past President, Ron Larson; Editor, Morton Denn; Treasurer, Monty Shaw; Secretary, Jeff Giacomin; and Members-at-Large, Lisa Mondy and Susan Muller.

Ron Larson also indicated that institutional subscriptions to the Journal of Rheology have decreased linearly from about 600 in 1990 to 420 in 1999.

In a straw vote, a majority of members present indicated that they approved discontinuing mailing abstract books to all members of the Society prior to annual meetings.

Monty Shaw delivered the Treasurer's report. Details of our sound financial position can be found in the Rheology Bulletin.

Faith Morrison, who chairs the Ad Hoc Committee on Constitutional Reform, led discussion related to an upcoming ballot. After much thoughtful discussion, we voted to submit each of the following items to a full ballot of the membership.

1. Gender-neutral language.
2. Grammar and punctuation changes.
3. Minor legalistic changes.
4. Minor substantive changes.
5. An amendment that would add a third Member-at-Large to the Executive Committee.
6. An amendment that would expand eligibility for the Bingham Medal to include residents of North America or any member of the Society of Rheology.

Everyone present voted to express their gratitude to Faith and the other committee members, Jeff Giacomin and Art Metzner, for their diligent effort in this important matter.

The meeting was adjourned at 7:30 p.m.

MINUTES OF THE EXECUTIVE COMMITTEE MEETING
October 17, 1999

The meeting was called to order at 9 a.m. in the Monona Terrace Conference Center, Madison, WI. Executive Committee Members in attendance included: Ron Larson, Gerry Fuller, Monty Shaw, Kurt Wissbrun, Paula Moldenaers, Don Baird, Morton Denn, and Andy Kraynik. Invited guests included: Janis Bennett, Marc Brodsky, Albert Co, Daniel DeKee, Jeff Giacomin, Rakesh Gupta, Chris Macosko, Faith Morrison, Susan Muller and Carl Schulteisz. The minutes of the March 13-14, 1999 Executive Committee Meeting, which appeared in the July 1999 Rheology Bulletin, were approved as read.

The Secretary announced the newly elected officers: President, Gerry Fuller; Vice President, Bill Russel; Past President, Ron Larson; Editor, Morton Denn; Treasurer, Monty Shaw; Secretary, Jeff Giacomin; and Members-at-Large, Lisa Mondy and Susan Muller.

Susan Muller, who chairs the Education Committee, reported on recent activities. We voted to offer a Student Poster Presentation Award of $200 at the Annual Meetings. Ron Larson read a report submitted by Bill Van Arsdale, who chairs the Membership Committee. The Society had 1654 members as of August 1999. Faith Morrison, who chairs the Ad Hoc Committee on Constitutional Reform, discussed the procedure for presenting proposed changes to the Constitution at the upcoming annual Business Meeting. We voted to have the Executive Committee appoint four members to edit pro and con statements to be sent with the ballot for the two constitutional amendments regarding the Bingham Award and the number of Members-at-Large on the Executive Committee. We discussed the possibility of implementing electronic balloting in the future. We voted to discontinue publishing a paper copy of the Membership Directory for the Society of Rheology. Monty Shaw delivered the Treasurer's report. Details of our sound financial condition can be found in the Rheology Bulletin. We voted to increase our Publication Reserve from $300,000 to $450,000. Don Baird described preparations for the Winter meeting in Hilton Head, SC, February 11-15, 2001; Saad Khan and Gareth McKinley will

organize the technical program. Carl Schulteisz outlined plans for the annual meeting in Bethesda, MD, October 20-25, 2001; Lynn Walker and Bob Butera will co-chair the Technical Program Committee. Chris Macosko discussed possible arrangements for the Minneapolis meeting in October 13-18, 2002. Daniel DeKee presented a proposal to organize a meeting in New Orleans in the Fall of 2003. Morton Denn provided the Editor's report for the Journal of Rheology. He discussed request and article download statistics for the online version of the Journal, manuscript flow activity, authorship, and editorial and review statistics. Ron Larson presented notes and thoughts from the AIP meeting on electronic publishing, June 15-16, 1999. We voted to provide $1,500 to support the Physics Olympiad. Marc Brodsky of AIP discussed various AIP initiatives related to e-commerce such as bundled virtual journals and Physics Today online. Webmaster Albert Co discussed member access to the online Membership Directory, the new online Rheology Index of rheology-related web sites, and web access statistics that show continued increase in online activity. Rakesh Gupta noted that paid advertisements and short technical articles now appear in the Rheology Bulletin, which he edits.

Following a brief executive session, the meeting was adjourned at 5:45 p.m.

FUTURE MEETINGS OF THE SOCIETY

72nd Annual Meeting
Hilton Head, South Carolina
February 11 - 15, 2001

73rd Annual Meeting
Bethesda, Maryland
October 20 - 25, 2001

74th Annual Meeting
Minneapolis/St. Paul (tentative)
October 13 - 18, 2002

RHEOLOGY BULLETIN AUTHOR GUIDELINES

The Rheology Bulletin publishes papers on the applied aspects of Rheology which are intended for the non-specialist. Appropriate topics include the application of rheological principles to a specific system, instrumentation for rheological measurements, description of interesting rheological phenomena, and the use of well-established rheological techniques to characterize products, processes or phenomena. Papers describing historical aspects of the practice of rheology and how these have influenced current trends are welcome. Also welcome are papers that address the present and changing status of rheological education. Consultation with the Editor prior to manuscript submission is encouraged.

YIELD POINT MEASUREMENTS WITH MODERN CS RHEOMETER

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Modern controlled-stress rheometers offer opportunities for determining a material's yield point. The yield stress is the minimum stress needed to initiate flow. At stress values below the yield stress, a material should deform like an elastic solid. Above the yield stress, flow occurs, and the material deforms continuously. A plot of deformation versus stress should allow for the determination of the yield stress. However, this plot can exhibit unusual behavior. Such observations are discussed here.

Introduction

For a yield stress material, if we increase the stress exponentially with time and monitor the resulting strain (on logarithmic coordinates), we expect to see the behavior shown in Figure 1. In practice, however, two disturbing effects arise; these are illustrated in Figure 2, and they make it difficult to identify the yield point.

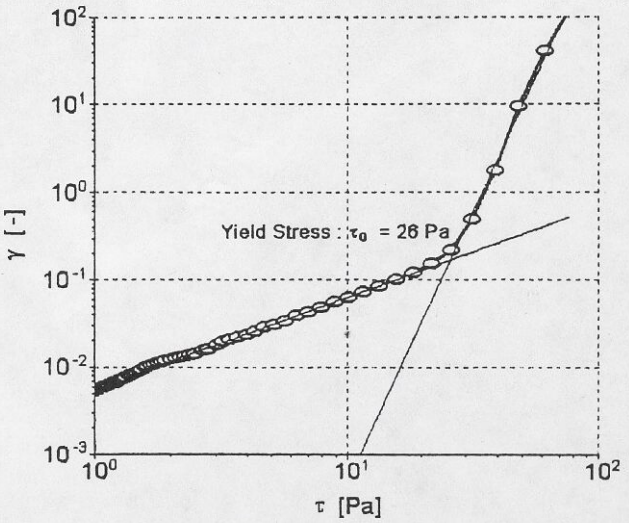

Figure 1 Typical deformation versus stress curve for a material with a yield point.

Firstly, at the beginning of the test, a very rapid increase in strain occurs that gives way to a curve of slope unity. This is followed by another accelerated increase of deformation (Figure 2, upper curve). The

initial region is often neglected and is explained to be the effect of inertia. If this were true, the ramping time should have an influence on this behavior. In fact, as shown in Figure 3, this start up behavior is observed independently of the ramping time employed. Longer times actually lead to an even larger initial slope, instead of a slope that is closer to the value of unity.

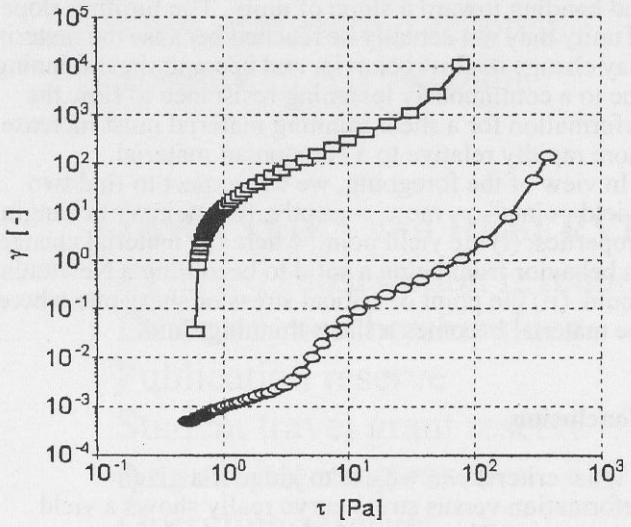

Figure 2 Practically observed deformation versus stress curves.

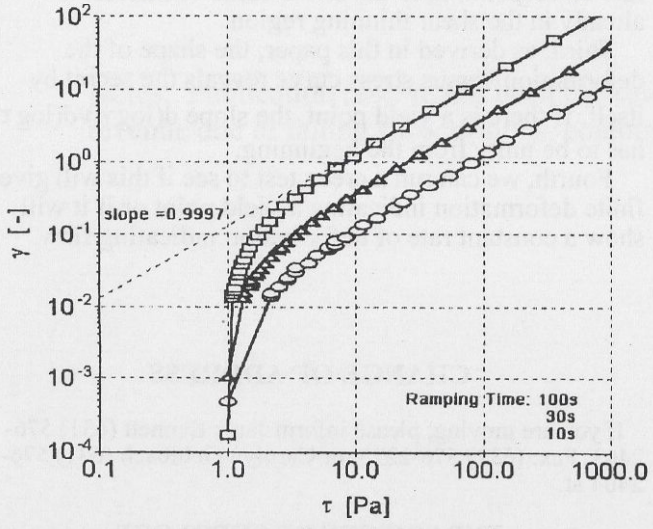

Figure 3 Influence of ramping time on the deformation versus stress behavior.

Secondly, after passing through what appears to be the yield point, the material shows a large increase in deformation. However, the deformation slows down upon a further increase in the stress (Figure 2, lower curve); this indicates an increasing resistance to flow. If the data are plotted as the ratio of the instantaneous shear stress to the instantaneous shear rate (an apparent viscosity), no increase in resistance is noted with increasing time. This absence of shear thickening is shown in Figure 4.

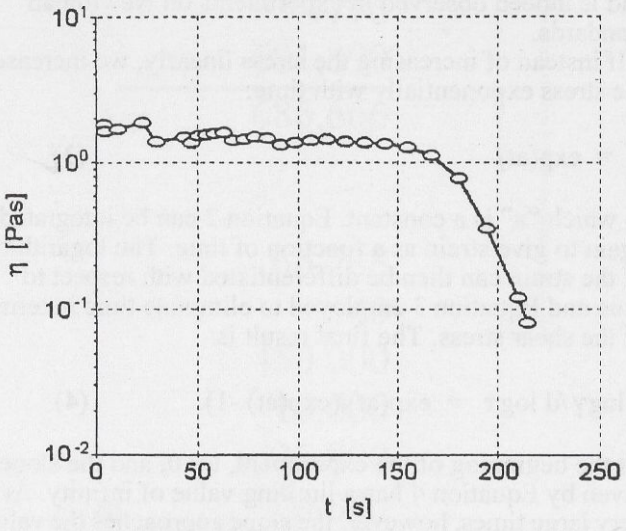

Figure 4 Viscosity versus time determined from data in yield point test.

To clarify these phenomena, we take a closer look at what deformation behavior we may expect on a theoretical basis for purely elastic and purely viscous materials.

Theoretical Deformation/Stress functions

(a) Elastic solids

Elastic solids follow Hooke's law:

$$\tau = G\,\gamma \qquad (1)$$

which implies a slope of unity on logarithmic coordinates of a plot of shear strain versus the shear stress. Therefore, yield stress materials should exhibit a slope of unity before the yield point.

(b) Viscous fluids

Viscous liquids follow Newton's law of viscosity:

$$\tau = \eta\,(d\gamma/dt) \qquad (2)$$

where it is assumed that the viscosity η is constant. If the shear stress increases linearly with time, it can be replaced in the above equation with at, where "a" is a constant. Upon rearranging Equation 2 and integrating the result, it is found that the strain increasses quadratically with time, or equivalently quadratically with stress. Consequently, the slope of strain versus stress is 2 on logarithmic coordinates. This result is independent of the ramping time and the liquid viscosity, and is indeed observed in experiments on Newtonian standards.

If instead of increasing the stress linearly, we increase the stress exponentially with time:

$$\tau = \exp(at) \qquad (3)$$

in which "a" is a constant. Equation 2 can be integrated again to give strain as a function of time. The logarithm of the strain can then be differentiated with respect to time and Equation 3 employed to eliminate time in terms of the shear stress. The final result is:

$$d \log\gamma / d \log\tau = \exp(at)/(\exp(at) - 1) \qquad (4)$$

At the beginning of the experiment, t = 0, and the slope given by Equation 4 has a limiting value of infinity. At very large times, however, the slope approaches the value unity. For purely viscous materials, therefore, the deformation versus stress curve begins with an infinite slope, and it bends toward a limiting slope of unity if the stress is increased exponentially. This behavior is shown in Figure 5, and there is excellent agreement between data and the predictions of Equation 4.

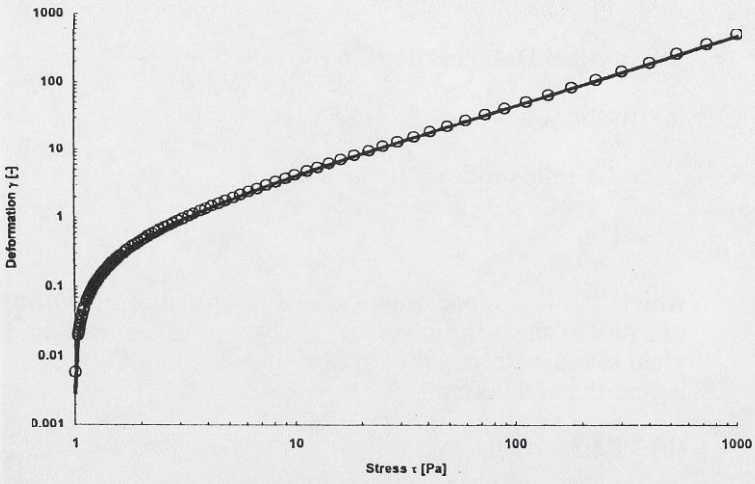

Figure 5 Measured and calculated deformation as a function of stress for a Newtonian oil of 100 Pa-s viscosity. The stress is increased logarithmically from 1 to 1000 Pa in 300 s.

Discussion

The question that arises immediately is, "What yield points have we seen in Figure 2?" The answer is that only materials with a real yield point start with a slope of unity from the very beginning. After passing through the yield point, the material behaves as a viscous liquid. Therefore, we see a strong incline originating from the yield point and bending toward a slope of unity. The limiting slope of unity may not actually be reached because the material may change its flow behavior and become shear thinning; due to a continuously lessening resistance to flow,the deformation for a shear thinning material must increase more rapidly relative to a Newtonian material.

In view of the foregoing, we can expect to find two "yield points" or, more correctly, two points of changing properties: (i) the yield point, where the material changes its behavior from being a solid to becoming a Newtonian liquid. (ii) the point of critical stress or shear rate where the material becomes a shear thinning fluid.

Conclusion

What criteria can we use to judge if a given deformation versus stress curve really shows a yield point or not? There are four things to look for.

One indicator is the value of the deformation at which the yield point is found. As a rule of thumb, the yield point is doubtful if the strain is greater than unity.

Second, we may represent the very same data as viscosity versus shear rate. We may find that the shear rate corresponding to the stress value of interest is already in the shear thinning region.

Third, as derived in this paper, the shape of the deformation versus stress curve reveals the secret by itself. If there is a yield point, the slope $d(\log\gamma)/d(\log\tau)$ has to be unity from the beginning.

Fourth, we can run a creep test to see if this will give a finite deformation indicating a yield point or if it will show a constant rate of deformation indicating flow.

CHANGE OF ADDRESS

If you are moving, please inform Janis Bennett (631) 576-2403, Fax: (631) 576-2223, or Carolyn Gehlbach (631) 576-2404 at

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The Society of Rheology
Assets and Liabilities
October 21, 1999

Units: USD

ASSETS	
Cash in checking account	4776
Balance in AIP account	681,890
	686,666
LIABILITIES and RESERVES	
Deferred subscription revenue	66,788
Deferred membership dues	40
Publication reserve	450,000
Student travel grant reserve	10,000
Annual Meeting reserve	35,000
Operating reserve	70,000
	631,828
Net available funds	**54,838**

Notes: Publication reserve has been increased this year to cover long-term losses in revenue due to falling subscriptions, combined with increased costs due to JORO.

The Society of Rheology

Statement of Revenues and Expenses, 10/99
1999 Projection and Proposed 2000 Budget

Units: USD

		1998 Budget	1998 Actual	1999 Budget	1999 Projection	2000 Budget
2.	***REVENUES***					
3.	Dues	58,000	83,903	59,000	39,000	61,000
4.	Interest	35,000	36,527	37,000	37,000	38,000
5.	Journal of Rheology	244,100	296,676	229,600	241,500	213,700
6.	Mailing List Sales	1,300	6	300	300	300
7.	Bulletin Advertising	0	1275	850	3825	850
8.	Annual Meeting	5,000	2417	5,000	5,000	0
9.	Short Course	5,000	8351	4,000	4,000	4,000
10.	**TOTAL REVENUE**	**348,400**	**429,155**	**335,750**	**330,625**	**317,850**
11.						
12.	***EXPENSES***					
13.	AIP Dues Bill & Collect.	0	8,304	8,500	6,800	9,000
14.	AIP Adm. Services	7,000	9,000	9,000	9,000	9,000
15.	AIP Mem. Soc. Dues	5,800	7,000	7,600	7,200	7,800
16.	AIP Financial Handling	4,500	4,300	3,600	600	0
17.	AIP Phys. Olympiad	1,500	1,500	1,500	1,500	1,500
18.	Misc. Contributions	0	0	1,000	1,000	1,000
19.	Renewal Billing	2,000	4,242	4,500	1,200	5,000
20.	Journal of Rheology	295,970	299,354	233,600	241,000	241,900
21.	Bulletins and Abstracts	10,000	19,170	13,000	15,677	13,000
22.	Short Courses	5,000	4,773	3,000	3,000	3,000
23.	Bingham Award	2,500	5,885	6,000	2,500	6,000
24.	Executive Cmt. Meetings	7,500	7,045	7,000	6,600	7,500
25.	Pres. Discretionary Fund	1,500	0	1,500	0	1,500
26.	Treas. Discr. Fund	1,500	0	1,500	0	1,500
27.	Progr. Chm. Discr. Fund	2,000	3,000	2,000	2,000	2,000
28.	Secretarial Services	1,000	0	1,000	300	1,000
29.	Mailing	2,000	40	4,000	2,600	4,000
30.	Office Expense	4,000	469	2,000	850	2,000
31.	Banking Services	250	129	250	135	250
32.	Liability Insurance	170	250	1803	2,250	1903
33.	Membership Directory	13,500	10,150	7,000	0	0
34.	Membership Broch. & Appl.	1,500	741	0	0	1500
35.	Accountant	1,500	1,597	1,700	1,800	1,800
36.	Student member travel	5,000	5,500	6,000	5,500	7,000
37.	Adv. Dep. for future mtg.	1,500	0	3,000	0	3,000
38.	Miscellaneous	3,000	216	2,500	1,500	2,500
39.	**TOTAL EXPENSES**	**380,190**	**392,665**	**332,553**	**313,012**	**334,653**
40.						
41.	Net Income	-31,790	36,490	3,197	17,613	-16,803
42.	ASSETS (excl. reserves)		173,583		54,838	

Notes: Line 13 due to AIP policy change on dues billing and collection; see JOR sheet Line 15 for corresponding reduction. 2000 Budget as approved by member vote at Madison meeting (minor addition errors due to last-minute changes have been corrected). Because the projected closing date for Madison meeting accounts is now known to be in February 2000, the projection for 1999 and the budget for 2000 will reflect a decrease and an increase, respectively, in meeting revenue (Line 8). Actuals on JoR are adjusted for miscellaneous journal expenses not paid through AIP.

Journal of Rheology

Statement of Revenues and Expenses, 1999 Projection and 2000 Budget

Units: USD

1.	1998 Budget	1998 Actual	1999 Budget[A]	1999 Projection[B]	2000 Budget[C]
2.					
3. Subscriptions	215,100	211,036	195,050	201,000	186,000
4. Reprints	6,700	8,406	9,800	7,000	7,800
5. Advertisements	21,000	18,241	18,000	18,500	18,000
6. Electronic pub. [D]	0	55,286	5,000	13,000	0
7. Miscellaneous	1,300	1,127	1,750	2,000	1,900
8. TOTAL REVENUES	**244,100**	**294,096**	**229,600**	**241,500**	**213,700**
9.					
10. Adver./Marketing	14,400	8,839	9,800	8,500	8,500
11. Reprints, Singles	8,400	8,437	8,300	9,000	9,000
12. Paper, Printing	37,200	40,596	38,000	38,500	42,000
13. SOR Editorial	45,000	46,617	45,000	45,000	49,000
14. Production	73,600	72,818	75,950	78,500	79,000
15. Fulfillment	15,120	7,876	8,250	7,500	7,900
16. Distribution	18,550	20,671	20,300	21,000	22,000
17. Electronic pub.(2)	83,700	92,861	28,000	33,000	24,500
18. TOTAL EXPENSES	**295,970**	**298,715**	**233,600**	**241,000**	**241,900**
19. Profit	**-51,870**	**-4,619**	**-4,000**	**500**	**-28,200**

Notes:

[A] 1999 Budget as reported in July 99 Bulletin . It assumes sales of 40 CD's and a spillover of costs.

[B] Based on 8/99 actuals and normal trends.

[C] 2000 Budget assumes CD sales will end and that JORO expenses will remain at contract levels, with no income.

[D] Line 6, of 1998 Actual is from 1998 CD sales; JORO has no income.