RHEOLOGY BULLETIN

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THE SOCIETY OF RHEOLOGY EXECUTIVE COMMITTEE - 1997-99

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RHEOLOGY SHORT COURSE

A two-day short course on Optical Rheometry will be offered in Madison, October 16-17, 1999. Course content includes an introduction to the physics of light propagation, optical methods, molecular models of optical properties, the design of optical experiments, and applications. The instructor is Professor G.G. Fuller of Stanford University. Additional details will be posted on the Society website as they become available. A complete description and registration information will be included in the July 1999 issue of the Rheology Bulletin.

71st ANNUAL MEETING MADISON, WI OCTOBER 17 - 21, 1999

The 1999 annual meeting of the Society of Rheology will be held at the Monona Terrace Convention Center in Madison, Wisconsin. The meeting organizers are:

Technical Program Chairs:

Robert C. Armstrong
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INSTRUMENT EXHIBIT Several companies will exhibit rheological instrumentation at the annual meeting.

POSTER SESSION A poster session will be held in Madison. Abstracts should be submitted using the web-based procedure to the session chair, Professor R.M. Kannan of Wayne State University -- rkannan@chem1.eng.wayne.edu

1998 JOURNAL OF RHEOLOGY PUBLICATION AWARD

The winners of the 1998 Journal of Rheology Publication Award are Michael J. MacDonald and Susan J. Muller for "Experimental study of shear-induced migration of polymers in dilute solution," Journal of Rheology, **40**, 259-283 (1996).

RHEOLOGY BULLETIN
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Visit the Society of Rheology on the web at
http://www.umche.maine.edu/sor/

Madison, Wisconsin, situated on an isthmus between Lakes Mendota and Monona, is a truly charming and picturesque city. Four lakes, 200 parks, miles of biking and hiking paths, and one of the loveliest university campuses in the country, offer an abundance of outdoor panoramas and activities. These, combined with a stimulating cultural environment, great shopping and dining, and an "irreverent spirit of fun," make Madison a great place to be.

The Dane County Regional Airport offers service via a number of major airlines. Transportation from the airport is available through hotel shuttles, or city limo and taxi service. An alternative is to fly to O'Hare in Chicago and take the Van Gelder Bus directly from O'Hare airport (International Terminal # 5, lower level, exit 5E) to Madison. The bus runs almost hourly and tickets ($18) can be purchased on board the bus. Additionally, interstate highways I-90 and I-94 intersect at Madison and provide easy access from Chicago, Milwaukee, and Minneapolis.

The annual meeting of the Society of Rheology will be held at the new Frank Lloyd Wright-designed Monona Terrace Convention Center, located two blocks from the State Capitol on the shores of Lake Monona. Originally proposed in 1938, this Convention Center brings to life one of Wright's final creative visions in a spectacular lakeside setting.

October in Madison is prime time for visitors. In fact, October 15-16, will be the University of Wisconsin Football Homecoming weekend. Early travel and lodging arrangements are advised.

Registration and housing forms, and other information on the Madison meeting, will be included in the July Bulletin.

TECHNICAL PROGRAM FOR MADISON

Authors wishing to present a paper in Madison should submit an abstract by **May 9, 1999**. The preferred medium for submitting the abstract is through the World Wide Web using the SoR abstract submission page at

http://www.umche.maine.edu/sor/

Otherwise, an abstract form may be requested from

Ms. Janis Bennett
c/o American Institute of Physics
500 Sunnyside Boulevard
Woodbury, NY 11797
Tel: (516) 576-2403; Fax: (516) 576-2223

The completed form should be returned to either of the technical program chairs, with a copy to the appropriate symposium chair. The planned symposia are:

1. **VISCOELASTICITY OF SYNTHETIC AND BIOLOGICAL POLYMER SOLUTIONS AND GELS -- Special symposium in honor of John Ferry:**

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Student-Member Travel Grants for Madison

The Society of Rheology is again offering grants to support the cost of public transportation to the annual meeting of the Society to graduate student members of the Society. Details concerning eligibility, application procedure, and application deadline may be found on the web page of the Society or by contacting Professor Don Baird of the Department of Chemical Engineering at Virginia Tech. He may be reached by phone at (540) 231-5998 or by e-mail at dbaird@vt.edu.

NOMINATIONS INVITED

Nominations are invited for the different Executive Committee positions of the Society for the 1999-2001 term. Please contact any member of the Nominating Committee which consists of:

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YIELD STRESS IN ORBITZ™

P. Dontula and C.W. Macosko
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At the 22nd annual short course on rheological measurements at the University of Minnesota in August 1997, two enthusiastic participants presented the instructors with an interesting problem: how do gel-like particles, some as large as 5 *mm* in diameter, remain suspended in the commercially available Orbitz™ drink? The results of a few rheological measurements reported here serve as a useful pedagogical tool. We have in fact used the ideas presented here as a home exercise in one of our courses, titled Principles and Applications of Rheology. We have also learned that Professor Larson has used this sample at the University of Michigan as a teaching example.

The overall appearance of Orbitz™ (Figure 1, Clearly Canadian Beverage Corp., Vancouver, Canada) is striking: the suspension is stable to violent agitation, but millimeter-size air bubbles entrained during agitation rise to the surface within seconds; a small angular displacement imparted to the liquid in the container moves the particles, but they recoil and even overshoot their initial positions and execute damped oscillations; and yet, the liquid appears to have the consistency of water. In the absence of other effects, large particles such as these will remain suspended only if the densities of the liquid and the particles are identical. All of these features suggest a complex rheological behavior and an excellent example for analysis.

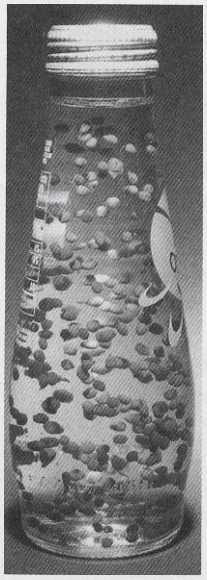
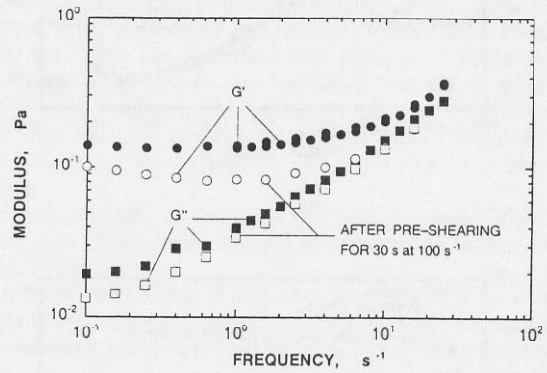
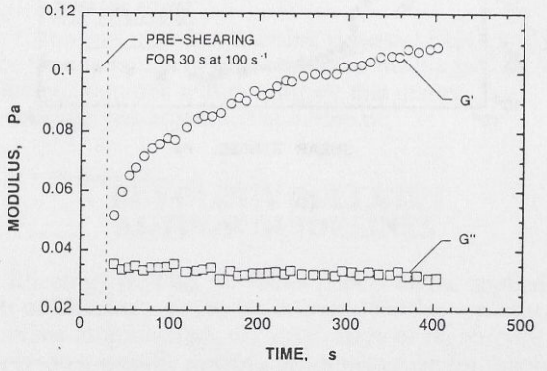


Figure 1 The commercially available Orbitz™.

Rheological properties of the supernatant liquid in Orbitz™ were measured at 20 ° C with a controlled-strain rheometer (RFS-II) and a controlled-stress rheometer (SR-2000), both manufactured by Rheometric Scientific, Piscataway, NJ. Concentric cylinders, or Couette, fixtures (32 *mm* inner cylinder diameter, 1 *mm* radial gap and 33 *mm* length in the RFS-II, and 29.5 *mm* inner cylinder diameter, 1.25 *mm* radial gap and 44.25 *mm* length in the SR-2000) maximized the torque signal. Water-soaked foam-lined covers minimized water loss by evaporation. The linear viscoelastic strain limit of the liquid determined by small amplitude oscillatory measurements (at 1 s^{-1}) was between 15% and 20%. Repeat measurements without any delay between experiments resulted in lower observed values of the elastic modulus, but those after a 5 *min* delay showed that the modulus had completely recovered to its original value, indicating a strain-sensitive structure in the liquid. Oscillatory measurements performed with and without pre-shearing the liquid are compared in Figure 2a. The frequency was stepped down from 100 s^{-1} to 0.1 s^{-1} in both experiments, and a 10% strain was imposed. Liquid



(a)



(b)

Figure 2 Elastic and viscous moduli of the supernatant liquid. (a) Versus frequency, with and without pre-shearing. (b) Versus time, after pre-shearing. The frequency was 1 s^{-1}, and the strain imposed was 10%.

inertia limited the highest frequency at which phase angles were accurately determined to about 30 s^{-1}. The elastic modulus G' falls with frequency, and plateaus at about 0.13 Pa. The values of G' after pre-shearing were consistently smaller than without pre-shearing, and rose with frequency below 1 s^{-1}. Because frequency sweeps take a few minutes to complete and impose small strain, the disrupted structure in the liquid may recover during the experiment. This is demonstrated in Figure 2b which traces the rise in G' with time after pre-shearing. The elastic modulus rose to about 90% of the value in Figure 2a in 7 *min* after shearing was stopped.

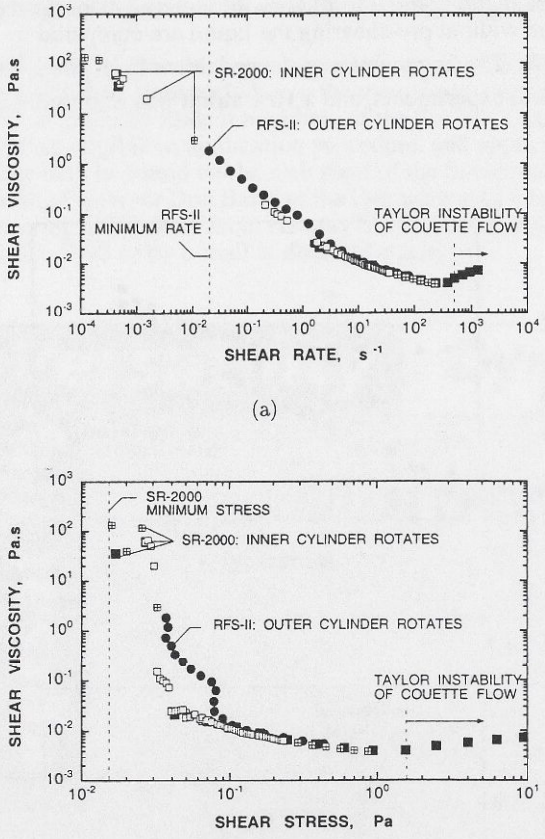


Figure 3 Shear viscosity of the supernatant liquid in Orbitz™ versus (a) shear rate, and the same data replotted versus (b) shear stress. Couette fixtures were used in both the rheometers. When the inner cylinder rotates and the shear rates exceed 500 s^{-1}, the critical Taylor number for the onset of vortices in the annular gap is exceeded; the ensuing secondary flow may raise the apparent viscosity.

Shear viscosity of the supernatant liquid was measured by two different experiments: "instantaneous" step-rate experiments, in which the velocity of the rotating cylinder was quickly raised to its programmed value on the controlled-strain rheometer, and creep experiments on the controlled-stress rheometer. Viscosity falls sharply with rising shear rate, and values from both experiments show reasonable agreement (Figure 3a). The shear viscosity is only four times that of water at 100 s^{-1}, explaining the fluidity of the sample at first sight. Viscosity replotted versus shear stress (Figure 3b) shows a sharp drop at a stress between 0.03 and 0.04 Pa. There are two critical stress levels, one around 0.04 Pa and the other around 0.075 Pa, in the measurements taken with the controlled-strain rheometer. This may be because stress in the liquid immediately adjacent to the moving member in the controlled-strain rheometer rises sharply at start-up and then falls to the measured value as the velocity profile develops. If the stress exceeds the yield stress, the liquid adjacent to the moving wall will yield. Then, the steady-state velocity profile and the time to attain it will depend on the shear rate and the rate of formation of the structure in the liquid, and may be quite complex. In contrast, during the creep experiment, the stress in the liquid never exceeds the programmed stress. Hence, the yield stress is more accurately determined by creep experiments. The yield stress τ of 0.04 Pa obtained in creep measurements compares favorably with 0.045 Pa obtained from oscillatory experiments in which the strain was raised in steps from 0.1% to 100% at a frequency of 5 s^{-1}. The yield stress is sometimes estimated as $G^*\gamma$, where G^* is the complex modulus at the linear viscoelastic strain limit γ. The yield stress τ of 0.04 Pa is roughly twice that used to suspend insoluble "builder" particles in liquid detergents (Barnes, 1980).

A balance between the buoyant (or gravitational) force, $4\,\Delta\rho\,\pi R^3/3$, and the restoring force due to the yield stress in the liquid, $\tau\,\pi R^2$, provides an estimate of the minimum (or maximum) density of a spherical particle of radius R that will remain motionless in the liquid. Here, $\Delta\rho$ is the absolute value of the difference in densities of the liquid and the particles. With particles of 5 *mm* in diameter, the maximum density difference that can be supported by the Orbitz™ liquid is about 12 kg/m^3. This is easily attained in practice if the particles are swollen in solution, as is the case with Orbitz™. Air bubbles smaller than about 60 μ m in diameter can be expected to remain stationary in Orbitz™.

ACKNOWLEDGEMENTS

The authors thank Susan C. Forman, Hercules Inc., and Alan Graham, Los Alamos National Laboratories, for bringing Orbitz™ to their attention. P. Dontula was supported by industrial and National Science Foundation funds through the Center for Interfacial Engineering at the University of Minnesota.

REFERENCES

Barnes, H.A., "Detergents," in Rheometry: Industrial Applications, edited by K. Walters (Wiley, Chichester, U.K., 1980).

MINUTES OF THE EXECUTIVE COMMITTEE MEETING
October 4, 1998

The meeting was called to order at 8:00 a.m. in the Fresh Cream Restaurant, Monterey, California. Executive Committee Members in attendance included: Ron Larson, Gerry Fuller, Monty Shaw, Kurt Wissbrun, Paula Moldenaers, Don Baird, and Andy Kraynik. Invited guests included: Janis Bennett, Albert Co, Jeff Giacomin, Rakesh Gupta, Dan Klingenberg, Pat Mather, Faith Morrison, Susan Muller, and Carl Schulteisz. The minutes of the March 29, 1998 Executive Committee Meeting, which appeared in the July 1998 Rheology Bulletin, were approved as read.

Ron Larson led discussion relating to on-line access to the Journal of Rheology. Topics centered around long-term strategies for economic viability and included: library concerns, enhanced features, industry-wide trends, and access by individual members of the Society as well as institutional subscribers. Kurt Wissbrun reported that the CD-ROM project was on schedule. Archival CD-ROMs of back issues of the Journal were being delivered. Webmaster Albert Co provided access statistics for the increasingly popular Society of Rheology Home Page. A data base of abstracts for society meetings, rheology index, and job listings were also discussed. Jeff Giacomin, Associate Editor for Finance, reported on non-member subscriptions to the Journal. The committee voted to provide $1000 in support of the International Congress on Theoretical and Applied Mechanics (ICTAM 2000), which will be held in Chicago, August 27 to September 2, 2000. Gerry Fuller suggested we consider increasing the monetary award associated with the Bingham medal. Faith Morrison reported on progress related to governance and revision of the constitution. Monty Shaw delivered the Treasurer's report. Details of our sound financial condition can be found in the Rheology Bulletin. We voted to obtain a Multimedia Liability Insurance Policy to cover publication activities. Rakesh Gupta indicated that three paid advertisements would appear in the Rheology Bulletin, which he edits. Technical articles for the Bulletin were also solicited.

The first session of the Executive Committee Meeting was adjourned at noon. A second session was called to order at 8:30 p.m. in the Monterey Marriott Hotel.

Gerry Fuller led discussion on future meetings of the Society. He reported on local arrangements and Pat Mather summarized the technical program for the Monterey meeting. Jeff Giacomin discussed local arrangements and Dan Klingenberg provided an overview of the technical program for Madison, Wisconsin, October 17-21, 1999. The International Congress on Rheology will convene in Cambridge, U.K., August 20-25, 2000. Don Baird described preparations for a Winter meeting in Hilton Head, South Carolina, February 11-15, 2001. Carl Schulteisz outlined plans for the regular annual meeting in Bethesda, Maryland, October 21-25, 2001, which he and Greg McKenna will organize. Minneapolis and New Orleans were discussed as potential sites for meetings in 2002 and beyond. Susan Muller, who chairs the Education Committee, discussed issues relating to compensation and travel expenses for instructors of Society short courses. On behalf of Bill Van Arsdale, Chair of the Membership Committee, Ron Larson reported a total of 1665 members as of August 1998.

Ron Larson read the Editor's report from Morton Denn, who was on sabbatical leave in Israel. The Journal of Rheology continues in good health.

After a brief executive session, the meeting was adjourned at 10:00 p.m.

MINUTES OF THE BUSINESS MEETING
October 6, 1998

The meeting was called to order at 5:30 p.m. in the Marriott Hotel, Monterey, California. The minutes of the October 21, 1997 Business Meeting, which appeared in the January 1998 issue of the Rheology Bulletin, were amended to reflect a change in venue for the Winter Meeting in 2001 from Ft. Meyers, Florida to Hilton Head, South Carolina.

President Ron Larson announced that the Journal of Rheology was available on-line to institutional subscribers. He also discussed trends in electronic publication and read the Editor's report from Morton Denn, who was on sabbatical leave in Israel. The Journal of Rheology continues to be a healthy publication. Future meeting locations were also announced.

Webmaster Albert Co provided statistics, which indicated the ever-increasing popularity and impact of our Home Page on Society activities. He described new features, such as a data base of meeting abstracts, and indicated that the membership directory could only be accessed by members of the Society.

Kurt Wissbrun reminded members that CD-ROMs containing all back issues of the Journal of Rheology were available for purchase.

Ron Larson read a report from Bill Van Arsdale, Chair of the Membership Committee. Society membership reached 1665 in August 1998.

Faith Morrison indicated that a revised constitution would be brought before the next business meeting in Madison, where those members present would vote on submission to a formal ballot.

Monty Shaw delivered the Treasurer's report, which indicated the sound financial condition of the Society and the Journal of Rheology. Details can be found in the Rheology Bulletin.

A question was raised concerning financial liability of the Society for nonmembers who attend our meetings. The Executive Committee will investigate this matter.

The meeting was adjourned at 6:35 p.m.

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.

BOOK REVIEW

FLUID MECHANICS: AN INTERACTIVE TEXT
James A. Liggett and David A. Caughey
CD-ROM (1998); ISBN 0-7844-0310-4
$100/$75 Students and ASCE Members
ASCE Press, 1801 Alexander Bell Drive, Reston, VA 20191
Tel: (800) 548-2723

Fluid Mechanics: An Interactive Text integrates a multimedia presentation with the computational capabilities of MATLAB (The MathWorks) to provide an introduction for undergraduates. This software was developed with Authorware (Macromedia) and runs on PC (486/50 MHz, Windows 3.1, 95, NT) and Macintosh (68030 or PowerPC, System 7.5 or later) computers with minimal system requirements (4X CD-ROM, 16 MB RAM, 30 MB disk space, 640x480 screen resolution, 256 colors). The CD-ROM must be in the drive for the program to start. A table of contents was not provided with the enclosed documentation, so a listing is provided below.

Preface and Users Guide, Introduction, Basic Considerations, Fluid Statics, Integral Description, Dimensional Analysis and Similitude, Laminar and Turbulent Flows, Incompressible Pipe Flow, Potential Flow, Boundary Layers, Flow Past Bodies, Compressible Flows, Open Channel Flows, Fluid Machinery, Transport.

These chapters are typically divided into small sections which fit the presentation method and possibly the attention span of the intended audience. These sections provide a good overview of most subjects covered in a typical undergraduate course on fluid mechanics. The reader can set the presentation "Level" starting with an overview (Level 1), then adding quantitative information (Level 2) and finally specialized information (Level 3).

One advantage of an interactive text is rapid navigation of the material. Chapters are selected from the Table of Contents or using numbers at the bottom of the screen. Each chapter is loaded from the CD-ROM as requested by the user. However, this process is slow, inhibiting a reader's ability to browse the text. A "word search" feature only works within the current chapter. A slide bar at the bottom of the screen and "Next", "Previous" and "Back" buttons provide navigation within a chapter. A "history list" provides access to any of the last 50 pages viewed by the reader. Screens can also be located using a "bookmark". Text in bold or colored font is linked to other screens including figures, graphs, equations and the glossary. This navigational feature is especially effective with equations, allowing a reader to view the referenced equation alone or in the context of a screen on which it appears. The "Table of Figures" and "Glossary Index" are also useful for jumping to a particular illustration of concept in the text. A "Figure Search" utility allows the reader to find animations, applications, figures, graphs, movies, photographs and tables using a text description.

Other advantages of an interactive text include annotation, visualization and computation capabilities. The reader can add "Notes" to a screen; the notes can be collected and saved as a text file for any chapter. The text also contains "Footnotes" inserted by the authors to expand on sentences marked by an asterisk in the text. Material cannot be copied from the text, but screens can be printed in landscape mode. Figures are displayed in "thumbnail" size but can be expanded by clicking on a "magnifying glass" icon. Some graphs and tables are directly accessible using the "Data" menu at the top of the screen. Animations and videos are launched using a "filmstrip" icon and controlled with arrow buttons at the bottom of the resulting frame. MATLAB enables a reader to interact with some graphs, tables and equations. This software is also used in a number of computational tools, which are launched using the "Tools" menu at the top of the screen. Descriptions of these tools are listed below:

Active Equation: plots equations
AreaFlow: solves the equations of isentropic flow for a calorically perfect gas
AxialVel: plots velocity diagrams for axial flow machines
BIEMer: solves internal potential and ground wter flows using boundary integral method
DiAna: determines dimensionless groups using a worksheet
EPANET: calculates flow and pressure in pipe networks (PC)
Fanno: obtains the flow of calorically perfect gas in a constant area duct with friction
Integrat: evaluates integrals
PipeFlow: obtains pipe flow with friction
Plotter: displays x-y and contour plots
PotFlow: displays planar and axisymmetric potential flows
Prandtl-Meyer Function: provides flow turning angle as a function of Mach number
Rayleigh: obtains flow of a calorically perfect gas in constant area ducts with heat addition
SlveTran: solves systems of nonlinear and/or transcendental equations
StdAtmos: displays equations and tables for a standard atmosphere to 90,000 m altitude
Units: converts values for dimensional quantities
WatrHamr: predicts water hammer in elastic pipes

These programs are documented in appendices at the end of some chapters. Additional documentation is available from the "Help" menu at the top of the screen.

Fluid Mechanics: An Interactive Text is a good overview of the subject for undergraduate students. The presentation implements useful navigational features with computational tools. I recommend purchase as a supplement to laboratory and lecture courses involving fluid mechanics.

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CHANGE OF ADDRESS

If you are moving, please inform: Janis Bennett (516) 576-2403, Fax: (516) 576-2223, or Carolyn Gehlbach (516) 576-2404 at

THE SOCIETY OF RHEOLOGY
c/o American Institute of Physics
500 Sunnyside Boulevard
Woodbury, NY 11797

The Society of Rheology

Statement of Revenue and Expense, and Revised 1999 Budget

October 31, 1998

Units: USD

	1997 Budget	1997 Actual	1998 Budget	1998 Projected	1999 Budget
REVENUES					
Dues	56,000	51,017	58,000	63,000	59,000
Interest	28,000	30,399	35,000	33,500	28,000
Journal of Rheology	208,350	231,133	244,100	255,770	229,600
Mailing List Sales	400	337	1,300	480	300
Bulletin Advertising	0	425	0	1600	850
Annual Meeting	6,000	-1032	5,000	8780	5,000
Short Course	10,000	3950	5,000	0	4,000
TOTAL REVENUE	**308,750**	**316,229**	**348,400**	**363,130**	**326,750**
EXPENSES					
AIP Adm. Services	7,000	9,000	7,000	9,000	9,000
AIP Mem. Soc. Dues	5,600	6,000	5,800	7,000	7,600
AIP Financial Handling	5,000	4,146	4,500	4,300	0
AIP Phys. Team Olympiad	1,500	0	1,500	1,500	1,500
Misc. Contributions	0	0	0	0	1,000
Renewal Billing	1,500	2,744	2,000	5,200	3,000
Journal of Rheology	208,350	187,825	295,970	253,946	229,600
Bulletins and Abstracts	15,000	11,801	10,000	8,840	13,000
Short Courses	10,000	3,100	5,000	3,000	3,000
Bingham Award	6,000	5,360	2,500	2,750	6,000
Executive Cmt. Meetings	7,500	4,037	7,500	4,000	5,000
Pres. Discretionary Fund	1,500	964	1,500	650	1,500
Treas. Discretionary Fund	1,500	0	1,500	0	1,500
Program Chm. Discr. Fund	4,000	553	2,000	2,000	2,000
Secretarial Services	1,000	0	1,000	0	1,000
Mailing	3,500	3,137	2,000	2,500	4,000
Office Expense	2,000	1,197	4,000	1,200	2,000
Banking Services	150	81	250	42	250
Liability Insurance	169	169	170	250	1803
Membership Directory	5,500	0	13,500	10,150	7,000
Membership Brochure	1,000	150	1,500	400	0
Accountant	1,500	1,635	1,500	1,600	1,700
Student member travel	10,000	8,287	5,000	4,500	5,000
Adv. Dep. for future mtg.	3,000	0	1,500	0	3,000
Miscellaneous	1,500	1,072	3,000	1,000	2,500
TOTAL EXPENSE	**303,769**	**251,258**	**380,190**	**323,828**	**311,953**
Net Income, $	4,981	64,971	(31,790)	39,302	14,797
NET ASSETS (excl. reserves)		169,000		182,000	

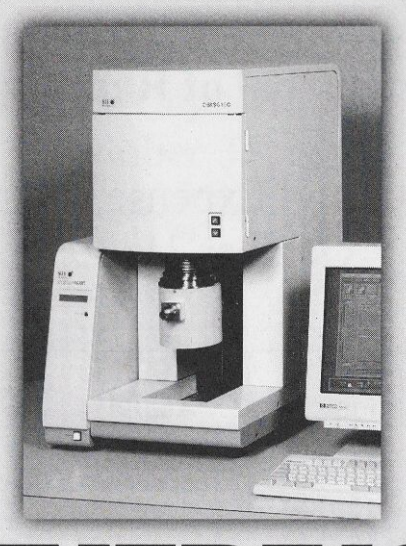
Journal of Rheology

Statement of Revenue and Expense, and Revised 1999 Budget
October 31, 1998

Units: USD

1.		1997 Budget	1997 Actual	1998 Budget	1998 Projection	1999 Budget
2.						
3. Subscriptions		187,150	200,617	215,100	206,850	195,050
4. Reprints		3,600	9,243	6,700	7,400	9,800
5. Advertisements		16,000	18,581	21,000	19,300	18,000
6. Electronic publishing		0	0	0	21,000	5,000
7. Miscellaneous		1550	3,182	1,300	1,220	1,750
8. TOTAL REVENUES, k$		**208,300**	**231,623**	**244,100**	**255,770**	**229,600**
9.						
10. Advertising/Marketing		12,000	9,710	14,400	9,590	9,800
11. Reprints, Single Copy		7,000	8,054	8,400	6,031	8,300
12. Paper, Printing		45,100	35,109	37,200	41,680	38,000
13. SOR Editorial		45,000	43,502	45,000	42,500	45,000
14. Production		64,500	55,751	73,600	57,140	69,000
15. Fulfillment		12,500	16,023	15,120	7,620	16,250
16. Distribution		18,450	19,676	18,550	20,335	20,250
17. Electronic publishing*		0	0	83,700	69,050	23,000
18. TOTAL COSTS, k$		**204,550**	**187,825**	**295,970**	**253,946**	**229,600**
19. Profit, k$		**3,750**	**43,798**	**(51,870)**	**1,824**	**0**

Notes: Line 6, Projected income in 1998 mainly from CD sales; expenses in line 17 are split between 1998 and 1999. Income from online journal is very uncertain and is therefore not included in Line 6.



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