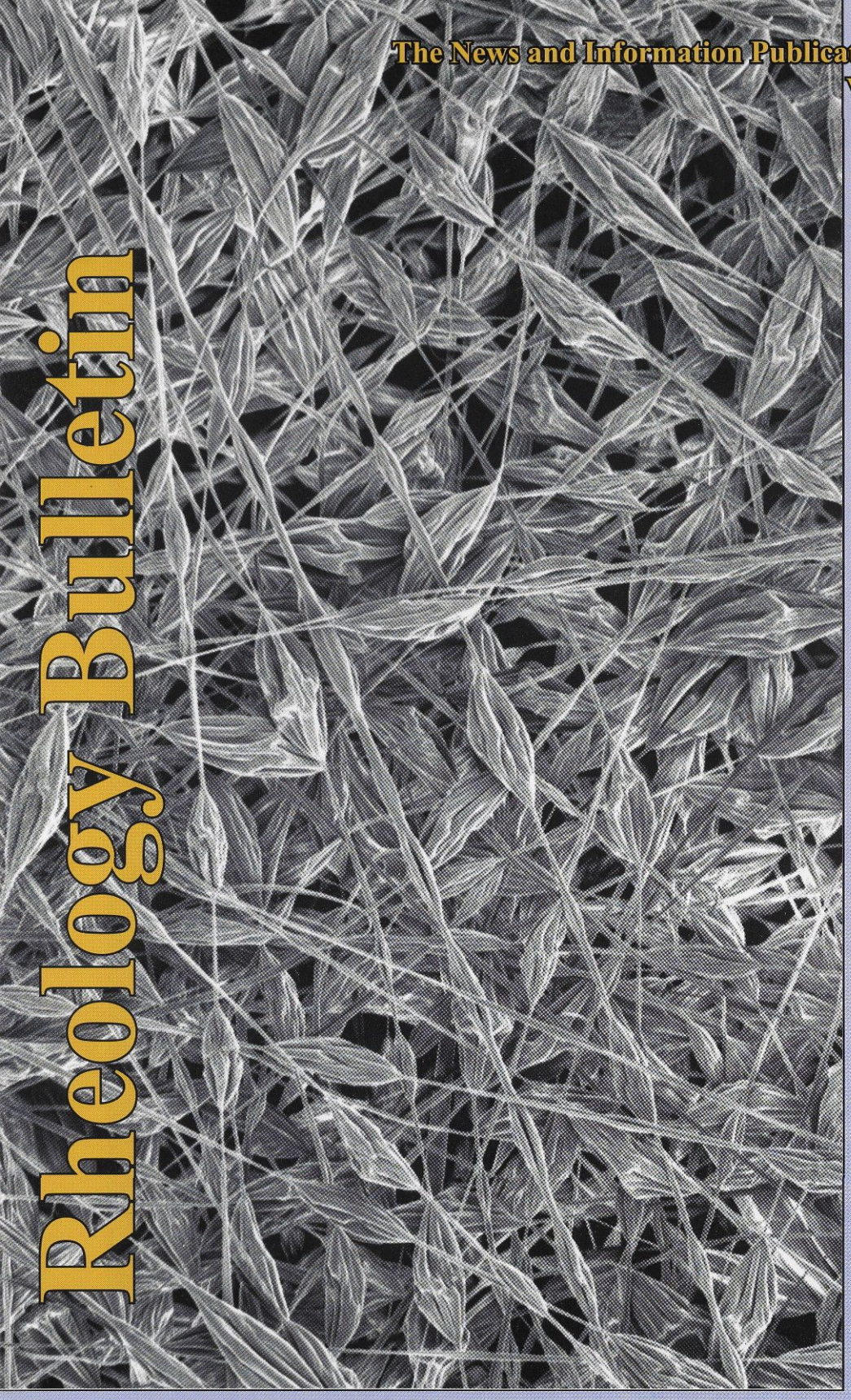
The News and Information Publication of The Society of Rheology
Volume 77 Number 2 July 2008

Rheology Bulletin



Rheology 2008
monterey • california

See You in Monterey!

Inside:

Cover photo shows electrospun fibers of poly(methyl methacrylate) showing 'beads on a string' morphology. The fibers have subsequently dried out by vapor loss and thus are known around the Hatsopoulos Microfluids Laboratory as 'nano-raisins on a string' (photocredit: Anish Tuteja, Wonjae Choi, Robert Cohen and Gareth McKinley, Massachusetts Institute of Technology USA).

Table of Contents

The Rheology Bulletin is the news and information publication of The Society of Rheology (SOR) and is published twice yearly in January and July. Subscription is free on membership in The Society of Rheology.

Change of address or letters to the editor: rheology@aip.org

Standing Committees

Membership Committee (2005-2007)
Patrick T. Mather, chair
Patrick D. Anderson
Shelley L. Anna
Charles P. Lusignan
H. Henning Winter

Education Committee (2005-2007)
Michael J. Solomon, chair
Robert J. Butera
Andrea Chow
Anthony J. McHugh
Jan Vermant

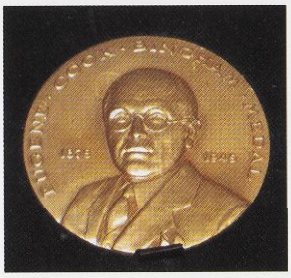
Meetings Policy Committee (2007-2009)
Faith A. Morrison, Chair
Albert Co
Ralph Colby
Gerald G. Fuller
Michael Graham
Gary Leal
Jules Magda
Robert L. Powell

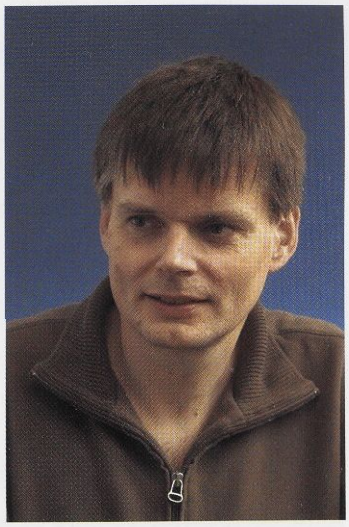
Bingham Award Committee
Ronald G. Larson (2005-2008), chair
William Hartt (2005-2008)
Ole Hassager (2006-2009)
Susan J. Muller (2007-2010)
Jay Schieber (2005-2008)
Norman Wagner (2006-2009)
Jan Vermant (2007-2010)

Webmaster	Albert Co
Editor, Rheology Bulletin	Faith A. Morrison
Associate Editor for Business, Journal of Rheology	A. Jeffrey Giacomin
Representative to AIP	Morton M. Denn
Representative to AIP Committee on Public Policy	Kalman Migler
Representative to and Chair AIP Publications Services Subcommittee	A. Jeffrey Giacomin
Rep. to AIP Liaison Committee for Under-Represented Minorities	Willie E. (Skip) Rochefort
Rep. to U.S. National Committee on Theoretical and Applied Mechanics	Michael D. Graham
Delegate to International Committee on Rheology	Andrew M. Kraynik

The Rheology Bulletin is archived on the SOR website at www.rheology.org/sor/publications/rheology_b/issues.htm

Hans Christian Öttinger is 2008 Bingham Medalist





Hans Christian Öttinger of the Swiss Federal Institute of Technology (ETH) in Zürich has been named the 2008 Bingham Medalist. He will receive this award at the XVth International Congress on Rheology and 80th Annual Meeting of The Society of Rheology in Monterey, California this August.

Hans Christian's formal education was obtained at the University of Freiburg in Germany. In Freiburg, he earned a Ph.D. in Physics in 1983 and completed his Habilitation in Theoretical Physics in 1988 under the direction of Professor J. Honerkamp. His work in the field of rheology began in 1986-87 while a post-doctoral student at the University of Wisconsin in Madison working under the guidance of Professor R.B. Bird. Hans Christian came to the ETH in 1989 as a researcher in the Polymer Physics Group of Professor J. Meissner. After Professor Meissner's retirement, Hans Christian became a Professor of Polymer Physics in 1996. During his tenure at ETH, Hans Christian has held the position of Head of the Institute of Polymers and Chairman of the Department of Materials. He is a member of the American, British and German Societies of Rheology, and the German Physical Society and Swiss Rheology Group. Over the past eight years, Hans Christian has also co-organized a series of workshops with the title "International Workshop on Non-equilibrium Thermodynamics and Complex Fluids."

The majority of Hans Christian's research within the field of complex fluids can be broadly grouped into two areas: kinetic theory and stochastic simulation techniques, and non-equilibrium thermodynamics. In addition, Hans Christian has been involved in several experimental projects that have built upon existing strengths at ETH in the rheometry of polymeric liquids, and developed new expertise in the area of complex flow fluid dynamics.

Hans Christian's first contributions to the field came in the area of kinetic theory modeling. This work involved the generalization and extension of classical theories

Group barbecue in July 2005.

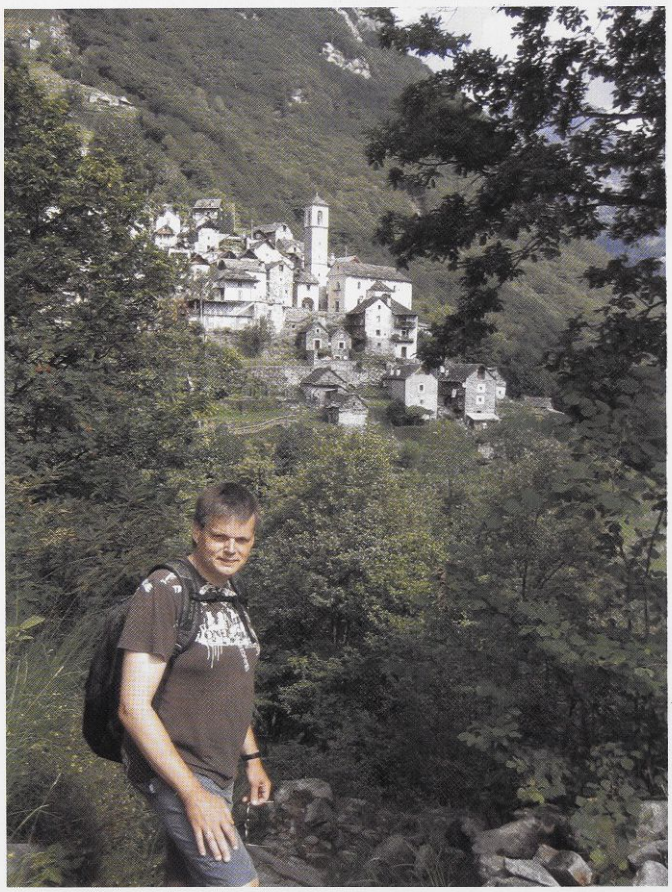
describing systems ranging from dilute solutions to liquid crystalline polymers. Particularly noteworthy is his work on rigid rod polymers, reptation models, and liquid crystalline polymers (with Ron Larson). Hans Christian's most important contributions in this area have been in the application of stochastic simulation techniques for polymeric liquids. He has authored a seminal book on this subject: *Stochastic Processes in Polymeric Fluids,* which has over 300 citations. In addition, Hans Christian developed a method known as Calculation Of Non-Newtonian Flow: Finite Elements and Stochastic SImulation Technique, or CONNFFESSIT. The CONNFFESSIT approach, or methods based on this idea, are widely used by rheologists and fluid dynamicists.

For the past decade, Hans Christian has worked on the development of a framework for non-equilibrium thermodynamics known as GENERIC, which stands for General Equation for the Non-Equilibrium Reversible-Irreversible Coupling. The foundation of this work is described in two papers co-authored with Miroslav Grimela in 1997 that combined have well over 300 citations. Hans Christian has continued to develop and extend the GENERIC framework and demonstrated its applicability to an incredibly wide range of topics such as thermodynamic consistency of constitutive equations, flow-induced crystallization of molten polymers, glass-forming liquids, hydrodynamics, molecular dynamic simulations and coarse graining methods. In addition, Hans Christian has recently authored a book entitled *Beyond Equilibrium Thermodynamics*, which presents the GENERIC formalism, its application to several topics in complex fluids, as well a more recent results on simulation methods. Hans Christian's pioneering work on non-equilibrium thermodynamics has had a dramatic impact on the entire field of rheology and complex fluids. There is no question that these contributions will continue to be a strong influence in rheology and numerous related fields.

Hans Christian is a clear thinker with a brilliant mind who is unafraid to tackle the most challenging problems in complex fluids rheology. He is also a person of the highest integrity who is both tenacious and playful in his pursuit of scientific truth. As noted by one of his colleagues, Hans Christian reveals a 'disarming humanity and simplicity of tract' in his interactions with collaborators. He is also a loving father to his four children, Simon, Selina, Benjamin and Alessandra, and devoted husband to his wife, Ricarda. When not writing papers like the "Role of nonequilibrium entropy in Einstein's theory of gravitation," Hans Christian enjoys hiking, collecting rare books, performing global positioning with his sextant (GPS), listening to music, and following SC Freiburg. Along with his weakness for acronyms, he also is known to enjoy Diet Coke and an occasional Big Mac.

Hans Christian Öttinger is a unique individual whose impact on the field of rheology has been truly remarkable. On behalf of the many members of the rheology community who are proud to consider Hans Christian both a colleague and a friend, I wish to congratulate him for receiving this most deserved honor.

David C. Venerus
Illinois Institute of Technology

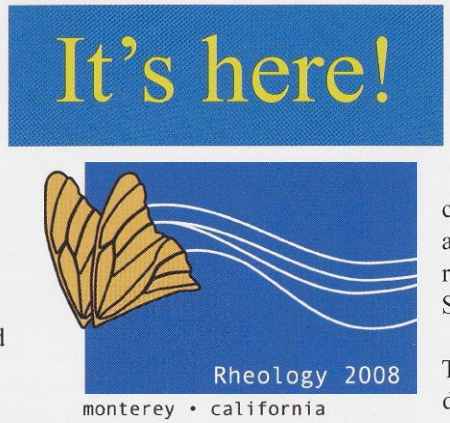


Hiking in Valle Verzasca, Ticino in July 2007.

International Congress on Rheology
Monterey, California USA
3-8 August 2008

Paper submitted? Airline tickets bought? Hotel Reservations made? Golf clubs and mountain bike ready to go? The Society of Rheology welcomes you and your guests to the XVth International Congress on Rheology (ICR), in Monterey, California USA. We only assemble as an International Congress every four years and Monterey promises to be spectacular!

More than 1027 people have registered and the schedule includes 664 presentations and 236 posters. This ICR is on track to break all records.



The 2008 Congress will take place at the Monterey Conference Center in Monterey, California. The host hotels are the Portola Plaza Hotel and the Monterey Marriott, with views of the famous Old Fisherman's Wharf and walking distance to Cannery Row and Monterey Bay Aquarium. Situated on Monterey Bay, the largest marine sanctuary in the United States, the town of Monterey is an international vacation destination with incredible restaurants, exciting recreational facilities, and fascinating points of interest. Hotel space is limited and attendees are encouraged to make reservations as soon as possible. The hotel reservation cutoff date is 14 July 2008.

The Congress technical program has been designed to highlight significant topics in contemporary rheology. The opening plenary lecture on Monday morning will be presented by Paul Callaghan from the School of Chemical and Physical Sciences at Victoria University of Wellington, New Zealand. The Congress will include a closing plenary lecture on Friday afternoon by Fred MacKintosh from the Department of Physics and Astronomy of Vrije Universiteit, the Netherlands. New to ICR2008, MacKintosh's lecture will be followed by a reception/lunch that will bring the Congress to a close early Friday afternoon. Attendees are encouraged to come to Monterey Sunday 3 August or earlier and to stay through the closing Friday afternoon reception.

Two short courses will be offered on the weekend before the Congress, 2-3 August 2008. A two-day short course on Suspension Rheology will be given by Jan Mewis and Norman Wagner. A one-day short course on Surfactant Rheology - Self-Assembly and Microstructure Dynamics will run on Sunday 3 August, taught by Pat Spicer and Srinivasa Raghavan. Those interested in both topics may take one day of the Suspension course followed by the Surfactant course. Details on the short courses are available on the web at www.rheology.org/ICR2008/ShortCourse/ShortCourse.htm.

The highlight of the ICR social calendar will be the Wednesday afternoon excursion, which is included for full delegates and for registered accompanying persons. There is a choice of seven excursions, one for every taste. There are two choices for winery tours, a Big Sur Coastline tour, the Monterey Marine Sanctuary whale watching tour, a kayak tour, a bike tour, and golf! For more information see the Congress website www.rheology.org/ICR2008/.

The online registration site is open at the Congress web site.

See you in Monterey!
Local Arrangements Co-Chairs:
Gerald Fuller
Andy Kraynik
Robert Powell

Teaching Rheology Using Product Design

Jan Vermant
K.U. Leuven, Belgium

Chris Macosko
University of Minnesota, USA

Here we describe two courses on experimental rheology offered over the past several years to seniors and first-year graduate students at our institutions. These laboratory courses use complex materials available from the shelves of our local retailers. We have found that measuring the rheology of face cream, shampoo, paint, chewing gum or plastic bags provides great motivation for students to learn rheology fundamentals. In this communication we describe the structure of the courses and give detailed instructions for others who may wish to duplicate this curriculum.

The two courses in Leuven and Minnesota are somewhat different, but what is common is the product-oriented approach. Typically we have 10-20 students who are asked to pair up (with three students per group one is usually a slacker!). Early on in the course each group selects a material from those listed in Table 1. Care is taken to ensure that all five of the material classes are represented in the materials studied.

Typically, after lectures on rheology fundamentals, rheometry, and a lab tour, each pair submits a plan including which rheometer geometry they will use and the types of linear and nonlinear data they plan to collect. They discuss this plan with the instructor. During this discussion, we put emphasis on how measurement problems need to be addressed. Students then get time in the rheometry lab to carry out their measurements, duly supervised by an experienced graduate student, postdoc, or lab manager. In the last week of semester the student teams give presentations describing their material, why its rheology is important for its performance in end-use and/or processing, and how their material-function measurements can be used to reverse engineer the structure of their product. Students are also asked to think about the molecular or formulation parameters that they could use to modify the rheological behavior of the products during processing or during the product life cycle.

Each of us has labs with several rotational rheometers capable of linear and nonlinear measurements including of normal stresses. We instruct each team to plan to complete their measurements within a 4-hour lab session. It should be quite possible to carry out this syllabus with just one modern rheometer. Apart from the lab time, students typically need some help with data analysis and interpretation. The latter may be time-con-

Table 1. Commercial materials used to teach rheology

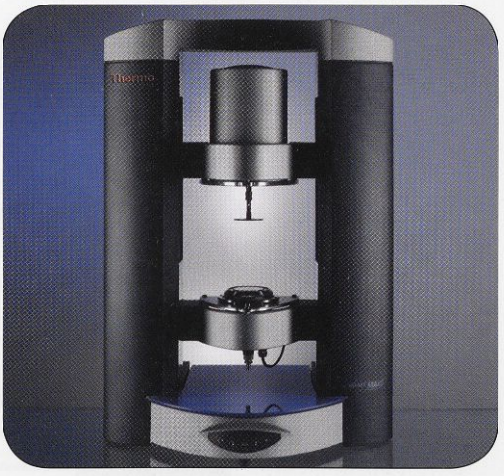
Class of material	Examples	NOTES
Polymeric liquids	grocery bag (LDPE) bottle (PE or PET-E) beer cup (PP)	Molten state, melt rheometer 150-250°C. May require more lab time. PET is somewhat difficult, needs to be dried under vacuum, also not dramatically viscoelastic.
Suspensions	latex paint lime-based paint mustard	Avoid solvent based paints. Be careful with acidity of certain foodstuffs.
Emulsions	face cream (e.g. Nivea) mayonnaise (e.g. comparing light vs. regular)	Slip is often a major issue with these emulsions.
Surfactants	shampoo (e.g. Garnier Ultra Doux for Kids, Clariant)	pH neutral shampoos are best. Some surfactants contain Cl^- ions, be careful for pitting corrosion! Transparent shampoos are nice; they get students thinking about the length scales involved. Some shampoos with suspended particles are often rheologically interesting.
Gels	foodstuff (ketchup, yogurt) hair gels toothpaste	These are difficult to measure and rheologically somewhat disappointing. The LVE properties show solid like behavior and often only the yield stress is rheologically relevant.

Which rheometer accessory do you need today?

Speed up formulation development and process optimization by benefiting from the Thermo Scientific HAAKE MARS rheometer with the broadest accessory portfolio available!

- RheoScope module to combine rheology with microscopy
- Peltier temperature control unit to predict storage and temperature stability
- Universal clamp for measurements in original sample container (such as crème pots or mascara container, etc.)
- Wide variety of measuring geometries

Which rheometer accessory do you need today?
Call us at +49 721 4094 444 for more.



Thermo Scientific HAAKE MARS rheometer

Thermo Fisher Scientific · Dieselstr. 4 · 76227 Karlsruhe
www.thermo.com/mars · info.mc.de@thermofisher.com

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

suming on the faculty and teaching assistants; in Leuven we have addressed this problem by instating a formal system for spending 'quality time' with the teaching staff, where the students get two vouchers, each valid for half an hour of consulting time from the teaching assistants.

During lectures, following the introduction of the different rheological concepts, we draw on examples from the literature to show how measurements of the different material functions can be used to infer relevant aspects about the intrinsic material properties, the processing behavior, or end-use properties. Examples of how this is done are listed in Table 2.

The rheology project aims at four distinct learning goals:

1. Understanding the different material functions and their relevance for material processes and products. Typically we try to emphasize the dual nature of rheology in materials processing and product design: linear viscoelasticity as an analytical tool, as some kind of mechanical microscope – and the non-linear properties as required for product performance or for predicting the behavior in processing flows. This part needs to be learned by the students early on in the project when they select the material functions that they intend to measure. There is always some feedback required at this stage of the project, typically after they submit their plan.

2. Selecting a measurement technique, performing the measurements and data analysis. This is something the students typically enjoy. It is best that students are warned beforehand about issues such as wall slip, sedimentation or creaming, and it is also advisable to have a good solvent trap in the lab to avoid evaporation. An explicit request is that students determine the limits of linear viscoelasticity and that they check the internal consistency of the data set they have obtained, e.g. use the Cox-Merz relation. This is maybe one of the most important lessons learned for those who will go on to practice rheology.

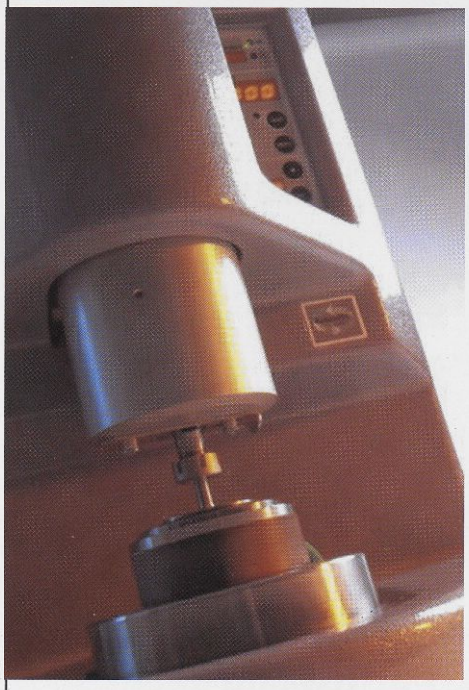
3. Choosing a constitutive model and fitting it to data. This part of the project is typically most challenging and especially relevant for the polymeric samples (where the relation between structure and rheology – see 4 - is less challenging). Overall, its importance has lost some of its weight in the assignment in recent years with the emphasis in teaching shifting somewhat to structure-

Table 2. Lecture examples linking deformation regimes and material functions with the various material classes.

Class of material	Linear viscoelastic properties	Generalized Newtonian behavior	Other non-Linear material functions
Polymeric liquids	Data on silly putty and LDPE (from [1,2]) are shown with a brief discussion on how MW and MWD affect properties [2]	Shear thinning is discussed, with an example of fitting an Ellis model [3,5]. Evaluations of shear rates in extrusion and injection molding.	Normal stress differences, transient normal stress differences [3] and transient elongational viscosities [1,4,5] and their role in extrusion and fiber spinning or blow molding [3,5]
Suspension	Stable suspensions : Effect of volume fraction and interaction potential on the moduli [6,7]	Range of shear rates and role of shear thinning in paints and inks [8] and shear thickening and liquid body armour [9]	Thixotropy (necessarily brief) using a model suspension of fumed silica in PDMS [10]
Emulsion	Emulsions as single relaxation time fluids (Maxwell), using rheology to measure droplet size [11]	Evaluation of shear rates in settling/creaming and product usage ('feel'), as discussed for example in [12]	Transient normal stress differences to evaluate morphology evolution [13]
Surfactants	Surfactant solutions as single relaxation time fluids (Maxwell) [14]	Flow curves of simple surfactants and relation to shear rates in filling, rubbing [12]	Demonstrate the Kaye effect [16,17] and extensional properties [18]
Gels	Solid-like behavior [15]	Yield stress and its relevance for toothpaste. Methods to measure yield stress [19,20]	Breakdown and recovery of gel structure, thixotropy [21]

MALVERN
INSTRUMENTS

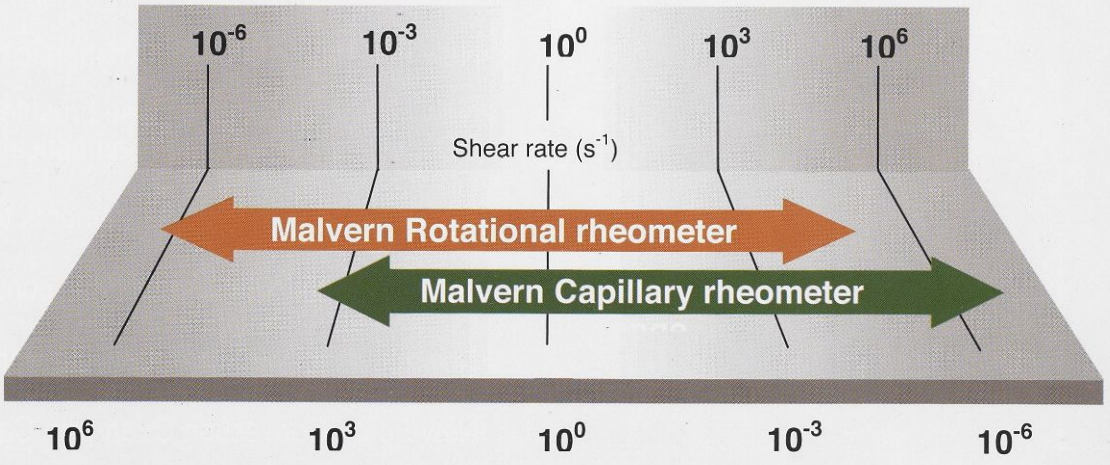
Innovations in rheological solutions



Malvern's rheological instruments have the unique ability to directly characterize material properties over 13 decades of shear rate. This means that physical material parameters can be measured, as well as their impact on process operation and end-use function.

These intelligent solutions apply to all industries where the rheological characteristics of a material determine its processability, performance and consumer acceptance.

Malvern is the only material characterization company with specialist resources in the measurement of particle size, shape, zeta potential, molecular weight and rheology. Malvern has the understanding and expertise to advise on how these microstructural parameters influence bulk rheological properties.



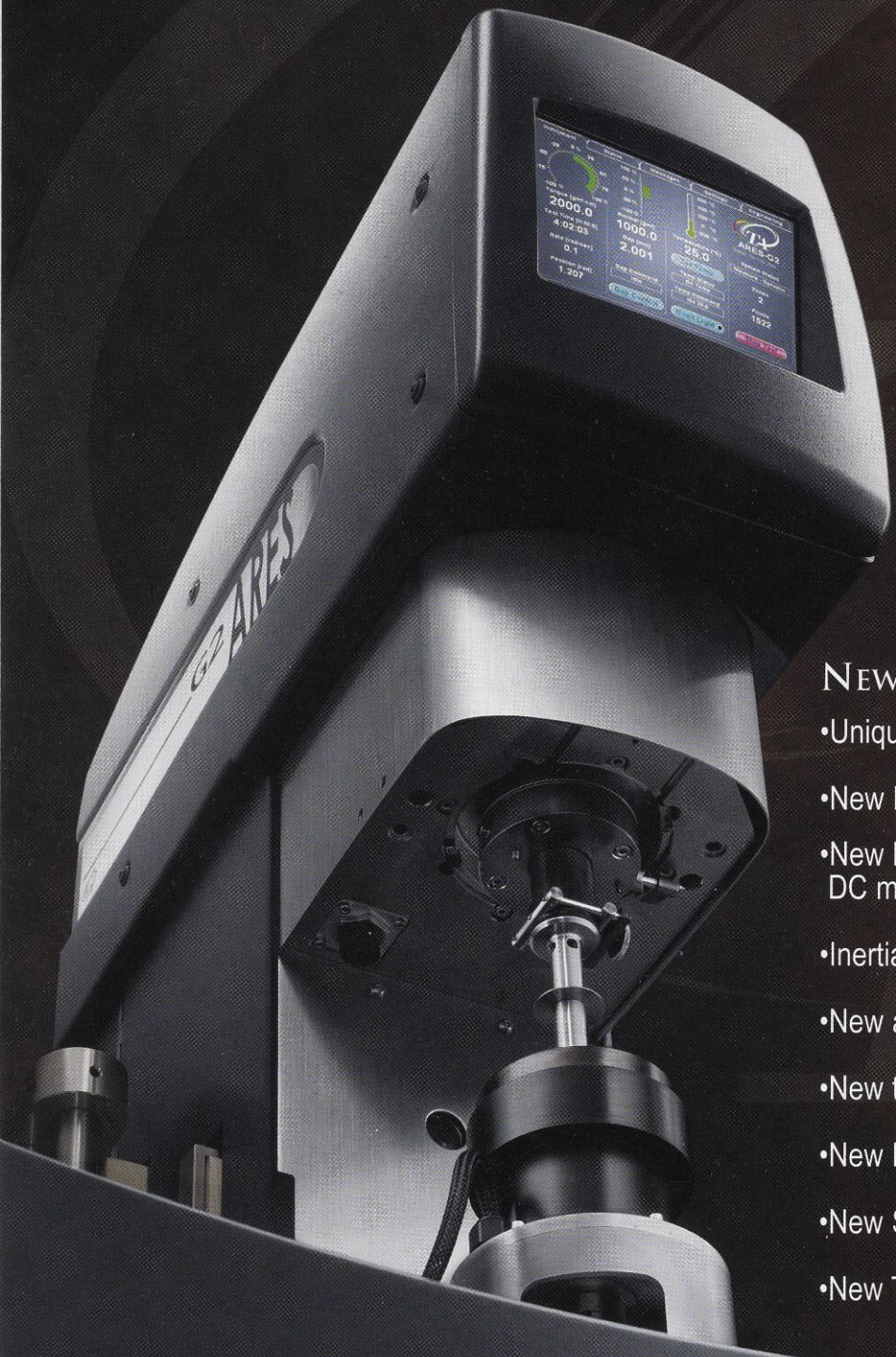
For more information, contact us on 508-480-0200 or e-mail to info@malvernusa.com

Visit our web site for "on demand" presentations, web seminars and application notes on rheology and light scattering

www.malvern.com

TA INSTRUMENTS

IT'S NOT A RHEOMETER... IT'S THE NEW ARES-G2 RHEOMETER.



NEW ARES-G2 RHEOMETER

- Unique separate motor and transducer technology
- New FRT with 5,000,000:1 dynamic range
- New high torque, friction free brushless DC motor with high resolution optical encoder
- Inertia free dynamic measurements to 100 Hz
- New advanced strain and stress control
- New touch screen with intuitive graphical interface
- New Force Convection Oven with Camera Viewer
- New Smart Swap™ Peltier Plate with Solvent Trap
- New TRIOS Software

WWW.TAINSTRUMENTS.COM

rheology relations (see 4).

4. Reverse engineering of the product: the relation between structure and rheology. In this part of the project, students have to establish the link between rheology and structure by trying to understand how the rheological behavior has been 'built-in' to the material. They should be able to discuss how parameters related to formulation or material design control its rheology and what they would measure when something goes wrong with the product or process. Some of the parameters that are discussed are listed in Table 3.

Table 3. Examples of parameters to be discussed for reverse engineering or product modification.

Class of material	Reverse engineering / structural parameters
Polymeric liquids	Polymer type, chain architecture, molecular weight and distribution
Suspension	Particle size, size distribution, (effective) volume fraction Effect of changing the interaction potential, medium viscosity
Emulsion	Droplet size (emulsification technique), volume fraction, stabilizers
Surfactants	Identify rheologically relevant components and suggest phase behavior (wormlike micelles or cubic phases) Concentration, presence of salt; solvent viscosity (e.g. glycerol)
Gels	Crosslink density, volume fraction of polymer Interaction potential

In our experience, students are particularly eager to understand the microstructural bases for different rheological responses in anticipation of having to solve a real problem by the end of the course. They also seem to be able to differentiate between the usage of rheology as an 'analytical method' and as a valuable engineering tool for finding parameters relevant for processing conditions or for designing end-use properties. Student response has been overwhelmingly positive, and we have enjoyed teaching it and exchanging our experiences. A detailed description of the course contents at the two institutions is given below. More information and materials are available on the web at cit.kuleuven.be/ltrk/PD/

KU Leuven H02X5a

This course is designed as an elective for the first semester of the final (5th) year of the chemical engineering master program. Typically also some material science and engineering students join the class. The number of students varies between 10 and 20. The course builds to a large extent on the book *Rheology: Principles, Measurements and Applications* (Macosko, Wiley, 1994) supplemented with *The Structure and Rheology of Complex Fluids* (Larson, Oxford, 1999. The course is 3 (ECTS) credits with 10 lectures of 2 hours.

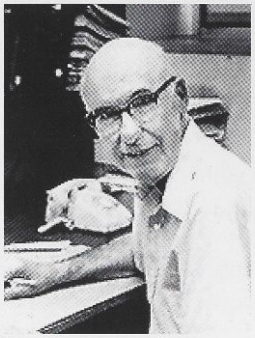
U Minnesota ChEn 8102

This course is designed as an elective for first year graduate students in chemical engineering in their second semester. However, typically, in addition to 5-7 chemical engineers, we have 3-6 materials majors and 1-2 biomedical engineers and often an aeronautical engineering, chemistry, pharmacy or even a food science grad student. Typically 2-4 seniors also take the course under 4702. They do the same exercises and exam but are graded separately.

Like the Leuven course we follow the structure of *Macosko,* supplemented with *Larson.* The course is 2 credits with 22 lectures, 50 min each. In addition to the laboratory exercise described above, two assignments contain rheometer data from the US National Institute of Standards viscoelastic standard, NIST 2491, polyisobutylene in pristane. The students are asked to evaluate the range of reliability of these data, test them against limiting relations, and fit them to several models.

A less intensive alternative:
For those who do not have the facilities to allow students to perform measurements, we experimented with a different approach a few years ago. Students were given a rheology-related problem in processing or formulation, such as instability in a film-blowing line or splashing and dripping paint. Subsequently, students were

(continues, Product Design, page 26)



Charles F. Curtiss 1921-2007

Charles F. Curtiss, Bingham medalist of The Society of Rheology and expert in molecular transport phenomena, died 24 December 2007 in Madison, Wisconsin USA.

Charles Curtiss was born 4 April 1921, in Chicago and attended high school in Neenah, Wisconsin. In 1942, he received his BS in chemistry from the University of Wisconsin - Madison and in 1948 he received his PhD degree also from University of Wisconsin – Madison, working with Joseph O. Hirschfelder. He joined the faculty of UWMadison in 1949, serving for 40 years as faculty member in chemistry; during much of this time he was Associate Director of the Theoretical Chemistry Institute. Chuck Curtiss supervised 3 M. S. candidates and 26 Ph. D. candidates, and worked with 18 postdoctoral associates. After retiring from UWMadison, Curtiss was Emeritus Professor of Chemistry (1989-2007).

Curtiss' research areas were kinetic theory of gases, nonequilibrium statistical mechanics of reacting gas mixtures, transport properties of dense gases, transport properties of polyatomic gases, molecular scattering phenomena, and molecular description of the rheology of polymer solutions and undiluted polymers. He published over 140 papers in refereed journals, including more than 10 on work after his retirement, as well as several book chapters. Chuck was coauthor of the 1200 page tome, *Molecular Theory of Gases and Liquids* (Hirschfelder, Curtiss & Bird), published in 1954 (corrected printing in 1964) and still in print, and of *Dynamics of Polymeric Liquids: Volume 2, Kinetic Theory*, 1977, (Bird, Hassager, Armstrong & Curtiss); second edition, 1987, (Bird, Curtiss, Armstrong & Hassager). Through these books he had a major impact on physical chemistry and chemical engineering. The book *Molecular Theory of Gases and Liquids* was listed as #4 in the list of most cited books for 1961-1972, and #9 in the 1967 ranking of most cited non-journal items.

He showed care in writing, a passion for accuracy, and mastery of various parts of the subject and their interrelations.

Chuck was a member of the American Chemical Society, Fellow of the American Physical Society and a member of the Society of Engineering Science, of which he had served as a Director. He served at various times on the editorial boards of *Journal of Chemical Physics*, *International Journal of Engineering Science*, *Physics of Fluids*, and *Physics and Chemistry of Liquids* and as consultant for various companies and government agencies. His work was recognized by the Bingham Award of The Society of Rheology in 1987, the Kurt Wohl Lecture of the University of Delaware, and the Eringen Award of the Society of Engineering Science.

Chuck was an exceptionally gifted applied mathematician. A 1952 paper with Hirschfelder on "The Integration of Stiff Equations" was listed in "13 Classic Papers in Applied Mathematics." Many of his colleagues were amazed at his talent for solving extremely complex physical problems by a combination of formal mathematics, uncanny intuition, and shrewd changes of variables. Comments were often made about the fact that Chuck usually wrote on 8 1/2 x 11 paper in "landscape" mode, with the 11 inch sides at top and bottom, so as to be able to accommodate very long equations. Many of the graduate students and faculty members of the chemistry department came to his office to seek help on difficult mathematics and physics problems. Chuck was always willing to listen carefully to their problems and then work with them to find solutions.

Chuck was very family-oriented; he is survived by his wife of 61 years Lois Curtiss. He knew a great deal about the Curtiss family genealogy and prepared this work for filing with the Wisconsin Historical Society. He had a nice collection of books and old family pictures. But most of all, he enjoyed going up to his summer cottage on a lake near Boulder Junction. He and his boys had built several buildings on their property, including an 8-sided outhouse, called the "octajohn," and a simple office-structure where Chuck could work on any kinds of theoretical problems that he had brought along.

R. Byron Bird
John E. Harriman
Frank A. Weinhold

John L. Schrag 1937-2008

John L. Schrag, Emeritus Professor of Chemistry at the University of Wisconsin-Madison and well known rheologist, died of renal cell carcinoma on Thursday, 7 February 2008, at his home in Madison, WI.

Professor Schrag was born on 14 April 1937 in Siloam Springs, Arkansas and grew up in Omaha, Nebraska, where he lived until 1960. Schrag received a B.A. degree in physics and mathematics from the University of Nebraska-Omaha in 1959, and M.S. and Ph.D. degrees in physics from Oklahoma State University in 1961 and 1967; he was a professor of analytical chemistry at the University of Wisconsin for 33 years.

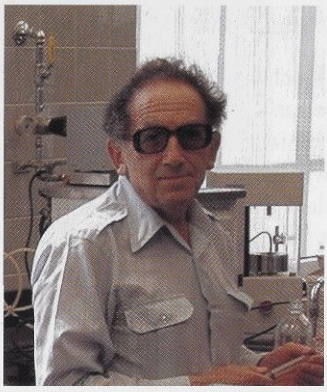
Schrag was a founding member of the Rheology Research Center at the University of Wisconsin and for his entire career served on its RRC Executive Committee. He served as co-editor of the Series *Advances in Polymer Science* from 1986-1998, and on the Advisory Board of the Petroleum Research Fund of the American Chemical Society for many years. He was a long-time member of The Society of Rheology. His research interests focused on the experimental determination of the influence of specific chemical structure, together with polymer-solvent and polymer-polymer interactions, on the conformational dynamics of macromolecules in solution.

Schrag was an accomplished teacher who won the University of Wisconsin's Chancellor's Award for Teaching and the Department of Chemistry Teaching Award. Schrag had a substantial knowledge of instrumentation, a deep understanding of physical phenomena, and an ability to combine these two to forge new chemical insight. SOR member and Schrag student Tim Lodge writes "John Schrag brought to his vocation remarkable dedication: to teaching, to critical thinking, to paying attention to detail, and to setting the highest possible standards. His style as advisor was not as a cheerleader, goading us on; not as a martinet, inspiring us through fear of retribution; not as "one of the gang," struggling with us side by side at the bench. Rather, he quietly but persistently created an expectation of success, and quietly but persistently helped us to achieve it."

Schrag was the recipient of many awards including being named Alfred P. Sloan Research Fellow and Fellow of the American Physical Society. "His concern for students, his absolute integrity, his willingness to forgo personal advancement for the good of the group, and his sense of humor and playfulness are what made him so valuable to us," colleague James W. Taylor said at his memorial service. Despite Schrag's great accomplishments, however, he lost one fight according to Taylor - that was with his desk. Schrag was well known for maintaining a workspace full of piles of papers, journals, research proposals, and other materials.

John Schrag is survived by his wife of 47 years, Beverly, his son, John Jeffrey, his sister Joanne Edwards, and many members of an extended academic family.

In January 2003, the Mills Street Modulator's Society, composed of John's graduate students and graduates, surprised John with a reunion on the occasion of his retirement. Those who came to it traveled from all over the country.



Vladimir at work in the NNF lab at MIT, 2006.

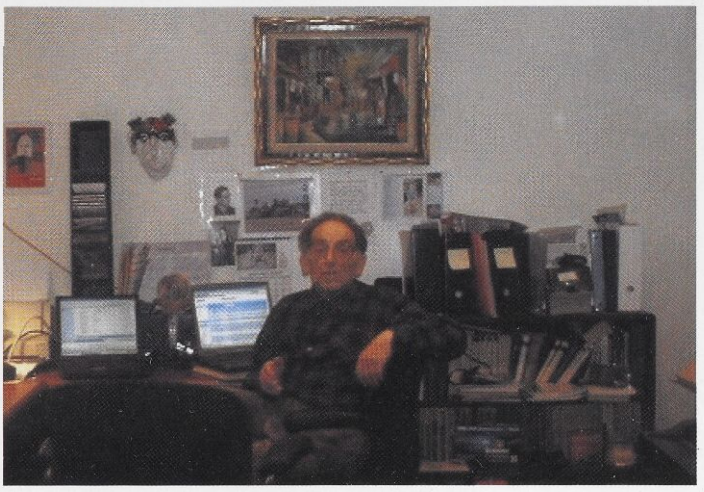
Vladimir Entov (1937 – 2008) An appreciation

On 10 April 2008 Vladimir Mordukhovich Entov passed away in Washington DC after a prolonged battle with cancer. Vladimir is known to many rheologists as the progenitor of the microfilament thinning rheometer which was introduced to the Western rheology community during the Golden Jubilee meeting of the British Society of Rheology in 1990 [1].

Vladimir was born in Moscow on 8 January 1937. He held a Master's degree in Mechanical Engineering from the Moscow Gubkin Oil and Gas Institute (now renamed the Gubkin Russian State Oil and Gas University) and a second Master's degree in Mathematics from Moscow University. He completed a 'Candidate of Science' (roughly equivalent to a western PhD) at Gubkin in 1965 and finally gained his Doctor of Science qualification (in a process analogous to the German 'Habilitation') at the Institute for Problems in Mechanics of the Russian Academy of Sciences in 1972. He worked first as a Senior Research Associate at the Institute of Mechanics at Moscow University from 1964-1971. After his habilitation he relocated to the prosaically-named Institute for Problems in Mechanics where he spent the majority of his career, rising through the ranks from Senior Research Associate to Principal Research Associate, to Head of Laboratory and Leading Scientist – the scientific leader of the Laboratory for Dynamics of Complex Fluids. In later years, Vladimir was able to arrange his schedule so that he spent the late Summer and Fall in Moscow fulfilling his teaching and research commitments, and the Spring as a visiting scientist further afield; he was a visitor at a number of institutions including Stanford, the Aerothermique Lab of the CNRS in Meudon (France), the Technion – Israel Institute of Technology, DAMTP (where he held the Kapitza Fellowship of the Royal Society), Worcester Polytechnic Institute and, most recently, MIT. Vladimir and Liya's children and grandchildren relocated to Arlington MA and Washington DC, so they were very happy to be able to spend regular extended periods on the US East Coast. It was a great pleasure to be able to welcome Vladimir to the Hatsopoulos Microfluids Laboratory for a month for several consecutive springs from 2003-2006. Vladimir was the archetypal itinerant Soviet scientist. His apparently-brusque style was uncomfortable to some, but the refreshing honesty and enthusiasm he brought to the laboratory was invigorating and liberating. He was just as happy to tell you when something you were doing was second rate as when it was first class. His favorite expressions – heard often around the NNF lab – were, in equal measures, "oops…this is not correct" and "yes, this is feasible."

I first met Vladimir in 1996 during the six month long Dynamics of Complex Fluids (DCF) program at the Newton Institute in Cambridge, where we were both long-term residents. I rapidly came to appreciate his incisive questioning during seminars and his extended discourses (over strong coffee and even stronger cigarettes) regarding the strengths and weaknesses of the speaker's analysis or experiments. At this time Vladimir was working on his most-cited (at least in the Western literature) work; a collaboration with John Hinch on the dynamics of capillary-induced thinning in a viscoelastic filament [2]. In this problem the squeezing induced by capillary pressure balances the viscous and/or elastic stresses in the fluid and the time-scale for the thinning process is self-selected by the fluid. Some of the key elements of the theory had appeared in earlier work by Vladimir with Alex Yarin [3] – including the notable result that when elastic stresses balance the capillary pressure, then the thinning process is self-similar with a constant strain rate corresponding to $2/(3*\lambda)$ where λ is the longest relaxation time of the fluid. The paper with Hinch clearly and completely sorts out the different regimes in the problem; including a visco-capillary balance at short times, an elasto-capillary balance at intermediate times, followed ultimately by a regime in which the finite extensibility of the polymer chains becomes important; in some cases the thread ultimately fails through rupture events of the individual chains [4]. This work greatly influenced my own thinking on the problem and also helped form the theoretical underpinnings of subsequent commercial instrumentation that used filament-thinning dynamics to probe the transient extensional viscosity of complex fluids.

Vladimir also greatly appreciated the value of experimentation, and although many may think of him as a theoretician first and foremost, he was also happy to



Vladimir's annual Christmas Greeting e-card, 2007.

get his fingers sticky in the lab. In one of my favorite memories of East-meets-West creative tension was one day when I wandered in to the NNF lab to find my two postdoctoral associates José Bico, Christian Clasen focused intently with Vladimir on the bizarre dynamics of a wormlike micellar jet undergoing breakup; The jet was being imaged with a very fancy (and expensive) digital high-speed video camera; but the forcing frequency was being supplied by a very robust earpiece loudspeaker cannibalized from a soviet-era telephone that Vladimir had brought with him from Moscow!

Although Vladimir's more recent work is well known and cited in the Western literature, it became clear as I got to know Vladimir more closely that there was a huge body of earlier work in the Russian literature that was unknown to most of us – much of it published with quaint hand-lettered graphics and somewhat obtuse (at least to Western eyes) notation. Vladimir worked for many years in problems of geomechanics, the role of viscous fingering instabilities in enhanced oil recovery and other reservoir engineering topics; especially in problems using complex liquids such as fracturing fluids, proppants and drilling muds. He continued to work extensively on these problems in recent years in close collaboration with a new research center established in Moscow by Schlumberger. He took my ignorance in his stride, and was never the all-too-familiar boorish type to say "well, when we studied this 30 years ago…" Instead, he would point you to the relevant paper and sit with you to explain what you really needed to think about. He co-authored twelve books (eleven in Russian) including two books with R.V. Goldstein and another two with G.I. Barenblatt. He edited two more books and co-authored over two hundred papers and reports. He was also advisor and mentor to a number of well-known and familiar names, including Alex Yarin (University of Illinois – Chicago – who was one of Vladimir's early doctoral students), Pavel Etinghof (MIT, Mathematics), as well as Alexei Rhozkov and A.V. Bazilevskii, who continue to work on related problems in geomechanics and the dynamics of complex fluids.

As Henry Ford noted; "Anyone who stops learning is old, whether at twenty or eighty. Anyone who keeps learning stays young". By any measure, Vladimir died young at heart….He will be sorely missed.

Gareth McKinley
MIT, April 2008

References:

[1] Bazilevsky, A.V., Entov, V.M. and Rozhkov, A.N., "Liquid Filament Microrheometer and Some of its Applications", Third European Rheology Conference, D. R. Oliver (ed.), Elsevier Applied Science, 1990, 41-43.

[2] Entov, V.M. and Hinch, E.J., Effect of a Spectrum of Relaxation Times on the Capillary Thinning of a Filament of Elastic Liquid, J. Non-Newt. Fluid Mech., 72(1), (1997), 31-54.

[3] Yarin, A.L. and Entov, V.M., Influence of Elastic Stresses on the Capillary Breakup of Dilute Polymer Solutions, Fluid Dyn., 19, (1984), 21-29.

[4] Bazilevskii, A.V., Entov, V.M. and Rozhkov, A.N., Failure of an Oldroyd Liquid Bridge as a Method for Testing the Rheological Properties of Polymer Solutions, Polymer Science Ser. A (translated from Vysokomolekulyarnye Soedineniya Ser. A pp. 474-482), 43(7), (2001), 1161-1172.

Do Try This at Home!

"It's is nothing like you would imagine." That's what Michigan Tech chemical engineering major Michael Via says when asked what it is like to run across a 4 ft by 12 ft by 9 in (1.2m x 3.7m x 23cm) pool of oobleck. Oobleck is the word co-opted from a Dr. Seuss children's book that has come to refer to a suspension of corn starch in water. Such a suspension, made by mixing corn starch and water in a 3:2 ratio by volume, is shear-thickening, and the surprising flow properties of oobleck have made it a favorite among the ooze-and-goop demonstrations that are used to get kids interested in science.

Via and his colleagues in the student chapter of the American Institute of Chemical Engineers (AIChE) at Michigan Technological University (Houghton, MI USA) got the idea for the oobleck run from a video on Youtube.com. The video, highlighted in the January 2008 *Rheology Bulletin*, showed TV personalities from the Spanish television program *El Hormiguero* running across a very deep pool of oobleck. Impressed with the spectacle and curious to try it themselves, the AIChE group decided to give it a go.

Tom Co tries out walking on the oobleck as Michael Via gives encouragement.

Armed with a "why not?" attitude, a cement mixer, and university connections at Grain Processing Corporation (a processor of corn starch), AIChE chapter president Tony Michalski arranged for a pallet (1500 lbs) of cornstarch to arrive at the Michigan Tech campus in late March. AIChE member Mike McLain volunteered to construct a sturdy frame, which, when lined with heavy plastic sheeting, made a secure container for the run. Michigan Tech's Spring Fling celebration was the chosen venue for the experiment, and, after signing a legal waiver, all comers were invited to give the oobleck a try.

"When you first look at the pool," says Via, "you can see ripples propagating across the fluid as if it were the surface of a pond." It does not look possible to walk on the fluid. "But, when you run on it," Via says, "it gives very minimally to your body weight, similar to running on a wood floor. There is also an amazing amount of traction. It looks as though it would be very slippery and hard to keep your balance on, but it is actually the opposite. The surface is quite tacky and very easy to run across." As long as you keep moving, that is.

Running across the top of a fluid is the main draw of trying the oobleck run, but the secondary experience is sinking into the fluid. As seen in the *El Hormiguero* video and at the Michigan Tech event (also on Youtube.com; search for Michigan Tech oobleck), once you stop moving, you sink into the suspension. "Sinking into the oobleck is beyond description. It's something that you just have to experience for yourself," says Via. Trying to pull a foot out of the oobleck can be difficult if you pull hard and fast. As any rheologist could tell you, however, a slow easing-out of the foot (low deformation rate) will work just fine.

Michael Via knows a thing or two about rheology, since concurrent with his experimental work with the dilatant fluid he was taking a course in polymer rheology with SOR member Faith Morrison, a faculty member at Michigan Tech. "My study of rheology helped me explain to others what was occurring during the run, but I feel that the run helped my study of rheology more than my study of rheology helped the run," Via says.

(continues, Oobleck, page 27)

Anton Paar

Fully automated, robotically operated: The HTR High Throughput Rheometer from Anton Paar.

- Automatic sample filling and cleaning of measuring systems
- Processes up to 96 samples in a single run up to 24 hours
- Modular setup, flexible to individual applications
- All standard MCR 301 test types, configurations and accessories apply

Check out the HTR at the ICR show, August 3-8, Monterey, CA

Anton Paar® USA

800-722-7556
info.us@anton-paar.com
www.anton-paar.com

Society Business

NEWS

Tigers, Hens, & Hawks Meet for Annual Rheology Symposium

Submitted by Norm Wagner and Matt Helgeson

Rheologists from around the mid-Atlantic region gathered in Newark, Delaware on 19 April 2008 for the 9th annual Tiger-Hen-Hawk Rheology Symposium. The Symposium has a long and rich tradition, beginning with rheology meetings jointly organized by William Schowalter from Princeton University and Art Metzner from the University of Delaware. Lehigh University joined the ranks in 2007. The symposium highlights student research related to the field of rheology with student presentations (by students only) and discussions throughout the day. The meeting is free to participants due to continued, generous support from TA Instruments and Anton Paar – both of whom sent representatives and provided exhibits of new and advanced rheological instruments.

Over 60 students and faculty were in attendance at this year's symposium from several schools, including Delaware, Princeton, Lehigh, and Pennsylvania State University. The program consisted of 13 oral presentations and 23 student posters over a wide range of topics, including the rheology of polymers, colloids, surfactants and complex fluids, self-assembled biological systems, microrheology, simulations and computational rheology, and related topics where rheology plays a critical role. Extra-planetary rheological experiments conducted on the International Space Station were also presented. Ralph Colby (Penn State) delivered a well received symposium plenary lecture, which summarized the history and current state of "polyelectrolyte solution rheology." The meeting concluded with the presentation of the Student Poster Awards. The first prize award (consisting of an autographed copy of Rubenstein and Colby's text on Polymer Physics) was given to Pushkar Lele for his poster entitled "Order to disorder transition due to anomalous rotation of particles in AC fields," and second prize was given to Radhika Nagarkar for her submission, "De novo design of strand swapping beta hairpin hydrogels."

The 10th Annual Symposium will be hosted in 2009 for the first time by Lehigh University (date TBD). The meeting is always open to new participants to accommodate the growing rheology community in the mid-Atlantic region. Members of the Society interested in attending the 2009 Symposium are encouraged to contact James Gilchrist of Lehigh University for further information.

Schoff Named Winner of Tess Award in Coatings

Clifford K. Schoff, formerly of PPG Industries and now a private consultant, will receive the Roy W. Tess Award in Coatings for 2008. The award is given by the Division of Polymeric Materials: Science and Engineering (PMSE) of the American Chemical Society.

Schoff is a researcher in the area of coatings defects, electropaint-substrate interactions, paint flow and rheological measurements, mechanical properties and cure of coatings. He has contributed over 40 papers, articles, and chapters to the coatings literature and has led ASTM Subcommittee D.01.24 on Physical Properties of Liquid Paints for over 20 years.

Schoff received B.S. and M.S. degrees in Chemistry from the University of Idaho, and he earned his Ph.D. in Chemistry from the University of St. Andrews, St. Andrews, Scotland in 1971 with a thesis on photodegradation of methacrylates. Schoff worked for PPG Industries Inc. for 28 years before turning to private technical and legal consulting in 2002.

Schoff will receive the Tess Award during the 236th National Meeting of the American Chemical Society in August in Philadelphia, PA. The Tess Award is presented annually in recognition of outstanding contributions to coatings science and technology. The purpose of the award is to encourage interest and progress in coatings science technology and engineering and to recognize significant contributions to the field.

Korea University Holds 9th International Symposium on Rheology

The Applied Rheology Center at Korea University hosted their 9th International Symposium on Applied Rheology (ISAR-9) 13-14 May 2008 at the Auditorium of the Hana Square, Korea University, Seoul. Invited speakers included Susan Muller (UC Berkeley), Mike Graham (UW Madison), Curt Frank (Stanford), Eric Furst (U Delaware), Pat Doyle (MIT), Norbert Willenbacher (Universitat Karlsruhe, Germany), Yong Lak Joo (Cornell), and Jae Chun Hyun (Korea University). The ISAR meetings are a forum for international scientific exchange in the field of rheology. The director of the Applied Rheology Center is Jae Chun Hyun.

Susan Muller, Jae Chun Hyun, and Keun Won Hyun enjoy a relaxing moment at ISAR-9.

Minutes of the ExCom Meeting

Sunday 16 March 2008
Four Point Hotel, Schiller Park, IL

Attending: Andy Kraynik, Monty Shaw, Bob Prud'homme, Dan Klingenberg, Marie-Claude Heuzey, John Brady, Janis Bennett, Norm Wagner, Faith Morrison

The meeting was called to order at 8:25am. Faith Morrison volunteered to take the minutes. Bob Prud'homme read the minutes from the previous ExCom meeting. The minutes were approved as read.

Monty Shaw gave the financial report. The Salt Lake City meeting finances were reviewed. The issue of whether the meeting ended net-positive depends on whether short course and ExCom meeting expenses are included in the meeting accounting. Shaw showed spreadsheets received from AIP. It is difficult to separate out details of expenses from these accounts. The final accounting numbers supplied by AIP do not match Shaw's calculations of the same number. Shaw plans to get this straightened out soon. The *Journal of Rheology* is making a profit. The financial position of the Society is sound.

John Brady gave the *Journal of Rheology* Editor's Report. Manuscripts are coming to the Journal from all over the world, as usual. 10-12 manuscripts arrive per month; PeerX-Press reports that 132 manuscripts were submitted in 2007, the acceptance rate was 43%, the average number of days from receipt to first decision was 98, and the average number of days from receipt to final decision was approximately 138. There is some uncertainty in these numbers because of how duplicate electronic submissions are counted. Brady believes that there were more than 132 manuscripts submitted; the number could be as high as 150. A more accurate accounting will be provided at a future ExCom meeting. Brady asked if review articles should be encouraged and solicited for the *Journal*. Review articles tend to increase impact factors. The ExCom discussed the issue, and the committee was generally positively inclined towards review articles. The *JOR* Editorial Board will be asked to submit and solicit review articles.

Bob Prud'homme reported on the AIP position policy. Our traditional position is that we do not take positions on policy. Prud'homme has been in discussion with Kalman Migler, who is our representative on the AIP Policy Committee. The AIP is considering reorganizing this committee from one that has a representative from each society to one with six members appointed by the AIP. The ExCom supported maintaining the traditional policy of not taking policy positions.

Bob Prud'homme reported for Mike Solomon that preparation for the two ICR short courses is progressing satisfactorily.

Bob Prud'homme reported from Jeff Giacomin that statistics from AIP on journal usage are now available online; he is in the process of mastering those materials.

Bob Prud'homme reported for Pat Mather, outgoing Membership Chair, and Shelley Anna, incoming Membership Chair, on the activities of the Membership Committee. Membership in 2007 was 1518. Saad Khan has agreed to join the Membership Committee. Membership is down from the peak numbers in the late 1990's. It is possible that we are stable at 1500, but the data could also be interpreted as a downward trend. Mather reports that the number of publications with the word "rheology" in the title is increasing but greatly exceeds membership in the SOR. All are encouraged to do what they can to increase membership. Norm Wagner reported AIChE student membership is free; perhaps a rheological manufacturer could be asked to fund SOR student memberships. ExCom members discussed targeting rheology nonmember authors as new members. Bob Prud'homme will give feedback on the ExCom discussion to Shelley Anna.

Bob Prud'homme announced that by email vote the ExCom has approved the selection of Hans Christian Öttinger as the 2008 Bingham Medalist. An article will appear in the July Bulletin and Öttinger will deliver the Bingham address in Monterey in August.

Bob Prud'homme initiated a discussion of the possible establishment of a Young Rheologist Award or an Industrial Rheology award. Norm Wagner suggested perhaps establishing an industrial/applied rheology best presentation award, given out during the SOR meeting. The committee was positive about this suggestion.

The committee discussed the details of an Early Career Award. The committee is inclined towards the establishment of an Arthur B. Metzner Early Career Award, to be given to a member of the Society who is younger than 35 at the time of nomination who has distinguished him/herself in rheological research or practice or in service to the Society. The committee agreed to ask Lynn Walker and Mike Solomon to draft details of the award, to circulate the draft to the Executive Committee, and to prepare an article describing the proposed award for the July Bulletin. The fleshed-out proposal will be discussed in the Society Business Meeting in Monterey. The timing of the nominations, deliberations, announcement of the Metzner award will be the same as the Bingham cycle. The Metzner committee will have an odd number of members (possibly 5 or 7). The *Journal* editor will be involved in the selection process. The details of how exactly the award will be constructed will be proposed by Walker and Solomon, subject to ExCom approval.

Bob Prud'homme led a discussion on the prize amounts for Society awards. APS has moved all their awards to $10,000. The ExCom reviews Society awards on a four year cycle and is due for the discussion this year. The Bingham Medal is currently $5,000, the Student poster prize is currently $200, the Service award includes no monetary award, and the Publication award is $1000, split among all authors.

Faith Morrison moved and Norm Wagner seconded that the Bingham award be increased to $10,000 to bring it to parity with other AIP awards. Motion passed unanimously. Andy Kraynik moved and Norm Wagner seconded that the Metzner award be accompanied by a $7,500 award. Motion passed unanimously. It was moved and seconded to double the publication award to $2000. Motion passed unanimously. It was moved and seconded to add second and third prizes to the student poster prize and to award $500, $300, and $200 for first, second and third prizes. Motion passed unanimously.

Issues that arose during the awards discussion is that we need guidelines for the poster award on the web on the awards page. Albert Co will be asked to do this. Also the ExCom needs to work with local arrangements committee members to make sure that the presentation ceremonies for all awards (Bingham, paper, student poster) are appropriate each year. Sponsors should be acknowledged; the sponsors of awards should be invited to present them at the banquet or session.

Andy Kraynik reported on the preparations for the ICR. The workload is ramping up and all involved are working hard to make a fabulous meeting. 986 abstracts have been submitted, and the accepted abstracts have been divided into 692 oral presentations in 16 sessions and 262 posters. There will be 14 plenary and keynote addresses. This is an expensive meeting for participants; there is some concern that there will be paper and

poster cancellations when the costs become apparent to registrants. Meeting registration deadline is 15 April. If authors do not register by the deadline, they are dropped from the program. There are some indications that attendance could reach 1000; there will be some difficulty in arranging overflow housing if this is the case.

Exhibitors have asked for a reduced fee for exhibitor attendees who do not plan to attend technical sessions. The ExCom agreed that the local arrangements committee should allow this, but they are directed to choose a fee that covers the cost of all social events (approximately $500).

Kraynik showed the ExCom the proposed schedule for Monterey. The ExCom approved the schedule but expressed concern that the afternoon coffee break is very close to lunch leaving a large block (9) of talks after the last coffee break. It was suggested to move the coffee break to after 3 afternoon talks, leaving the last session of the day to contain 6 talks.

Kraynik reported that sponsors are needed for events. Organizers are encouraged to obtain those sponsorships.

Kraynik reported that the current plan is that student registrants will not attend the beach party; the ExCom declined to support the additional expense of covering student attendance at the beach party. Local arrangements committee may solicit external sponsorship that would allow student registrants to attend. Preparations for the ICR are coming along well.

Bob Prud'homme reported on Madison 2009 for Jeff Giacomin. Arrangements are proceeding; Jeff Morris, CCNY will be program chair.

Kraynik reported on Santa Fe 2010. The contract has been signed with the Santa Fe Hilton and with the new Convention Center, which will be completed in Fall 2008.

No update was received on the 9-13 October 2011 Cleveland meeting.

John Brady and Julie Kornfield will prepare a proposal for Pasadena in Winter 2013, perhaps for the August ExCom meeting or maybe for the March 2009 ExCom meeting.

Marie-Caude Heusey presented a proposal for 11-17 October 2013 Montreal, Quebec, Canada at the Hilton Montreal Bonaventure to be hosted by herself and Paula Wood-Adams. The ExCom accepted this proposal with enthusiasm.

Bob Prud'homme presented a proposal for a new *ad hoc* committee with the charge to develop a white paper called "SOR 2030" that assesses future issues the Society will face and to make recommendations for actions that will strengthen the Society in the next 20 years. Pat Mather has agreed to serve on the committee.

Bob Prud'homme also presented a second proposal for a self-assessment project. This project would be an attempt to survey the current status of the Society to find out who we are. The results of this project would feed into the "SOR 2030" project. Both proposals will be discussed by email and again in Monterey.

Dan Klingenberg reported that response to the Monterey student travel award program has been strong. The ExCom directed Klingenberg to approve all applicants who satisfy application criteria; it was left to a future email discussion to determine how much awardees would receive.

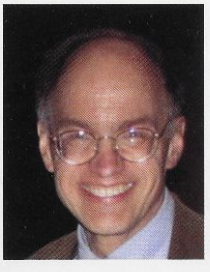
The meeting entered Executive Session at 3:47 pm. The meeting was adjourned at 4:12pm.

Submitted by Faith Morrison

Treasurer's Report

To the membership:

The tables included here summarized the financial situation for The Society of Rheology at the end of calendar year 2007, along with a proposed budget for 2009. The latter will be presented for the approval of the Membership at The Society's Annual Meeting in Monterey in August. The financial position The Society at the end of 2008 is not likely to follow the trend shown in the Balance Sheet, due to anticipated losses



at the International Congress on Rheology this year. Current estimates for these losses are around $200,000, which will be handled by reduction of the Meeting Reserve and removal of funds from the Unrestricted category. The Annual Meeting Salt Lake City showed a modest profit, after accounting for Student Travel. Details will be provided at the Annual Meeting. As for 2009, we also will be suffering from lower principal and interest rates on our reserves. In

addition, higher *Journal of Rheology* publication expenses are expected in 2009, but licensing income (see Royalties and Reprint Sales) is anticipated to increase modestly. Higher award amounts are also included in the budget.

Respectfully submitted,
Montgomery T. Shaw, Treasurer

The Society of Rheology, Inc.
Balance Sheet

(all amounts, USD)	2007 Year End	2006 Year End	2005 Year End	2004 Year End	2003 Year End
Assets					
Cash in checking account	24,466	9,777	12,721	29,012	2,047
Securities	0	0	0	0	0
Balance in AIP account	1,292,672	1,185,978	1,056,188	976,655	938,047
Total Assets	1,317,138	1,195,755	1,068,909	1,005,667	940,094
Liabilities and Net Assets					
Liabilities					
Deferred revenue	111,995	129,339	132,396	155,969	143,603
Total Liabilities	111,995	129,339	132,396	155,969	143,603
Net Assets					
Publication reserve	450,000	450,000	450,000	450,000	450,000
Student travel grant reserve	10,000	10,000	10,000	10,000	10,000
Annual Meeting reserve	300,000	200,000	200,000	100,000	100,000
Operating reserve	100,000	100,000	100,000	100,000	70,000
Unrestricted	345,143	306,416	176,513	189,698	166,491
Total Net Assets	1,205,143	1,066,416	936,513	849,698	796,491
Total liabilities and net assets	1,317,138	1,195,755	1,068,909	1,005,667	940,094

Journal of Rheology
Receipts and Disbursements

	2009 Budget	2008 Budget	2007 Year End	2007 Projection	2006 Year End
RECEIPTS					
Subscriptions	171,000	170,000	171,391	181,500	171,729
Royalties & Reprint Sales	23,200	10,200	17,203	17,413	10,105
Ad Sales	34,000	36,000	33,556	30,353	35,650
JORO revenue	54,000	41,000	51,816	53,076	42,280
Miscellaneous	1,000	1,000	1,000	1,000	7,190
TOTAL RECEIPTS	283,200	258,200	274,966	283,342	266,954
DISBURSEMENTS					
Ads	10,000	7,000	9,830	11,047	7,199
Reprints, Single Copy	1,800	1,900	1,354	2,203	1,647
Paper, Printing	24,000	20,000	22,480	22,607	18,502
SOR Editorial	39,000	41,000	36,935	44,489	39,534
Production	42,000	30,000	37,125	36,335	29,841
Fulfillment	6,425	6,425	6,025	5,987	6,364
Distribution	25,100	20,100	21,020	17,797	18,724
Electronic publishing	34,000	35,000	33,055	33,058	33,570
Miscellaneous	7,300	4,800	5,896	6,071	5,494
TOTAL DISBURSEMENTS	189,625	166,225	173,720	179,595	160,874
Net	93,575	91,975	101,246	103,748	106,080

Treasurer's Report

The Society of Rheology
Receipts and
Disbursements
(all amounts, USD)

	2009 Budget	2008 Budget	2007 Year End	2007 Projection	2006 Year End
RECEIPTS					
Dues	52,000	56,000	52,495	52,750	55,040
Interest	52,000	58,000	62,442	65,174	52,862
Journal of Rheology	283,200	258,200	274,966	283,342	266,954
Mailing List Sales	0	0	465	0	-66
Donations	0	0	0		0
Bulletin Advertising	5,000	5,000	13,480	17,224	3,105
Annual Meeting (net)	0	0	20,338	3,010	-4,671
Short Course (net)	0	0	1,360	1,229	-5,797
TOTAL RECEIPTS	392,200	377,200	425,546	422,729	367,427
DISBURSEMENTS					
AIP Dues Bill & Collect.	11,000	11,000	11,037	11,670	10,779
AIP Adm. Services	9,000	11,000	7,508	8,140	10,311
AIP Mem. Soc. Dues	7,600	8,000	7,909	7,909	7,936
Contributions and Prizes	12,000	1,900	1,910	1,877	329
Journal of Rheology	189,625	166,225	173,720	179,595	160,874
Bulletin	16,000	12,000	16,298	14,767	16,773
Bingham Award	12,000	7,000	5,000	5,000	5,000
Executive Cmt. Meetings	11,000	8,000	17,018	10,985	10,460
Pres. Discretionary Fund	1,500	1,500	0	0	159
Treas. Discr. Fund	1,500	1,500	0	400	0
Bulletin Editor Discr. Fund	1,500	1,500	0	0	
Progr. Chm. Discr. Fund	2,000	2,000	2,805	4,000	0
Webmaster Discr. Fund	3,000	3,000	685	1,800	0
Office Expenses	3,000	3,000	3,212	3,301	2,234
Banking Services	66	100	0	0	20
Liability Insurance	4,500	7,500	3,830	4,970	3,823
Membership Broch. & Appl.	500	500	0	300	432
Accountant	2,100	2,100	1,910	0	1,925
Student member travel	24,000	24,000	21,468	10,309	0
Annual meetings, future	8,000	4,000	16,932	15,510	8,601
Website	500	1,000	484	300	282
Miscellaneous	500	500	0	0	0
TOTAL DISBURSEMENTS	320,891	277,325	291,724	280,832	239,940
Net	71,309	99,875	133,822	141,897	127,487

the end

(Product Design, continued from page 13)

asked to look for the material functions to be measured that could help solve the problem along similar lines to what is discussed above. They then had to propose the purchase of a type of rheometer to a 'board of directors' with a presentation. The 'board' was composed of senior graduate students and postdocs who were very keen to play this role and formed a very challenging audience.

When graduate students take the course, they sometimes lobby to choose materials that they want to characterize for their thesis research. This can be very helpful to the students who need rheology for their research, but it leads to a wide disparity in the quality and scope of the reports. Moreover, it is hard to cover all the classes of materials.

Acknowledgments

Development of the Minnesota course has benefited greatly from input from David Giles, our Rheology Lab Director, and past teaching assistants Carlos Lopez and T. Stylianopoulos. For the Leuven course the input of Jan Mewis, Paula Moldenaers, Peter Van Puyvelde and Christian Clasen and the postdocs and graduate students is appreciated.

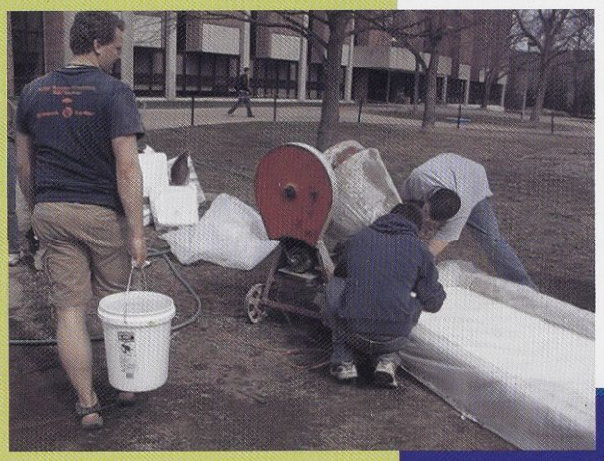
References

[1] Laun, HM, Description of nonlinear shear behaviour of a low density polyethylene melt by means of an experimentally determined strain dependent memory functions. Rheol. Acta, 17 (1): 1-15 (1978).
[2] Eckstein, A; Suhm, J; Friedrich, C; Maier, RD; Sassmannshausen, J; Bochmann, M; Mulhaupt, R, Determination of plateau moduli and entanglement molecular weights of isotactic, syndiotactic, and atactic polypropylenes synthesized with metallocene catalysts Macromolecules, 31 (4): 1335-1340 (1998).
[3] Morrison, F; Understanding Rheology, Oxford University Press (2001).
[4] Sentmanat, M; Wang, BN; McKinley, GH, Measuring the transient extensional rheology of polyethylene melts using the SER universal testing platform J. Rheol.., 49 (3): 585-606 (2005).
[5] (a) Aggasant, JF; Avenas, P; Carreau JP; Sergent, JP, Polymer Processing Principles and Modeling, Hanser (1998) and (b) Tadmor, Z; Gogos, CG, Principles of Polymer Processing, 2nd Ed. Wiley, 2006.
[6] Raynaud, L; Ernst, B; Verge, C; Mewis, J, Rheology of aqueous latices with adsorbed stabilizer layers Source: J. Coll. Int. Sci., 181 (1): 11-19 (1996).
[7] Mewis, J; Vermant, J Rheology of sterically stabilized dispersions and lattices Prog. Organic Coatings, 40 (1-4): 111-117 (2000).
[8] Temple C. Patton, Paint Flow and Pigment Dispersion: A Rheological Approach to Coating and Ink Technology , Wiley-Interscience (1979).
[9] Lee, YS; Wetzel, ED; Wagner, NJ The ballistic impact characteristics of Kevlar (R) woven fabrics impregnated with a colloidal shear thickening fluid J. Mat. Sci., 38 (13): 2825-2833 (2003).
[10] Dullaert, K; Mewis, J A model system for thixotropy studies J. Rheol., 45 (1): 23-32 (2005).
[11] Pons, R; Erra P; Solans, C; Ravey, JC; Stebe, MJ, Viscoleastic properties of emulsions – their relationship with structure and equilibrium properties J. Phys. Chem., 97 (47): 12320-12324 (1993).
[12] Cussler E.L. and G. D. Moggridge, Chemical Product Design, Cambridge University Press, Cambridge, U.K., (2001).
[13] Vinckier, I; Moldenaers, P; Mewis, J, Transient rheological response and morphology evolution of immiscible polymer blends J. Rheol., 41 (3): 705-718 (1997).
[14] Rehage H; Hoffmann H, Rheological properties of viscoelastic surfactant systems J. Phys. Chem., 92 (16): 4712-4719 (1988).
[15] Chambon F; Winter HH Stopping of crosslinking reaction in a PDMS polymer at the gel point. Polym. Bull, 13:499-503 (1985).
[16] Kaye A, A Bouncing Liquid Stream, Nature 197 : 1001 (1963).
[17] Versluis, M.; Blom, C; van der Meer, D; van der Weele, K; Lohse, D Leaping shampoo and the stable Kaye effect J. Stat. Mech. Theory and Exp., Art. No. P07007 (2006).
[18] Rothstein, JP Transient extensional rheology of wormlike micelle solutions: J. Rheol. 47 (5): 1227-1247 (2003).
[19] Stokes J.R., Telford TH, Measuring the yield behaviour of structured fluids. J. Non Newt. Fluid Mech.,124, 137-146 (2004).
[20] Moller, PCF; Mewis, J; Bonn, D: Yield stress and thixotropy: on the difficulty of measuring yield stresses in practice Soft Matter, 2 (4): 274-283 (2006).
[21] Dullaert, K; Mewis, J: Thixotropy: Build-up and breakdown curves during flow J. Rheol . 49 (6): 1213-1230 (2005).

Oobleck, continued from page 18)

For those who would also like to try to reproduce the oobleck demo, here's some advice from the Michigan Tech crew. Getting on and off the oobleck is messy and can be slippery; carpeting should be used at both ends so that this can be done safely. Since the cornstarch is difficult to clean from the carpeting, disposable carpet scraps are recommended for this purpose. A powered cement mixer is a must, since a large volume of oobleck is needed for the run. The oobleck is non-hazardous, but depending on your locale, disposal may be difficult and should be planned for ahead of time.

One final piece of advice from Via: "From my personal experience, laying down and being fully covered in the oobleck is also an amazing experience, but I don't recommend it for anyone who is claustrophobic."



The cement mixer was an essential element to the oobleck walk set-up. At right, AIChE president Tony Michalski helps with the suspension preparation.

When up on top of the suspension, participants were moved to dance (right). Getting out of the bath once sunk in was a challenge (top).

(Meetings, continued from back cover)

2012

Summer 2012
XVI[th] International Congress on Rheology, location TBA (every four years; in 2012 in Europe)

See also:
www.rheology.org/sor/info/other_meetings.htm
www.rheology-esr.org/Meetings.php
www.appliedrheology.org/ (click on conferences)

CALENDAR OF RHEOLOGY CONFERENCES AND COURSES

2008

9-13 July 2008
The 13th International Congress of Biorheology and the 6th International Conference on Clinical Hemorheology, State College, Pennsylvania, USA, Herbert Lipowsky and Herbert Meiselman (www.outreach.psu.edu/programs/isbisch/; held every three years).

2-3 August 2008
SOR Short Course on Suspension Rheology, by Jan Mewis and Norman Wagner, Monterey, CA USA; option is available for participants to attend the first day of Suspension Rheology course on Saturday and the Surfactant Rheology course (below) on Sunday.

3 August 2008
SOR Short Course on Surfactant Rheology - Self-Assembly and Microstructure Dynamics, by Patrick T. Spicer and Srinivasa R. Raghavan, Monterey, CA USA

3-8 August 2008
XVth International Congress on Rheology and 80th Annual Meeting of The Society of Rheology, Monterey, CA USA, Gerry Fuller and Bob Powell, www.rheology.org/ICR2008/

18-20 August 2008
North American Thermal Analysis Society (NATAS) - Rheology Session, Atlanta, Georgia USA, Jai Pathak, www.natasinfo.org

24-30 August 2008
XXIInd International Congress of Theoretical and Applied Mechanics ICTAM 2008, Adelaide, Australia, prandtl.maths.adelaide.edu.au/ictam2008/

1-2 September 2008
Complex Fluids & Microfluidics Workshop, Melbourne, Australia Leslie Yeo, Ravi Prakash Jagadeeshan, and James Friend

2009

15-17 April 2009
5th Annual European Rheology Conference AERC 2009, Cardiff UK, Tim Phillips and Phil Bowen (www.rheology-esr.org/AERC/2009/)

15-18 June 2009
5th International Symposium on Food Rheology and Structure - ISFRS 2009, Peter Fischer, Zurich Switzerland (every 3 years; www.isfrs.ethz.ch)

17-18 October 2009
SOR Short Course on Rheology (topics TBA), Madison, WI USA

18-22 October 2009
81st Annual Meeting of The Society of Rheology, Madison, WI USA, Jeff Giacomin

2010

Spring 2010
6th Annual European Rheology Conference AERC 2010, location TBA

Summer 2010
5th Pacific Rim Conference on Rheology, location Hokkaido, Japan, Hiroshi Watanabe (approximately every 4 years)

23-24 October 2010
SOR Short Course on Rheology (topics TBA), Santa Fe, NM USA

24-28 October 2010
82nd Annual Meeting of The Society of Rheology, Santa Fe, New Mexico USA, Andy Kraynik

2011

Spring 2011
7th Annual European Rheology Conference AERC 2011, location TBA

8-9 October 2011
SOR Short Course on Rheology (topics TBA), Cleveland, Ohio USA

9-13 October 2011
83rd Annual Meeting of The Society of Rheology, Cleveland, Ohio USA, Pat Mather

(continues page 27)