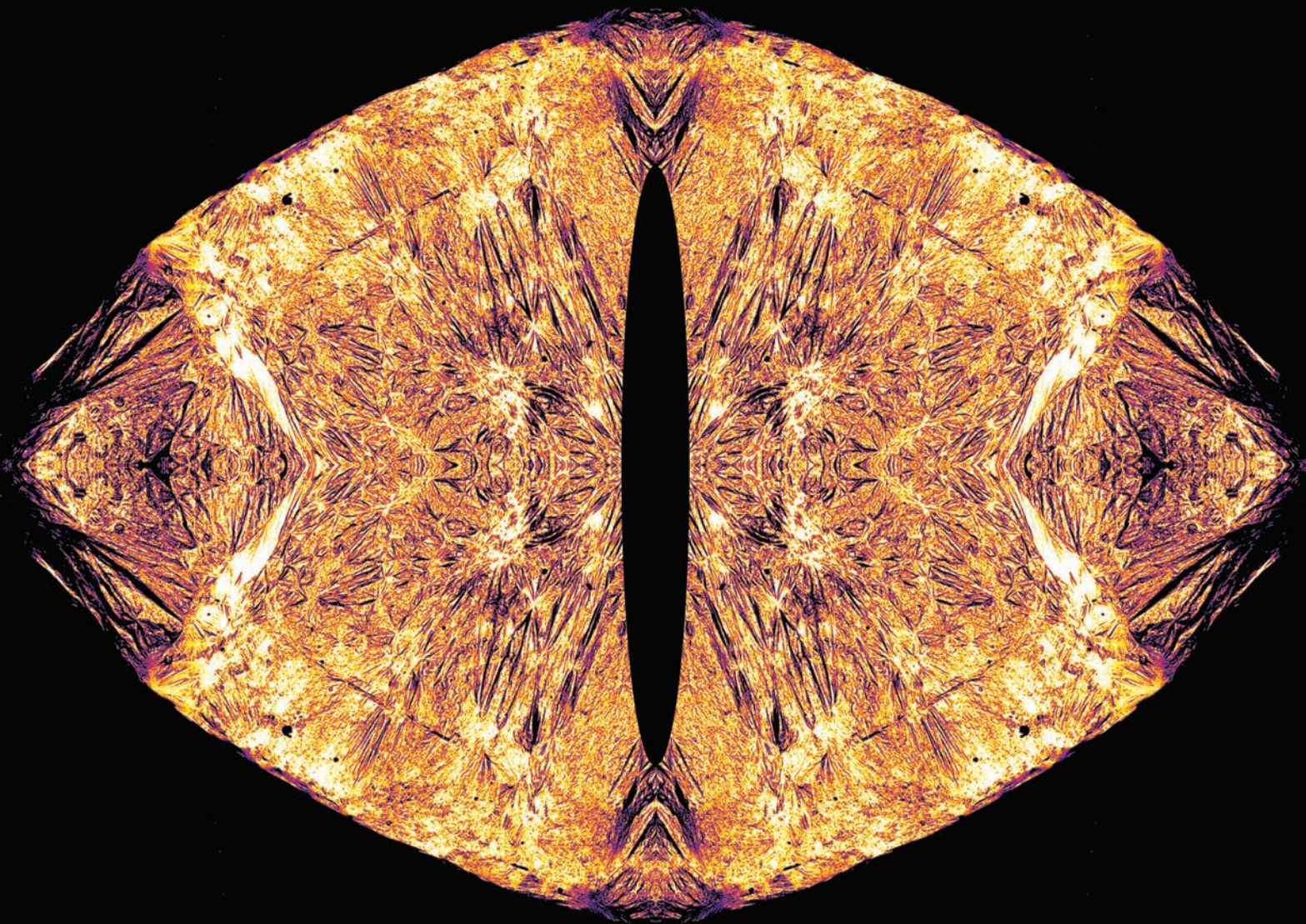


Rheology Bulletin



Inside:

- **Houston Report**
- **Technical Program for Raleigh**
- **Book Review: *Microfluidics***
(authors Furst and Squires)
- ***In Memoriam: Hanswalter Giesekus***
- **Rheology in South Africa**



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(Jan 2018-Dec 2019)

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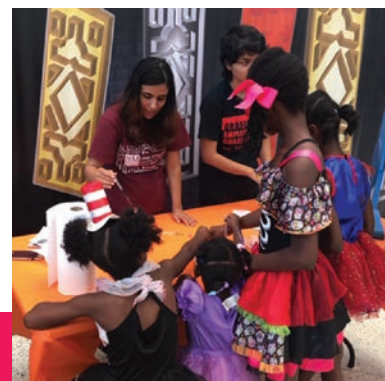
Eric M. Furst

Amy Shen

Table of Contents

SOR 90 th : Houston 2018	4
Gallery of Rheology 2018 Houston	6
Letter from SOR President	11
Review: <i>Microrheology</i> , by Furst & Squires	12
<i>Review by Aditya S. Khair</i>	
Hanswalter Giesekus (1922 – 2017)	14
Rheology Around the World: South Africa	16
Technical Program for Raleigh	17
<i>Sibani Lisa Biswal and Steve Hudson</i>	
News/Business	19
<i>News, Volunteers needed, Awards, Ex-Com minutes, Business Meeting minutes, Treasurer's report</i>	
Events Calendar	32

SOR K-12 Outreach in Houston; see p. 4.



On the Cover: *The Eye of Sauron* by Alan R. Jacob, Lilian C. Hsiao and Michael Dickey of North Carolina State University, U.S.A. was the first-place choice for the Gallery of Rheology in Houston. Gallium is a liquid metal that forms an elastic native oxide skin. The oxide skin surrounding the liquid metal manifests creases on the air-liquid metal interface. A high energy concentric backscattering detector (CBS) is used to obtain an electron microscopy image which captures an enhanced contrast image of the wrinkles present on the interface. The crinkles resemble fiery flames when false color is applied. This image reveals the rich interfacial phenomenon displayed by liquid metals which is yet to be properly understood. For additional Gallery news, see pages 6 and 20.

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. Letters to the editor may be sent to: fmorriso@mtu.edu

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Student Travel Grants Administrator (2018-2019)

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SOR Designee to AIP Governing Board (Mar 2020)

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SOR Representative on AIP Education Liaison Committee (Dec 2019)

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SOR Representative on AIPP Publishing Partners Committee (2018-2020)

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Gareth McKinley

Kathleen Weigandt

Kathleen Weigandt

A. Jeffrey Giacomini

Peter Olmsted

Roseanna Zia

Gerald G. Fuller

Gerald G. Fuller

TBD

Gerald G. Fuller

Shelley Anna

Houston 2018



The Student-Industry Forum, sponsored by AIP, the Dow Chemical Company, and The Society of Rheology, attracted nearly 100 participants and filled the Westin's Monarch Room with the lively sounds of networking.

Houston, Texas USA

Houston, we have a . . . no wait, there were no problems at the 90th Annual Meeting of The Society of Rheology, which was held in Houston, Texas 14-18 October 2018. The local arrangements team, led by Jason Maxey, made sure that was the case.



The meeting kicked off with some pre-meeting events that have become a tradition. Two short courses were offered in Houston on Saturday and Sunday. "Rheology of Polymer Composites and Nanocomposites" attracted 18 attendees and was offered by Ramanan

Krishnamoorti (University of Houston), Megan Robertson (University of Houston) and Tirtha Chatterjee (The Dow Chemical Company). "Structure and Rheology of Foams and Emulsions" brought in 22 registrants for instructors Sibani Lisa Biswal (Rice University) and Vivek Sharma (University of Illinois at Chicago).

Also preceding the meeting was the K-12 outreach event at the Children's Museum of Houston, organized by Jonathan Rothstein and the SOR Education Committee. The event is designed to teach children how fun science can be, and in particular, how much fun rheology can be. Volunteer meeting attendees set up more than ten demonstration tables to involve kids. SOR outreach activities are partially funded by a grant from the American Institute of Physics (AIP) Venture Partnership Fund, an

AIP program that teams AIP staff with member society co-principal investigators on projects that promote the physical sciences. For more on the rheology outreach demonstrations and to learn how to obtain rheology outreach kits for your own events, go to www.ecs.umass.edu/mie/faculty/rothstein/links.htm.

The meeting's Welcoming Reception, sponsored by TA Instruments, took place high on the 24th floor of the Westin, in the Monarch Room, which provided excellent evening views and a chance to meet up with old friends. The meeting sessions, organized by Technical Program Chairs Marie-Claude Heuzey and Gordon Christopher, were held at the Westin Galleria in meeting rooms on two sides of a large shopping mall, the Galleria. The proximity of the mall meant there were opportunities for interesting meals and snacks and perhaps a few errands. The Houston meeting included seven parallel sessions running, as usual, from Monday through noon Thursday.

New in Houston was the invitation of Industrial Keynote Speakers. Of the thirteen topical sessions in Houston, eleven had sessions designated as keynote in which a rheology practitioner from industry gave applied context to the science and technology presented in the session. The idea, which came from Houston Technical Program Chairs Marie-Claude Heuzey and Gordon Christopher, an



After a light roasting, 2018 Bingham medalist Michael Rubenstein receives the medal and plaque from SOR president Norman Wagner in Houston.



As usual, the meeting breaks were held in the exhibitor space where a wide variety of rheological devices were on display and vendors were present to answer questions.

was to unite theory and practice and provide opportunities for networking among investigators coming from multiple perspectives. The keynotes were well attended and appreciated by the speakers themselves. “Being invited to present an Industrial Keynote on my work with insoluble fiber networks was a great opportunity to showcase that we in industry can take sophisticated techniques pioneered by our academic colleagues and apply them to commercially important situations,” commented Ross Clark from CP Kelco, a leading producer of specialty hydrocolloids. “The engagement that came from making this presentation was certainly useful to me and hopefully those who listened to it learned more about how rheological techniques are used commercially.”

A variety of social and administrative events were

scheduled throughout the meeting. On Monday at lunch, SOR teamed with the American Institute of Physics and the Dow Chemical Company to present a Student-Industry Forum. Led by Maryam Sepehr and Gerry Fuller, this event had a new organizational structure. Boxed lunches were provided, and attendees were seated at round tables with mentors from industry or academia. To mix things up a bit, the event had a kind of “speed dating” vibe, with Fuller calling time every ten minutes or so, and the mentors switched tables. The system is a bit unorthodox, but it did the trick, with participants able to talk in small groups with several different mentors. On Monday evening, registrants boarded busses to the Saint Arnold Brewing Company for the main meeting reception sponsored by The Society of Rheology. The Saint Arnold is Texas’ oldest craft brewery, brewing since 1994. The main tasting room easily accommodated all the meeting attendees, and the reception included Texas-sized portions of hot and cold food and plenty of beer. Tours of the brewery were offered, and everyone received a souvenir pint glass.

Tuesday’s lunch hosted the annual Society Business Meeting, and Tuesday evening Bingham medalist Michael Rubenstein was roasted and feted at the banquet and awards reception. The

(continues page 8)



The SOR Early Career Award, named after distinguished rheologist Art Metzner, was awarded to Thibaut Divoux in Houston; Divoux is shown with SOR president Norman Wagner.

GALLERY OF RHEOLOGY STANDOUTS

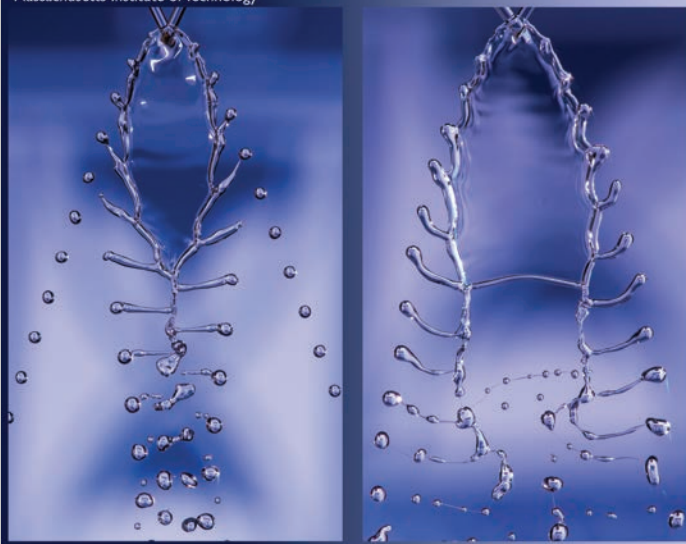
SOR Houston 2018

Viscoelastic Fishbones

("stretching the sands of time")

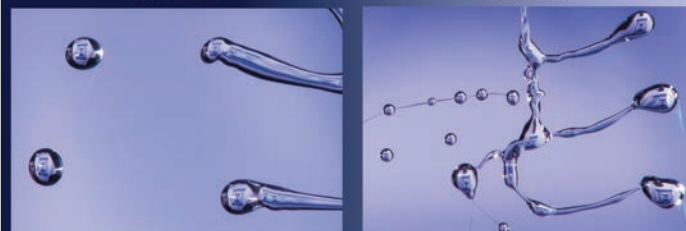
Bavand Keshavarz, Michela Geri, and Gareth H. McKinley
Massachusetts Institute of Technology

SoR 90th Annual Meeting
Houston, Texas



Newtonian

Viscoelastic

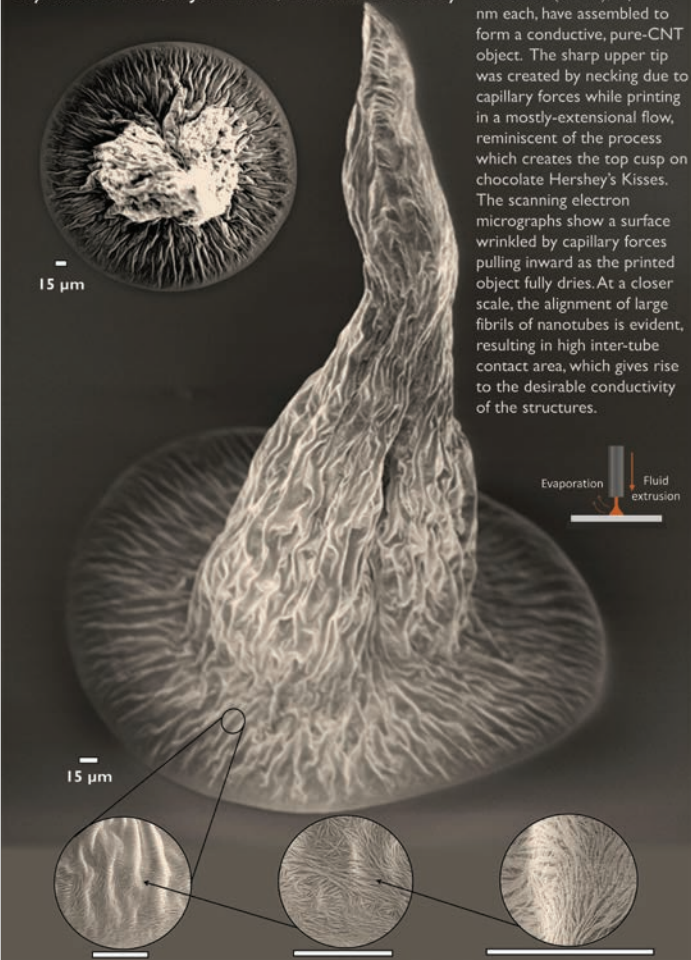


Two identical fast liquid jets collide into each other at an oblique angle. To the naked eye they form a blurred liquid fan. Inspired by the images of flying bullets from Doc Edgerton (MIT pioneer of high-speed imaging), we visualize these phenomena using a high-speed air-gap flash that releases a 20,000 volts arch into the air in less than 300 nanoseconds. Liquid patterns are then frozen in time. The Newtonian fishbones break into a chain of droplets that depart from the liquid fan. For the viscoelastic liquids, the enhanced elongational viscosity delays the breakup and leads to the formation of beads and elongated filaments. The SoR sandclock background is positioned in such a way that "the sands of time are stretched in the filaments and then relax in the droplets".

Carbon Nanotube Wizard Hat

Crystal E. Owens, A. John Hart, Gareth H. McKinley

In this 3D-printed structure, more than 50 billion carbon nanotubes (CNTs), $2 \mu\text{m} \times 2 \text{nm}$ each, have assembled to form a conductive, pure-CNT object. The sharp upper tip was created by necking due to capillary forces while printing in a mostly-extensional flow, reminiscent of the process which creates the top cusp on chocolate Hershey's Kisses. The scanning electron micrographs show a surface wrinkled by capillary forces pulling inward as the printed object fully dries. At a closer scale, the alignment of large fibrils of nanotubes is evident, resulting in high inter-tube contact area, which gives rise to the desirable conductivity of the structures.



2nd Place (tie), Gallery of Rheology Contest

90th Annual Meeting of The Society of Rheology, Houston Texas, USA.

See News for more information on these images.



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AND RHEOMETRY

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- From rotational viscometers to oscillatory rheometers

(continued from page 5)

final social event of the evening was the Wednesday evening poster session and reception, sponsored by Anton Paar USA. The poster session included the student/postdoc poster contest and the Gallery of Rheology Contest, in which beautiful rheological images were showcased. See the dedicated article on the Gallery in this issue of the *Bulletin*.

By Thursday after 325 talks and 129 posters it was a wrap, and Jason rode off into the sunset for well deserved rest. We next gather in Raleigh, North Carolina with Saad Khan as our host. Looking forward to next time!

(More photos on pages 10, 31)



The Outreach Event at the 90th Annual SOR Meeting took place at the Children's Museum of Houston. With leadership from the Education Committee, volunteers shared their enthusiasm for our science with children of all ages.

The Industrial Keynote Program brought many industrial rheologists to Houston, including this PPG crew: (Left to right) Vijesh Tanna, Yu Wang, Hao Sun, and Steve Barancyk.

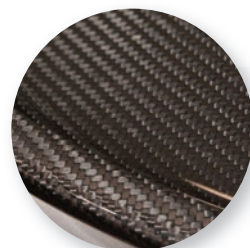
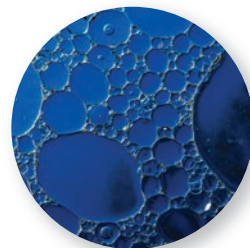


The Monday reception at the Saint Arnold Brewery was quite memorable. Each attendee received an SOR pint glass (displayed here by Savvas Hatzikiriakos, University of British Columbia) and there was beyond plenty to eat at the long, convivial tables. And, of course, some brews.

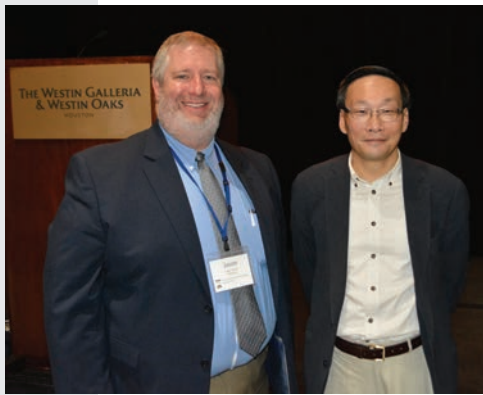
SOR Houston 2018



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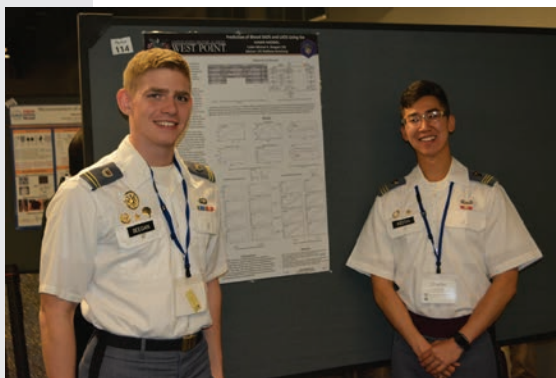
The Discovery Hybrid Rheometer combines the **MOST ACCURATE** rheological measurements with the **MOST EXTENSIVE** line of easy-to-use environmental systems and accessories, ensuring you have the right rheometer for every job.



Local Arrangements Chair Jason Maxey (Haliburton) with opening plenary speaker Wilson Poon from the University of Edinburgh.



Nearly every recipient (all but one) of the Metzner Early Career Award was present in Houston! Back row, left to right: Anson Ma, Charles Schroeder, Richard Graham, Jonathan Rothstein, and Randy Ewoldt. Front row, left to right: Patrick Underhill, 2018 Metzner Awardee Thibaut Divoux, Evelyne van Ruymbeke, and Aditya Khair.



US Military Academy, West Point, Cadets Michael K. Deegan and Charles Keith at the poster session in Houston with Deegan's poster on modeling blood rheology, coauthored with advisor LTC Matthew Armstrong.



SOR Houston 2018



Bingham medalists present in Houston gathered for the traditional picture. In the back row, left to right: Gary Leal, Norm Wagner, Gerry Fuller, Eric Shaqfeh, Mort Denn, Bill Schowalter, Ron Larson, and Tom McLeish. Front row, left to right: Gareth McKinley, Greg McKenna, Ralph Colby, 2018 Bingham Medalist Michael Rubinstein, Julia Kornfield, John Dealy, John Brady, and Hiroshi Watanabe.

Letter from the President

Norman Wagner, President
The Society of Rheology

Dear Members,

Firstly, best wishes for the New Year – as we embark on our own mission of self-improvement, know that 2019 brings some significant improvements and commitments to your Society. Before describing these, I wish to recount the noteworthy achievements of 2018 for SOR, and start by com-



mending Local Arrangements Chair, Jason Maxey (and his local arrangements committee) and Technical Program co-Chairs Marie-Claude Heuzey and Gordon Christopher (and all of their session chairs) for creating and executing a truly record-breaking and stimulating annual meeting in Houston this past October! You can read more about the magnificent breadth of

activities that complemented an outstanding technical program: the wonderfully impactful K-12 outreach lead by Jonathan Rothstein, the visually engaging Gallery of Rheology competition lead by Randy Ewoldt, the highly attended (over 90 students and postdocs) Careers in Rheology AIP-Dow Student Industry Forum in a lunch format led by Maryam Sepehr, all of our exciting and engaging Industrial Keynote Speakers, and of course, our social activities for which we thank the generous financial support of our industrial sponsors and exhibitors!

As members, you approved two new, important committees that will provide the legally necessary (and desired) oversight of the financial health of the Society:

The new Audit Committee is charged to “provide independent oversight of financial reporting and disclosure of the Society.” We are grateful to our volunteers, Monty Shaw, Rekha Rao, and Bamin Khomami, who have agreed to serve with three-year terms (staggered) as noted in the list of Officers and Committees.

The newly approved Financial Advisement Committee is charged to “provide independent advice to the Executive Committee on financial planning and investment strategy of the Society.” We are grateful for Anne Grillet’s continued leadership and willingness to chair this committee with members Mike Solomon and John Brady comprising the committee. These terms are also staggered three-year terms of service.

Note that, by Society rules, our very capable and ef-

Read more on:

- Thanks to volunteers, meeting planners
- New standing and ad hoc committees formed
- Revised worldwide rheology nomenclature adopted
- Encouragement to publish in JOR
- Volunteer opportunities available
- New student member roles
- Nominating Committee forming

ficient (and volunteer) Treasurer, Chris White, is an ex-officio member of both of these committees.

This new year also brings a revised world-wide, official rheology nomenclature, which is being maintained by the Society of Rheology and can be found on our new website.

As also discussed at the Society’s Business Meeting in Houston this past October, the membership requested an ad hoc Journal Publishing Committee to monitor the rapidly evolving politics of scientific publishing, evaluate the operation of the new AIPP publishing partnership, and advise the Executive Committee as we navigate toward a new and uncertain scientific publishing landscape. We have asked volunteers Lynn Walker (editor-in-chief of *Rheologica Acta*), Gary Leal (editor of *Physical Review Fluids*) and Dimitris Vlassopoulos (associate editor of *Soft Matter*) as an international body of experts to help guide us. This committee will provide annual reports to the Society for the next five years, which is the duration of our current publishing partnership with AIPP. Note that AIPP is also taking active measures to get ahead of international movements to fundamentally change scientific publishing and revenue models, with Fred Kontur and Bridget D’Amelio, our partners from AIPP, providing constant updates on AIPP initiatives and their professional evaluation of international, political actions that could affect our Society’s journal. Importantly, Chris White (Society Treasurer) was our designee on an AIP panel of experts who met at the White House with an OSTP representative to provide our Society’s perspective on the opportunities and threats posed by various international political movements to change specific scientific publishing and dissemination practices. Our voice was heard, at least for the present, and the US government is not altering its current rules regarding the publication of government-funded research. Our Society also has two official liaisons to AIPP, Peter Olmsted and Roseanna Zia, who provide a valuable conduit for information, as well as our Society’s designee to the AIPP Board of Managers, Jeff Giacomini. Of note, our Society has received its first \$100,000 guaranteed payment under

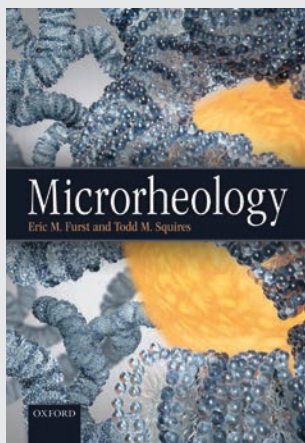
(continues page 18)

Book Review:

Microrheology (Oxford, 2017)

by E. M. Furst and T. M. Squires.

Review by Aditya S. Khair, Carnegie Mellon University



The term microrheology refers to the interrogation of viscoelastic fluids through the movement of embedded colloidal probe particles. A probe particle serves, effectively, as a tiny rheometer. Early micro-rheological measurements date back to the 1920s, in which magnetic particles were forced through biological samples, including cells. These are examples of *active* microrheology,

where probe motion is driven by external forcing (e.g., a magnetic field). Modern interest in microrheology was sparked by the seminal work of Mason and Weitz¹ in 1995, who inferred the linear viscoelastic moduli of complex fluids (including a colloidal suspension, an entangled polymer solution, and a concentrated emulsion) from light scattering measurement of the Brownian motion of probes. The crucial link between probe dynamics and the linear viscoelasticity of its surroundings is provided by the Generalized Stokes-Einstein Relation (GSER), of which more will be said later. These measurements are examples of *passive* microrheology, in which the material is driven only slightly out of equilibrium by the diffusive probe motion, which itself results from the incessant, random, thermally-driven collisions of a probe with neighboring solvent molecules. Over the last quarter of a century or so, experimental and theoretical micro-rheological studies have been conducted on a variety of materials: colloidal suspensions, polymeric liquids, worm-like micelle solutions, glasses, hydrogels, cells, and protein solutions to name a handful. Given this explosion of activity, a book that synthesizes the developments in this emergent field of rheology is timely. To that end, the present text by Prof. Furst (U. Delaware) and Prof. Squires (U.C. Santa Barbara) introduces the reader to the theory and practice of microrheology.

A theme of the book is to determine where microrheology fits within the broader suite of rheological measurement techniques. Indeed, this question was addressed by Prof. Furst in his plenary lecture entitled “Microrheol-

ogy's place in the rheologist's toolbox,” at the February 2017 SOR meeting in Tampa. Certainly, microrheology has advantages over conventional mechanical rheometry (as discussed in Chapter 1.1.1 “Why microrheology?”): microrheology requires only small sample volumes (see figure 3.16); experiments can be performed with relatively simple equipment; data can be gathered across several decades in frequency over short acquisition times; and microrheology can probe the local (perhaps heterogeneous) environment of soft materials, whose viscoelastic properties are too weak to measure via other techniques. Equally, there are serious issues as to the interpretation of the data gathered from a microrheology experiment: chiefly, does microrheology recover the “true” viscoelastic properties of a material, as would be measured in mechanical rheometry? The theoretical foundation of passive microrheology is the GSER, which definitively relates the (experimentally measurable) mean-squared displacement of a probe to the linear-viscoelastic moduli of its surroundings, under certain conditions (e.g., a continuum material with no chemical probe-material interactions). That is, when the appropriate conditions are met, passive microrheology can quantitatively recover the true linear-viscoelastic properties of a material. The authors carefully lay out the derivation of the GSER in Chapter 3 (“Passive microrheology”), including a lucid discussion of how the GSER differs when viewed in the time and frequency (Fourier or Laplace) domains.

In active microrheology the probe drives a material out of equilibrium, with the hope of ascertaining nonlinear rheological properties, such as a shear-rate-dependent viscosity, or normal stress coefficients. It is the resistance that the probe feels under an imposed motion that is actually measured; to infer rheological properties from this is non-trivial, since the GSER is no longer applicable. In fact, one should not expect that active microrheology recovers the true viscoelastic properties of a material, in general: sources of discrepancy include non-viscometric flow due to the moving probe; Lagrangian unsteadiness; and direct probe-material interactions. These issues have been theoretically analyzed for probe motion in model colloidal dispersions, as discussed in Chapter 7 (“Active Microrheology”).

The organization of the book is logical, with natural paths that readers could select to suit their interests. Chapters 1 and 2 are essential reading for anyone new to microrheology. Specifically, Chapter 1 presents an introduction to microrheology, soft materials, and relevant aspect of colloidal



(continues page 17)

Special Issue on Dense Suspension Dynamics

Guest Editor: Jeff Morris, CCNY

Guest Co-Editor: Emanuela Del Gado, Georgetown University

Expressions of intent to submit a paper are invited for a special issue of the *Journal of Rheology*. Scheduled for publication in early 2020, this issue will focus on the dynamics of dense suspensions, systems at high solid fractions resulting in strong nonlinear material response, including large normal stresses, shear thickening, and jamming. We seek a broad array of contributions from experiments, theory and simulation, as well as academia, national labs, and industry. Contributions that elucidate structure, in particular at the particle scale, are particularly welcome.

This special issue follows recent focus meetings on the topic, including at the Kavli Institute for Theoretical Physics (Physics of Dense Suspensions) held at UCSB and organized by B. Chakraborty, E. Del Gado, J. Morris, advised by W. Poon, as well as the workshop on the Rheology of Dense Suspensions held at Georgetown University, organized by E. Del Gado, D. Blair, B. Chakraborty, & J. Morris, and the SoftComp workshop on Dense Suspension Flow at the University of Edinburgh, organized by W. Poon, M. Cates, and D. Vlassopoulos.

Accepted articles will be circulated among all authors participating in the special issue, for comments and questions that will be published following the article, with replies from the authors.

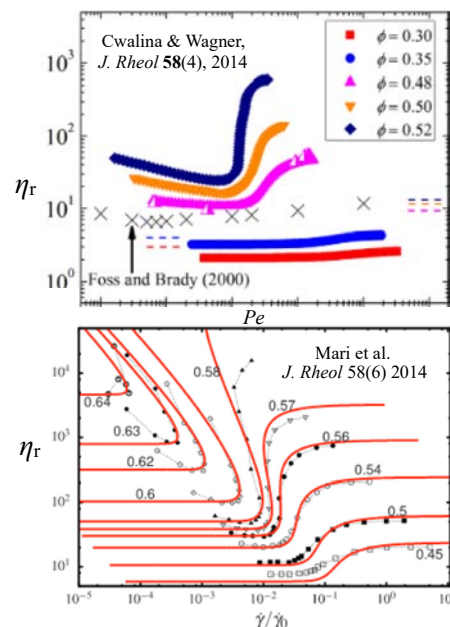
An Editorial Foreword will be co-written by B. Chakraborty, E. Del Gado, and J. Morris.

Expression of Intent

If you plan to submit a paper, expressions of intent are encouraged at your earliest opportunity, as it would be useful for us to have a list of potential contributors prior the submission deadline.

- Please inform Ania Bukowski, Editorial Assistant, by e-mail to JOR-EditorialOffice@aip.org
- Use **INTENT - Special Issue/Dense Suspensions** in the subject header of your message.
- Indicate a tentative title for your manuscript.
- Include contact author's name, institution and email, and those of known or proposed co-authors.

DEADLINE FOR SUBMISSIONS: **September 30, 2019**



Passings



Hanswalter Giesekus (1922 – 2017)

By Roger Tanner and Ken Walters

His Life.

Hanswalter Giesekus was born on January 4th 1922 at Hückeswagen, a small town about 20km east of Düsseldorf in the province of Nordrhein-Westfalen. His father was Walter Giesekus and his mother was Emmy Giesekus, née Langenberg. Both father and mother were country folk and had received only an elementary school education. The parents were practising Christians and subsequently Hanswalter followed their example. In his childhood he experienced the Great Depression and the subsequent rise of Nazism in Germany. During his school education, he displayed wide interests in literature, history, art and music (he learnt to play the violin) as well as in mathematics and physics. After leaving school, he went on a few months of pre-military service – spent partly in France- and then in the autumn of 1940 he enrolled in the University of Göttingen, concentrating on physics. However, after one year he was called up to serve in an air intelligence unit. From 1943, he worked in a newly established Institute in Freiberg-im-Breisgau, There he experienced a bombing raid on November 24th 1944 and the house where Giesekus was living was destroyed. Fortunately he was on his way to a Bible class at the time of the raid, and so he escaped.

After the end of the war, in the autumn of 1945, he resumed his studies at Göttingen; he was permitted to do this because of his non-involvement in Nazi activities. He received his Diploma in 1948 and his Doctorate in 1950.

In July 1950, Giesekus joined Bayer AG. At first he was in a division at Dormagen, north of Cologne, and then he was moved to the Engineering Department of Applied Physics at Leverkusen in 1953. There he met Dr. Juri Pawlowski, who got him interested in rheology. Thus began his stellar career in the subject and he published a string of influential papers from 1954 onwards. In 1955 Hanswalter married Hanna (née Hoppe) and they had six children- five boys and one girl.



The authors of this Obituary heard him give an extraordinarily interesting invited talk on secondary flow around a rotating sphere in a non-Newtonian fluid at the 4th International Congress on Rheology held at Brown University in Providence, Rhode Island in August 1963; this was our first contact with Dr. Giesekus. The lecture not only showed elegant theory but it also contained a film of a relevant experiment.

In 1970 Giesekus moved to the new University of Dortmund as Professor of Fluid Mechanics in the Department of Chemical Engineering. There he built up a research group practically from scratch. He spent 1978 at the Department of Chemical Engineering at the University of Delaware, following an invitation from Professor Arthur Metzner. During his tenure in Dortmund he followed Dr. W. Meskat as Executive Editor of *Rheologica Acta*; he was Editor from 1975 until 1987- a long tenure of 14 years.

Giesekus formally retired in 1987 but continued lecturing and research as Emeritus Professor after that. In his ‘retirement’, he published two books, one entitled “Phänomenologische Rheologie” was published by Springer-Verlag in 1990 and is discussed below and the other is centred on the life and beliefs of Blaise Pascal, the scientist and philosopher after whom the unit of pressure (N/m^2) is named. Giesekus was awarded the British Society of Rheology Gold Medal in 1990.

After a marriage lasting 59 years, Hanna died on 1 July 2014. Hanswalter remained a very active Christian until his death on 4 December 2017. They are survived by their six children, 15 grandchildren and a great-grandson.

His Research Work.

Although Giesekus’s best-known work is in rheology, his early publications stemming from his doctoral thesis were on the physics of rare earths, and it was not until 1954 that papers on rheology began to appear. Bayer

AG seemed to have given him liberty to do theoretical research on rheology, and a stream of excellent papers, mostly single-author works in the German language, was published from 1954 onwards. For some reason, these papers are not easy to track down on popular websites- for example the ISI Web of Science omits most of the early papers, but Professor Henning Winter has published a list of all of them (Rheologica Acta 28: 437-448 (1989)). To quote Winter:” A general remark

recently by Professor Kostas Housiadas using the program ‘Mathematica’.

Giesekus investigated suspensions of various sorts of dumbbells using statistical methods and published a number of papers on turbulent drag reduction and stability of flow in viscoelastic flow. His best-cited paper (with over 500 citations on the Web of Science) is the paper where the Giesekus constitutive model was

explored (Journal of Non-Newtonian Fluid Mechanics, 11: 60-109 (1982)). As the author explains in the text, most of the ideas were published some 16 years earlier as ‘Die Elastizität von Flüssigkeiten’, Rheologica Acta 5: 29-35 (1966). The original paper was not widely cited and does not appear in the Web of Science.

The book ‘Phänomenologische Rheologie’ was published by Springer-Verlag in 1994 after his formal retirement from Dortmund , but it was thought out over a long period beginning during the time Giesekus was writing his Habilitation thesis (licence to teach) at the Technical University of Darmstadt in 1962-1970. It is very thorough

and each chapter is prefaced with a Biblical quotation from the books of Ecclesiastes and Job. They are often very appropriate. For instance in Chapter 2 (Kinematic Foundations) we find, from Ecclesiastes 7:24 “ In weiter Ferne liegt der Grund alles Geschehens und tief; ja tief verborgen: Wer kann ihn ausfindig Machen?” From an English Bible this verse reads “ That which is far off, and exceedingly deep, who can find it out?”. Many rheologists would agree with this statement regarding the complexity of finite strain.

Satisfyingly, mainly through his theoretical work, his memory and his profound influence on rheology continues.



Hanswalter Giesekus and Sir Sam Edwards with J. Ferguson (centre) in 1990. Giesekus and Edwards both received a Gold Medal from the British Society of Rheology at this time; Ferguson was the President of the BSR.

was that Giesekus had published many profound results in the German literature which, only many years later, were independently rediscovered and published in the international literature.”

His great capacity for accurate mathematical work is exemplified by a 1962 paper in Rheologica Acta in which he computed the drag on a sphere in a viscoelastic fluid by a perturbation method. The algebra involved in these calculations is very difficult, and there was some previous work in the literature, but Giesekus was the first to obtain a correct result, which has since been verified

Rheology Around the World: South Africa



As part of The Society of Rheology's mission to advance and promote rheology, SOR has an International Outreach Program headed by Gerry Fuller (Stanford University). Fuller's charge is to pay attention to how rheology societies and events around the world are faring, and to sort out how SOR can help. Sometimes the interaction is a visit from Fuller; sometimes it is a short course on rheology, sometimes it is arranging some funding for getting a meeting organized. This year, the International Outreach Program collaborated on a rheology short course in South Africa.

Chris Macosko (University of Minnesota) and Gareth McKinley (Massachusetts Institute of Technology) visited the Southern African Society of Rheology (SASOR) 27-28 September 2018 and presented a short course on rheology. There were 39 attendees to the short course, primarily students from Cape Town area universities, as well as participants from South Africa, Zambia, and Congo. The short course was organized by Professor Rainer Haldenwang (Cape Peninsula University of Technology) and Dr. Sonia Fidder-Woudberg (Stellenbosch University). The two-day program was hosted at the Stellenbosch Institute for Advanced Study (STIAS) in South Africa on the Stellenbosch University Campus. Macosko and McKinley presented 12 lectures and conducted an interactive problem solving session based on material prepared by Macosko, Fuller, Randy Ewoldt (University of Illinois, Urbana-Champaign), and McKinley. The course was followed by SASOR's biennial 2-day meeting, which was attended by many of the short course students.



Photo captions. Top, attendees and instructors at the SASOR rheology short course at Stellenbosch University, 27-28 September 2018. Above, Macosko and McKinley with SASOR Executive Committee members Veruscha Fester (outgoing SASOR president), Sonia Fidder-Woudberg, David Perret (newly elected president), Rainer Halendwang, and Peter Goosen (treasurer). At right, McKinley and Macosko demonstrate strain hardening in extension with a lightly crosslinked, swollen rubber worm.



probe chemistry. This is followed in Chapter 2 with a primer on continuum mechanics and colloidal hydrodynamics relevant to (low Reynolds number) probe motion in microrheology. Even though the Reynolds number is typically small, the authors correctly emphasize the importance of transient inertia, which endows the resistance experienced by a probe with a memory of the history of its motion, just as would occur due to viscoelastic effects. Further, the repeated analogies between linear elasticity, linearized viscous flow (i.e., the unsteady Stokes equations), and linear viscoelasticity, as embodied in the “Correspondence Principle” (Chapter 2.4), are well laid out. Chapters 3 through 6 focus on passive microrheology. Chapter 3 sets forth the derivation of the GSER. Chapters 4-6 explain how to perform the measurements: via multiple particle tracking (4), light scattering (5), and interferometric tracking (6). The reader interested in passive microrheology alone could focus on Chapters 1 through 6. The text moves to active microrheology in Chapter 7, followed by a discussion of relevant experimental techniques in Chapter 8 (“Magnetic bead microrheology”) and Chapter 9 (Laser tweezer microrheology”). The book concludes in Chapter 10 with a selection of applications of microrheology, along with ideas for future work. Certain chapters conclude with exercises for the reader. The book should be accessible to those with an undergraduate-level knowledge of fluid dynamics, differential equations, and physical

chemistry attained in a typical chemical engineering program, for instance.

Experimental and theoretical advances continue unabated in the short time since this book was published, which indicates the vitality of microrheology. Such advances include (but are by no means limited to): (i) differential dynamic microscopy for passive microrheology, under conditions where other particle tracking methods fail;² (ii) the proposition of a non-equilibrium Stokes-Einstein relation for colloidal suspensions;³ and (iii) predictions for passive microrheology (via tracer diffusion) in suspensions of active, self-propelled particles.⁴ Evidently, microrheology will continue to occupy a significant compartment in the rheologist's toolbox. The book by Prof. Furst and Prof. Squires will be *de rigueur* for those wishing to learn about this evolving area of rheology.

References

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Technical Program for Raleigh

Organizers:

Lisa Biswal

Department of Chemical Engineering
Rice University

Steven Hudson

National Institutes of Standards and
Technology

Sessions

1. Rheometry: Advanced Techniques and Methods
2. Interfacial Rheology
3. Microfluidic and Confined flows
4. Flow Induced Instabilities and Non-Newtonian Fluids
5. Suspensions, Colloids, and Granular Materials
6. Surfactants, Foams, and Emulsions
7. Polymers Solutions, Melts and Blends
8. Additive Manufacturing and Composites
9. Out of Equilibrium Systems: Gels and Glasses
10. Biomaterials and Biofluid Dynamics
11. Active and Directed Systems
12. Applied Rheology for Pharmaceuticals, Food, and Consumer Products
13. Rheology Poster Session
14. Gallery of Rheology Contest

the new AIPP Publishing Partnership Agreement for the Journal of Rheology. We look forward to continued growth in the subscription base and readership of the Journal under this new partnership in support of our Society!

As you prepare your research achievements for publication, please continue to send your best work to the Journal of Rheology, which continues to excel as an internationally recognized leader among all rheology-centric journals thanks largely to the seemingly tireless efforts of our editor, Ralph Colby, associate editor, Roseanna Zia, and publishing partner, AIPP. Please remember that publishing your best work in the Journal of Rheology directly supports the Society!

Returning to the new, SOR now has an ad hoc Inclusion and Diversity Committee. In September of 2018 the AIP Venture Partnership Fund approved the Society's proposal, "SOR Membership, Inclusion, and Diversity Initiative" with two years of funding (contingent on progress) totaling \$54,000. We are pleased that Kelly Schultz, co-author of the proposal and Chair of the SOR Membership Committee will also Chair this new ad hoc committee, with Matt Liberatore, Maryam Sepehr, Susan Muller, Safa Jamali, Lilian Hsiao and myself as the initial members. We will be looking to add a student member (see the call for applications in this Bulletin). The goal of this effort is to better achieve SOR's mission to "expand the knowledge and practice of rheology, ... as well as to disseminate to diverse communities what rheology is, and how it impacts rheology and the world." As a start, we will be evaluating both who we are, and how the Society currently serves, and can better serve in the future, the broad community of scientists and engineers, students and educators who consider themselves, at least in part, rheologists. A professional survey, constructed by this committee and professionals from AIP's Statistical Research Center, will be arriving by email. Please make an effort to respond to this survey, as it becomes the data we can use in partnership with experts at AIP to improve and broaden our Society. A summary of the survey results will be made available to the membership this summer, and new programming will be implemented at the SOR's Annual Meeting in

October in Raleigh. The survey will also provide you with a conduit to provide suggestions and criticisms, but you are always welcome to contact Kelly, myself, or any member of the committee directly.

As your President, I am always open to listen to your suggestions as well as complaints. We are an all-volunteer society, and are blessed with a large number of members who continue to serve the Society, but are always looking for new volunteers! This is an election year and a nominating committee is being formed to identify candidates for service on the Executive Committee, which will be announced in late spring. According to our constitution: "For a period of forty-five (45) days following the date of such notification, additional nominees may be named by petition forwarded to the Secretary and signed by at least fifteen (15) members in good standing of The Society."

In addition to, or as an alternative to, volunteering for service on one of our many committees or deciding to make the serious commitment to run for elected office, you can always contribute financial resources to our Student Travel Grant Program at the time of membership renewal or at any time directly via the new Society web site. Please also consider nominating eligible candidates for our Society awards and Fellowship, which are due soon!

Student members, please consider applying for the two new SOR service opportunities for an advisory role on the Executive Committee or as a member of the new Inclusion and Diversity Committee. A request for applications was emailed to all members in good standing, and faculty advisors are asked to encourage appropriate students from their institutions to apply.

Finally, as you enjoy this Bulletin, please join me in thanking Faith Morrison for her extraordinary volunteer efforts to bring you both the Society's news in this Bulletin as well as inspired reporting of how rheology plays a role in our world more broadly in an appealing form and professional, timely manner. Faith also continues to serve the scientific community as our Society's designee to the AIP Governing Board, until her (non-renewable) term expires in 2020, and for which we will be required to identify a suitable replacement.

Best wishes for a healthy and successful 2019.



The Society of Rheology was founded in 1929 to foster the study of the mechanical properties of deformable materials. SOR is a founding member of the American Institute of Physics.

Visit our web site www.rheology.org/sor/



NEWS

2018 SOR Fellows Inducted

The Class of 2018 of Society of Rheology Fellows numbered seven, and six were present in Houston to receive recognition (shown below, left top right): Kalman Migler (NIST), Roger Bonnecaze (University of Texas, Austin), Jeffrey Giacomini (Queen's University, Ontario), Montgomery Shaw (University of Connecticut), Pier-Luca Maffettone (University of Naples Federico II), and Dimitris Vlassopolous (University of Crete).



Attention Society of Rheology Student Members!

Do you have an interest in service to the Society? We have two new service opportunities for your consideration.

The Society of Rheology is seeking a student member to serve in an advisory role on the Executive Committee by representing SOR student interests more broadly. The student representative to the SOR

Executive Committee will provide guidance and advice to the Executive Committee, in a non-voting role. Requirements include attending the executive committee meetings (spring meeting at AIP in College Park (28 April 2019), and the Sunday immediately preceding the Annual SOR Meeting). Note that limited financial support is provided for travel. Terms are for two years, non-renewable.

An additional Student Member is also sought to serve on the SOR ad hoc Inclusion and Diversity Committee for a two-year term. The new Inclusion and Diversity Committee, which was formed to implement the proposed initiative funded by The Society of Rheology and the American Institute of Physics, is chaired by Kelly Schultz (Lehigh University). This committee meets approximately monthly via teleconference and at the SOR Annual Meeting, and among other activities, is developing enhanced student programming at the annual meeting. Applicants should be attending the Annual SOR Meetings in October 2019 and Winter 2021. Applicants with leadership or organizational experience in student-focused career development programming (such as a GRS) are especially encouraged to apply.

Applications are due by March 1st, 2019 to start by March 15th. Application should be in the form of a single, three page PDF consisting of a cover letter highlighting your qualifications, including any leadership or executive service, a one page brief CV, and a short letter from your thesis advisor simply acknowledging their support for your service commitment. Applicants should be a student member of The Society of Rheology at the time of application. Applications should be submitted via The Society of Rheology website. Note that both positions require a commitment through the Winter 2021 meeting (February 2021) and students intending to complete their dissertation before that time, but commit to fulfill their term while a postdoc or young professional in a rheology career, will be considered without prejudice. Questions about the representative position can be directed to the President of The Society of Rheology (wagnernj@udel.edu) while questions about the I&D Committee member position should be directed to the chair, Kelly Schultz (kes513@lehigh.edu).

Bylaws Revision Passes

In his formal capacity as the Secretary of The Society of Rheology, and in accordance with Article VIII of the Rules, Albert Co has certified the approval of the 2018 ballot to the Membership on the modification of the Rules of The Society of Rheology. The Rules Amendments concerned the addition of "ARTICLE VI - Audit Committee" and "ARTICLE VII - Financial Advisement Committee" and passed by 333 for and 6 against. The count was certified to the Secretary by Frederick Kontur of AIP on 14 December 2018.

Article numbers of subsequent articles will be adjusted accordingly. Please see <https://www.rheology.org/sor/Amendments/2018/> for details of the Rules Amendments. Amendments as approved shall become effective immediately. The updated copy of the Rules of The Society of Rheology will appear on the web early in 2019.

Nominations Needed: Bingham, Metzner

David Venerus (Chair, Bingham Award Committee)
Peter Olmsted (Chair, Metzner Award Committee)

The Society of Rheology is seeking nominations for two prestigious awards. The first is the Bingham Medal, awarded to an individual who has made an outstanding contribution to the science of rheology. The second is the Arthur B. Metzner Early Career Award, given to an individual early in his/her career who has distinguished him/herself in rheological research, rheological practice, or service to rheology. These awards spotlight the superb scientific research performed in the field of rheology.

For this year the submission deadline for both awards is 22 February 2019. The nomination materials should be combined into a single concatenated PDF file and uploaded at <https://www.rheology.org/SoRBinghamNom/> (for Bingham Medal) or <https://www.rheology.org/SoRMetznerNom/> (for Metzner Award). The single concatenated PDF file must not be more than 20 MB.

Descriptions of the awards, list of past recipients, and the requirements of the nomination packages are available at <https://www.rheology.org/SoR/Awards/Bingham/> (for Bingham Medal) and <https://www.rheology.org/SoR/Awards/Metzner/> (for Metzner Award).

Additional information can be found at <https://www.rheology.org/sor/Awards/Bingham/Nom2019> and <https://www.rheology.org/sor/Awards/Metzner/Nom2019>.

Please note that this year nomination packages should include a high-resolution headshot of the nominee suitable for publication.

Gallery of Rheology, Raleigh 2019

The Gallery of Rheology is becoming an institution. First held in Denver and subsequently in Houston, the Gallery event consists of soliciting interesting images from rheological research for display at the annual SOR meeting. Attendees at the meeting are asked to vote for their favorite images, and three top images are identified. Gallery co-chairs in 2018 Randy Ewoldt and Vivek Sharma plan to run a third version in Raleigh in October 2019. Watch the SOR website for details. If you have any suggestions for improvement of this new meeting feature, please contact the organizers.



Gallery of Rheology co-chairs Randy Ewoldt and Vivek Sharma and poster session co-chair Vivek Narsimhan with winners of the Gallery of Rheology event. From left to right: Ewoldt, Alan Ranjit Jacob, Crystal E. Owens, Sharma, Bavand Keshavarz, Narsimhan, and Micela Geri.

The favorite images from the Houston Gallery of Rheology appear in this Bulletin, with the top choice on the cover and the other outstanding images inside.

The Eye of Sauron by Alan R. Jacob, Lilian C. Hsiao and Michael Dickey of North Carolina State University, U.S.A. was the first-place choice for the Gallery of Rheology in Houston. Gallium is a liquid metal that forms an elastic native oxide skin. The oxide skin surrounding the liquid metal manifests creases on the air-liquid metal interface. A high energy concentric backscattering detector (CBS) was used to obtain an electron microscopy image which captures an enhanced contrast image of the wrinkles present on the interface. The crinkles resemble fiery flames when false color is applied. This image reveals the rich interfacial phenomenon displayed by liquid metals which is yet to be properly understood.

Two other Gallery images were singled out, both from the Massachusetts Institute of Technology (see page 6). Viscoelastic Fishbones (“Stretching the Sands of Time”) was the work of Bavand Keshavarz, Michela Geri, and Gareth H. McKinley. In this set of images two identical fast liquid jets collide into each other at an oblique angle. To the naked eye they form a blurred liquid fan, but with a high-speed air-gap flash that releases a 20,000 volts arc into the air in less than 300 nanoseconds, liquid patterns are frozen in time. The Newtonian fish bones break into a chain of droplets that depart from the liquid fan. For the viscoelastic liquids, enhanced elongational viscosity delays the droplet breakup and leads to the formation of bead and elongated filaments.

Carbon Nanotube Wizard Hat was created by Crystal E. Owens, A. John Hart, and Gareth H. McKinley. The image is a scanning electron micrograph of a 3D printed structure in which more

than 50 billion carbon nanotubes (CNTs), 2 microns by 2 nanometers each, have assembled to form a conductive, pure-CNT object. The sharp upper tip was created by necking due to capillary forces while printing in a mostly extensional flow, reminiscent, in the eyes of the creators, of the process which creates the top cusp on chocolate “kisses.”

Poster Contest Results, Houston 2018

The poster session in Houston was well attended with an excellent selection of refreshments courtesy of sponsor Anton Paar USA. The Student/Post-Doc Poster Competition was conducted by session chairs Vivek Narsimhan and Rajesh Khare. Honored in the Student category were: 1st place, Ali Slim (University of Houston), *Dynamics of polymer grated nanoparticles controlled by soft confinement*, with coauthors Ryan Poling-Skutvik, Jacinta C. Conrad, and Ramanan Krishnamoorthi; 2nd place Valerian Hirschberg (Université Laval), *Fatigue analysis via Fourier transform of the stress*, with coauthors Manfred Wihelm and Denis Rodrigue; 3rd place Jiho Choi (University of Illinois at Urbana-Champaign), *Elastic stress during stepwise reduction in shear rate for thixotropic suspensions* with coauthor Simon A. Rogers. Congratulations!



Poster session co-chair Vivek Narsimhan with awardees Ali Slim (1st place), Valerian Hirschberg (2nd place), and Jiho Choi (3rd place).

Nominations Solicited: SOR Fellows

Paula Moldenaers
Chair, SOR Fellowship Committee

Outstanding members of The Society of Rheology, who have contributed to rheology through the science, technological accomplishments, peer-reviewed literature, and/or service can be nominated for Fellowship in The Society of Rheology. The Qualifications are given in details by Section 7 of ARTICLE IX of the SOR Rules. Only SOR members who have been members of good standing for at least 8 years are eligible for this member category.

The requirements of the nomination package and more details can be found at www.rheology.org/sor/fellowship/nom2019.

The nominating documents should be combined into a single PDF file and uploaded at www.rheology.org/SoRFellowNom/, following the instructions found there. The single concatenated PDF file must not exceed 20 MB. The deadline for submission is 15 March 2019.

Nominations that are not successful in their first year will be automatically carried over for two additional years, after which they must be refreshed by a new submission.

We are especially keen to receive industrial rheologists into the ranks of the Fellows.

TA Distinguished Young Rheologist

TA Instruments names Dr. Rossana Pasquino as a “Distinguished Young Rheologist”

New Castle, Delaware, USA. July 10, 2018 – TA Instruments is pleased to announce the latest recipient of the Distinguished Young Rheologist award: Dr. Rossana Pasquino, Associate Professor at the University of Naples Fredrico II.

Dr. Pasquino is recognized for her work in the rheology of complex fluids, using it as a tool to detect morphology and microscopic properties. Over the course of her career, she has been involved in various aspects of the soft matter world, with a focus on the rheological properties of viscoelastic solutions, colloids and polymers.

The Distinguished Young Rheologist Award recognizes young faculty members that show exceptional promise

in the field of rheology and is designed to accelerate their research through equipment grants. Recipients are nominated by a group of the most established and respected academic researchers in the field.

Terry Kelly, President of TA Instruments said, “Academic research into novel materials continues to expand the scope of rheological measurements into exciting new applications and market segments. Our programs like the Academic Matching Grant and Distinguished Young Rheologist awards demonstrate our strong and continued commitment to academia.”

TA Instruments congratulates Dr. Pasquino on this award and wishes her a long and successful career.

TA Instruments – a subsidiary of Waters Corporation (NYSE: WAT) – is the leading manufacturer of analytical instruments for thermal analysis, rheology, and microcalorimetry. The company is headquartered in New Castle, Delaware, USA, and has direct operations in 24 countries.



New Edition of Viscoelasticity Text

4th Edition of "Introduction to Polymer Viscoelasticity" authored by Montgomery T. Shaw and William J. MacKnight has been published (John Wiley and Sons). This new edition includes a large number of new problems with answers provided to instructors.

Student Member Travel Grants for SOR Annual Meeting, Raleigh

The Society of Rheology is offering student-member travel grants to support the cost of attending its 91st Annual Meeting in Raleigh, NC USA. Watch the SOR website for details.

BoardSource: a Resource for All SOR members

The American Institute of Physics (AIP) is a federation member of BoardSource, an online community with the mission to inspire and support excellence in nonprofit governance and board and staff leadership (www.boardsource.org). All AIP Member Societies (which includes SOR) and members of Member Societies have access to BoardSource's member education resources. Member

Society staff members and volunteer leaders register on an AIP dedicated landing page (www.boardsource.org/aip); each individual creates his/her own username and password. There is no limit to the number of individuals from each Member Society who can create accounts. Content and benefits include:

- Free and unlimited access to consistent and reliable information to guide board leadership and governance practices.
- Monthly member education webinars
- Hundreds of 101-, 201-, and 301-level topic papers
- The BoardSource Exchange
- Downloadable templates, tools, infographics, and more
- Ask-an-Expert email service
- Retained strategic search with Board Member Connect

Please feel free to use BoardSource to assist in your SOR or other nonprofit activities.

Minutes of the ExCom Meeting

Sunday, 14 October 2018

West Alabama Room, Westin Galleria Houston, Houston, Texas

Attending: Norm Wagner, Michael Graham, Gareth McKinley, Albert Co, Chris White, Eric Furst, Michel Cloire, Amy Shen, Faith Morrison, Andy Kraynik, Roseanna Zia, Peter Olmsted, Jason Maxey, Bridget D'Amelio (AIPP), Fred Kontur (AIPP), Monty Shaw, Maryam Sepehr, Liz Dart Caron (AIP), Kelly Schultz, Gordon Christopher, Marie-Claude Heuzey, Gerry Fuller, Claire McIlroy (BSR), Saad Khan, Lillian Hsiao, Lisa Biswal, Steve Hudson, and Roger Bonnacaze.



President Norm Wagner called the meeting to order at 8:30 am in West Alabama Room, Westin Galleria Houston, Houston, Texas. Wagner reviewed the Vision, Values and Mission of SoR and presented the goals of the meeting.

The minutes of 6 May 2018 meeting were presented. A motion to approve the minutes with minor corrections was seconded and passed. Approval of minutes via e-mails before publishing in the Rheology Bulletin was discussed.

Associate editor Roseanna Zia presented the JOR Editor's Report for Editor Ralph Colby. Zia went over the

list of invited reviews in the process of appearing in JOR. Graphs showing the acceptance and rejection rate, number of submissions by countries from 2014 to 2018, the manuscript processing time, and the published page counts per year were presented. The Journal Impact Factor of JOR is 2.969, the 5-Year Impact Factor is 3.419, and the Cited Half-Life is ">10.0". A motion to accept the report was seconded and passed.

Chris White presented the Treasurer's report. White reported that the financial condition of the Society is in good shape; however, there are concerns in the longer term. SoR ran a surplus of \$47K for the year 2017; the year 2018 should show a net surplus. SOR enters a Publishing Partnership with AIPP on the publication of JOR. Various graphs were presented. A motion to accept the report was seconded and passed.

Monty Shaw reported on the activities of the ad hoc Audit Committee. The members of the committee are Monty Shaw (chair), Rekha Rao and Bamin Khomami. A motion to accept the report was seconded and passed.

Chris White reported for the ad hoc Financial Advice Committee. The members of the committee are Anne Grillet (chair), Michael Solomon, John Brady and Chris White (ex-officio). Several recommendations of the committee were presented. A motion to accept the report was seconded and passed.

Albert Co reported on the progress of the newly designed website. Several web pages were demonstrated. A web app for students to easily sign up for the Student-Industry Forum was introduced at the Houston meeting.

Bridget D'Amelio (AIPP) gave an overview of the Publishing Partnership and presented data on sales update. D'Amelio also went over the current projects and initiatives: new thesaurus, article collections, and AIP books.

Peter Olmsted reported the activities of the AIP Publishing Partnership Committee.

Maryam Sepehr reported on the outreach activities (Jonathan Rothstein, chair) and short courses (Maryam Sepehr, chair) of the Education Committee. The annual outreach event will be held at the Houston Children's Museum on Sunday October 14th from 1 pm to 4 pm. There are 10 demonstration tables manned by 30+ volunteers. Through a grant from AIP Venture Fund, the committee have developed a series of Outreach Events in box kits that can be shipped upon request. New this year are movies to go along with each activity.

At the Houston meeting, the short course (two-day) "Structure and Rheology of Foams and Emulsions" (instructors: Sibani Lisa Biswal and Vivek Sharma) has 22 attendees. The other short course (two-day with demo) "Rheology of Polymer Composites and Nanocompos-

ites” (instructors: Ramanan Krishnamoorti, Megan Robertson, and Tirtha Chatterjee) has 18 attendees. These give a total of 40 attendees, with 80% professionals. Suggestions for future short courses are welcome.

Plans for “Introduction to Rheology” were discussed. The course is to offer basic rheology education, decoupled from the more technically-advanced SoR short courses. The plans include physical classes (one-day) in different geographical locations and a series of short videos.

The AIP-Dow Student Industry Forum will be held on Monday October 15th from noon to 1:15 pm. More than 90 students and post docs have signed up through the web app. There will be 45 minutes of round table discussion (lunch provided) with 7-8 students and an industrial speaker per table and three rotations of the industrial speakers per table. A mixer session of 30 minutes will follow after the round table discussion.

A motion to accept the report was seconded and passed.

Faith Morrison reported on the Rheology Bulletin. Contributions of articles were requested.

Liz Dart Caron (AIP) provided an update on the AIP-SOR relationship and AIP Strategic Planning. Faith Morrison also gave updates of AIP activities.

Gerry Fuller reported on International Outreach activities. This year Fuller visited China (Shanghai), Brazil (Rio de Janeiro), and South Africa. Next year there is plan to visit Mumbai, India.

Claire McIlroy (BSR) talked briefly about the British Society of Rheology.

Michel Cloitre talked briefly about the European Society of Rheology. AERC 2019 will be held in Portoroz, Slovenia from April 8th to April 11th, 2019.

Michael Graham and Andy Kraynik chaired the session on SoR meetings.

Andy Kraynik presented graphs that show the trends of the annual meetings. The Houston meeting has record attendance that is greater than the Philadelphia meeting (> 513).

Jason Maxey reported on the local arrangements of the Houston meeting. The meeting has a total registrants of 520, the highest number of attendants to date. The budget is also in fairly good shape.

Gordon Christopher and Marie-Claude Heuzey reported on the Technical Program of the Houston Meeting. A total of 454 papers has been submitted to date.

Eric Furst reported on the Student Travel Grants. This year the budget is \$30K and 30 students received the travel grants.

Saad Khan and Lillian Hsiao reported on the local arrangements of the Raleigh Meeting (2019). The meeting rooms at Raleigh Convention Center were reviewed. The current plan is to hold the Monday evening reception at the NC Museum of Art.

Lisa Biswal and Steve Hudson discussed the plans for the Technical Program of the Raleigh Meeting (2019). The proposed 12 sessions and the corresponding session chairs were discussed. A list of possible plenary speakers were presented.

Roger Bonneau gave updates on the local arrangements of the Austin Meeting (Winter 2021). The meeting will be held at the Marriott Austin Downtown, which is now under construction. The hotel contract was signed in January 2018.

Albert Co stated that there were no updates on the local arrangements of Bangor Meeting (2021).

Bids for the 2022 meeting are solicited.

Michael Graham led the discussion on plenary speaker reimbursement policy.

Kelly Schultz reported for the Membership Committee. Graphs that showed the historical trends of membership were presented. Several efforts to increase memberships were summarized. Additional ideas to increase membership were discussed. A motion to accept the report was seconded and passed.

Kelly Schultz discussed the initiatives to look into the diversity and inclusion in SoR meetings. AIP has developed worksheets and other resources for meeting organizers.

Gareth McKinley reported on the status of several SoR history projects. Mikayla Cleaver (Gettysburg College) worked as a summer (2018) intern, funded by SoR, to do archival research and preparation of biographies of past Bingham Medalists. Draft biographies were completed for 36 Bingham Medalists. The status of the oral histories were reported. McKinley completed an oral history with Ken Walters in the summer of 2018. Several proposed projects were described.

The general session ended at 2:45 pm. The executive session started at 2:55 pm.

Gareth McKinley endorsed the final version of the Official Rheology Nomenclature, with one minor correction noted by McKinley. The motion to accept the current version was seconded and passed unanimously.

Gareth McKinley proposed to fund a history intern for \$9K in 2019, plus \$1K for McKinley’s travel to AIP. A motion to approve the proposal was seconded and passed unanimously.

Norm Wagner discussed the increase in the funding of the AIP Venture Partnership Fund Inclusion and Diversity Initiative to \$27K per year. A motion to approve the increase was seconded and passed unanimously.

Michael Graham proposed the following policies for invited speakers:

Plenary speakers, including award lecturers:

- Up to four nights of accommodation at the conference hotel is provided.
- Economy class fare to and from the meeting is covered.
- Meeting registration and banquet fees are provided.

Industrial keynote speakers:

- Meeting registration will be offered and covered if requested.

A motion to approve the policies was seconded and passed unanimously.

A motion to change the ad hoc Financial Advisement Committee to a standing committee passed unanimously.

A motion to change the ad hoc Audit Committee to a standing committee passed unanimously.

Both motions require amendments of the SoR rules. Information on electronic balloting will be sent to the membership to approve the amendments.

The following mandate to the Education Committee (based on McKinley's white paper) was proposed:

- Create a panel of potential lecturers for a one-day introduction to rheology course.
- Empower them to prepare a one-day introduction to rheology course with lecture materials.
- Bring this to the Executive Committee for approval and implementation by May 2019.

A motion to approve the mandate passed unanimously.

The following charge to the ad hoc Publication Committee was proposed:

Overview current AIPP publishing arrangement and explore alternative publishing options to be considered at the end of the current five year contract. The committee will report yearly to the Executive Committee.

A motion to approve the charge passed unanimously.

The following Financial Advisement Recommendation was discussed:

Invest as proposed (~\$1M in CDs and \$700K in other investments) to achieve long term growth with overall low risk to capital. Authorized up to \$2,500 for professional financial advisement. Report back before May 2019.

A motion to follow the recommendation passed unanimously.

The Executive Session was adjourned at 4:05 pm.

Submitted by Albert Co, Secretary

Minutes of the Business Meeting

Tuesday, October 16, 2018

Houston, Texas

President Norm Wagner called the meeting to order at 12:03 pm in the Galleria I Ballroom of the Westin Galleria Houston, Houston, Texas (107 in attendance).

Wagner reviewed the SoR Vision, Values and Mission. A motion to approve the minutes of the previous Business Meeting in Denver, Colorado passed.

Wagner gave an overview of the AIPP Publishing Partnership.

Wagner reported that the Executive Committee had approved the proposal to change both the ad hoc Audit Committee and the ad hoc Financial Advisement Committee to standing committees. The change will require amendments of the SoR Rules.

Wagner also reported the creation of two new ad hoc committees: "Journal Publication" and "Inclusion and Diversity."

Chris White presented the Treasurer's Report. The budget for 2019 was discussed. A motion to accept the report was seconded and passed.

Ralph Colby gave the Editor's Report. A new feature is the inclusion of review articles. Selected items were discussed. A motion to accept the report was seconded and passed.

Kelly Schultz gave the report for the Membership Committee. Several items were discussed.

Michael Graham reported on the annual meetings: the current Houston meeting and the Raleigh meeting in 2019.

Jonathan Rothstein reported on education and outreach activities. An outreach event was held at the Houston Children's Museum on Sunday October 14th from 1 pm

Visit the SOR History Portal at AIP!
history.aip.org/society-portals/sor/sor.html

to 4 pm. There are 10 demonstration tables manned by 30+ volunteers. Through a grant from AIP Venture Fund, the committee have developed a series of Outreach Events in box kits that can be shipped upon request. New this year are movies to go along with each activity.

At the Houston meeting, the short course (two-day) "Structure and Rheology of Foams and Emulsions" (instructors: Sibani Lisa Biswal and Vivek Sharma) has 22 attendees. The other short course (two-day with demo) "Rheology of Polymer Composites and Nanocomposites" (instructors: Ramanan Krishnamoorti, Megan Robertson, and Tirtha Chatterjee) has 18 attendees. These give a total of 40 attendees, with 80% professionals.

The AIP and Dow Chemical Company sponsored our Student Industry Forum, "Careers in Rheology", which was held on Monday October 15th from noon to 1:15 pm. More than 90 students and post docs have signed up through the web app. There were 45 minutes of round table discussion (lunch provided) with 7-8 students and an industrial speaker per table and three rotations of the industrial speakers per table.

Norm Wagner and Kelly Schultz discussed the AIP VPF Inclusion and Diversity Initiatives. SoR received a \$54,000 matching grant from the AIP Venture Partnership Fund.

The meeting was adjourned at 1:05 p.m.

Submitted by Albert Co, Secretary.

Treasurer's Report



The Society of Rheology has a strong financial position. This report will be a summary of the current financial position followed by a discussion of the changes occurring in 2019. First, the current financial position. The most recent figures, for 2017, were presented at the October meeting in Houston. In 2017,

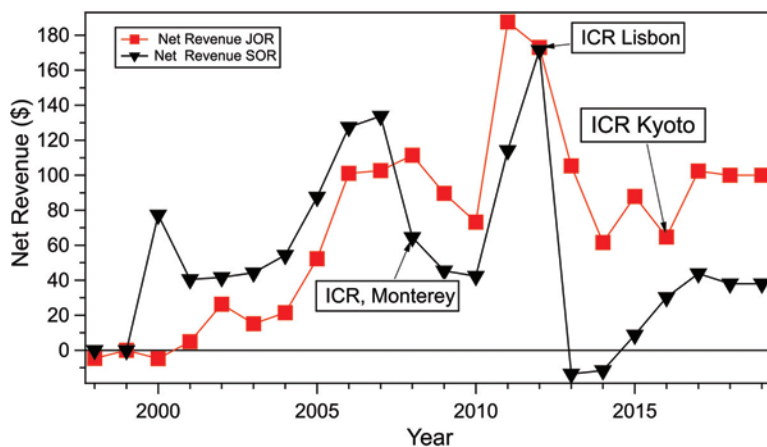
there were four sources of increased revenue: two SOR meetings, a dues increase and an increase in consortium sales from the Journal. These combined with expected expenses contributed to a net revenue of \$47K. The official figures for 2018 will be presented to both the Executive meeting in April and the July 2019 Bulletin. The projections for 2018 net revenue are similar to 2017.

SOR has significant financial reserves, a strong brand and dedicated following. The accompanying charts document expenditures and revenues for the past years including the 2019 budget proposal. For 2017 expenditures were in line with expectations as shown in the tables presented below. The journal expenses have been aggregated into three categories for this report; fixed expenses for producing the JOR in any form, plus direct print and online expenses. The fixed JOR expenses were (\$135,901): The on-line expenses were (\$21,849) and the print expenses were (\$61,292). The total expenses for the Journal of Rheology were \$219,043, which is similar to previous year's expenses. The revenue for 2017 was from the following major categories: Dues, \$64K, interest \$7K, and JOR \$321,421. Both meetings in 2017 had net revenue, Tampa (\$26K) and Denver (\$8K). A further breakdown of each of these categories is available from the Treasurer on request and has been presented to the Executive Committee. All of the revenues and expenses for 2018 will be detailed in the April report to the Executive committee meeting and included in the July Bulletin.

2019 will be a transition year for The Society of Rheology. We are a society with growing financial reserves that require more extensive oversight and management. The executive committee has recognized this transition and taken three definitive steps: The establishment of formal audit, financial advisement committees, and a partnership with AIPP for publishing the JOR.

The Society greatly appreciates the three members who have been appointed to the audit committee, Monty Shaw, Bamin Khomami, and Rekha Rao. The audit committee has already met, examined the books, reported to the executive committee and delivered recommendations on the accounting practices for the Society. These recommendations have been implemented.

The Society also appreciates the three members of the Financial Advisement Committee: Anne Grillet, Michael Solomon and John Brady. This committee is charged



Treasurer's Report

with developing specific recommendations for investments based on the directions given by the executive committee. This committee will present its findings at the spring executive committee meeting.

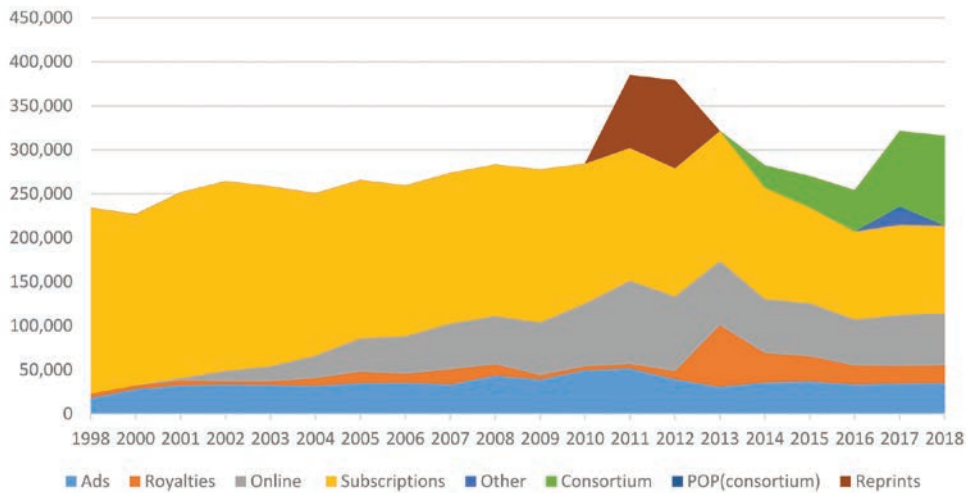
The third major change in 2019 will be the five year partnership with the American Institute of Physics Publishing (AIPP) for the Journal of Rheology. While this has several implications, here we will address the impact on the treasury. The partnership will guarantee an income of \$100K/yr. to the Society of Rheology. Any net revenue greater than the \$100K will be split with AIPP. We have estimates of this income, but for 2019 a

conservative estimate is used (~\$140K) for net revenue, this is slightly higher than in 2017, \$102k.

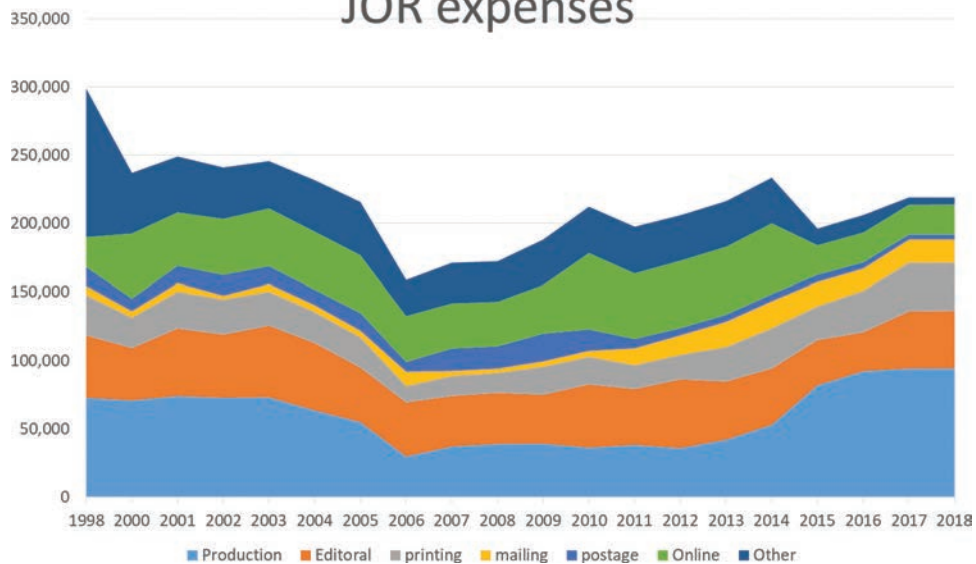
The longer term financial prospects for SOR have stabilized. SOR is still dependent on the surplus revenue from the JOR to support annual operating expenses, but this revenue is now guaranteed for the next five years. The formation of a finance advisement committee may yield additionally revenue, but carries risk of principle. These efforts have stabilized the financial position of the SOR.

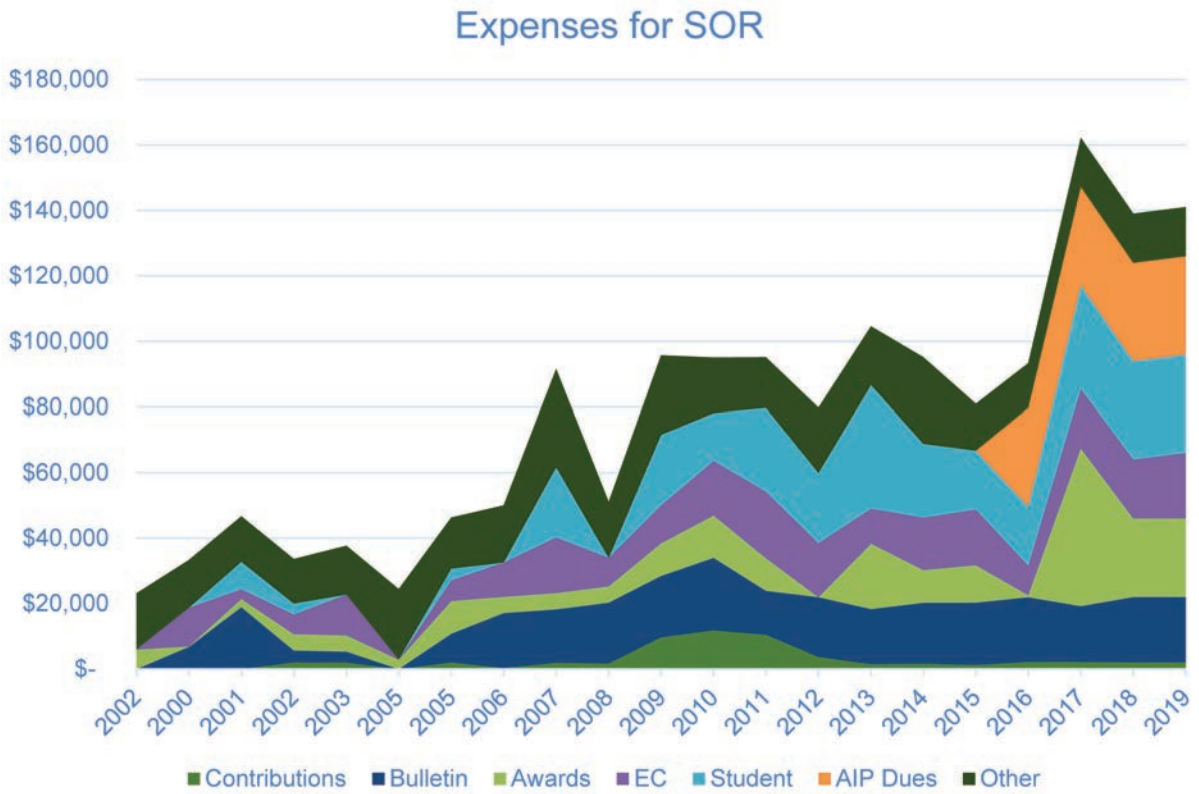
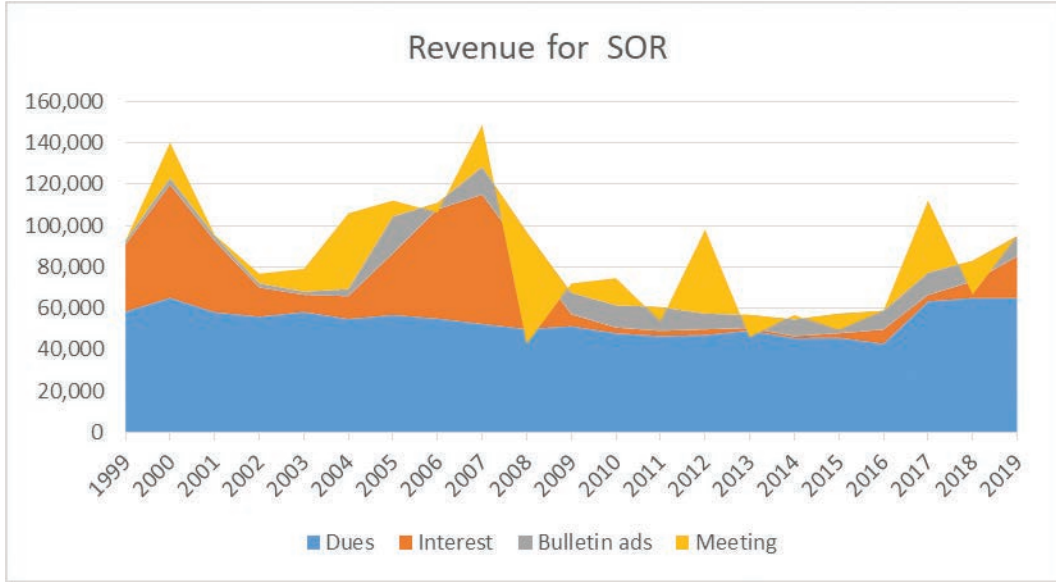
Sincerely,
Christopher White, Treasurer

JOR Revenue



JOR expenses








The Society of Rheology	2019	2018	2017	2016	2015	2014
RECEIPTS	Budget	Estimate	Year End	Year end	Year end	Year End
Dues	\$ 73,060	\$ 73,060	\$ 63,935	\$ 42,892	\$ 44,980	\$ 45,590
Interest	\$ 20,000	\$ 10,000	\$ 6,817	\$ 6,812	\$ 2,092	\$ 942
Journal of Rheology	\$ 140,000	\$ 290,000	\$ 321,436	\$ 270,858	\$ 284,180	\$ 297,016
Donations	\$ 2,000	\$ 1,000		\$ -	\$ -	\$ -
Bulletin Advertising	\$ 9,000	\$ 9,000	\$ 10,855	\$ 9,113	\$ 9,505	\$ 8,092
Annual Meeting (net)	\$ -		\$ 38,975	\$ -	\$ (14,589)	\$ 2,181
Short Course (net)	\$ -		\$ 10,575	\$ -	\$ 2,195	\$ 10,385
TOTAL RECEIPTS	\$ 244,060	\$ 383,060	\$452,593	\$ 329,675	\$ 328,363	\$ 364,207
	\$ -					
DISBURSEMENTS	\$ -					
AIP Dues Bill & Collect.	\$ 30,000	\$ 30,000	\$ 28,561	\$ 25,942	\$ 27,876	\$ 10,287
Journal of Rheology	\$ 40,000	\$ 200,000	\$ 219,043	\$ 200,372	\$ 196,266	\$ 247,550
Bulletin	\$ 19,000	\$ 19,000	\$ 17,036	\$ 19,770	\$ 19,664	\$ 18,590
Awards	\$ 25,650	\$ 25,650	\$ 49,828	\$ 3,602	\$ 25,401	\$ 20,097
Executive Cmt. Meetings	\$ 20,000	\$ 20,000	\$ 18,163	\$ 9,028	\$ 18,713	\$ 17,484
Discr. Funds.	\$ 10,500	\$ 10,500	\$ 3,966	\$ 4,325	\$ 197	\$ 2,522
International Activities Fund	\$ 5,000	\$ 5,000	\$ 2,963	\$ 4,469	\$ -	\$ -
Student member travel	\$ 30,000	\$ 30,000	\$ 31,767	\$ 15,097	\$ 31,000	\$ 22,497
Mis (ins, acc, ws,etc)	\$ 14,000	\$ 14,000	\$ 11,607	\$ 11,870	\$ 12,034	\$ 12,333
TOTAL DISBURSEMENTS	\$ 194,150	\$ 354,150	\$ 382,934	\$ 294,475	\$ 331,151	\$ 351,359
	\$ -					
Net	\$ 49,910	\$ 28,910	\$ 69,659	\$ 35,200	\$ (2,788)	\$ 12,847

Journal of Rheology	2017	2016	2015	2014	2013
REVENUES					
Advertising Sales	\$ 34,609	\$ 33,603	\$ 32,141	\$ 35,886	\$ 30,800
Royalties	\$ 19,828	\$ 21,340	\$ 28,369	\$ 33,197	\$ 69,736
Single-Copy Sales	\$ -	\$ 3,342	\$ -	\$ -	\$ 105
Consortium Access Fees	\$ 53,169	\$ 52,081	\$ 60,007	\$ -	\$ -
Consortium Subscription	\$ 81,930	\$ 45,734	\$ 35,766	\$ -	\$ -
JOROL Income	\$ 75,479	\$ -	\$ -	\$ 150,364	\$ 72,872
Subscriptions	\$ 56,421	\$ 99,385	\$ 110,170	\$ 75,569	\$ 148,137
Total Revenue	\$321,436	\$255,485	\$266,453	\$295,016	\$ 321,649
EXPENSES					
Fixed cost	\$ 135,901	\$ 114,516	\$ 113,994	\$ 116,381	\$ 108,784
Print	\$ 61,292	\$ 62,121	\$ 65,966	\$ 67,330	\$ 59,522
Online	\$ 21,850	\$ 22,166	\$ 21,903	\$ 51,785	\$ 49,609
Total Expenses	\$219,043	\$198,803	\$201,863	\$235,497	\$ 216,337
NET	\$102,393	\$ 56,682	\$ 64,590	\$ 59,520	\$ 105,312

**The Society of Rheology, Inc.
Balance Sheet**

(all amounts, USD)	2017	2016	2015	2014	2013
Assets					
Cash in checking account(s) 	\$ 7,096	\$ 45,027	25,181	69,163	147,077
Schwab Account	\$ 1,003,871				
Balance in AIP account	\$ 850,907	\$ 1,729,796	1,731,373	1,665,049	1,595,079
Total Assets	\$ 1,861,874	\$ 1,774,823	1,756,554	1,734,212	1,742,155
Liabilities and Net Assets					
Liabilities					
Deferred revenue	\$ 140,325	\$ 21,474	132,440	104,337	100,652
Total Liabilities	\$ 140,325	\$ 21,474	132,440	104,337	100,652
Net Assets					
Publication reserve	\$ 450,000	\$ 450,000	450,000	450,000	450,000
Student travel grant reserve	\$ 30,000	\$ 30,000	30,000	30,000	30,000
Annual Meeting reserve 	\$ 300,000	\$ 300,000	300,000	300,000	300,000
Operating reserve	\$ 150,000	\$ 150,000	150,000	150,000	150,000
Unrestricted	\$ 743,857	\$ 783,606	826,554	699,875	711,503
Total Net Assets	\$ 1,673,857	\$ 1,713,606 	1,624,114	1,629,875	1,641,503
Net Income	\$ 47,693	\$ 39,743			
Total liabilities and net assets	\$ 1,861,874	\$ 1,774,823	\$ 1,756,554	1,734,212	1,742,155

Treasurer's Report

end

The Society of Rheology

Our Vision

An international community of rheologists working towards common goals as articulated in our founding Constitution.

Values

We are the nexus of excellence in the theory and practice of rheology. We are committed to advancement and promotion of the rheological sciences and practice of rheology broadly across diverse groups of individuals, disciplines and industries.

Mission

We aim to expand the knowledge and practice of rheology through education, partnership and collaboration with associated fields, industries, and organizations, as well as to disseminate to diverse communities what rheology is, and how it impacts humanity and the world.

Adopted by the SOR Executive Committee, 10 June 2017





SOR Fellows at the Banquet, back row: Monty Shaw, Lynn Walker, Pier-Luca Maffettone, Wes Burghardt, Eric Shaqfeh, Mort Denn, Gerry Fuller, Bill Schowalter, Ron Larson, Hiroshi Watanabe, Andy Kraynik, Jeff Giacomini, John Dealy, Roger Bonnacaze, Dimitris Vlassopoulos, Kalman Migler. Front: Gary Leal, Pierre Carreau, Paula Moldenaers, Faith Morrison, Tom McLeish, John Brady, Antony Beris, Don Baird.



Left, Thank you Anton Paar for sponsoring a raffle, adding additional excitement to the Houston Poster Session. Shown awarding the tablet is Anton Paar representative Darin Hunter.

(Calendar, continued from page 32)

2021

21-25 February 2021

92nd Annual Meeting of The Society of Rheology, Austin, TX, USA, Roger Bonnacaze.

1-6 August 2021

Pacific Rim Conference on Rheology, PRCR2021, Vancouver, Canada.

10-14 October 2021

93rd Annual Meeting of The Society of Rheology, Bangor, Maine, USA, Albert Co.

2022

October 2022

94th Annual Meeting of The Society of Rheology, location, TBA.

2023

29 July-4 August 2023

XIXth International Congress on Rheology, Athens, Greece, Dimitris Vlassopoulos. This meeting

was moved forward one year to eliminate a regular scheduling conflict with the quadrennial ICTAM scheduled in 2024.

2024

February 2024

95th Annual Meeting of The Society of Rheology, location, TBA.

August 2024

25th International Congress of Theoretical and Applied Mechanics (ICTAM).

October 2024

96th Annual Meeting of The Society of Rheology, location, TBA.

2025

October 2025

97th Annual Meeting of The Society of Rheology, location, TBA.

For other meeting notices, see also: www.rheology.org/sor/info/Other_Meetings; www.appliedrheology.org



The Society of Rheology
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CALENDAR OF RHEOLOGY CONFERENCES AND COURSES

2019

8-11 April 2019

Annual European Rheology Conference, AERC2019, Portoroz, Slovenia. (rheology-esr.org/aercs).

15-17 April 2019

Institute of Non-Newtonian Fluid Mechanics (INNFM) Spring Rheology Meeting, Lake Vyrnwy Wales, UK, Karl Hawkins. (www.innfm.org.uk/).

3-7 June 2019

5th International Soft Matter Conference, Edinburgh, Scotland, UK, Alexander Morozov (www.ismc2019.ed.ac.uk/).

2-6 September 2019

European School on Rheology, Leuven, Belgium (cit.kuleuven.be/smart/rheoschool).

6-7 September 2019

ECIS Training Course “Microfluidics and Surface Rheology,” Leuven, Belgium (ecis2019.com).

8-13 September 2019

Conference of the European Colloid and Interface Society, ECIS 2019, Leuven, Belgium (ecis2019.com).

19-20 October 2019

SOR Short Course on Rheology (topic TBA), Raleigh, North Carolina USA.

20-24 October 2019

91st Annual Meeting of The Society of Rheology, Raleigh, North Carolina, USA, Saad Khan; technical program Lisa Biswal and Steve Hudson.

2020

2-7 August 2020

XVIIIth International Congress on Rheology, Rio de Janeiro, Brazil, Paulo de Souza Mendes and Roney Thompson (icr2020.com); in Athens, Greece in 2023.

23-28 August 2020

25th International Congress of Theoretical and Applied Mechanics (ICTAM), Milano Italy, Alberto Corigliano (www.ictam2020.org).

(continues, page 31)