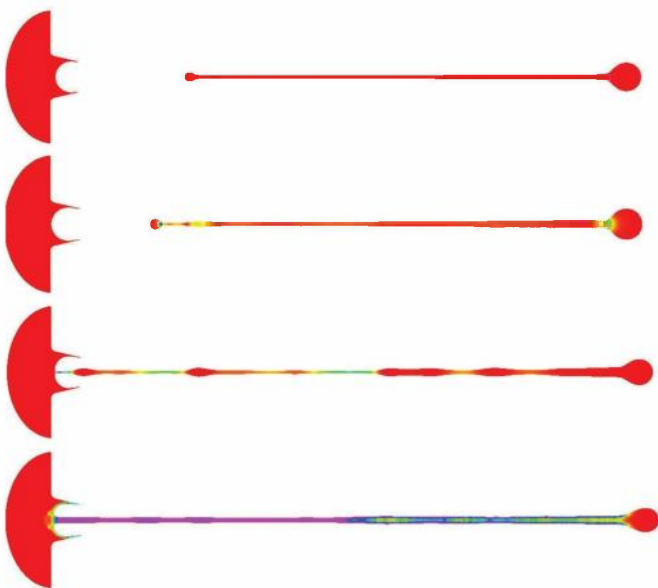

THE BRITISH SOCIETY OF RHEOLOGY

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THE BRITISH SOCIETY OF RHEOLOGY

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THE BRITISH SOCIETY OF RHEOLOGY



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EDITORIAL

Welcome to Volume 54 (issue #2) of the British Society of Rheology Bulletin. The main theme of this edition of the Bulletin concerns a recent INNFM meeting on “Advances in Non-Newtonian Fluid Mechanics” held at Chicheley Hall in March 2013. The meeting contained a Mini-Symposium on “Theoretical Rheology” to commemorate the work of Prof. Russell Davies, who will be retiring from his current position as Head of the Institute of Mathematics at Cardiff University in December 2013. One of the keynote speakers from that session, Bob Anderssen, has provided an article about Russell and his work as a tribute. At the same meeting it was announced by the current Society of Rheology President, Prof. Jeff Giacomini, that Prof. Gareth McKinley would be awarded the prestigious Bingham Medal at the next SoR meeting in Montreal in October. To celebrate this richly-deserved award, Jeff has been kind enough to provide the Bulletin with an “academic tree” tracing Gareth’s PhD supervisors back through time. Finally, in a rather shameless attempt to avoid having to produce new copy, I have introduced a “From the Archives” section: in this first instalment I have taken an article on “Rheology in the Printing Ink Industry” from the very first Bulletin (of the then “British Rheologists’ Club”) to coincide with the theme of the forthcoming midwinter meeting (on “coating, painting and printing”).

Rob Poole, Liverpool July 2013.

SUBMISSIONS TO THE BULLETIN

Submissions to the Bulletin are welcomed. Electronic submissions by email to the Editor (bulletin@bsr.org.uk) are preferred in word format (e.g. .doc or .docx). Please always provide a contact name, address, e-mail, or telephone number in case of problems. The deadline for submission is Feb. 15th, June 15th and Oct. 15th, respectively, for three issues annually.

COVER ILLUSTRATION

Simulations of inkjet formation for solutions of polystyrene in diethylphthalate at different molecular weights (at concentrations that give the same final drop speed) shown when the main drop is 1 mm from the nozzle exit. Images from top to bottom show: a Newtonian fluid of viscosity 0.02 Pa.s; molecular weight of 50 kDa at a concentration of 3%; molecular weight of 200 kDa at 0.095%; a 0.003% solution at a molecular weight of 2000 kDa. The colours (from red to purple) show the viscoelastic stress. (Ref: C. McIlroy, O.G. Harlen, N.F. Morrison. “Modelling the jetting of dilute polymer solutions in drop-on-demand inkjet printing” to appear in Journal of Non-Newtonian Fluid Mechanics (2013)).

AIMS OF THE SOCIETY

The way liquids flow and solids deform affects all aspects of life.

Extraction and processing of crude oil, moulding of plastics, use of toothpaste, spreading of margarine, painting and the lubrication of joints in the human body are all examples of processes depending upon rheological behaviour. Rheology is defined as the science of the deformation and flow of matter.

If your work is concerned with rheology in any way, then you have much to gain by joining the British Society of Rheology, including

- advance your knowledge by attending our conferences
- receive publications including Rheology Abstracts, Bulletin and Rheology Reviews
- learn of current instrumentation and accessories plus new developments.
- access to non-Newtonian Club linking industry and academia
- travel Grants, Poster Prizes, Career Opportunities
- network with fellow members who, while working in a different discipline or industry, may be facing similar problems to yours

The Society is non-profit making and is registered as a charity. For the details, you are warmly welcome to visit our web site <http://www.bsr.org.uk/>, and to apply for membership on-line.

A Tribute to Arthur Russell Davies on his Retirement
The Interconversion Dilemma that is Russell Davies:
Not $G \rightarrow J$ or $J \rightarrow G$, but Rheology $\rightarrow$ Mathematics or
Mathematics $\rightarrow$ Rheology?

Bob Anderssen

Russell and I first met in 1979 at the Delaware Conference “International Symposium on Ill-posed Problems: Theory and Practice”. The common links that forged an immediate friendship were numerical differentiation, the regularization of ill-posed problems and real-world applications.

As a flow-on effect of the interaction initiated by that meeting, Russell took study leave in 1984 to come to Canberra to work with me on numerical differentiation, inverse problems and spectral methods, but not rheology at this stage. This proved to be a very productive research period for Russell and cemented our collaboration and friendship.

In those early years, our discussions focussed on spectral methods and methodology for inverse problems. This included the linear functional strategy, because it represented a practical and useful way to stabilize the recovery of information from an inverse problem. Rheology only entered our collaboration when CSIRO, in response to an Australian government request, initiated collaborative research related to “value adding to food”. Now, along with wheat flour dough rheology, relaxation spectrum recovery, interconversion and the Bernstein theorem became recurring themes in our conversations and collaboration.

For Russell, because of the fundamental role that it played in rheometry, efficient relaxation spectrum recovery was the “holy grail”. The key observation, which led to the conceptualization of “sampling localization” and the subsequent publications [1], was the realization that partial viscosities and elastic moduli could be formalized as linear functionals defined on the relaxation spectrum. Russell’s PhD studies in Oxford, which had involved practical aspects of Fourier analysis, came to the rescue in terms of how to exploit this realization.

The “sampling localization” result is a good illustration of how easy it is to make assumptions about the recovery of information from observational data which do not correctly reflect the reality of the situation. It is often

tacitly assumed that if experimental data are measured on some interval, then the information to be recovered will be recoverable on a corresponding interval independent of the actual experimental protocol used. In relaxation spectrum recovery, using oscillatory shear data, “sampling localization” shows, among other things, that measurements of the storage and loss moduli over the frequency range

$$\omega_{\min} < \omega < \omega_{\max}$$

only determines the relaxation times (τ) on a shorter interval within the reciprocal times interval

$$\omega_{\min}^{-1} < \tau < \omega_{\max}^{-1}$$

Furthermore, the experimental situation is quite different from the theoretical in that if one knew the underlying analytic function exactly on some interval then it follows theoretically that it would be known everywhere.

In 2006, Russell again took study leave in Canberra as a CSIRO Mathematics and Information Sciences visiting scientist. A key goal was the resolving of the interconversion problem [2]: Is the observed instability in solving the interconversion equation to go from J to G a numerical implementation artefact or a fundamental theoretical aspect. The resulting collaboration, in which Frank de Hoog played a central role, represents an excellent example of the impact of applications on mathematics. Not only were we able to establish theoretically that $G \rightarrow J$ is stable and $J \rightarrow G$ cannot be guaranteed to be stable, but also that one can extend the interconversion formalism to the solution of first kind convolution Volterra integral equations, and thereby derive new results about the behaviour of the solutions of such equations.

As we all know, Russell has been a tower of strength in the development of modern rheology, and his mathematical gifts have played a significant role in the quality of his rheological contributions.

Here surfaces Russell’s interconversion dilemma: which of Rheology→Mathematics and Mathematics→Rheology is stable and which is unstable. Ken Walters would say with a twinkle in his eye that it is matter of “theology”. Others would say it is only a “curiosity” or, like the “Deborah Number”, it is the ratio of the time scales. For Russell, the

stability is hidden in the fundamental mathematical facts that form the foundation of rheology such as Bernstein's theorem, because it formalizes the connection of smooth (completely monotone) relaxation moduli with measure theoretic approximations of the real world via the Laplace transform. The potential for instability is hidden in how carefully and rigorously such theoretical results are used to obtain practical rheological insight from experimental measurements.

In various ways, many colleagues in rheology and in mathematics as well as in the wider scientific community have benefited directly and/or indirectly from Russell's approaches to exploiting the rheology-mathematics interconversion. It was a pleasure for all of us who attended the Chicheley Hall celebrations last March to honour Russell's retirement, acknowledge his various contributions and to wish him and Celia enjoyable and rewarding years in retirement.

One is fortunate in life if one has people of the quality and stature of Russell as both a colleague and friend. The friendship involved enjoyable times chopping wood and drinking red wine in Machynlleth, dinners in Aberdovey and walking in the countryside in both Wales and Canberra.

References

- [1] A. R. Davies and R. S. Anderssen, Sampling localization in determining the relaxation spectrum, *J. Non-Newt. Fluid Mech.* 73 (1997), 163-179
- [2] R. S. Anderssen, A. R. Davies and F. R. de Hoog, On the sensitivity of interconversion between relaxation and creep, *Rheologica Acta* 47 (2008), 159-167

"From the Archives"

BULLETIN OF THE

BRITISH RHEOLOGISTS' CLUB

Address for communications: c/o The Institute of Physics,
at The University, Reading, Berks.

NO. 1

JANUARY 1941

Issued (gratis) to members of the Club only.

RHEOLOGY IN INDUSTRY

I. Rheology in the Printing Ink Industry, by V.G.W. Harrison, B.Sc., Ph.D., A.Inst.P., Senior Physicist, Printing and Allied Trades' Research Association.

Printing inks consist essentially of a pigment ground into an oily vehicle. The purpose of the vehicle is twofold: first, it enables the pigment to be distributed easily and evenly over the printing surfaces, and secondly, it acts as a binding medium for attaching the pigment to the paper or material being printed. Vehicles are of two main kinds: (1) mineral oils, and (2) drying oils, such as linseed and tung oils. Inks made on a mineral oil basis are used mostly for printing newspapers and magazines in which a highly absorbent paper is used. "Drying" of such inks takes place by the absorption of some of the vehicle by the paper, leaving a fairly hard and apparently dry mixture of pigment and vehicle on the surface.

Inks/

-2-

Inks of the second class dry by oxidation of the oil to form a hard, rub-proof film in which the pigment is embedded; such inks are used for better class work and for printing on non-absorbent surfaces.

The physical properties of printing inks are important. In the printing press, ink is placed in a duct and is fed by a rotating roller through a narrow adjustable gap on to the distributing rollers. These rollers break up the ink thoroughly and spread it on to the printing block. Finally, the paper is pressed into contact with the block and most of the ink transferred from block to paper. Trouble may arise at each of these stages if the rheological properties of the ink are unsuitable.

In the first place, ink sometimes refuses to feed properly through the narrow gap of the ink duct. Instead, it rolls round and round on top of the duct and very little is transferred to the rollers. The cause of this behaviour is not clear, but it seems probable that the ink is behaving as a plastic with a "yield value" so high that the shearing received in the duct is insufficient to liquefy it; also the degree of wetting of the duct roller by the ink seems to be important.

The purpose of the distributing rollers is to break down the thixotropy of the ink and to smooth out any irregularities in the feed of ink from the duct. The ink is usually passed from one to another of a chain of many rotating rollers, some of which are provided with a reciprocating motion along their axis. With high speed presses a trouble which frequently arises is spraying of ink from the rollers, some inks being much worse in this respect than others. Ink spray is of two kinds, (1) fairly large drops, which seem to be thrown off the rollers by centrifugal force, but which are not found at any great distance from the machine, and (2) a fine mist, which has a strong tendency to persist and which can be carried for distances of several yards. This mist deposits on sheets of paper stacked in the room, causing an objectionable discolouration. The reasons for this misting are obscure and are the subject of research. It seems probable, however, that properties such as viscosity, surface tension and fibrosity are involved.

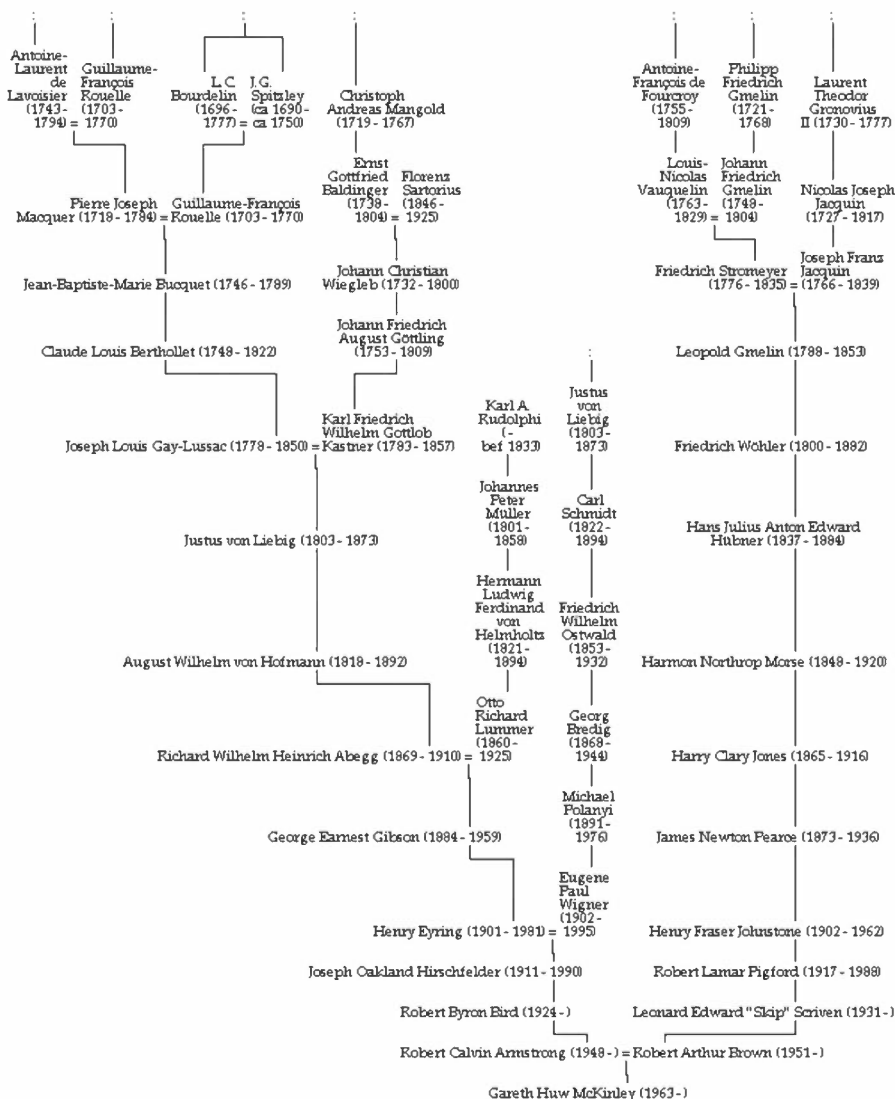
For satisfactory prints, it is essential that the inked impression left on the paper should follow the outline of the type or block as closely as possible. An ink of too low viscosity tends to spread before drying is complete, causing blurring and distortion of tone values in halftone work. Also, when the block is mounted vertically, a low viscosity ink tends to run down the block before the impression is made, so that even inking is impossible. On the other hand, if the ink is of too high viscosity, large forces are developed in high speed presses at the moment when the paper is separated from the block, and these forces may be sufficient to tear off the surface layers of the paper. The pieces so torn off leave objectionable white specks in the print, and the detached paper fibers get covered with ink and fill up the spaces between the halftone dots of the block, giving dirty highlights.

It is thus obvious that, for the best results, the rheological properties of inks need study and control in the works; also, once the best inks for a given purpose are found, these properties should not be altered by the printer by the addition of oils, varnishes, etc. without good reason. At present, the control of the rheological properties of inks is still largely effected by the subjective estimation of such qualities as "body", "length" and "tack". These are not simple physical properties, but some combination of them which may or may not have any real bearing on the behaviour of the ink on the machine. One of the first problems of a rheologist who is required to place the grading of inks on a more scientific basis is to analyse these subjective judgements as far as possible. Thus "body" appears to involve mainly a study of anomalous viscosity, "length" denotes the capacity of an ink
for/

for being drawn out into long, fairly stable threads, and is thus connected with fibrosity, while "tack" is a vague term, but seems to be used mainly to denote the degree of stickiness felt when a film of ink is broken between forefinger and thumb. He must then decide whether these properties are important from the point of view of the printing process, and if so, devise methods for measuring them. Finally, and not least important, the results of the measurements must be interpreted in terms of the printing and working qualities of the ink.

The purpose of rheology in industry is not necessarily to replace the subjective judgments of the practical man, but to supplement them. Without instrumental means of measurement, errors are always liable to be made when the expert has his "off days" or is away from the works. This is now being increasingly realised and the position of rheology in the ink industry thus seems assured for some time to come.

Academic Genealogy¹ for Gareth McKinley



¹An academic, or scientific, genealogy, organizes a family tree of scientists and scholars according to dissertation supervision relationships

Notes for Gareth McKinley's academic genealogy

Gareth McKinley obtained his PhD from the Massachusetts Institute of Technology, under the joint supervision of “the two Bobs”: Bob Armstrong and Bob Brown. He is currently Professor of Teaching Innovation and Associate Head for Research in Mechanical Engineering at the same institution. In October he will be awarded the Bingham medal by the Society of Rheology.

There are many illustrious scientists within Gareth's scientific family tree. Gareth's grandfather on the Bob Armstrong side of the family – R. Byron “Bob” Bird – will be familiar to many BSR members. Bob Bird has made huge contributions to the field of rheology (amongst other fields) and is perhaps most famous for two books: “Transport Phenomena”, with W. E. Stewart and E. N. Lightfoot, Wiley, and “Dynamics of Polymeric Liquids” Vols. 1 and 2 (Fluid Dynamics with R. C. Armstrong and O. Hassager and Kinetic Theory, with C. F. Curtiss, R. C. Armstrong, and O. Hassager). Bob Bird himself won the Bingham medal in 1974. Now almost 90, Bob continues to come to his office on a daily basis at the University of Wisconsin-Madison to work and still publishes (Bulletin readers may recall his contribution in the last edition!).

Continuing the theme of Bingham medal winners, and again skipping a generation, the second ever winner (in 1949) was Henry Eyring. Eyring (February 20, 1901 – December 26, 1981) was a theoretical chemist whose primary contribution was in the study of chemical reaction rates and intermediates. His equation for fitting shear-viscosity data may be familiar to rheologists. Eyring was a member of The Church of Jesus Christ of Latter-day Saints and was distantly related to Mitt Romney through his mother's side of the family.

Going further back we get to Hermann Ludwig Ferdinand von Helmholtz (Aug. 31, 1821 – Sept 8, 1894) who was a German physicist who made significant contributions to numerous areas of modern science. This is who the “Kelvin–Helmholtz” instability is (half)named for. This instability occurs when there is a velocity difference across the interface between two fluids. An example is wind blowing over water: the instability manifests in waves on the water surface. Finally I would like to mention Joseph Louis Gay-Lussac (6 Dec 1778 – 9 May 1850) who was a French chemist and physicist. He is known mostly for two laws related to gases, and for his work on alcohol-water mixtures, which led to the “degrees Gay-Lussac” used to measure the strength of alcoholic beverages in many countries (ABV). A street is named for him in Paris, close to the site of the ESPCI where Pierre and Marie Curie discovered Radium and whose former director, Pierre-Gilles de Gennes (Nobel Prize 1991), will be known to many rheologists.

Tree: Jeff Giacomini, Madison. Text: Rob Poole, Liverpool

BSR Student Travel Awards

The 301st Council Meeting established the principle that student travel grants have the objective of encouraging students to disseminate their research. Applicants for a student travel bursary must normally have been a member of the Society for 9 months, may be working worldwide and presenting research at a conference, by paper or poster. The grant will be made on receipt of a report on the event.

The British Society of Rheology wishes to establish a transparent mechanism for the award of travel bursaries and to solicit applications from its student membership. Travel bursaries are available to student members of the Society to present their research at a conference that contains a strong rheological element, in situations where no other sources of funding are available to cover the whole cost of the meeting. Suitable conferences include the International Congress of Rheology, the Annual European Rheology Conference and conferences organized by the Society.

The next closing date for consideration of the award of a travel bursary is Thursday 5th September 2013 with successful applicants notified by the end of September. Applicants should include in their submission the name and location of the conference, the title, authors and abstract of the paper submitted to the conference, a breakdown of the projected costs of attending the meeting and a supporting letter from their research supervisor. The support of the British Society of Rheology should be mentioned in the conference presentation. The Society's logo may be used for this purpose. Payment of the bursary will be made on receipt of a report on the conference. The conference report will be published in the Bulletin of the Society.

Applications for a travel bursary should be sent to the Secretary (secretary@bsr.org.uk).

Simon Cox
BSR Honorary Secretary



The British Society of Rheology

Midwinter Meeting 2013

“Coating, Printing and Painting”

December 16th & 17th, 2013

Institute for Manufacturing

University of Cambridge

This meeting aims to provide an overview of current research in rheology particularly in its application to printing, painting and coatings, for example in contact and inkjet printing, and spray painting.

Keynote Speakers

Prof Detlef Lohse (University of Twente)

Dr Philip Threlfall-Holmes (AkzoNobel)

Prof Rhodri Williams (Swansea University)

Organising committee:

- **Oliver Harlen** (University of Leeds)
o.g.harlen@leeds.ac.uk
- **Ian Hutchings** (University of Cambridge)

Website: <http://www.bsr.org.uk/meetings.asp>

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University of Cambridge
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Phone: 01223 765598

BSR Annual Award 2013

Nominations are invited for the BSR Annual Award 2013. Each year the BSR makes an award to an individual in recognition of their contributions to rheology. The criteria for the award focus on the scientific merit of the candidate: a person who has made a significant contribution to rheology either through a single paper or more sustained activity. The recipient in 2012 was Tim Phillips, in 2011 David James, and in 2010 João Maia.

Nominations, with a brief supporting statement, should be sent to the President, on president@bsr.org.uk, by the end of August 2013.

Simon Cox
BSR Honorary Secretary

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- Smart Swap™ Geometries & Temperature Systems
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www.tainstruments.com

Thermo Scientific HAAKE RheoScope module: image acquisition at (very) high shear rates using a stroboscope light source

Key words

Thermo Scientific HAAKE MARS, Thermo Scientific HAAKE RheoScope module, Stroboscope light source, Data acquisition at high shear rates, Emulsions, dispersions

The optionally available stroboscope light source extends the capabilities of the HAAKE RheoScope module, facilitating on the one hand an investigation of rheological phenomena on a structural level also at (very) high shear rates and providing on the other hand an improvement of the quality of the microscopic images at lower shear rates due to a shorter exposure time and a higher light intensity.

Thanks to the stroboscope light source, e.g. the behavior of paints and inks during the coating process can be investigated with the RheoScope or the coalescence of emulsion droplets under high shear rates. Shear-induced orientation and deformation in a sample as well as the structural disaggregation and recovery under defined temperature and shear conditions are further examples.

Instead of using a cold light source, a stroboscope (model BVS-II Wotan, Polytech GmbH) can be connected to the RheoScope module using the same light guard. This modification can be made done by the user within seconds without any tools. The stroboscope light source is equipped with a Xenon flash lamp and has a maximum flash frequency of 200 Hz. In order to synchronize the microscopic data acquisition with the flash light of the stroboscope, only the integration time of the camera in the HAAKE RheoWin software needs to be adapted.

High quality images can be obtained up to a shear rate of $44\,000\text{ s}^{-1}$ using the HAAKE RheoScope camera in combination with the stroboscope light source. Based on experience and depending on the individual sample, images up to a shear rate of 2000 s^{-1} can be taken with a cold light source. This means, that the use of a stroboscope light source with the HAAKE RheoScope module extends the measuring range by factor of 20.



Thermo Scientific RheoScope module

In Fig. 1 microscopic images of a dispersion of mineral oil in silicone oil are depicted at three different shear rates using a cold light source (Fig. 1a - c) and a stroboscope (Fig 1e - f). A plate/plate measuring geometry with a diameter of 35 mm and a polished surface using a measuring gap of $50\text{ }\mu\text{m}$ was used. Significant differences are already visible at a shear rate of 1290 s^{-1} (Fig. 1b and 1e):

Images taken using a stroboscope have a much higher quality than those obtained with a cold light source.

Fig. 2 shows, that high quality images up to a shear rate of 44000 s^{-1} can be taken using a stroboscope light source.

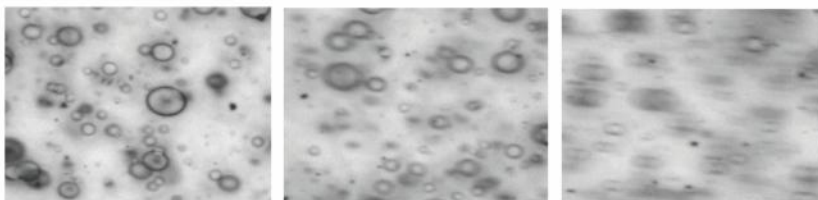


Fig. 1a - c: Images taken using a cold light source at different shear rates: 630 s⁻¹ (1a), 1290 s⁻¹ (1b) and 2520 s⁻¹ (1c)

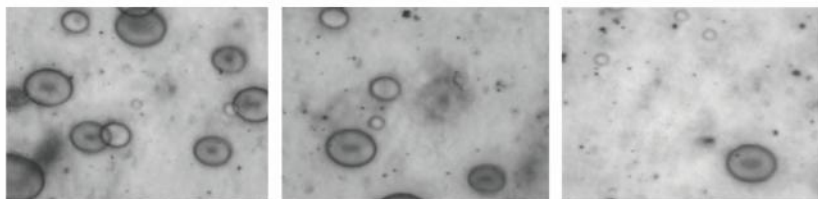


Fig. 1d - f: Images taken using a stroboscope light source at different shear rates: 630 s⁻¹ (1d), 1290 s⁻¹ (1e) and 2520 s⁻¹ (1f)

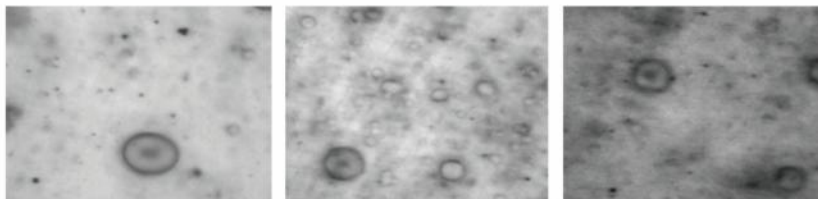


Fig. 2a - c: Images taken using a stroboscope light source at higher shear rates: 5670 s⁻¹ (2a), 12600 s⁻¹ (2b) and 44000 s⁻¹ (2c)

Order information

222-2050 Optional accessory for HAAKE RheoScope module: Stroboscope light source with Xenon flash lamp with maximum flash frequency of 200 Hz (85 V – 265 V / 50 Hz – 60 Hz)

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BSR award winners: Annual Award (AA), Gold Medal (GM)

Back row (left-to-right); Prof. Gareth McKinley (AA 1994), Dr. Oliver Harlen (AA 2006), Prof. Anthony Pearson FRS (GM 1986), Prof. João Maia (AA 2010)

Second row (left-to-right); Prof. David James (AA 2011), Prof. Russel Davies (AA 2005), Prof. Roger Tanner FRS (GM 2000), J.F. Hutton (AA 1979)

Third row (left-to-right); Prof. Manfred Wagner (AA 1981), Prof. Tim Phillips (AA 2012), Prof. Ken Walters FRS (GM 1984)

Front row (left); Dr. Ralph Oliver (AA 1998); (right); Prof. Paula Moldenaers (AA 1991)

Chicheley Hall, March 2013 (photo courtesy of Treesha Baird)

Vernon Harrison Award 2013

In 2003 the British Society of Rheology decided to institute a new annual award for the most distinguished PhD thesis in rheology. The aim of this award is to recognise excellence, creativity and novelty in research and will be awarded to the postgraduate student who, in the opinion of the adjudicating committee, has made the most original and significant contribution to any branch of rheological research (experimental, computational or theoretical) leading to the award of a PhD degree in a given academic year. This prize is partly supported by the Vernon Harrison Bequest. Dr Neil Goulding from Cardiff University was the 2012 winner, with his thesis on "Wavelet Regularization and the Continuous Relaxation Spectrum". The prize for the award will be £500 and an illuminated certificate. The deadline for submission of nominations for the tenth award is 30 September 2013. Entries for the Annual BSR Doctoral Prize for 2013 should now be submitted. Any person who has submitted and successfully defended a thesis in any area of rheology at a higher education institution in the United Kingdom between 1 September 2012 and 31st August 2013 is eligible, whether a member of the Society or not. Each entry should consist of:

- * A two page summary of the research and the key achievements which especially distinguish it as a candidate for this award;
- * A letter from the thesis supervisor confirming the recommendation of the award of a PhD by the candidate and supporting the case for the award, highlighting the specific original contributions of the candidate;
- * The name and address of the external PhD examiner. The Committee may subsequently ask to see a copy of the final version of the thesis in reaching their decision.

An Adjudicating Committee appointed by the Council of the British Society of Rheology will consider the entries. Particular attention will be given to the originality and quality of the thesis. Entries will be selected by the Adjudicating Committee for presentation at a meeting of the British Society of Rheology in December. The Adjudicating Committee may award any number of first and secondary prizes. Travel funds will be available to assist candidates to attend the prize meeting. Proposals for the 2012-13 award should reach the BSR secretary on secretary@bsr.org.uk by September 30th 2013.

Minutes of the 72nd Annual General Meeting (Draft)
Kavli Royal Society International Centre, Chicheley Hall, Tuesday
26th March 2013, 5.30-6.05pm.

1. Present

The President and 28 members. Three votes were cast by email.

2. Apologies for absence

Received from Roland Keunings, Bettina Wolf, Phil Banfill, Rhodri Williams.

3. Minutes of the 71st AGM

These were agreed as a true record of the meeting and signed by the President.

4. Matters arising

There were none.

5. Reports of the Officers

5.1. President

Bill began his report by thanking the organisers of the INNFM meeting at the Kavli Centre at Chicheley Hall for their continuing support of the BSR through these events. You may be aware that it is a long standing tradition to hold the BSR AGM in conjunction with the Easter Meeting of the Institute of Non-Newtonian Fluid Mechanics (INNFM). He also added his congratulations to the INNFM on organising a particularly interesting meeting at a beautiful location.

Also on the theme of meetings, last year's BSR mid-winter meeting was held in Aberystwyth, at another beautiful location on the sea-front. The topic was "Extensional Flows" and the meeting was organised by Simon Cox and David Binding. The meeting was well attended, with about 40 delegates, and a particular highlight was the 2011 BSR Annual award presentation to Prof. David James and his lecture. The delay to this presentation was due to David not being able to come to the previous Midwinter Meeting because of prior commitments.

The next mid-winter meeting will be on the topic of "Coatings, paints and printing" and held in Cambridge, 16–17 December 2013. The organisers are Oliver Harlen and Ian Hutchings.

We continue to receive strong support from the instrument manufacturers who support the BSR meetings, publications and awards to students for which we are very grateful. However, as mentioned last year, we are aware that how the BSR works together with manufacturers is something that we should review from time to time. As a result we have written to the key manufacturers of Rheological equipment asking for their input. We hope that as a result of this it will be possible for the BSR to build on its relationship with our industry sponsors in the future.

In 2011 the BSR Council was informed that the European Society of Rheology had received a proposal to amend its constitution in order to allow individual membership of the ESR. The underlying reason for this is that some of the national societies in Europe have very low membership. This is a sensitive topic not least

because a European Society of Rheology that allows membership is potentially a competitor for national societies. The ESR formed a sub-committee to consider the proposal, and how any concerns could be addressed and mitigated, the resulting draft proposal was presented to representatives of the national societies at the ISFRS in Zurich last year. The finalised proposal was put to a vote at the 2012 ICR in Lisbon and accepted, the ESR is now in a position to start taking individual members and we will keep you informed of developments. In conjunction with this the ESR is also developing a new web-site that they hope will also be a platform for provision of web services to national societies and provide additional facilities such as discussion forums. The BSR is awaiting the launch of the site and will consider how to proceed in terms of our existing site once the ESR site is established.

Prof. P. Rhodri Williams of Swansea University has been nominated by the council to be the next President of the British Society of Rheology. Professor Williams is a world renowned rheologist in fields ranging from extensional flows to blood rheology, he has received the BSR Annual Award and has served on the BSR Council, both as an ordinary member and treasurer. In my opinion he is thoroughly deserving of this post and Bill commended his nomination.

Bill took the opportunity to thank all the members of the BSR Council for all their efforts over the past year. He had enjoyed working with them and relied heavily on their support and advice. They do a great deal in the background to keep the society functioning that is not obvious and he thanked the following officers individually. Simon Cox is doing a great job as secretary and Bill thanked him for being so supportive over his tenure. Steve Goodyer, who is continuing his excellent job as treasurer. Tim Phillips has continued his very efficient job of membership secretary. Alex Lubansky moved back to Australia and so had to resign as abstracts editor, we would all like to thank him for his efforts. Bill expressed his thanks to Nick Hudson who stepped into the breach and once again took on the role. Rob Poole is doing a great job with the bulletin, and Bill's thanks go to him. Bettina Wolf is stepping down from the council. Bill said a special thank you to her for all her efforts with the non-Newtonian club, on behalf of himself and the rest of the Council. Finally, Oliver Harlen will also be stepping down from the council as Immediate Past President. Bill extended his thanks to him especially for all the support he has given over the course of my tenure.

As a result of these moves we have had a number of vacancies on the Council for Ordinary members. Because of the timing of the vacancies, in that two came up shortly after the last AGM we took the decision to co-opt two new members Dr Maria N. Charalambides & Dr Richard Watson. They are standing for election along with Dr Manlio Tassieri.

5.2 Treasurer

Steve Goodyer presented the BSR finances. They are very steady of late with the income for 2012 being £17,975 compared with £18,179 for the previous year. Expenditure was also very similar, outgoings of £16,837 being slightly up on last

year's expenditure of £15,332 as a result of more money being spent on travel awards and prizes (£1,616 more than the previous year).

Publications and meetings, the main activities of the society generally break even, which means that the membership income of £5,429 is spent on travel awards, prizes, council expenses and miscellaneous items such as public liability insurance. A net income of £1,137 can be attributed to the £1,646 interest received on a lump sum of £40,000 which was invested in a deposit account in 2011.

5.3 Hon. Secretary

Simon Cox reported a busy year as secretary, thanks in part to organising the midwinter meeting in Aberystwyth. Forty delegates ventured over the border, fortunately before the snow arrived, for a feast of rheology, with invited presentations from Gareth McKinley and Jens Eggers. And if that wasn't enough, David James gave a well-received annual award talk following his 2011 prize. The TA/BSR Poster Prize was awarded to Chris Rowlatt of Cardiff University during the meeting, for his poster on "An eXtended Spectral Element Method for Two-phase Viscoelastic Flows".

Also from Cardiff University, council were pleased to award Tim Phillips the 2012 annual award for his work on computational methods for the flow of non-Newtonian fluids. Nominations are now open for the 2013 award: please get in touch with Bill or Rhodri before the end of May if you wish to nominate someone, and do bear in mind that the annual award can also recognise achievements by young rheologists!

There were two excellent applications for the 2011/2012 Vernon Harrison Award, and this prize also went to Cardiff University: Dr Neil Goulding, who is now at Bristol University, received his prize in Aberystwyth for a thesis on "Wavelet Regularization and the Continuous Relaxation Spectrum".

The BSR's Travel Awards offer UK PhD students who are members of the society a contribution of £250 towards attending a rheological conference of their choice to present their work. There were two applications for Travel Awards last March and two in October. We awarded them to Gabriel Choong (Nottingham), for the 28th International Conference of the Polymer Processing Society in Thailand, and to Ying Chen (Manchester), for the ICR in Lisbon.

We have made small modifications to the BSR website over the past year, hopefully making it easier to use, and are planning further additional functionality. Unfortunately there are still some problems that require fixing, so please let us know if you come across one.

5.4 Membership Secretary.

Tim Phillips reported that the total current membership (on 24th March 2013) was 357, of whom 77 are Honorary Members, 254 are UK-based, 56 are from Europe and 47 from the rest of the world.

The total membership reported at last year's AGM was 357; there have been 16 new members and 16 resignations.

Take-up of membership following the offer of a year's free membership has been patchy. Potential members are now asked to confirm that they wish to join the BSR before they are issued with access to the website, and are then advised to enter their personal details so as to receive all BSR publications. Four took up this membership after the Midwinter Meeting in Aberystwyth in 2012.

A considerable amount of time is spent chasing members for their membership fees. As of today there have been 157 membership fee payments for 2012 which, given that there are 77 honorary members, means that 123 are still outstanding.

5.5 Bulletin Editor.

In Rob Poole's first year in charge, issues number 2 and 3 of Volume 53 and issue number 1 of Volume 54 have been published and sent to members. In these issues we have been fortunate enough to obtain articles from Malcolm Mackley on scientific instruments he has developed, a series of articles supporting the Ken Walters Commemorative Symposium at ICR 2012, including a limerick from Bob Bird and a lovely article from Roger Tanner discussing their Historical Perspective book; we also had articles from two Vernon Harrison award winners (David Hoyle and Neil Goulding).

In the most recent Bulletin we had contributions from Ralph Oliver and a certain "Dr Watson" together with an interview with Roland Keunings to mark the end of his tenure as Editor of JNNFM. Rob has some ideas for further articles and would encourage members to contact him directly should they wish to contribute something.

Rob has also begun the long job of creating electronic versions (pdfs) of the Bulletin archive. He has scanned the "British Rheologists Club Bulletin #1" and plans to slowly work his way through the Bulletins which we do not have electronic versions of. The intention is also to use these to provide a "from the archives" section in each Bulletin.

5.6 Abstracts Editor.

Dr Alex Lubansky stepped down during the year, as he was returning to Australia to pursue his career. Dr Nick Hudson took over the reins on a temporary basis until today. Over the year, 2415 Abstracts were elicited from over 100 different journals. These were published in 2 double issues (55-1&2, 55-3&4), both electronically on the BSR website, and as hard copy for a number of subscribers (who finance the production) and abstractors. The editor always seeks new abstractors – it is not an onerous task, and you do receive the hard copy.

5.7 Publications Manager's report:

All Bulletins and Abstracts are produced in the Print Unit at the University of Strathclyde, then collected, inserted into envelopes which are labelled, and taken to the mailroom by a packer, and then posted out from the University. In a typical year, 3 separate Bulletins and 2 double issues of the Abstracts are produced and distributed. Also, any fliers that are needed to be sent to our members are also despatched in this way.

5.8 Report on membership survey:

Rob Poole was commissioned to run a survey of members last year. The response was excellent (about 100 people), and the results were to be discussed at the council meeting the next day.

6. Election of Officers and Council members:

There being no further nominations, the nominations circulated with voting papers were approved unanimously by those present at the meeting. The Council for 2013-14 was therefore elected as follows:

President	Prof. P.R. Williams
Hon. Secretary	Prof. S.J. Cox
Hon. Treasurer	Mr S. Goodyer
Membership Secretary	Prof. T. N. Phillips
Bulletin Editor	Dr R.J. Poole
Abstracts Editor	Dr N.E. Hudson

Ordinary members of Council:

Dr M. Charalambides
Dr B. Dobraszczyk
Dr S. Fielding
Mr P. Hodder
Dr M. Tassieri
Dr R. Watson

Bill Frith was thanked for his work as president; he now becomes Immediate Past President.

7. Any other business

Council have suggested replacing the cheque that is currently part of the annual award with something more memorable; we would welcome suggestions.

Simon Cox
Honorary Secretary

William Frith
President

**BSR Student Travel Award Report for the Conference
Report on the 8th Annual European Rheology Conference 2nd–5th
April 2013, Leuven, Belgium**

I would like to thank the British Society of Rheology for its kind support, which made my attendance possible at the 8th Annual European Rheology Conference, held at Leuven, Belgium, from 2nd to 5th April 2013. This has been an inspiring experience for me, and has had a marked impact on my formation as a rheology practitioner.

This conference, organized jointly by the Belgium and Dutch Rheological Societies, with local organisers Peter Van Puyvelde and Patrick Anderson, consisted of varied and interesting symposia. These sessions hosted many excellent talks delivered by high-profile researchers and practitioners. The subject matter was highly interesting and kept the audience busy and active in covering such a variety and wide scope of areas. The venue was most accommodating, offering a welcoming environment to listen and share ideas, and the opportunity to get to know people in the field of rheology in the beautiful Belgium city of Leuven.

Specifically, I was interested in sessions on Computational Rheology, Flow-induced Structure Development, Fluid Mechanics and Flow Instabilities, and Rheology in Living Systems. These subjects lie closely related to my PhD studies, which are on the numerical simulation of worm-like micellar systems in complex flows with application to biomedical and oil-extraction situations. With this in mind, the papers on flow through contraction settings, shear banding and yield-stress fluids, I found most instructive.

My contribution to the conference was given, firstly, in the poster session, where I presented a study based on ‘The numerical simulation of cable coating flows with pom-pom and EPTT models’, characterising industrial melts, with the ultimate objective of providing predictive toolsets to help practitioners with quality control and product development. This session was well attended, and most stimulating, providing interesting questions and new suggestions to continue my research path. Then secondly, through a co-- authored talk delivered by Mike Webster, who presented an oral paper addressing ‘Excess pressure drop (EPD) and vortex dynamics results for the benchmark 4:1:4 contraction expansion flow of thixotropic/micellar fluids’. This work compares a new micellar, thixotropic constitutive approach that introduces viscoelasticity into the network structure construction/destruction kinetic equation, versus the network-based, non-thixotropic EPTT constitutive model, both being shear-thinning. The new micellar models provide consistent excess pressure drop (EPD) values at low We and rising EPD at high elasticity levels. These new micellar models also show great promise in that they manifest higher limiting We than observed with the Modified Bautista-Manero model, from which they originated. Moreover, a convoluted

Micellar/EPTT model was presented, which is capable of reaching stable numerical solutions at relatively large We (~ 300), and that provides cover for a wide range of deformation rates relevant for practical and industrial purposes.

A plethora of interesting talks and posters were presented during the conference. A prominent talk was delivered by Oliver Harlen on inkjet printing. This exposed the key properties of fluids suitable for this application and set the outlines for ink-jet printing and design, based on rheological features of the printing-ink. Under the topic of worm-like micelles, Suzanne Fielding delivered a talk on a universal fluid criterion for banding and necking instabilities to arise, based on common shear flows in rheology. Philippe Coussot presented a talk addressing the boundary layers and non-flowing regions for yield stress fluids. Manuel Alves presented a study on the micro-scale for wormlike micellar solutions past a confined cylinder. Marc Fardin showed some results on viscoelastic turbulence in micellar solutions, where stable shear banded flows evolve into chaotic ones at high elasticity levels.

On rheometry, varied and new approaches to characterise materials were shown during the conference, ranging from novel fluids to nanoscale dimensions. Sunhyung Kim presented an experimental technique showing superposition rheometry for worm-like micellar fluids and Dirk Sachsenheimer presented Capillary Breakup Extensional Rheometry (Caber) for the same type of materials. Anke Lindner gave a talk on measurement of shear material functions of dilute polymer solutions at the micro-scale. This author used a serpentine channel, from which first normal stresses and relaxation times can be obtained, these lying outside the scope of conventional rheometers. Annie Colin gave a keynote talk on how microfluidics could be applied to study rheological properties of complex fluids. Alexandra Aliche presented a talk on the experimental determination of material functions from LAOS for yield-stress fluids.

The symposium for Fluid Mechanics and Flow Instabilities was well populated and held the attention of a wide audience. There, Joana Malheiro presented a paper dealing with the detection of the Dean instability for the flow of viscoelastic liquids in curved channels, using finite volume techniques. Hyun Wook Jung presented a talk on instabilities in film and coating processes. Roland Kádár presented a study on the dynamics of polymer melt extrusion instabilities. Christophe Perge gave a talk in which a new experimental technique, based on ultrasonic imaging, gives evidence of secondary flows in a Taylor-Couette device whilst analysing wormlike micelle solutions.

In the biosystems field, Michael Graham treated the flow-induced segregation in blood and other multicomponent suspensions, in which they discussed how some additives could affect the segregation process and further physiological functions of the blood.

Moreover, I took benefit from the opportunity to expose my own wider research work and gain feedback from many senior colleagues, as with Mike Webster and Octavio Manero, regarding the simulation of micellar fluids in contraction-expansion configurations and in shear banding situations; with Paulo de Souza Mendes, in a most instructive discussion on the formulation of constitutive equations for thixotropic visco-elastoplastic materials; and with Fausto Calderas, on the experimental techniques used to measure shear and extensional material functions of complex fluids and a technological application using ultrasonic waves for dispersing solids into melts to enhance polymer properties.

I was highly motivated to meet practitioners whose research I have been reading and learning about during my studies. This experience was truly beneficial, in offering the opportunity to share promising ideas with high-profile researchers in the field. Of these personal note must go to Roger Tanner, a long-standing rheologist in the field, and Michael Cates, who was presented with the Weissenberg Award this year at AERC 2013.

J. Esteban López-Aguilar, Swansea

**Institute of Non-Newtonian Fluid Mechanics (INFFM) Conference on
“Advances in Non-Newtonian Fluid Mechanics” held at Chicheley
Hall, 25th to 27th March 2013**

This year, the INFFM decided to move its annual meeting outside Wales; it made a very fine choice of venue, namely the Kavli Royal Society International Centre at Chicheley Hall. The latter is a stunning Grade I Georgian Country mansion set within several acres of green space, having being described as one of ‘the dozen finest and loveliest English country houses’ by the British architectural historian and author Marcus Binney. The mansion looked especially striking on the days of the Conference due to a thin dusting of bright snow all over the untrodden fields and high branches of the still naked trees (even though it was almost April!).

The theme of the meeting was ‘Advances in Non-Newtonian Fluid Mechanics’ and it attracted around 40-50 delegates from all over the world. The first session was mostly a theoretical session describing rheological models for diverse applications such as the effect of pre-strain on dough behaviour (Roger Tanner), flow of flexible glass fibres and effect of orientation on viscosity measurements of PP (Don Baird), droplet coalescence behaviour in confined shear measurements (Paula Moldeneers) and molecular dumbbell suspension models in Large Amplitude Shear Flow (Jeff Giacomin). This was followed by a session focussing on more practical aspects of rheology, covering subjects such as core and reservoir flows through porous media (Anthony Pearson) and four talks based around the theme of extensional rheology: LDPE melt behaviour under various test conditions

(Manfred Wagner), flows around a square array of rods (David James), ultra-high extensional rheometry of polymer melts (João Maia) and new developments in rotational rheometers (Joerg Laeuger).

The second day started with a session of quite disparate topics. Gerry Fuller gave a lovely talk about the role of rheology in tear film stability and contact lens comfort. An interfacial rheometer was used to probe the rheology of meibum, an oily substance that prevents evaporation of the eye's tear film, which was found to be strongly viscoelastic and helpful in arresting dewetting. This talk was followed by a contribution from Oliver Harlen regarding capillary thinning and jet break-up of complex fluids. Oliver used the Giesekus model to incorporate shear thinning effects into the models. One of the images from Oliver's talk is the cover print of this edition of the *Bulletin*. BSR members wishing to know more about this subject are encouraged to attend the next BSR Midwinter meeting (see back cover for details). The current BSR secretary, Simon Cox, gave the next talk where he gave a beautiful introduction to the rheology of foams. The final talk in the session was by another committee member, Suzanne Fielding, regarding a general criterion for shear banding including transient shear banding which may be observed for fluids which, although they display a monotone stress-shear-rate relationship in the steady state, may nevertheless exhibit transient shear banding during stress overshoots in start-up flows. Interested members are referred to Suzanne's (with R. L. Moorcroft) paper on this subject in *Physical Review Letters* (**110** (2013) 086001).

Next came the mini-symposium on 'Theoretical Rheology' in honour of Professor Richard Davies who will be retiring from his current position as Head of the Institute of Mathematics at Cardiff University at the end of the year. Prof Davies seemed delighted with the presents his colleagues presented him including a framed group photo taken in 1985 (CDs of classical music, vouchers and even a tea towel!). Two talks of the mini-symposium concentrated on inverse problems: the interconversion of rheological material parameters J and G using viscoelasticity theory (Bob Anderssen) and the inverse determination of relaxation spectra from rheological test data (Igor Emri). These were followed by mostly fluid mechanics focussed talks on pressure driven flow studies in Smectic A Liquid crystals (Sean McKee), instabilities in polymer melts and solutions (Helen Wilson), corner flows of viscoelastic fluids modelled through various rheological constitutive laws (Jonathan Evans), modelling of the blood flow crisis in sickle-cell anemia (Bruce Caswell) and Prandtl boundary layers in viscoelastic flows (Michael Renardy). The use of Fractional Calculus for critical power law gels in the linear viscoelastic regime was also presented in this mini-symposium (Gareth McKinley). The final session on the second day included a talk by this year's BSR Annual Award winner, Prof Tim Phillips, on the theme of bubble dynamics in viscoelastic fluids. Prof Phillips highlighted the important parameters affecting bubble behaviour (surface tension, viscous and elasticity properties, distance from free surface) and presented solutions obtained from Boundary Element Techniques. The last talk of

the day was from the BSR President, Prof Bill Frith, who gave a lecture on the practical aspects of engineering structures for consumer products which will result in the desired properties. He talked about structuring of aqueous phases in products (such as in ice-creams) and surfactant polymer mixtures (shampoos and shower gels).

The third and final day started with talks on polymer effects in microfluidic devices (Xue Feng Yuan), applications of the Proper Generalized Decomposition method by Paco Chinesta and a talk on open channel flow of viscoplastic materials by Paul Slatter.

Last but not least came a session with talks on the exploitation of the yield stress phenomenon for practical purposes such as droplet encapsulation and particle fractionation (Ian Frigaard), numerical solutions for secondary flows in serpentine channels of viscoelastic fluids (Rob Poole) and analytical solutions for extensional coalescence in microfluidics (Adam Burbidge).

The meeting also included a poster session with the winner of the best poster prize Claire McIlroy, University of Leeds (modelling jetting of inkjet solutions: see cover image) and an instrument exhibition by TA Instruments (Peter Hodder) and Anton-Paar (Steve Goodyer). The latter two, together with Cardiff University, were official sponsors of the Conference. The AGM of BSR also took place on the evening of the second day (minutes are included in this issue of the Bulletin).

Maria Charalambides, London
Rob Poole, Liverpool

Commentary on the 338th Council Meeting of the BSR

Chicheley Hall

The 338th Council Meeting was held in the beautiful surroundings of the Kavli Royal Society International Centre at Chicheley Hall on Wednesday 27th March 2013 at 1pm. It immediately followed the scientific meeting "Advances in Non-Newtonian Fluid Mechanics", organised at the same venue by Prof Peter Townsend and Prof Ken Walters of the Institute of Non-Newtonian Fluid Mechanics.

The meeting opened with apologies for absence, approval of the minutes of the previous meeting, and an efficient run-through of the list of matters arising from that meeting. The treasurer reported that the accounts of the Society are in good health, roughly breaking even this year as usual. He also received formal thanks from Simon Cox for his help with the financial arrangements for last year's Midwinter meeting in Aberystwyth. The committee ratified the request of a new member from Australia to join the Society.

The Bulletin Editor noted that the present issue of the bulletin will have arrived in the membership's mailboxes during this week, its contents including an article from this year's Vernon Harrison award winner, and an interview with Roland Keunings on the occasion of his standing down as editor of JNNFM.

The abstracts editor led a discussion on whether the society should continue to provide the abstracts service to members and it was agreed that the committee should email the membership to invite comment. There was a discussion as to whether the Society's annual award should continue in the form of a cash prize or whether a plaque or medal would be a nicer idea and more meaningful to the recipient. The committee also discussed ways in which the mechanisms for soliciting and for judging nominations might be improved.

Volunteers came forward to attend on behalf of Council the committee meeting and dinner of the ESR at AERC in Leuven the week following.

With that, and after an enjoyable sandwich lunch, the committee dispersed out into the snow covered grounds of Chicheley Hall, and from there to the arctic platforms of Milton Keynes Central.

Suzanne Fielding
Ordinary member of Council

Press release from Aptifirst



#1. Aptifirst Ltd is introducing the CTPT3, a computer-controlled workability test for fresh cement or concrete pastes. Based on the two-point test originally developed by Dr Geoff Tattersall at the University of Sheffield in the 1970s, the instrument measures the torque required to rotate an impeller in a 20 - 30 litre sample of the test material at a series of controlled speeds. The resulting plot of torque against speed allows two characteristics of the, usually, Bingham Fluid rheology to be deduced, viz the slope of the line after the yield stress has been exceeded. The CTPT3 includes many improvements on previous versions, notably the

use of a robust but accurate, especially designed torque transducer fitted on the impeller shaft so that the impeller torque is measured directly rather than on the motor side of a gearbox. By so doing, there is no longer any need to determine a baseline to allow for losses in the drive chain or due to temperature changes of oils and grease in the gearbox, or to effect calibration runs as the transducer may be factory calibrated. In order to determine rheology, a rotational bob is supplied with the CTPT3 in order to offer defined geometry. The instrument is supplied with a PC system with purpose-written software, although a version with an embedded PC and touch-screen monitor is available to order.

#2. Aptifirst Ltd supplies a range of made-to-order precision extrusion dies for most capillary rheometers and for other rheological studies. Hyperbolic profile, tapered profile and standard cylindrical profile dies are supplied in a choice of materials, including tungsten carbide and stainless steel.

#3. Aptifirst Ltd has expertise in designing and constructing a range of specialised instruments for rheological investigations, including a "syringe capillary rheometer" for studies of an alumina paste for direct writing rapid manufacturing technology, a purpose-built, remote-controlled, intrinsically safe capillary extrusion rheometer for studying the rheology of explosives and propellants, instrumented hyperbolic dies, a system for non-contact measurement of die swell and viscous heating, adapters for determining the pressure coefficient of viscosity and more.

Press release from Anton Paar

Anton Paar Open New Facility at St. Albans

Anton Paar officially opened their new UK headquarters at St. Albans on 22nd May, 2013. Friedrich Santner, CEO of Anton Paar, made the journey from Graz in Austria to cut the ribbon and explained how the last decade has seen Anton Paar grow from just over 400 persons to almost 2,000. Many customers attended the event and were provided with a demonstration of Anton Paars latest rheometer, the MCR702. The instrument incorporates a TwinDrive™ motor and was well received by the audience. Following the demonstrations rheology based lectures were delivered by Bettina Wolf and Steve Goodyer. A free hog roast with buffet was also provided. The new facility is twice the size of the company's previous facility in Hertford and incorporates a large demonstration laboratory dedicated to Anton Paar instruments.



Peltier Temperature Control for RheolabQC

From a quick single-point check to complex rheological investigations: The RheolabQC sets new standards for carrying out routine rheological tests. The RheolabQC is based on the newest and most innovative technologies used in R&D rheometers. It provides unrivalled performance combined with very easy operation and robust design. Adding to the versatility of the RheolabQC is the new peltier

temperature controller. This accessory can cool and heat samples without any water supply and covers the range 0°C-180°C.

For further information or assistance please contact

steve.goodyer@anton-paar.com

CONFERENCE & COURSE DIARY

2013		CONFERENCES & MEETINGS
30 -31 July Zlin, Czech Republic	'Novel trends in rheology V' Contact person: Prof. Ing. Martin Zatloukal, Ph.D. mzatloukal@ft.utb.cz Conference website: http://noveltrends5.ft.utb.cz/home.html	
18 – 22 Aug Durham	IUPAC 10th International Conference on Advanced Polymers via Macromolecular Engineering Organiser: Dr Lian Hutchings (l.r.hutchings@durham.ac.uk) Conference website: http://www.dur.ac.uk/soft.matter/apme2013/	
13 -17 Oct Montreal Quebec	The Society of Rheology 85th Annual Meeting For updates see http://www.rheology.org/sor/annual_meeting/default.htm	
18 -21 Nov Rueil Malmaison France	5th Workshop on Viscoplastic Fluids: From Theory to Application Conference Organization: Patricia Fulgoni patricia.fulgoni@ifpen.fr Scientific Correspondent: Anthony Wachs VPF2013@ifpen.fr	
16 -17 Dec Cambridge	BSR MWM2013: Coating, Printing and Painting Organising Committee: Ian Hutchings (University of Cambridge), Oliver Harlen (University of Leeds; o.g.harlen@leeds.ac.uk) Meeting Contact: Alice Cozens ac867@cam.ac.uk	
2014		CONFERENCES & MEETINGS
8 -11 Apr Karlsruhe Germany	9th Annual European Rheology Conference (AERC 2014) Organiser/Contact details: German Rheological Society (DRG) Conference Contact: Prof. Dr. N. Willenbacher: Norbert.Willenbacher@kit.edu Prof. Dr. M. Wilhelm: Manfred.Wilhelm@kit.edu Conference website: http://www.aerc2014.kit.edu/	
2013		COURSES & WORKSHOPS
Nov 2013 St. Albans UK	Rheology Workshop Steve Goodyer, Anton Paar Ltd, 13, Harforde Court, John Tate Road, Hertford, SG13 7Q T: +44 (0)1992 514730; F: +44 (0)1992 514739 E: steve.goodyer@anton-paar.com	
2014		COURSES & WORKSHOPS
13 - 15 May Glasgow	Process Rheology CONTACT: Dr Nick Hudson, Dept Pure & Applied Chemistry, University of Strathclyde, 295 Cathedral Street, Glasgow, UK T: +44(0)141 5482162; F: +44(0)141 5484822 E: n.e.hudson@strath.ac.uk	



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