



FRC

The Pulp & Paper Fundamental Research Society

## Advances in Pulp and Paper Research

**14<sup>TH</sup>** Fundamental Research Symposium  
in the Oxford and Cambridge Series

held at

**St Anne's College  
Oxford  
England**

**13th – 18th September 2009**

The Pulp and Paper Fundamental Research Society is an independent, charitable organisation registered in Great Britain for the promotion of research and education in the pulp and paper industry. Its principal activity is the organisation of these four yearly Symposia, alternately in the English Universities of Oxford and Cambridge.

## Symposium Venue

The 2009 Symposium will return to the university city of Oxford but to a new venue for the FRC, St Anne's College which combines modern facilities with the traditional aspects of an Oxford College. Conveniently located close to the centre of old Oxford, St Anne's College offers a purpose built lecture theatre and modern en-suite bedrooms. In addition to the technical sessions and daytime refreshments the college also offers a full accommodation package which will enable delegates to enjoy the ambience of college life and gain full benefit from this week long event. All facilities at the college are literally within a few minutes walk of each other.



## Accommodation & Dining

St Anne's College offers 184 well appointed en suite bedrooms offering a degree of comfort not always found in college accommodation, surrounding a central lawned area situated within 5 acres of tranquil leafy grounds. Many of these rooms can be made up as twins and in addition there are 90 standard rooms with wash basins and shared bathrooms. The main accommodation packages are offered on the basis of the en suite rooms unless otherwise specified. All rooms have internet connections and will be reserved on a strictly first come first served basis.

Lunch and evening dinners will be taken in the College Dining Hall and will be of restaurant quality. St Anne's College enjoys an enviable reputation for both food and service. In a recent competition amongst Oxford Colleges, the highly coveted award for "Chef of the Year" went to the St Anne's head chef.

## Poster Session: "Fundamental Research Communications"

In a new departure for FRC Symposia the 2009 event will also include posters in an auxiliary event "Fundamental Research Communications". There will be an introductory session on the Tuesday afternoon when presenters will be given the opportunity to introduce their posters, which will be available for further viewing during all refreshment breaks and at the end of the technical sessions each day. In addition to the Symposium Proceedings delegates will also receive abstracts of the posters in their delegate bags upon arrival at St Anne's College.

## Symposium Fees

Having listened to the feedback from delegates at the last FRC Symposium the 2009 event is being offered, for delegate administration purposes, on the basis of two separate fees, an *Event Fee* and a *Residence Fee* but the intention is that delegates should take advantage of both packages to gain maximum benefit from this event. Details of what is being provided for those fees are shown below and in addition there will be reduced fees for bona fide students and retired persons together with other limited variations as shown in the Fee Summary on Pages 10/11.

### *The Event Fee*

This Fee covers attendance at the full event, lunch and two refreshment breaks each day together with a full hard back set of Proceedings for the Symposium: two volumes containing the research and review papers to be collected from the Registration desk upon arrival in Oxford and, shortly after the event, a third volume of all the discussions including a full index and a fully searchable CD containing all three volumes of the Proceedings. Upon arrival at the event delegates will also receive in their delegate bag a separate booklet containing the abstracts for the auxiliary "Fundamental Research Communications" poster event. Registered delegates will also be offered, by means of a password to be provided closer to the event, the facility to download copies of up to five papers in the period leading up to the Symposium.

### *The Residence Fee*

This fee provides bed & full English breakfast accommodation at St Anne's College, Oxford plus an evening meal for 5 nights, Sunday to Thursday inclusive. The evening meal will be provided as dinner in the college on 3 nights, a welcome reception with buffet on the Sunday evening and attendance at the Banquet (with entertainment) to be held at Exeter College, Oxford on the Thursday evening. The fee also includes a guided bus tour of Oxford on Wednesday afternoon.

The FRC considers that this is a very attractively priced package for accommodation in fully-equipped en suite rooms with restaurant quality food, compared to local alternatives. Delegates to the event who do not avail themselves of this Residence Package will not be able to attend any of the evening meals including the banquet. Attendance at the banquet will not be offered on a separate basis as numbers in the Exeter College dining hall are strictly limited and will be reserved on a first come first served basis for delegates and accompanying persons.



# Programme

**MONDAY SEPTEMBER 14**

**08:50 START**

**Welcome from the Chair of the Fundamental Research Committee**

**S.J. I'Anson**, University of Manchester, UK

**Keynote address**

**SESSION 1: FIBRE PREPARATION**

**Session Chair: Warren Batchelor**

1. Novel fractionation methods: separation in a viscoplastic fluid.  
A. Madani, S. Storey, J.A. Olson, **D.M. Martinez**, *University of British Columbia, Canada*; J. Salmela, *VTT, Finland*.
2. The net normal force per crossing point: A unified concept for the low consistency refining of pulp suspensions.  
**J.C. Roux**, J.-F. Bloch, R. Bordin and P. Nortier. *Laboratoire de Génie des Procédés Papetiers, France*.

**10:45 – 11:15 COFFEE**

3. Simulation of flotation deinking lines: effect of surfactant concentration on process yield.  
**D. Beneventi**, J. Allix, P. Nortier, *Laboratoire de Génie des Procédés Papetiers, France*; E. Zeno and B. Carré, *CTP, France*.
4. Analysis of fibre deformation processes in high consistency refining based on Raman microscopy and X-ray diffraction.  
**W. Hamad**, N. Gurnagul and D. Gulati, *FPIInnovations—Paprican, Canada*.

**12:30-13:45 LUNCH**

**SESSION 2: FIBRE SUSPENSIONS AND FORMING**

**Session Chair: Ari Kiviranta**

5. New experimental results on the flow regimes in closed channel flows of wood fibre suspensions.  
**A. Jäsberg**, M. Kataja, *University of Jyväskylä, Finland*; P. Raiskinmäki, *Jyväskylä University of Applied Science, Finland*.
6. Near-wall estimates of the concentration and orientation distribution of a semi-dilute rigid fiber suspension in Poiseuille flow.  
**P. Krochak**, J.A. Olson and D.M. Martinez, *University of British Columbia, Canada*.

**15:00 – 15:30 COFFEE**

7. Evolution of the paper structure along the length of a twin-wire former.  
**S.B. Lindström**, T. Uesaka, *Mid Sweden University*; U. Hirn, *Graz University of Technology, Austria*.
- 7a. Response to 'Evolution of the paper structure along the length of a twin-wire former'  
**D. Söderberg**, *STFI-Packforsk, Sweden*.
8. Single fibre flexibility measurement in a flow cell based device.  
**R. Eckhart**, M. Donoser and W. Bauer, *Graz University of Technology, Austria*.

**17:00 CLOSE**

## TUESDAY SEPTEMBER 15

### 09:00 START

#### Session Chair: Norayr Gurnagul

9. **Review:** Optical properties of paper: theory and practice  
**R.R. Farnood**, University of Toronto, Canada.

### SESSION 3: TRANSPORT AND MOISTURE INTERACTIONS

10. A comparison between hygroexpansion and hydroexpansion of paper – influence of grammage, moisture content, and fibre furnish, and the effect of chemical modifications  
**P.A. Larsson**, L. Wågberg, *KTH Royal Institute of Technology, Sweden*; M. Hoc, *STFI-Packforsk, Sweden*.
11. On the importance of in-plane shrinkage and through-thickness moisture gradient during drying on cockling and curling phenomena  
**P. Lipponen**, T. Leppänen, J. Hämäläinen, *University of Kuopio, Finland*;  
A. L. Erkkilä, *Metso Paper, Finland*.

### 10:45 – 11:15 COFFEE

12. Flow permeability of fibrous porous materials. Micro-tomography and numerical simulations  
**V. Koivu**, K. Mattila, J. Alaraudonjoki, M. Kataja, *University of Jyväskylä, Finland*;  
M. Decain, J.-F. Bloch, *Laboratoire de Génie des Procédés Papetiers, France*;  
C. Geindreau, *University of Grenoble, France*.
13. Anisotropic and multiscale moisture transport in paper: Impact of pore and fiber space tortuosity.  
Y. Defrenne, S. Ramaswamy, V. Goel, A. Gupta, Y. Zhdankin, *University of Minnesota, USA*; S. Lavrykov and **B.V. Ramarao**, *SUNY, USA*.

### 12:30-13:45 LUNCH

#### Session Chair: William Sampson

14. A simple model of the air permeability of paper.  
P. Shallhorn and **N. Gurnagul**, *FPIInnovations—Paprican, Canada*.
15. A laboratory investigation into the origin of machine direction microstriations.  
**M.F.C. Lucisano** and H. Vomhoff, *STFI-Packforsk, Sweden*.

### 15:00 – 15:30 COFFEE

16. **Review:** Biochemistry in papermaking.  
**J.J. Pawlak**, *North Carolina State University, USA*.

### FUNDAMENTAL RESEARCH COMMUNICATIONS (POSTERS)

An introductory overview of work presented in posters will be provided in a series of brief presentations, after which delegates will break to view and discuss the posters over a glass of wine. A list of poster presentations is available on the symposium website (<http://www.frcl4oxford2009.org.uk/>).

## WEDNESDAY SEPTEMBER 16

### 08:45 START

### SESSION 4: RUNNING WEBS

#### Session Chair: Anders Åström

17. Instability of webs: The prediction of troughs and wrinkles.  
**J.K. Good**, J.A. Beisel, H. Yurtcu, *Oklahoma State University, USA*.

18. System stability of the open draw section and paper machine runnability.  
**S. Edvardsson**, *Mid Sweden University, Sweden*; T. Uesaka, *FPIInnovations—Paprican, Canada*
19. Wet web rheology on a paper machine.  
**A. Tanaka**, J. Asikainen, J.A. Ketoja, *KCL Science and Consulting, Finland*.

### 10:30 – 11:00 COFFEE

## SESSION 5: STRUCTURE AND ANALYSIS

### Session Chair: Daniel Söderberg

20. **Review:** Three-dimensional structural analysis of paper.  
**J.-F. Bloch**, S. Rolland du Roscoat, *Laboratoire de Génie des Procédés Papetiers, France*
21. Structural invariance of stochastic fibrous networks.  
**C.T.J. Dodson**, W.W. Sampson, *University of Manchester, UK*.

### 12:15-13:15 LUNCH

22. Spatial partitioning of the structural properties of tissue and towel grades.  
**D.S. Keller**, *Miami University, USA*; D. Branca and O. Kwon, *SUNY, USA*.
23. Introducing a concept to link 3D paper structure to 2D paper properties.  
**U. Hirn**, M. Donoser, J. Kritzinger, W. Bauer, *Graz University of Technology, Austria*.

### 14:30 CLOSE

## THURSDAY SEPTEMBER 17

### 09:00 START

### Session Chair: Wolfgang Bauer

24. **Review:** Surface analysis  
**J. Preston**, *Imerys, UK*.

## SESSION 6: MECHANICAL PROPERTIES

25. Developing a deeper understanding of the constitutive behaviour of paper.  
**D.W. Coffin**, *Miami University, USA*.
26. Development of the notched shear test.  
**M. Nygård**s, S. Östlund, *KTH, Sweden*; C. Fellers, *STFI-Packforsk, Sweden*.

### 10:45 – 11:15 COFFEE

27. The influence of microfibrillated cellulose on paper strength and surface properties.  
**K. Syverud**, G. Chinga-Carrasco, Ø. Eriksen, *PFI, Norway*; Ø. Gregersen, *Norwegian University of Science and Technology, Norway*.
28. The effect of fibre orientation on the zero-span testing of paper.  
S. Dowlatshahi, **M.T. Kortschot**, *University of Toronto, Canada*.

### 12:30-13:45 LUNCH

### Session Chair: Gary Baum

29. **Review:** Permanence, durability and degradation.  
**H. Ding**, *Doble PowerTest, UK*
30. On the mechanisms of mechano-sorptive creep reduction by chemical cross-linking.  
**M. Gimåker**, L. Wågberg, *KTH, Sweden*; A.-M. Olsson, L. Salmén, *STFI-Packforsk, Sweden*.

## 15:00 – 15:30 COFFEE

31. Effects of furnish related factors on tension and relaxation of wet webs.  
**E. Retulainen** and K. Salminen, *VTT, Finland*.
32. Prediction of fibre orientation and stiffness distributions in paper – an engineering approach.  
**T. Wahlström**, *Stora Enso, Sweden*.
33. Effect of drying conditions on the tensile properties of paper.  
**P. Mäkelä**, *STFI-Packforsk, Sweden*.

## 17:15 CLOSE

## FRIDAY SEPTEMBER 18

## 09:00 START

### Session Chair: John Roberts

34. **Review:** Bioactive paper – a paper science perspective.  
**R. Pelton**, *McMaster University, Canada*.

### SESSION 7: CHEMISTRY

35. Bioactive enzymatic papers.  
W. Shen, M.S. Khan, J. Tian, L. Xu, **G. Garnier**, *Monash University, Australia*.
36. Adhesive and long-range capillary forces between hydrophobic surfaces in water: effects of surface topography.  
**V. Wallqvist**, P.M. Claesson, A. Swerin, *Institute for Surface Chemistry, Sweden*;  
C. Östlund, *STFI-Packforsk, Sweden*; J. Schoelkopf, P. Gane, *Omya Development, Switzerland*.

## 10:45 – 11:15 COFFEE

37. Optimizing precipitated calcium carbonate floc structure and strength for papermaking applications.  
**R. Gaudreault**, N. Di Cesare, *Cascades Inc., Canada*; T.G.M. van de Ven, *McGill University, Canada*; D. Weitz, *Harvard University, USA*.
38. On fundamentals and applications of superhydrophobicity in papermaking and packaging.  
**A. Swerin**, *Institute for Surface Chemistry, Sweden*.

## 12:30-13:45 LUNCH

### SESSION 8: COATING AND PRINTING

#### Session Chair: Patrice Mangin

39. A structural analysis of the thermal conductivity of paper coatings: Application of particle deposition simulation to a lumped parameter model.  
**P. Gerstner**, J. Paltakari, *Helsinki University of Technology, Finland*; C.J. Ridgeway, P.A.C. Gane, *Omya Development, Switzerland*.
40. Probabilistic analysis of small-scale print defects with aligned 2D measurements.  
**M. Mettänen**, M. Lauri, R. Ritala, *Tampere University of Technology, Finland*;  
U. Hirn, *Graz University of Technology, Austria*.
41. Fundamental studies of linting in offset printing of newsprint.  
**W.J. Batchelor**, A. Sudarno, C. Gujjari, *Monash University, Australia*; P. Banham, *Norske Skog, Australia*.

## CLOSING REMARKS: S.J. I'Anson, FRC Chairman

## 15:30 SYMPOSIUM CLOSE AND COFFEE



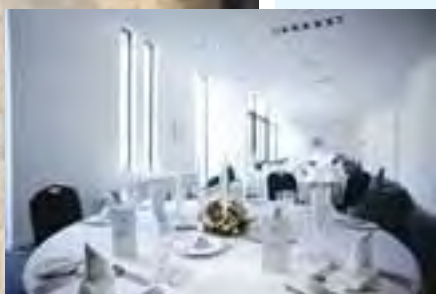
## Social and Accompanying Persons Programmes

In keeping with the approval comments received at the 2005 event, the social programme has again been kept to a minimum leaving plenty of time for catching up with old colleagues and collaborators and for forging new contacts in the college bar or for exploring the beautiful and historic city of Oxford, which is within close walking distance of the college.

An Accompanying Persons social package has been arranged as detailed below taking in visits to the city and local area attractions. This will be subject to minimum numbers.

### Social Programme

- |                                 |   |
|---------------------------------|---|
| <b>Sunday 13th September</b>    | - Welcome Reception with drinks and fork buffet   |
| <b>Monday 14th September</b>    | - Speakers Dinner in Ruth Deech Foyer<br>- Informal Dinner for delegates in Dining Hall   |
| <b>Tuesday 15th September</b>   | - Poster Session discussions with wine.<br>- Informal Dinner for all in Dining Hall   |
| <b>Wednesday 16th September</b> | - Mid afternoon guided bus tour of Oxford plus free time to explore at leisure before returning to St Anne's College for Dinner |
| <b>Thursday 17th September</b>  | - Pre Dinner Drinks Reception at Museum of History of Science<br>- Banquet at Exeter College with musical entertainment         |



## Accompanying Persons Social Programme

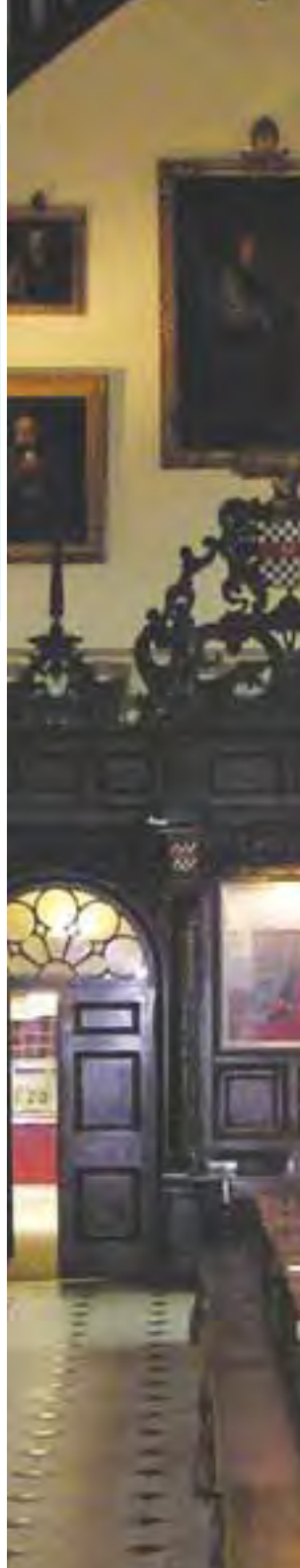
<b>Sunday 13th September</b>	- Join delegates for the Welcome Reception
<b>Monday 14th September</b>	- Themed tour in Oxford with guide
<b>Tuesday 15th September</b>	- Full Day Coach tour of Cotswolds
<b>Wednesday 16th September</b>	- Morning at leisure - Join delegates for coach tour of Oxford
<b>Thursday 17th September</b>	- Visit to Waddesdon House inc Lunch

### Banquet

To provide delegates to the 14th FRC Symposium with the complete Oxford experience the Symposium Banquet is to be held in the beautiful old Dining Hall of Exeter College, the fourth oldest college in the University of Oxford having been founded in 1314 by the Bishop of Exeter, Walter de Stapeldon. To further enhance this experience the pre dinner drinks reception will be held in the History of Science Museum located adjacent to Exeter College in the heart of old Oxford. Attendance at the banquet is strictly limited to 150 and places will be allocated, on a first come first served basis including accompanying persons, to those delegates purchasing the Residence Package. Delegates taking the Residence Package too late to be allocated places will be offered alternative dining facilities for the Thursday evening.



Dining Hall  
Exeter College



## Summary of Available Fees

### **EARLY REGISTRATION (before Friday 17 July 2009)**

**The Event Fee** (as detailed on page 3)      £625 plus £13.75 VAT = **£638.75**

**The Residence Fee** (as detailed on page 3)      £595 plus £18.60 VAT = **£613.60**

**Student Event Fee**      £350 plus £7.70 VAT = **£357.70**

Students claiming this reduced fee will be required to provide a note from their supervisor to the effect that they are bona fide students. They may also be required to assist with the administration of the event.

**Student Residence Fee**      £480 plus £18.60 VAT = **£498.60**

As further encouragement to students a reduced residence fee is being offered but this will be on the basis of occupying rooms that do not have full en suite facilities. The rooms concerned have washbasins and shared bathrooms. If students require full en suite facilities then the full Residence Fee must be paid.

**Retired Persons Event Fee**      £315 plus VAT £6.93 = **£321.93**

In keeping with the practice established at previous events genuine retired persons are being offered attendance at the 2009 event at a reduced fee, Such persons will be required to confirm that they no longer have any gainful income and that they do not offer their services as consultants. Retired persons registering at this fee level will however still have to pay the full Residence fee.

**Accompanying Persons Residence Fee**      £350 plus £16.20 VAT = **£366.20**

This fee is offered to accompanying persons sharing a twin bedded room with a full registered delegate. Such accompanying persons would receive full accommodation, all dinners including the banquet, attendance at the welcome reception plus two lunches and varied refreshments to fit in with the timings of the Accompanying Persons social programme.

**Accompanying Persons Social Package Fee**      £75 plus £11.25 VAT = **£86.25**

This package provides a themed walking tour within Oxford on Monday, a full day coach tour of The Cotswolds on Tuesday and a visit (by coach) to Waddesdon House, a nearby "Stately Home", including Lunch on Thursday.

### **3 Day Registration Event Fee**

£450 Plus £9.90 VAT = **£459.90**

This fee allows for attendance at any three contiguous days with lunch and refreshment breaks on each day plus the proceedings of the Fundamental Research Symposium and the Fundamental Research Communications poster event.

### **3 Day Residence Fee**

£395 Plus 18.20 VAT = **£413.20**

This fee provides accommodation at St Anne's College together with associated meals and social events for any three contiguous nights.

### ***LATE REGISTRATION (after Friday 17 July 2009)***

The "early registration" fees apply only for registrations received prior to Friday 17th July 2009. After that date the full **Event Fee** will increase by **£100** plus VAT and the various other **reduced event fees** will increase by **£50** plus VAT.

### **On-Line Registration**

Registration for this event is available on-line by following the links on the event website

[www.frc14oxford2009.org.uk/](http://www.frc14oxford2009.org.uk/)

Confirmation of attendance can be secured by credit card payment or by provision of a purchase order number against which an Invoice will be issued. If you do not have access to the internet or have other restrictions which prevent utilisation of the on-line registration procedure then please contact the FRC booking agents Archer Yates Associates Ltd

either by email on [frc@archer-yates.co.uk](mailto:frc@archer-yates.co.uk)

or by telephone on +44(0)1608 659900

to discuss your registration requirements.

### **Terms & Conditions**

In order to receive the discounted Early Registration rate fully completed Registrations must be received and accepted by the organisers by Friday 17th July 2009, clearly showing the planned method of payment.

Registrations received and accepted after this date will be charged at the higher Late Registration rate.

Invoices are due for payment immediately upon receipt. Completion and acceptance of a Registration for this event is deemed to form a business contract between the Delegate and the organisers of the event, the FRC.

Registration at the event will commence at 16.00 on Sunday 13th September 2009 and continue until 19.30. Thereafter the registration desk will be open each day during normal Symposium hours.

The FRC and St Anne's College cannot accept responsibility for any loss, damage or injury to delegates, accompanying persons or their property whilst attending this event. Delegates should ensure that they are adequately insured for all eventualities whilst attending the event.

## Cancellations

Cancellations will be accepted and fees refunded (less 20% handling charge) only if made in writing and received by Archer Yates Associates Ltd ten days before the event. There can be no refunds thereafter but substitutions may be made at any time by advising Archer Yates Associates Ltd in writing.

**VAT.** The 14th FRC Symposium is deemed to be an Education/Research event organised by an eligible body (FRC). The Symposium and directly related board and lodging costs are therefore exempt from UK VAT. Associated social events including the banquet and some support services are not exempt and are subject to the VAT shown above and on the on-line Registration Form and must be paid by all delegates registering for this event.

## Further Information

Full details of this event can be found on the event website  
[www.frc14oxford2009.org.uk/](http://www.frc14oxford2009.org.uk/)

If however further information is required please contact the FRC booking agents

Archer Yates Associates Ltd  
Threshers Yard, West Street, Kingham, Oxfordshire OX7 6YF  
Tel +44 (0) 1608 659900 Fax +44(0) 1608 659911  
Email [frc@archer-yates.co.uk](mailto:frc@archer-yates.co.uk)

The 14th Fundamental Research Symposium is being organised by the FRC and is co-sponsored by APPITA, PAPTAC, PITA and TAPPI.

