MAPHYSTO NEWS

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THIS ISSUE

INTRODUCTION

What you are currently reading is the first issue of MAPHYSTO NEWS. It is the intention that future issues will appear bi-annually around February and September.

The Centre for Mathematical Physics and Stochastics - MaPhySto - is a mathematical research centre funded by the Danish National Research Foundation. The Centre came into existence on 1 April 1998 and it is located administratively at Department of Mathematical Sciences, University of Aarhus. The Scientific Director is Ole E. Barndorff-Nielsen and a group of about twenty mathematicians, from the universities of Copenhagen, Odense, Aalborg and Aarhus, are associated with the Centre as "Principal Investigators". In addition, the Centre comprises a number of "Associated Investigators".

The main fields of activity of MaPhySto are Mathematical Physics (e. g. quantum mechanics, statistical mechanics, quantum field theory) and Stochastics (e. g. stochastic analysis, interactive particle systems, stochastic matrices, free probability), with some particular emphasis on the interplay between these two fields. Aspects of Stochastic Computation, Inverse Problems and Analytic Number Theory are also part of the ambit of the Centre.

FIGURE 1. Scientific Director
Ole E. Barndorff-Nielsen

The personal research of the participating investigators form the backbone of the Centre activities. Based on this, MaPhySto aims to build up knowledge and research in parts of the above-mentioned areas that seem of key importance for future developments in mathematics, whether theoretical or applied. It is sought, in particular, to expand and make more coherent the spectrum of competence represented in mathematics in Denmark.

Concretely, MaPhySto seeks to achieve this through a broad range of activities: short and long term visits by leading international researchers; workshops; conferences; concentrated advanced courses; and summer-schools.

Longer lecture series by international or Danish mathematicians are also given.

As an important element in securing a lasting effect of these endeavours the Centre has a number of postdoc positions, that are generally announced internationally.

Recent Events

Start-up meeting in Middelfart. On May 1-2, 1998 the Centre staff and most of the Principal Investigators defied a national strike and gathered for a short start-up workshop. The meeting took place at Middelfart Kursuscenter with the picturesque surroundings of Lillebælt and new-leaved beech forest.

The purpose of the meeting was two-fold: Firstly, since the Centre's ambition is to combine the efforts of different groups (both geographically and mathematically) of researchers, it is important to *see* and *talk* to each other. Secondly, it was felt necessary to have this gathering as a sort of a mental "lift-off" of the Centre and its endeavours.

Of course there were also many practical details to be sorted out on this occasion.

FIGURE 2. Centre staff and most of the Principal Investigators. From left to right (back row): Oddbjørg Wethelund (centre secretary), Jan Philip Solovej, Eva B. Vedel Jensen, Arne Jensen, Bergfinnur Durhuus, Steffen L. Lauritzen, Michael Sørensen, Ole E. Barndorff-Nielsen, Martin Jacobsen, Erik Skibsted and Erik Balslev. Front row: Jesper Møller, Søren Have Hansen (project manager), Jens Ledet Jensen, Goran Peskir and Uffe Haagerup. Absent are Søren Asmussen, Jan Ambjørn, Jørgen Ellegaard Andersen, Svend Erik Graversen and Jørgen Hoffmann-Jørgensen.

Malliavin Calculus. In the week May 25-29, 1998, Bernt Øksendal (University of Oslo) gave a *Concentrated Advanced Course on Malliavin Calculus – with applications to finance.* The Course had 40 participants representing the European countries Finland, Sweden, Norway, Denmark, Germany, Portugal, Spain and Italy.

The combination of Bernt Øksendal's well-prepared enthusiastic lectures and the afternoon problem sessions (run by our highly competent post-doc Fred Espen Benth) proved very fruitful. During the course Fred wrote up some supplementary notes which subsequently were sent to each participant. The notes appeared as No. 1 of the MaPhySto *Miscellanea* series.

Bernt has kindly agreed to give a similar course at a later occasion on some of the connections to quantum physics. This course will of course be announced in due time.

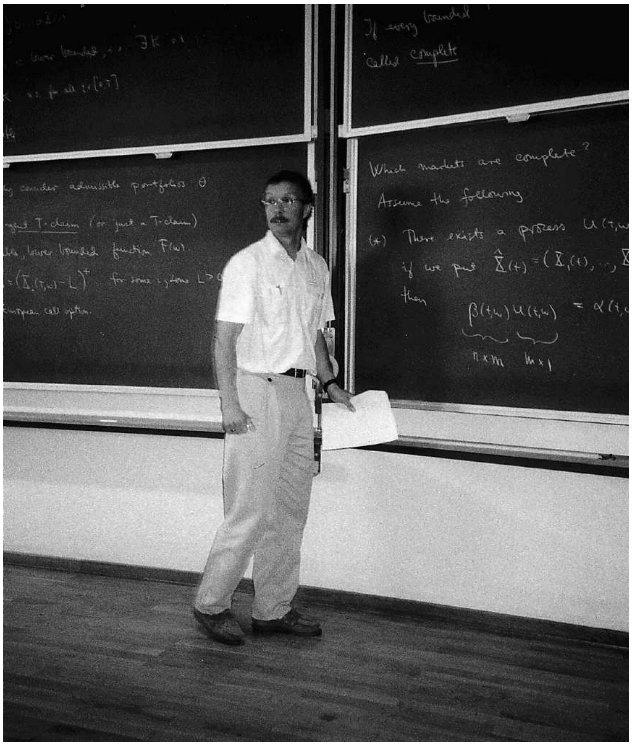

FIGURE 3. Lecturer Bernt Øksendal

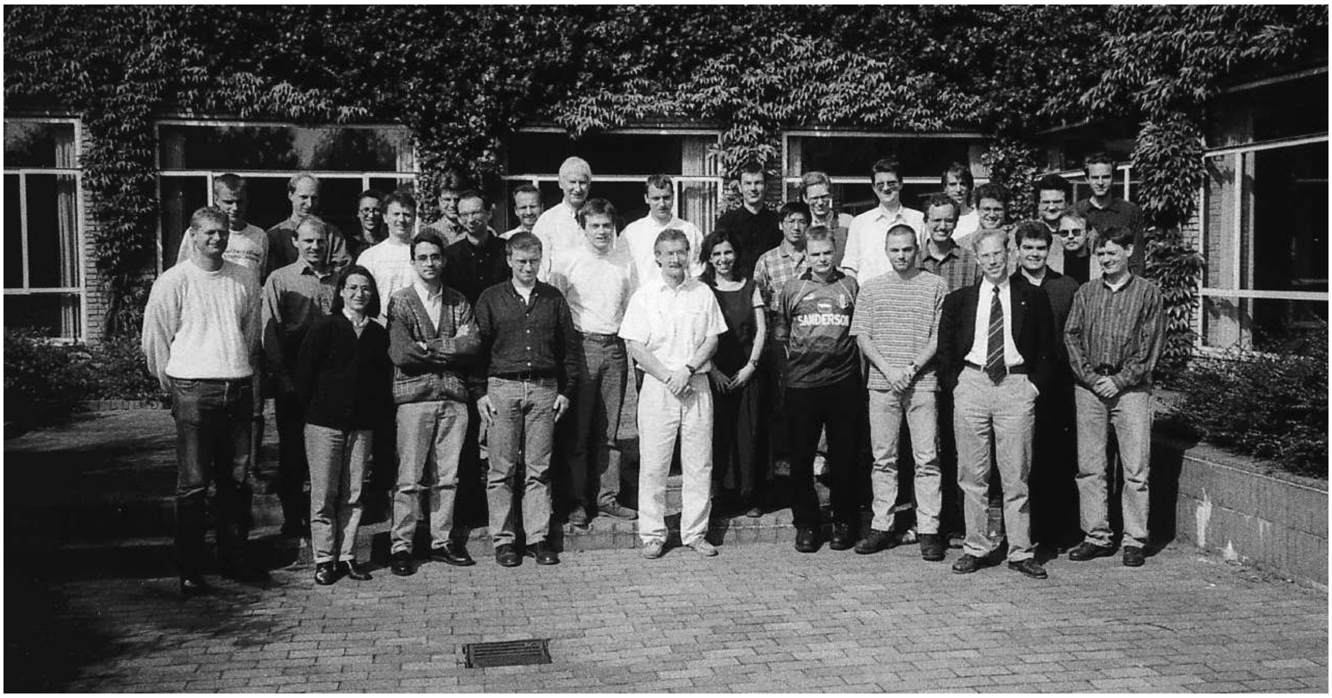

FIGURE 4. Most of the participants of the Malliavin Calculus course.

Mini-workshop on Stochastics. From Tuesday, August 4, 1998 to Thursday, August 6, 1998 MaPhySto organized an informal mini-workshop on topics in Stochastics. The workshop was a natural consequence of the substantial expertise represented by visitors to the Centre during that week.

The speakers and titles were:
Albert Shiryaev (Moscow): *On the laws of the "downfalls" in Brownian motion*;
Goran Peskir (Aarhus): *On Brownian motion in a force field*;
Thomas Mikosch (Groningen): *The extremes of the periodogram*;
Rimas Norvaiša (Vilnius): *Integration of rough sample functions and modelling of stock price changes*;
Fred Espen Benth (Aarhus): *The Malliavin derivative for random distributions*;
J. Hoffmann-Jørgensen (Aarhus): *Optimal stopping times*;
Ole E. Barndorff-Nielsen (Aarhus): *Superposition of Ornstein-Uhlenbeck type processes*;
Martin Jacobsen (Copenhagen): *Discretely observed diffusions: Classes of estimating functions and criteria for choosing good ones*.

The abstracts of the eight talks are gathered in a small note which has appeared as No. 3 of the MaPhySto *Miscellanea* series.

Summer School on Markov chain Monte Carlo. About 60 young European postdocs and PhD students attended the summer school from Friday, August 7, 1998 to Tuesday, August 11, 1998, where invited specialists gave a systematic introduction as well as an exposition of current research on Markov chain Monte Carlo methods (MCMC). The Summer School was mainly funded by MaPhySto and by the ESF programme "Highly Structured Stochastic Systems". The EU programme for Training and Mobility also contributed.

Invited speakers:
Carlo Berzuini (Pavia): *Tutorial lectures on graphical modelling and BUGS*;
Arnoldo Frigessi (Oslo): *Issues on rigorous analysis of the convergence of MCMC algorithms*;
Andrew Gelman (New York): *Lectures on Bayesian statistics and MCMC*;
Peter Green (Bristol): *Tutorial lectures on Markov chain Monte Carlo*;
Jesper Møller (Aalborg): *A review on perfect simulation for spatial processes*
Gareth Roberts (Cambridge): *MCMC: Introduction to algorithms and theory*.

Programme Committee: Arnoldo Frigessi, Jesper Møller, Gareth Roberts. Local organizers: Martin Bøgsted Hansen, Jesper Møller, Lisbeth Grubbe Nielsen. For further details, see

`www.maths.nott.ac.uk/hsss/Workshops/summerschool.html`

Mini-workshop on Mathematical Physics. On August 18, 1998 MaPhySto organized a small one-day workshop on topics in Mathematical Physics.

Jan Dereziński (Warsaw) gave a talk on *The Fermi golden rule, the Mourre theory, and the Feshbach method in spectral analysis*. He presented a general method in the perturbation theory of eigenvalues embedded in absolutely continuous spectrum. The results will be applied to Pauli-Firz Hamiltonians from quantum field theory.

Anders Holst (Lund) gave a talk entitled *Trapped modes for semi-infinite elastic rods* in which he presented an explicit example, where embedded eigenvalues occur.

Winfried Sickel (Jena) talked on *Composition operators on fractional order Sobolev spaces*, dealing with general questions in functional analysis and partial differential equations.

Future Events

The list below is taken from our web-page `www.maphysto.dk/events/` listing events where (at least) the dates and main content have been fixed. From the above-mentioned web-page you may find more information on each of the events.

Fall 1998: University of Aarhus: *Graduate course on Analytic Number Theory.*

21-25 September, 1998: University of Copenhagen: *Concentrated Advanced Course: An Introduction to Stochastic Partial Differential Equations.*

November, 1998: University of Copenhagen: *Mini workshop on Landau Matrices and Statistical Models of Strings.*

5-7 November, 1998: University of Aarhus: *Workshop on Geometric Scattering.*

10-14 November, 1998: University of Aarhus: *Concentrated Advanced Course on Queueing Network Theory.*

November-December: University of Aarhus: *Graduate course on Marked Point Processes and Piecewise Deterministic Processes.*

January 1999: University of Aarhus: *Thematic period on Lévy Processes, Product Integrals and Pathwise Integration.* The thematic period comprises a Concentrated Advanced Course (7-8 January), a Workshop (11-13 January) and a Conference (18-22 January).

21-23 January 21-23, 1999: University of Copenhagen: *A short workshop on Geometric and Microlocal Analysis.*

22-26 February 22-26, 1999: University of Aarhus: *Concentrated Advanced Course on Stochastic Simulation.*

17-22 May, 1999: University of Odense: *Concentrated Advanced Course on Free Probability.*

9-20 August, 1999: University of Aarhus: *Summerschool on Empirical Processes.*

Furthermore, on July 8, an on-going seminar on *Geometric Mathematical Physics* was initiated with a talk of V. Turaev on *Seiberg-Witten invariants of 3-manifolds.*
The *Geometric Mathematical Physics* seminar will in general be a monthly seminar during terms. It will be announced via the web-page `www.maphysto.dk/events/GMFseminar/` and announcements will be sent to the mathematics departments at the universities in Denmark.

Personnel News

Linda Stougaard Nielsen. After finishing a master's degree in statistics, Linda Stougaard Nielsen was in the spring term of 1998 employed by the Laboratory for Computational Stochastics (StocLab), Department of Mathematical Sciences, University of Aarhus. During this, she also did some preliminary administrative work for MaPhySto.

Søren Have Hansen. From April and onwards, Søren Have Hansen has been employed by MaPhySto as project manager. Søren has a master's degree in mathematics (algebraic geometry) and is currently taking a PhD in the same subject. After finishing this (in September '99), Søren will put his research efforts into the areas of geometric tomography, stochastic geometry and computation.

Fred Espen Benth. As of April 1st, Fred Espen Benth has been appointed as (the first) post-doc at MaPhySto. Fred Espen Benth took his PhD at the University of Oslo and has since then been working at the Norwegian Computing Center in Oslo.

Currently Fred is working with stochastic analysis, Malliavin calculus and white noise analysis.

Jens Ledet Jensen. Also on April 1st, member of the board of MaPhySto, Jens Ledet Jensen was appointed as a full professor at the Department of Mathematical Sciences, University of Aarhus.

Eva B. Vedel Jensen. On July 1st, Scientific Director of Laboratory for Computational Stochastics (StocLab), Eva B. Vedel Jensen was appointed research professor at the Department of Mathematical Sciences, University of Aarhus.

Martin Bøgsted Hansen. On August 1st, Martin Bøgsted Hansen became associate professor at the Department of Mathematics, Aalborg University, as a joint venture between Aalborg University and MaPhySto. Martin Bøgsted Hansen took his master's degree at the University of Aarhus, the PhD at the Royal Veterinary and Agricultural University, Copenhagen and has since then been assistant professor at Aalborg University.

Currently Martin is working in stochastic geometry and will, as a part of MaPhySto, mainly study statistical perspectives of inverse problems.

Alexei Venkov. From August and two and a half years on-wards Alexei Venkov has been appointed guest professor at the Department of Mathematical Sciences, University of Aarhus with funding from MaPhySto. He is currently professor at the Steklov Institute in Sct. Petersburg, Russia.

Together with Erik Balslev (also in Aarhus) he will run a series of graduate courses in *analytic number theory* and organize an international *Conference on Selberg Theory*.

Gorm Salomonsen. From September 1st, Gorm Salomonsen has been appointed for a two-year post-doc period. Gorm Salomonsen took his PhD from the University of Aarhus in 1996. Most of Gorm's PhD-study took place at the Max Planck Institut für Mathematik in Bonn and since receiving his PhD he has been working at the University of Bonn.

Gorm will do research in scattering theory and global analysis.

Current and Future Guests.
From `www.maphysto.dk` you may find more about each of the individuals mentioned below.

Albert Shiryaev (Steklov Institute, Moscow): Visiting from 1998/07/26 until 1998/09/26.

Nikolai Leonenko (Kiev University): Visiting from 1998/09/09 until 1998/09/30.

Yuri Makeenko (Moscow): Visiting from 1998/08/23 until 1998/10/23.

Jim Dai (Georgia Tech.): Visiting from 1998/10/02 until 1998/11/20.

Mathieu Kessler (Universidad de Murcia): Visiting from 1998/10/01 until 1998/11/30.

Andras Vasy (Berkeley): Visiting from 1998/11/05 until 1998/11/07.

Victor Pérez-Abreu (CIMAT, Mexico): Visiting from 1999/01/05 until 1998/01/22.

Richard M. Dudley (MIT): Visiting from 1999/01/06 until 1998/01/22.

Thomas Mikosch (University of Groningen): Visiting from 1999/01/07 until 1998/01/22.

Rimas Norvaiša (Vilnius): Visiting from 1999/01/07 until 1998/01/22.

PUBLICATIONS

Below you will find a list of recent publications from MaPhySto. You may order the publications from MaPhySto or go to the MaPhySto web-page `www.maphysto.dk` from where you may down-load (most of) the publications mentioned.

Research Reports (ISSN 1398-2699).

1998-21 (September 1998): *On the scattering operator for the Schrödinger equation with a time-dependent potential* by Arne Jensen.

1998-20 (September 1998): *On arbitrage and replication for fractal models* by Albert N. Shiryaev.

1998-19 (September 1998): *Exact Distributional Results for Random Resistance Trees* by Ole E. Barndorff-Nielsen and Tina Hviid Rydberg.

1998-18 (September 1998): *Incorporation of a Leverage Effect in a Stochastic Volatility Model* by Ole E. Barndorff-Nielsen and Neil Shephard.

1998-17 (September 1998): *On weighted $L^2(\Omega)$-Spaces, their Duals and Ito Integration* by Fred Espen Benth.

1998-16 (September 1998): *Nonparametric Bayes inference for concave distribution functions* by Martin B. Hansen and Steffen L. Lauritzen.

1998-15 (September 1998): *Space-time multi type log Gaussian Cox processes with a view to modeling weed data* by Anders Brix and Jesper Møller.

1998-14 (September 1998): *Random Matrices and K-theory for Exact C^*-algebras* by U. Haagerup and S. Thorbjørnsen.

1998-13 (August 1998): *An Example of Non-Attainability of Expected Quantum Information* by Ole E. Barndorff-Nielsen and R. D. Gill.

1998-12 (August 1998): *Euclidean and Lorentzian Quantum Gravity – Lessons from Two Dimensions* by J. Ambjørn, R. Loll, J.L. Nielsen and J. Rolf.

1998-11 (July 1998): *The Malliavin Derivative of Generalized Random Variables* by Fred Espen Benth.

1998-10 (August 1998): *Quantum Geometry and Diffusion* by J. Ambjørn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen and Y. Watabiki.

1998-9 (June 1998): *Inhomogeneous Markov point processes by transformation* by Eva B. Vedel Jensen and Linda Stougaard Nielsen.

1998-8 (June 1998): *NBI Matrix Model of IIB Superstrings* by Jan Ambjørn and L. Chekhov.

1998-7 (May 1998): *Perfect simulation of conditionally specified models* by Jesper Møller.

1998-6 (May 1998): *Maximal Inequalities for the Ornstein-Uhlenbeck Process* by Svend Erik Graversen and Goran Peskir.

1998-5 (May 1998): *Non-perturbative Lorentzian Quantum Gravity, Causality and Topology Change* by Jan Ambjørn and R. Loll.

1998-4 (May 1998): *Random Matrices with Complex Gaussian Entries* by Uffe Haagerup and Steen Thorbjørnsen.

1998-3 (May 1998): *Extensions of Fill's algorithm for perfect simulation* by Jesper Møller and Katja Schladitz.

1998-2 (April 1998): *Controlling the Velocity of Brownian Motion by its Terminal Value* by Goran Peskir.

1998-1 (April 1998): *Stationary and selfsimilar processes driven by Lévy processes* by Ole E. Barndorff-Nielsen and Victor Pérez-Abreu.

Miscellanea (ISSN 1398-5957).

1998-4 (August 1998): *Number Theory and Spectral Theory* by Erik Balslev.

1998-3 (August 1998): *Abstracts from the Mini-workshop on Stochastics (August 4-6, 1998, University of Aarhus).*

1998-2 (July 1998): *On asymptotics of estimating functions* by Michael Sørensen.

1998-1 (June 1998): *An addendum to 'An Introduction to Malliavin Calculus with Applications to Economics' – Exercises with solutions and miscellaneous notes* by Fred Espen Benth.

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