



# BRÅKET



*Information om seminarier och högre undervisning  
i matematiska ämnen i Stockholmsområdet*

NR 34

FREDAGEN DEN 24 OKTOBER 2008

## BRÅKET

Veckobladet från  
Institutionen för matematik  
vid Kungl Tekniska Högskolan  
och Matematiska institutionen  
vid Stockholms universitet

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Sista manustid för nästa nummer:  
Torsdagen den 30 oktober  
kl. 13.00.

### Disputation i numerisk analys

Jesper Carlsson disputerar vid KTH på avhandlingen *Optimal Control of Partial Differential Equations in Optimal Design* fredagen den 7 november kl. 10.00. Se sidan 8.

Money, jobs: Se sidorna 11–12.

## SEMINARIER

Fr 10–24 kl. 11.00–12.00. Optimization and Systems Theory Seminar. Johan Karlsson, Optimeringslära och systemteori, KTH: *Inverse Problems in Analytic Interpolation for Robust Control and Spectral Estimation*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 33 sidorna 8–9.

Fr 10–24 kl. 11.00–12.00. KTH/SU Mathematics Colloquium. (Observera dagen, tiden och lokalen!) Hillel Furstenberg, The Hebrew University of Jerusalem, Israel: *Ergodic fractal measures*. Sal E3, KTH, Osquars Backe 14, 2 tr. Se Bråket nr 32 sidan 8.

Fortsättning på nästa sida.

### Ny teknologi och matematikundervisning

En seminariedag med detta tema skall anordnas vid KTH måndagen den 27 oktober. Se Bråket nr 33 sidan 7.

### Disputation i optimeringslära och systemteori

Johan Karlsson disputerar på avhandlingen *Inverse Problems in Analytic Interpolation for Robust Control and Spectral Estimation* fredagen den 31 oktober kl. 13.00 i sal F3, KTH, Lindstedtsvägen 26, b.v. Se Bråket nr 33 sidorna 8–9.

### The Philosophy of Logical Consequence

En workshop med denna titel skall äga rum i Uppsala den 31 oktober – 2 november 2008. Se sidan 6.

### Ledig anställning

Stockholms universitet söker en doktorand i matematisk statistik. Se sidan 9.

### Seminarier (fortsättning)

- Fr 10–24 kl. 13.15–14.15. Graduate Student Seminar.** Oscar Andersson Forsman, Matematik, KTH: *Fuchsian groups*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- Fr 10–24 kl. 15.15. Extra kombinatorikseminarium.** (*Observera dagen, tiden och lokalen!*) László Lovász, Budapest: *New mathematical problems inspired by very large graphs*. Katalin Vesztergombi, Budapest: *Randomly growing graph sequences*. Endre Szemerédi, Budapest: *Title to be announced (not yet confirmed)*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.
- Må 10–27 kl. 10.00–11.30. Ny teknologi och matematikundervisning.** Stefan Knutsson och Anna-Karin Högfeldt, KTH Learning Lab, och Tommy Ekola, Matematik, KTH: *Webcasting av miniföreläsningar*. Salongen, Osquars Backe 31. Se Bråket nr 33 sidan 7.
- Må 10–27 kl. 11.30–11.50. Ny teknologi och matematikundervisning.** Eva Malmström Jonsson, vicerektor vid KTH: *Om KTHs gymnasiesamarbete och rekryteringsarbete*. Salongen, Osquars Backe 31. Se Bråket nr 33 sidan 7.
- Må 10–27 kl. 13.15–16.00. Ny teknologi och matematikundervisning.** Thomas Lingefjärd, docent i matematikdidaktik vid Göteborgs universitet: *Tekniska hjälpmedel i matematikundervisningen — ett paradigmskifte*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 33 sidan 7.
- Må 10–27 kl. 15.15. Seminarium i matematisk statistik.** Professor Gennady Samorodnitsky, Cornell University: *Inverse problems for regular variation, linear filters, functional equations and a cancellation property for  $\sigma$ -finite measures*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 33 sidan 5.
- Ti 10–28 kl. 13.15. Plurikomplexa seminariet.** Salla Franzén, SU: *Hartogs domains and propagation of continuity*. Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 5.
- On 10–29 kl. 10.15–12.00. Kombinatorikseminarium.** Michelle Bucher-Karlsson, KTH: *Minimal triangulations of products of polygons*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.
- On 10–29 kl. 11.00–12.00. KTH/Nordita/SU Seminar in Theoretical Physics.** Alessandro D. A. M. Spallicci di Filottrano, Université d’Orléans: *Radial fall last 2400 years*. Sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 5.
- On 10–29 kl. 13.00. Seminarium i statistik.** Docent Tatjana Pavlenko: *Supervised classification models in a high-dimensional framework*. Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati. Se Bråket nr 33 sidan 5.
- On 10–29 kl. 14.30–15.30. KCSE (KTH Computational Science and Engineering Centre) Seminar.** Shervin Bagheri, Mekanik, KTH: *Computational aspects in stability and control of fluids*. Rum RB 15, Roslagstullsbacken 15, AlbaNova universitetscentrum. Se Bråket nr 33 sidan 3.

**Fortsättning på nästa sida.**

### Seminarier (fortsättning)

- On 10–29 kl. 15.15. Seminarium i matematisk statistik. Åke Svensson, SU:** *Inference on generation times in epidemics*. Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 5.
- To 10–30 kl. 13.15–14.15. Minicourse in mathematics. Stephanie Yang:** *Moduli of curves. Third lecture*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 32 sidan 7.
- To 10–30 kl. 14.00–15.00. Institut Mittag-Leffler Seminar. Jim Isenberg, University of Oregon, Eugene:** *Non-constant mean curvature solutions of the Einstein constraint equations*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 4.
- To 10–30 kl. 15.30–16.30. Institut Mittag-Leffler Seminar. Oscar Reula, FaMAF, Córdoba, Argentina:** *Boundary conditions for coupled quasilinear wave equations with application to isolated systems*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 4.
- Fr 10–31 kl. 10.30–11.30. Optimization and Systems Theory Seminar. (Observera tiden!) Anders Rantzer, LTH:** *Price mechanisms for distributed control synthesis*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.
- Fr 10–31 kl. 13.15–14.15. Graduate Student Seminar. Alan Sola, Matematik, KTH:** *Univalent functions IV*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.
- Må 11–03 kl. 15.15–16.00. Seminarium i matematisk statistik. Eric Nordenstam, Matematik, KTH:** *Eigenvalues of GUE matrices and tilings of a hexagon*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.
- On 11–05 kl. 16.00–17.00. KTH/SU joint Mathematics and CIAM Colloquium. Jens Eggers, University of Bristol:** *The role of self-similarity in singularities of PDE's*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Kaffe/te serveras kl. 15.30 i pausrummet, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 4. Se sidan 10.
- On 11–05 kl. 19.00. Populärvetenskaplig föreläsning i fysik. Professor Kerstin Jon-And, Fysikum, SU:** *ATLAS-experimentet — redo för upptäckter: Om möjligheterna att upptäcka ny fysik vid LHC*. Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 6.
- To 11–06 kl. 10.30. Seminar in Fluid Mechanics. Gaëtan Compère, Université Catholique de Louvain:** *Transient mesh adaptivity applied to fluid-structure interaction problems with large displacements*. Seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8. Se sidorna 10–11.
- To 11–06 kl. 13.15–14.15. Minicourse in mathematics. Stephanie Yang:** *Moduli of curves. Fourth lecture*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 32 sidan 7.
- To 11–06 kl. 15.15–16.15. AlbaNova and Nordita Colloquium in Physics. Professor Elvira Fortunato, Materials Science Department, New University of Lisbon:** *The (r)evolution of thin film transistors*. Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 7.

Fortsättning på nästa sida.

**Seminarier (fortsättning)**

**Fr 11–07 kl. 11.00–12.00. Optimization and Systems Theory Seminar.** **Andrea Gombani**, Institute for Biomedical Engineering of the National Research Council, Padova, Italy: *Rational interpolation methods and the Sylvester equation*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 8.

**Fr 11–07 kl. 13.15–14.15. Graduate Student Seminar.** **Alexander Engström**, Matematik, KTH: *Title to be announced*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**INSTITUT MITTAG-LEFFLER SEMINAR****Jim Isenberg:****Non-constant mean curvature solutions  
of the Einstein constraint equations**

*Abstract:* While much is known about constant mean curvature (CMC) and near-constant mean curvature (near-CMC) solutions of the Einstein constraint equations, only recently has there been progress in understanding and constructing solutions of the constraints which are neither CMC nor near-CMC (non-CMC). Using the conformal method together with gluing techniques, we review what is known about CMC and near-CMC solutions, and then discuss the recent results and the recent progress that has been made with non-CMC solutions.

*Tid och plats:* Torsdagen den 30 oktober kl. 14.00–15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

**INSTITUT MITTAG-LEFFLER SEMINAR****Oscar Reula:****Boundary conditions for coupled quasilinear wave equations  
with application to isolated systems***Authors:*H.-O. Kreiss ([http://arxiv.org/find/gr-qc/1/au:+Kreiss\\_H/0/1/0/all/0/1](http://arxiv.org/find/gr-qc/1/au:+Kreiss_H/0/1/0/all/0/1)),O. Reula ([http://arxiv.org/find/gr-qc/1/au:+Reula\\_O/0/1/0/all/0/1](http://arxiv.org/find/gr-qc/1/au:+Reula_O/0/1/0/all/0/1)),O. Sarbach ([http://arxiv.org/find/gr-qc/1/au:+Sarbach\\_O/0/1/0/all/0/1](http://arxiv.org/find/gr-qc/1/au:+Sarbach_O/0/1/0/all/0/1)),J. Winicour ([http://arxiv.org/find/gr-qc/1/au:+Winicour\\_J/0/1/0/all/0/1](http://arxiv.org/find/gr-qc/1/au:+Winicour_J/0/1/0/all/0/1)).

*Abstract:* We consider the initial-boundary value problem for systems of quasilinear wave equations on domains of the form  $[0, T] \times \Sigma$ , where  $\Sigma$  is a compact manifold with smooth boundaries  $\partial\Sigma$ . By using an appropriate reduction to a first order symmetric hyperbolic system with maximal dissipative boundary conditions, well-posedness of such problems is established for a large class of boundary conditions on  $\partial\Sigma$ . We show that our class of boundary conditions is sufficiently general to allow for a well-posed formulation for different wave problems in the presence of constraints and artificial, non-reflecting boundaries, including Maxwell's equations in the Lorentz gauge and Einstein's gravitational equations in harmonic coordinates. Our results should also be useful for obtaining stable finite-difference discretizations for such problems.

*Tid och plats:* Torsdagen den 30 oktober kl. 15.30–16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

## GRADUATE STUDENT SEMINAR

**Oscar Andersson Forsman:**  
**Fuchsian groups**

*Abstract:* I will give an elementary introduction to Fuchsian groups and discuss their role in the geometry of surfaces.

*Tid och plats:* Fredagen den 24 oktober kl. 13.15–14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

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## PLURIKOMPLEXA SEMINARIET

**Salla Franzén:**  
**Hartogs domains and propagation of continuity**

*Abstract:* A Hartogs domain in  $\mathbb{C}^2$  is a domain which is rotation invariant in the second coordinate. We will consider propagation of continuity and of  $\mu$ -continuity for analytic functions on such domains. More precisely, the following question will be studied.

Given a complete Hartogs domain  $G$  in  $\mathbb{C}^2$ , what requirements should be placed on  $G$  for the following to hold? If a function  $f$  is analytic in  $G$ , continuous up to the Shilov boundary and  $\mu$ -continuous on the Shilov boundary for some modulus of continuity  $\mu$ , then  $f$  is  $\mu$ -continuous on the closure of the domain.

*Tid och plats:* Tisdagen den 28 oktober kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

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## KTH/NORDITA/SU SEMINAR IN THEORETICAL PHYSICS

**Alessandro D. A. M. Spallicci di Filottrano:**  
**Radial fall last 2400 years**

*Abstract:* The radial fall through Aristotle, Galilei, Newton and Einstein has constituted the reference for unveiling the nature of gravitation. For a captured star falling into a supermassive black hole, the motion is driven by the radiation emitted. In the 1990s, the concept of self-force has been proposed for a point-particle moving in a curved background. Radiation reaction is to be taken into consideration to detect the gravitational waveform coming from such captures. An account on the state of the art of the subject is given.

*Tid och plats:* Onsdagen den 29 oktober kl. 11.00–12.00 i sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum.

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## SEMINARIUM I MATEMATISK STATISTIK

**Åke Svensson:**  
**Inference on generation times in epidemics**

*Abstract:* The speed at which an emerging infection spreads depends on the time intervals between primary and secondary infections. Based on a model with random transmission functions, it is discussed how and if it is possible to learn anything about the transmission process from observations on the epidemic curve or the epidemic tree.

*Tid och plats:* Onsdagen den 29 oktober kl. 15.15 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

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## KOMBINATORIKSEMINARIUM

### Michelle Bucher-Karlsson: Minimal triangulations of products of polygons

*Abstract:* The use of volume of simplices in hyperbolic geometry for combinatorial problems, initiated by Thurston, has proven successful for minimal triangulations of polytopes. For example, the best lower bound so far for the minimum number of  $n$ -dimensional simplices in a triangulation of the  $n$ -cube was found by Smith as the ratio of the hyperbolic volume of the ideal cube to the ideal regular simplex in hyperbolic  $n$ -space. I will show how to use volumes in products of hyperbolic planes to give lower bounds for the minimal number of simplices needed in a triangulation of the product of two convex polygons, improving lower bounds by Bowen, De Loera, Develin and Santos.

*Tid och plats:* Onsdagen den 29 oktober kl. 10.15–12.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## WORKSHOP

### The Philosophy of Logical Consequence

Denna workshop skall äga rum under tiden 31 oktober – 2 november 2008 i Thunbergsalen, Kollegiet för Samhällsforskning (SCAS), Thunbergsvägen 2, Uppsala. Den arrangeras av Nationalkommittén för logik, metodologi och filosofi (KVA) i samarbete med Kollegiet för Samhällsforskning (SCAS) och institutionerna för filosofi och matematik vid Uppsala universitet.

**Organisationskommitté:** Sten Lindström, Erik Palmgren, Rysiek Sliwinski och Dag Westerståhl.

**Kontaktperson, information, frågor:** Professor Sten Lindström, telefon 070-213 0178, e-post [Sten.Lindstrom@philos.umu.se](mailto:Sten.Lindstrom@philos.umu.se).

Anyone planning to attend should pre-register by sending an e-mail message to Sten Lindström no later than October 24. For more information, visit the home-page of the workshop: <http://web.me.com/stenlindstrom/Webbplats/workshop.html>.

## POPULÄRVETENSKAPLIG FÖRELÄSNING I FYSIK

### Kerstin Jon-And: ATLAS-experimentet — redo för upptäckter: Om möjligheterna att upptäcka ny fysik vid LHC

*Sammanfattning:* Efter cirka 15 års uppbyggnadsarbete är ATLAS-detektorn klar att ta data vid CERN:s nya accelerator LHC. Nästa år väntas LHC leverera protonkollisioner vid en energi som aldrig tidigare uppnåtts i en accelerator. Förhoppningarna är stora att data från ATLAS och LHC kommer att ge svar på någon eller några av de stora, hittills obesvarade, frågorna inom elementarpartikelfysiken: Vad består universums mörka materia av? Hur uppstår massa? Finns det fler än tre rumsdimensioner? Föreläsningen ger en kort introduktion till hur ATLAS-detektorn fungerar och försöker sedan förklara hur ATLAS-experimentet kan bidra till svaren på frågorna ovan.

*Tid och plats:* Onsdagen den 5 november kl. 19.00 i Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.

## OPTIMIZATION AND SYSTEMS THEORY SEMINAR

**Anders Rantzer:**

### Price mechanisms for distributed control synthesis

*Abstract:* Many control applications have a decentralized structure, where each subunit has access to different information about the system state. Still, most control theory has been developed in a centralized setting, where all measurements are processed together to compute the control signals. This paradigm has conceptual advantages, but also inherent limitations in terms of complexity and integrity. The purpose of this lecture is to show how ideas from convex optimization and game theory may help to go beyond the traditional paradigm to support analysis and synthesis of distributed controllers.

In particular, we will reconsider well established methods for decomposition of large scale optimization problems by introduction of dual variables. These can be interpreted as prices in a market mechanism serving to achieve mutual agreement between different subproblems. The same idea can be used for decomposition of large scale control systems, with dynamics in both decision variables and prices. The dynamics bring interesting new phenomena. For example, expected future prices could be highly relevant for today's decisions.

*Tid och plats:* Fredagen den 31 oktober kl. 10.30–11.30 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## SEMINARIUM I MATEMATISK STATISTIK

**Eric Nordenstam:**

### Eigenvalues of GUE matrices and tilings of a hexagon

*Abstract:* There has been a lot of interest in tiling models, particularly the limiting properties of such models as the size of the tiled area tends to infinity. It turns out that in a suitable scaling limit of tilings of a hexagon with rhombuses, it is possible to recover the distribution of the eigenvalues of a GUE (Gaussian Unitary Ensemble) matrix. I shall sketch a proof of this fact, thereby illustrating some of the techniques in this field.

*Tid och plats:* Måndagen den 3 november kl. 15.15–16.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## ALBANOVA AND NORDITA COLLOQUIUM IN PHYSICS

**Elvira Fortunato:**

### The (r)evolution of thin film transistors

*Abstract:* Amorphous oxide semiconductors are nowadays playing an important scientific and technological role for the next generation of optoelectronic devices. The recent applications using these new semiconductor materials, besides covering both p- and n-type semiconductor properties, present a high electronic mobility, being the structure amorphous. This specific characteristic contrasts to conventional amorphous semiconductors like a-Si:H, where carrier transport is limited by the disorder of the amorphous phase, i.e. band tail limited. In this lecture we will present some of the recent achievements already obtained with special attention to thin film transistors.

*Tid och plats:* Torsdagen den 6 november kl. 15.15–16.15 i Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.

## DISPUTATION I NUMERISK ANALYS

Jesper Carlsson

disputerar på avhandlingen

**Optimal Control of Partial Differential Equations  
in Optimal Design**

fredagen den 7 november 2008 kl. 10.00 i sal F3, KTH, Lindstedtsvägen 26, b.v. Till opponent har utsetts *professor Peter Hansbo*, Chalmers tekniska högskola, Göteborg.

***Abstract of the thesis***

This thesis concerns the approximation of optimally controlled partial differential equations for inverse problems in optimal design. Important examples of such problems are optimal material design and parameter reconstruction. In optimal material design the goal is to construct a material that meets some optimality criterion, e.g. to design a beam, with fixed weight, that is as stiff as possible. Parameter reconstruction concerns, for example, the problem to find the interior structure of a material from surface displacement measurements resulting from applied external forces.

Optimal control problems, particularly for partial differential equations, are often ill-posed and need to be regularized to obtain good approximations. We here use the theory of the corresponding Hamilton-Jacobi-Bellman equations to construct regularizations and derive error estimates for optimal design problems. The constructed Pontryagin method is a simple and general method where the first, analytical, step is to regularize the Hamiltonian. Next its Hamiltonian system is computed efficiently with the Newton method using a sparse Jacobian. An error estimate for the difference between exact and approximate objective functions is derived, depending only on the difference of the Hamiltonian and its finite-dimensional regularization along the solution path and its  $L^2$  projection, i.e. not on the difference of the exact and approximate solutions to the Hamiltonian systems.

Another treated issue is the relevance of input data for parameter reconstruction problems, where the goal is to determine a spacially distributed coefficient of a partial differential equation from partial observations of the solution. It is here shown that the choice of input data, that generate the partial observations, affects the reconstruction, and that it is possible to formulate meaningful optimality criteria for the input data that enhance the quality of the reconstructed coefficient.

In the thesis we present solutions to various applications in optimal material design and reconstruction.

## OPTIMIZATION AND SYSTEMS THEORY SEMINAR

Andrea Gombani:

**Rational interpolation methods and the Sylvester equation**

*Abstract:* We illustrate here how a simple interpolation formula based on the Sylvester equation can be used to obtain a parametrization of Schur interpolants of fixed degree when the Pick matrix is singular. This idea is used to derive some results on reduced order Schur interpolants.

The talk is based on joint work with György Michaletzky.

*Tid och plats:* Fredagen den 7 november kl. 11.00–12.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.



**Stockholms universitet söker en doktorand  
i matematisk statistik**

Matematiska institutionen vid Stockholms universitet utlyser en doktorandanställning i matematisk statistik. Mer information på svenska om anställningen finns på [http://www.math.su.se/content/1/c6/02/88/59/foutb0810\\_sve.pdf](http://www.math.su.se/content/1/c6/02/88/59/foutb0810_sve.pdf) respektive på engelska på [http://www.math.su.se/content/1/c6/03/73/23/foutb0810\\_eng.pdf](http://www.math.su.se/content/1/c6/03/73/23/foutb0810_eng.pdf). Sista ansökningsdag är torsdagen den 20 november 2008, och anställningen skall tillträdas den 1 januari 2009 (ev. vid annan tid enligt överenskommelse). Utlysningen gäller huvudsakligen följande projekt:

**Bayesian phylogenetic inference**

*Main supervisor:* **Tom Britton**, Mathematical Statistics, SU.

*Co-supervisor:* **Fredrik Ronquist**, Naturhistoriska Riksmuseet.

Phylogenetic analysis (inference of evolutionary trees) is used throughout the life sciences. Important applications include classification of organisms, identification of viruses and bacteria, study of molecular evolution, comparative analyses of genetic data, and determination of the geographic origin of organisms. Bayesian inference using Markov chain Monte Carlo (MCMC) simulations has recently become a popular approach in this field, mainly due to its computational efficiency and its ability to handle complex and realistic evolutionary models (see e.g. <http://www.mrbayes.net>). The present project aims at exploring the full potential of the Bayesian MCMC approach. Two subprojects have been identified, but others could also be considered within the main area.

In each MCMC step, a small random change of some parameters is performed. It has proven difficult to search through the large and complex parameter space of phylogenetic problems using such small steps. In particular, the small random changes of tree topology used currently are quite inefficient. The first subproject aims at developing more sophisticated topology proposals based on approximations of the target distribution. The challenge of this subproject is to find an optimal balance between quick but dirty, and slow but more exact approximations. Success will require both good mathematical skills and stochastic intuition, as well as computational experimentation.

Most statistical analyses of phylogenetic problems performed today are based on extremely simple evolutionary models, but theoretical biologists are now rapidly exploring more realistic and complex model components. The second subproject aims at providing a flexible framework for combining such model components into hierarchical Bayesian super-models, which can be efficiently sampled using MCMC methods. The framework should also allow so-called model averaging using MCMC, in which the MCMC method is used to explore a potentially large, predefined space of super-models. This subproject requires a talent for logical and mathematical analysis of the structure of statistical models in general and phylogenetic models in particular, and a good understanding of the mathematical transformations needed to move between different parameter spaces.

A successful candidate should have a background including probability and statistical inference, combined with good computational skills and preferably also an interest in biological questions.

Tom Britton  
Studierektor för forskarutbildningen  
i matematisk statistik vid SU

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**KTH/SU JOINT MATHEMATICS AND CIAM COLLOQUIUM**

**Jens Eggers:**

**The role of self-similarity in singularities of PDE's**

*Abstract:* Singularities lie at the heart of many physical phenomena like shock formation, drop formation, air entrainment, or flow separation. Here we survey results on the formation of point-like singularities (or blow-up) in evolution equations. We use a similarity transformation of the original equation with respect to the blow-up point, such that self-similar behaviour is mapped to the fixed point of a dynamical system.

We point out that analysing the dynamics close to the fixed point is a useful way of characterizing the singularity, in that the dynamics frequently reduces to very few dimensions. As far as we are aware, examples from the literature either correspond to stable fixed points, low-dimensional centre-manifold dynamics, limit cycles, or travelling waves. For each “class” of singularity, we give detailed examples, and we emphasise the physical meaning of the singularities.

*Tid och plats:* Onsdagen den 5 november kl. 16.00–17.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Kaffe/te serveras kl. 15.30 i pauserummet, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 4.

**SEMINAR IN FLUID MECHANICS**

**Gaëtan Compère:**

**Transient mesh adaptivity applied to fluid-structure interaction problems with large displacements**

*Abstract:* This talk deals with the issue of computing fluid-structure interaction (FSI) problems with large displacements of the structure. The most common way of dealing with FSI is to adopt an Arbitrary Lagrangian Eulerian (ALE) formulation of the fluid equations. ALE formulations allow to take into account small motions of the nodes in the fluid caused by the displacement of the structure. This approach suffers from obvious limitations as node repositioning cannot always provide a valid mesh when significant displacements or deformations of the structure are considered.

One way of addressing this issue is to remesh the entire domain when the displacements of the structure are too large to be handled. In this work, another approach is presented. It consists in applying local mesh modifications both to optimize the quality of the tetrahedra and to comply a mesh size field. This approach is globally advantageous compared to global remeshing:

- Local solution projection procedures can be built in a way that ensures local conservation.
- The mesh remains unchanged in large parts of the domain.
- Local mesh modifications can be performed in parallel, enabling transient adaptive simulations to run on parallel computers.

In this context, we specifically focus on the handling of ill-shaped elements resulting from the node motion. Several efficient procedures have been set up in the past to that purpose but eliminating all of them remains a challenging task.

Another issue is to find a global adaptation procedure that combines the different mesh modification operators available to provide a mesh with a satisfying quality to the best computational price.

(Continued on the next page.)

Finally, a few examples are presented in order to show the potential of the proposed technique.

*Tid och plats:* Torsdagen den 6 november kl. 10.30 i seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8.

## MONEY, JOBS

*Columnist:* Johannes Lundqvist, Department of Mathematics, Stockholm University.  
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Info = information. This will be given and repeated until obsolete. Rely on other sources as well.

BBKTH = Bulletin Board at the Department of Mathematics, KTH.

BBSU = Bulletin Board at the Department of Mathematics, SU.

The following information, with links, is also available at <http://www2.math.su.se/~johannes/mj.html>.

Unless stated otherwise, a given date is the last date (e.g. for applications), and the year is 2008. A number without an explanation is a telephone number.

### Standard information channels

1. A channel to information from Vetenskapsrådet: <http://www.vr.se/naturteknik/index.asp>.
2. A channel to information from the European Mathematical Society: <http://www.emis.de>.
3. A channel to information from the American Mathematical Society: <http://www.ams.org>.
4. KTH site for information on funds: <http://www.kth.se/aktuellt/stipendier>.
5. Stockholm University site for information on funds: <http://www2.su.se/forskning/stipendier/databas.php3>.
6. Umeå site for information on funds: [http://www.umu.se/umu/aktuellt/stipendier\\_fond\\_anslag.html](http://www.umu.se/umu/aktuellt/stipendier_fond_anslag.html).
7. Job announcement site: <http://www.maths.lth.se/nordic/Euro-Math-Job.html>. This is run by the European Mathematical Society.
8. Stiftelsen för internationalisering av högre utbildning och forskning (STINT) site for information on funds: <http://www.stint.se>.
9. Nordisk Forskerutdanningsakademi (NorFA) site for information on funds: <http://www.norfa.no>.
10. Svenska institutet (SI) site for information on funds: <http://www.si.se>.

### New information

#### *Jobs to apply for*

11. SU söker en doktorand i matematisk statistik. Sista ansökningsdag är den 20 november. Web-info: [http://www.math.su.se/content/1/c6/02/88/59/foutb0810\\_sve.pdf](http://www.math.su.se/content/1/c6/02/88/59/foutb0810_sve.pdf). Se sidan 9.
12. Försvarets radioanstalt (FRA) söker en matematiker/kryptolog. I arbetet ingår bland annat att med matematiska metoder analysera och värdera signalskyddssystem, analysera och konstruera algoritmer och att göra teoretiska utredningar av matematisk och matematisk-statistisk karaktär. Sista ansökningsdag är den 17 november. Web-info: <http://www.fra.se/tjanst-0188.shtml>.

### Old information

#### *Money to apply for*

13. Stiftelsen G. S. Magnusons fond utdelar stipendier och anslag inom ämnesområdet matematik för följande ändamål: Stöd till doktorander. Stöd till den som önskar ytterligare meritera sig efter doktorsexamen. Stöd till svenska forskare för forskning hemma eller i utlandet samt för inbjudan av utländska gästforskare. Bidrag för att kvarhålla forskare inom landet. Stöd till den som inom sin verksamhet utnyttjar matematik och som önskar bidrag till vetenskaplig förkovran inom ämnet. Sista ansökningsdag är den 2 februari 2009. Web-info: [http://www.kva.se/KVA\\_Root/swe/awards/scholarships/detail\\_scholarships.asp?grantsId=45](http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=45).

#### *Jobs to apply for*

14. Københavns Universitet söker doktorander i matematik. Sista ansökningsdag är den 1 januari 2009. Web-info: <http://www.math.ku.dk/english/programmes/ph.d/apply/>.

(Continued on the next page.)

15. Institut Mittag-Leffler announces a number of Post Doctoral Fellowship Grants for the academic year 2009/2010. The subject areas for the year's two programs are: Mathematical Logic: set theory and model theory (September 1 – December 15, 2009). Dynamics and PDE's (January 15 – June 15, 2010). Last day for application is January 20, 2009. Web-info: <http://www.mittag-leffler.se/programs/0910/grants.php>.
  16. Umeå universitet söker två universitetslektorer i matematik, varav en är med inriktning mot matematisk analys. Sista ansökningsdag är den 15 december. Web-info: [http://www.umu.se/umu/aktuellt/arkiv/lediga\\_tjanster/312-3204,3036-08.html](http://www.umu.se/umu/aktuellt/arkiv/lediga_tjanster/312-3204,3036-08.html).
  17. Umeå universitet söker en professor i matematisk statistik. Sista ansökningsdag är den 15 december. Web-info: [http://www.umu.se/umu/aktuellt/arkiv/lediga\\_tjanster/311-3037-08.html](http://www.umu.se/umu/aktuellt/arkiv/lediga_tjanster/311-3037-08.html).
  18. Skolan för datavetenskap och kommunikation (CSC) vid KTH kungör "the Dahlquist Postdoctoral Fellowship", uppkallat efter professor Germund Dahlquist, KTHs pionjär inom numerisk analys. Priset är forskning på heltid på KTH Numerisk Analys. Prisperioden är ett år, och kan förlängas med ytterligare ett år. Sista ansökningsdag är den 15 november. Web-info: [http://www.kth.se/csc/om/priser/dqf/1.14813?l=sv\\_SE](http://www.kth.se/csc/om/priser/dqf/1.14813?l=sv_SE).
  19. University of Iceland söker en "Associate Professor" i tillämpad matematik. Sista ansökningsdag är den 1 november. Web-info: <http://www.raunvis.hi.is/Reiknifr/>.
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