



BRÅKET



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

NR 4

FREDAGEN DEN 26 JANUARI 2001

BRÅKET

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

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Red. för Bråket

Institutionen för matematik

KTH

100 44 Stockholm

Sista manustid för nästa nummer:

Torsdagen den 1 februari kl. 13.00.

Disputation i optimerings- lära och systemteori

Camilla Landén disputerar vid KTH på avhandlingen *On the term structure of forwards, futures and interest rates* fredagen den 16 februari kl. 10.00. Se sidan 6.

Kurs

Jan-Erik Björk, Mikael Passare:
Valda problem i komplex analys.
Se sidan 3.

SEMINARIER

Fr 01–26 kl. 9.00–10.00. Kollokvium i fysik. Professor Torleif Härd, Strukturbiokemi, KTH Novum, Huddinge: *Biomolecular NMR spectroscopy — an overview of applications*. Sal F01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v. Se sidan 6.

Må 01–29 kl. 13.15–15.00. Seminarium i algebraisk geometri. Giovanni Molica, Messina: *A problem by Greco*. Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101. Se Bråket nr 3 sidan 3.

Ti 01–30 kl. 13.15. Seminar in Theoretical Physics. Universitetsadjunkt Bengt Malm, Fysikum, SU: *What time is it in Copenhagen?* Rum 4731, Fysikum, SU, Vanadisvägen 9. Se sidan 7.

Ti 01–30 kl. 13.15–14.00. Seminar in Theoretical and Applied Mechanics. Sergey N. Gurbatov, Radiophysics Department, University of Nizhny Novgorod: *The decay of multiscale signals — a deterministic model of Burgers turbulence*. Seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8. Se sidan 3.

Ti 01–30 kl. 13.15–14.15. Seminarium i PDE och spektralteori. E. Korotyaev, Potsdam: *Trace formulas in terms of resonances*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Ti 01–30 kl. 14.00–15.00. Mittag-Leffler Seminar. Nicola Gambino, Manchester: *Lattices and frames in CZF*. (Joint work with Peter Aczel.) Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 3.

Fortsättning på nästa sida.

Kurs

Torsten Ekedahl: Konkret datoralgebra. Se sidan 5.

Seminarier (fortsättning)

- On 01–31 kl. 10.15–12.00. Inför Mittag-Leffler-året 2001/02. Jan-Erik Björk:** *Harmoniska mått och Brownsk rörelse.* (Det första av två föredrag.) Rum 306, Cramérummet, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101. Se Bråket nr 3 sidan 6.
- On 01–31 kl. 10.30–11.30. Seminarium i PDE och spektralteori. N. Filonov, S:t Petersburg:** *Example of a periodic Schrödinger operator with an eigenvalue of infinite multiplicity.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- On 01–31 kl. 13.15. Seminarium i analys och dynamiska system. Vadim Y. Kaloshin,** Princeton: *Superexponential rate of growth of the number of periodic points for generic diffeomorphisms.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 3 sidan 7.
- On 01–31 kl. 14.00. Seminarium i algebraisk geometri. Michael Shapiro:** *Gromov-Witten theory, Hurwitz numbers, and matrix models (following A. Okounkov and R. Pandharipande).* Sammanträdesrum 3548, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 5. Se sidan 4.
- On 01–31 kl. 14.00–15.00. Mittag-Leffler Seminar. Helmut Schwichtenberg,** München: *Program extraction from classical proofs.* (Joint work with Ulrich Berger and Wilfrid Buchholz.) Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 4.
- On 01–31 kl. 15.15. Presentation av examensarbete i matematisk statistik. Annica Dominicus:** *Associations- och regressionsmodeller för tvillingdata med binär respons.* Rum 306, Cramérummet, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101. Se sidan 5.
- On 01–31 kl. 15.30–16.30. Mittag-Leffler Seminar. Dag Normann,** Oslo: *Definability and totality in typed lambda calculus.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 7.
- To 02–01 kl. 15.15–17.00. Kombinatorikseminarium. Fedor Duzhin:** *On the lower bounds for the number of periodic billiard trajectories in manifolds embedded in Euclidean space.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.
- On 02–07 kl. 10.15–12.00. Inför Mittag-Leffler-året 2001/02. Jan-Erik Björk:** *Harmoniska mått och Brownsk rörelse.* (Det andra av två föredrag.) Rum 306, Cramérummet, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101. Se Bråket nr 3 sidan 6.
- To 02–08 kl. 16.15–18.00. Seminarium i matematik och fysik vid Mälardalens högskola (Eskilstuna). Jan Schoultz,** Linköpings universitet: *Elevers möjligheter och svårigheter att förstå naturvetenskap.* Rum B315, Mälardalens högskola, Eskilstuna. Internet-adressen till information om seminariet är <http://www.ima.mdh.se/seminarier/index.e.shtml>.
- Fr 02–09 kl. 11.00–12.00. Optimization and Systems Theory Seminar. Camilla Landén,** Optimeringslära och systemteori, KTH: *Title to be announced.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.
In the seminar Camilla Landén will give a summary of her doctoral thesis, which she will defend on Friday, February 16. See page 6.
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SEMINAR IN THEORETICAL AND APPLIED MECHANICS

Sergey N. Gurbatov: The decay of multiscale signals — a deterministic model of Burgers turbulence

Abstract: This work is devoted to the study of the decay of multiscale deterministic solutions of the unforced Burgers' equation in the limit of vanishing viscosity. We construct the initial perturbation as a piecewise linear analogue of the Weierstrass function. The wave numbers of this function form a "Weierstrass spectrum", which accumulates at the origin in geometric progression. "Reverse" sawtooth functions with negative initial slope are used in this series as basis functions, while their amplitudes are chosen by the condition that the distribution of energy over exponential intervals of wave numbers is the same for the continuous spectrum in Burgers turbulence. By combining these two ideas, we can obtain an exact analytic solution for the velocity field.

We also notice that such multiscale waves may be constructed for the multidimensional Burgers' equation. Shocklines form self-similar regular tree-like structures. This model also describes important properties of Burgers turbulence such as the self-preservation of the evolution of large-scale structures in the presence of small-scale perturbation.

Tid och plats: Tisdagen den 30 januari kl. 13.15–14.00 i seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8.

DOKTORANDKURS I MATEMATIK

Jan-Erik Björk, Mikael Passare: Valda problem i komplex analys

Kursen ges varannan vecka under vårterminen 2001. Verksamheten fungerar som en arbetsgrupp där deltagarna turas om att hålla seminarier om aktuella frågor. Det första mötet för terminen äger rum tisdagen den 30 januari kl. 13.15–15.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101.

MITTAG-LEFFLER SEMINAR

Nicola Gambino: Lattices and frames in CZF

Abstract: This is joint work with Peter Aczel.

The familiar notions of lattice and frame need to be modified if one wishes to work within an intuitionistic and predicative framework such as Constructive Zermelo-Fraenkel set theory, CZF. In this talk we will present the notions of set generated and set presented lattice and frame, that are suitable to transfer some familiar results in the context of CZF.

First of all, set generated and set presented lattices and frames are closely related to various notions of formal space introduced in the literature. Secondly, set generated and set presented frames allow to define models for CZF similar to the ones Boolean algebras provide for classical ZF. Such models allow indeed to obtain independence results for CZF.

Tid och plats: Tisdagen den 30 januari kl. 14.00–15.00 i Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I PDE OCH SPEKTRALTEORI

E. Korotyaev:

Trace formulas in terms of resonances

Abstract: Consider two selfadjoint operators H_0 and $H = H_0 + V$, such that $V(H_0 - i)^{-1}$ belongs to the trace class. We prove some trace formulas in terms of resonances and bound states. These results are applied to Schrödinger operators in $L^2(\mathbb{R})$ and $L^2(\mathbb{R}_+)$.

Tid och plats: Tisdagen den 30 januari kl. 13.15–14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

MITTAG-LEFFLER SEMINAR

Helmut Schwichtenberg:

Program extraction from classical proofs

Abstract: This is joint work with Ulrich Berger and Wilfrid Buchholz.

It is well-known that it is undecidable in general whether a given program meets its specification. In contrast, it can be checked easily by a machine whether a formal proof is correct, and from a constructive proof one can automatically extract a corresponding program, which by its very construction is correct as well. This — at least in principle — opens a way to produce correct software, e.g. for safety-critical applications. Moreover, programs obtained from proofs are “commented” in a rather extreme sense. Therefore it is easy to maintain them, and also to adapt them to particular situations.

We will concentrate on the question of classical versus constructive proofs. It is known that any classical proof of a specification of the form $\forall x \exists y B$ with B quantifier-free can be transformed into a constructive proof of the same formula. However, when it comes to extraction of a program from a proof obtained in this way, one easily ends up with a mess. Therefore, some refinements of the standard transformation are necessary.

In the talk I will explain a refined method of extracting reasonable and sometimes unexpected programs from classical proofs.

Tid och plats: Onsdagen den 31 januari kl. 14.00–15.00 i Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I ALGEBRAISK GEOMETRI

Michael Shapiro:

Gromov-Witten theory, Hurwitz numbers, and matrix models (following A. Okounkov and R. Pandharipande)

Abstract: This talk is a short exposition of the ideas in a recent preprint by A. Okounkov and R. Pandharipande. In 1992 Kontsevich proved Witten’s conjecture by establishing a mathematical connection between the intersection theory of $\overline{M}_{g,n}$ and matrix models. This work gives an alternative approach to Witten’s conjecture (Kontsevich’s theorem) based on the formula for Hurwitz numbers.

Tid och plats: Onsdagen den 31 januari kl. 14.00 i sammanträdesrum 3548, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 5.

SEMINARIUM I PDE OCH SPEKTRALTEORI

N. Filonov:

Example of a periodic Schrödinger operator with an eigenvalue of infinite multiplicity

Abstract: At the end of the 20th century the following hypothesis was popular: *The spectrum of a Schrödinger operator with periodic coefficients is absolutely continuous.* In the three-dimensional case we construct functions $u \in C_0^\infty$, $V \in C^\infty$, and a positive matrix-function $g \in C^\alpha$, $\forall \alpha < 1$, such that $-\operatorname{div}(g\nabla u) + Vu = 0$.

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

PRESENTATION AV EXAMENSARBETE I MATEMATISK STATISTIK

Annica Dominicus: Associations- och regressionsmodeller för tvillingdata med binär respons

Abstract: The issue for the thesis is association and regression models for twin data on binary traits. Different aspects of the concordance, which is a measure of association within twin pairs, are discussed. It is shown that the pairwise concordance is the probability parameter in a binomial distribution when conditioning on the number of twin pairs with at least one affected member. This is used to make inference on the measures of concordance. A confidence interval for the pairwise concordance is first computed, and the relationship between the casewise and the pairwise concordance is then used to compute a confidence interval for the casewise concordance.

Several different regression models, such as conditional logistic regression, random effects models, GEE, and bivariate logistic regression, are described. Differences in interpretation of parameters, efficiency and the practical issues of implementation are discussed. Data on phobia in children are analysed using several of the methods mentioned. The methods produce almost the same estimates of regression coefficients and standard errors. One exception is the conditional logistic regression, which produces estimates and standard errors that are almost twice as large as those obtained from the other methods.

Tid och plats: Onsdagen den 31 januari kl. 15.15 i rum 306, Cramérrummet, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101.

DOKTORANDKURS I MATEMATIK

Torsten Ekedahl: Konkret datoralgebra

Tid: Torsdagar kl. 13.15–15.00. Kursen startar den 1 februari.

Plats: Rum 42 (stora datorsalen), hus 5, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101.

Kursen kommer att genom laborationer ta upp ett antal exempel på hur man kan använda datoralgebra för att undersöka matematiska problem. Examination sker genom utförande och presentation av ett mer omfattande problem. Fortlöpande information om kursen kommer att finnas tillgänglig under http://www.matematik.su.se/~teke/konkret_datoralgebra.html.

KOLLOKVIUM I FYSIK**Torleif Härd: Biomolecular NMR spectroscopy —
an overview of applications**

Abstract: The large information content of the nuclear magnetic resonance (NMR) spectrum makes this technique a very powerful tool for studies of structure and behaviour of molecules in solution. Advances during the last two decades have extended the applications to biomolecules such as proteins and nucleic acids. Today, NMR is used to study biomolecular structure, dynamics on a wide range of time scales, interactions between biomolecules, and it is also used for drug discovery and development. The objective of the lecture will be to give an easily digested overview of the modern methodology, the hardware, and applications in biotechnology and structural biology.

Tid och plats: Fredagen den 26 januari kl. 9.00–10.00 i sal F01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v.

DISPUTATION I OPTIMERINGSLÄRA OCH SYSTEMTEORI**Camilla Landén**

disputerar på avhandlingen

On the term structure of forwards, futures and interest rates

fredagen den 16 februari 2001 kl. 10.00 i Kollegiesalen, Administrationsbyggnaden, KTH, Valhallavägen 79. Till fakultetsopponent har utsetts *professor Kristian R. Miltersen*, School of Business and Economics, Odense.

Abstract of the thesis

This thesis consists of four papers which all treat term structures, either of forwards and futures or of interest rates.

In the first paper we consider a diffusion type model for the short rate, where the drift and diffusion coefficients are modulated by an underlying Markov process. The main objective of the paper is to study how bond pricing can be carried out in this framework, both when the underlying Markov process is observable and when it is not.

In the second paper we investigate when a model of the Heath-Jarrow-Morton-type (HJM) for the futures prices generically implies a Markovian spot price, that is when no matter which initial term structure is used for the futures prices, the spot price implied by the futures prices always satisfies a stochastic differential equation.

In the third paper we investigate the term structure of forward and futures prices for models in which the price processes are assumed to be driven by a multi-dimensional Wiener process and a general marked point process. For an infinite-dimensional model of HJM-type of the futures and forward prices we study properties of the futures and forward convenience yield. We also study affine term structures, general pricing of futures options, and the problem of fitting a finite-dimensional factor model to an observed initial futures price curve.

In the fourth paper we consider interest rate models of the HJM-type, where the forward rates are driven by a multi-dimensional Wiener process and the volatility is a smooth functional of the present forward rate curve. Building on earlier results in the field, concerning when such a model can be realized by a finite-dimensional Markovian state space model, we present a general method to actually construct such a realization.

SEMINAR IN THEORETICAL PHYSICS

Bengt Malm: What time is it in Copenhagen?

Abstract: In recent years there have been several remarkable experiments illustrating the uncertainty relation for energy and time. E.g. decreasing the uncertainty in energy gives a larger uncertainty in time.

Another example: Suppose that two particles arrive at the same place “at the same time”. Although neither time of arrival can be determined accurately, it is still possible to find out with almost unbelievable precision if the particles arrived simultaneously. These experiments make it hard to use the picture of particles as extended “wave packages”.

Tid och plats: Tisdagen den 30 januari kl. 13.15 i rum 4731, Fysikum, SU, Vanadisvägen 9.

MITTAG-LEFFLER SEMINAR

Dag Normann:

Definability and totality in typed lambda calculus

Abstract: We will consider three typed lambda calculi, PCF due to Scott/Plotkin, Real PCF due to Escardo, and M-omega due to Niggel. For all three calculi we will consider the semantics based on Scott domains and address problems related to the definability of, and relative to, hereditarily total objects.

Tid och plats: Onsdagen den 31 januari kl. 15.30 – 16.30 i Institut Mittag-Leffler, Auravägen 17, Djursholm.

KOMBINATORIKSEMINARIUM

Fedor Duzhin:

On the lower bounds for the number of periodic billiard trajectories in manifolds embedded in Euclidean space

Abstract: Let $X \subset \mathbb{R}^{m+1}$ be a closed smooth strictly convex hypersurface. The billiard ball is a point which moves inside X in a straight line and rebounds from X making the angle of incidence equal to the angle of reflection. The classical problem is to estimate the number of n -periodic billiard trajectories inside the given billiard domain.

We consider the generalization of this problem: X is a smooth closed m -dimensional manifold embedded in Euclidean space \mathbb{R}^n . The definition of periodic billiard trajectory will be given. We show how to estimate the number of 3-periodic billiard trajectories.

Seminariets hemsida: <http://www.math.kth.se/~kozlov/seminar.html>.

Tid och plats: Torsdagen den 1 februari kl. 15.15 – 17.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.
