



# BRÅKET



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

NR 15

TORSDAGEN DEN 20 APRIL 2000

## BRÅKET

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

Redaktör: Gunnar Karlsson

Telefon: 08-790 84 79

Telefax: 08-790 72 99

Adress för e-post:

gunnark@math.kth.se

Postadress:

Red. för Bråket

Institutionen för matematik

KTH

100 44 Stockholm

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Sista manustid för nästa nummer:

Torsdagen den 27 april kl. 13.00.

## Kurs

*Boris Altshuler: Localization and  
Chaos in Mesoscopic Systems. Se  
sidan 4.*

## SEMINARIER

**Ti 04–25 kl. 10.15. Plurikomplexa seminariet.** George  
**Khimshiashvili:** *Nonlinear Fredholm operators in  
(hyper-)complex analysis.* Sal MIC 2215, Matema-  
tiska institutionen, Polacksbacken, Uppsala uni-  
versitet.

**Ti 04–25 kl. 13.30. Plurikomplexa seminariet.** Mihai  
**Putinar:** *Spherical isometries and function theory  
on the unit ball of  $\mathbf{C}^n$ .* Sal MIC 2215, Matema-  
tiska institutionen, Polacksbacken, Uppsala universitet.  
Se sidan 3.

**Ti 04–25 kl. 14.00 – 15.00. Mittag-Leffler Seminar.**  
**Boyan Sirakov,** Paris: *Harnack type estimates for  
weakly coupled elliptic systems.* Institut Mittag-  
Leffler, Auravägen 17, Djursholm.

**On 04–26 kl. 10.30 – 11.30. Analysseminarium.** S. T.  
**Kuroda,** Department of Mathematics, Gakushuin  
University, Tokyo: *Parameterization of selfadjoint  
operators  $H$  in relation to a given  $H_0$ .* Seminarierum  
3733, Institutionen för matematik, KTH, Lind-  
stedtsvägen 25, plan 7. Se sidan 3.

**On 04–26 kl. 13.15. Dynamiska systemseminariet.**  
**Mattias Sandberg** presenterar sitt examens-  
arbete: *Gowdy spacetimes.* Seminarierum 3733,  
Institutionen för matematik, KTH, Lindstedts-  
vägen 25, plan 7. Se Bråket nr 14 sidan 4. Internet-  
adressen till information om seminariet är [http://  
www.math.kth.se/math/research/dynsyst](http://www.math.kth.se/math/research/dynsyst).

**On 04–26 kl. 15.15 – 16.00. Seminarium i matematik och  
fysik vid Mälardalens högskola (Västerås).**  
**John Noble,** Institutionen för matematik, KTH:  
*The directed polymer in a random environment.* Rum  
N24, Mälardalens högskola, Högskoleplan, Väster-  
ås. Se Bråket nr 14 sidan 5. Internet-adressen till  
information om seminariet är [http://www.ima.  
mdh.se/\\_seminars.htm](http://www.ima.mdh.se/_seminars.htm).

Fortsättning på nästa sida.

**Seminarier (fortsättning)**

- To 04–27 kl. 14.00–15.00. Mittag-Leffler Seminar. Donatella Danielli**, Baltimore: *Optimal regularity in the subelliptic obstacle problem*. Institut Mittag-Leffler, Auravägen 17, Djursholm.
- To 04–27 kl. 15.30–16.30. Mittag-Leffler Seminar. Makoto Sakai**, Tokyo: *Hele-Shaw flows moving boundary problem whose initial domain has a corner with right angle*. Institut Mittag-Leffler, Auravägen 17, Djursholm.
- Fr 04–28 kl. 9.00–10.00. Kollokvium i fysik. Professor Vladilen Letokhov**, Institute of Spectroscopy, Troitsk, Russia: *Lasers in science and technology*. Sal F01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v. Se Bråket nr 14 sidan 4.
- Professor Letokhov är under år 2000 innehavare av Tage Erlanders professur, som under detta år är placerad vid avdelningen för atomspektroskopi, Lunds universitet. Erlanderprofessuren inrättades vid Naturvetenskapliga forskningsrådet av riksdagen år 1981 för att hedra Tage Erlander på hans 80-årsdag.*
- Fr 04–28 kl. 11.00. Licentiatseminarium i mekanik. Bo Johansson**, Mekanik, KTH: *Experimental study of shock wave focusing in a confined chamber*. Seminarierum 40, Institutionen för mekanik, KTH, Teknikringen 8, b.v.
- Ti 05–02 kl. 10.15–12.00. Professor Boris Altshuler**, Princeton: *Localization and Chaos in Mesoscopic Systems*. (Den första i en serie om fyra föreläsningar.) Sal F43, Sing-Sing, KTH, Lindstedtsvägen 30, 2 tr. Se sidan 4.
- On 05–03 kl. 16.15–17.00. Seminar in Theoretical and Applied Mechanics. (Observera dagen och tiden!) Professor Bengt Enflo**, Mekanik, KTH: *Nonlinear standing waves in closed tubes*. Seminarierum 40, Institutionen för mekanik, KTH, Teknikringen 8, b.v. Se sidan 5.
- Fr 05–05 kl. 9.00–10.00. Kollokvium i fysik — docentföreläsning. Dr Vlad Korenivski**, Nanostrukturfysik, KTH: *Magneto-electronic device physics*. Sal F01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v. Se sidan 5.
- Fr 05–05 kl. 13.00. Licentiatseminarium i teoretisk fysik. Lars Sandberg**, Teoretisk fysik, KTH: *Modelling electrostatic interactions in biophysical systems*. Seminarierummet, Teoretisk fysik, KTH, Osqualdas väg 6.
- Må 05–08 kl. 15.15. Seminarium i matematisk statistik. Andreas Lindell**: *Numerical investigations of the distributions of the longest excursions in tied down simple Random Walks and Brownian Bridges*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 3.
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**PLURIKOMPLEXA SEMINARIET**

**Mihai Putinar:**

**Spherical isometries and function theory on the unit ball of  $\mathbf{C}^n$**

*Abstract:* Linear isometric operators on a Hilbert space link some classical function theory problems (such as bounded interpolation for analytic functions in the unit disk) to operator theory results (co-isometric extensions, unitary dilations and von Neumann's inequality). The first part of the seminar will be an introduction to these aspects from the point of view of function theory of a single complex variable.

The second part of the seminar will show the difficulties encountered in  $\mathbf{C}^n$ ,  $n > 1$ , when trying to solve similar problems, and how the Hilbert space interpretation (positivity, spherical isometries, etc.) can help in finding partial solutions.

*Tid och plats:* Tisdagen den 25 april kl. 13.30 i sal MIC 2215, Matematiska institutionen, Polacksbacken, Uppsala universitet.

**ANALYSSEMINARIUM**

**S. T. Kuroda:**

**Parameterization of selfadjoint operators  $H$  in relation to a given  $H_0$**

*Abstract:* Given a selfadjoint operator  $H_0$ , perturbation methods aim to characterize families of operators which are considered close to  $H_0$  in qualitative or quantitative sense. The resolvent formula, which determines the difference of the resolvents of  $H$  and  $H_0$ , is a typical tool. In a rather general setup the formula goes beyond the perturbation theory and leads to parameterizations of *all* selfadjoint operators in relation to  $H_0$ . In the so-called  $\mathcal{H}_{-2}$  perturbation the parameter set is a certain set of bounded operators between spaces scaled in terms of  $H_0$ , and in the approach related to Krein's formula it is a certain set of pairs  $\{M, \gamma\}$  of subspaces  $M$  and selfadjoint operators  $\gamma$  in  $M$ . In this talk, an attempt will be made to present a systematic account of this subject. Applications to singular interactions such as point or surface interactions will be mentioned if time permits.

The talk is based on joint work with Hiroshi Nagatani and Pavel Kurasov.

*Tid och plats:* Onsdagen den 26 april kl. 10.30–11.30 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**SEMINARIUM I MATEMATISK STATISTIK**

**Andreas Lindell:**

**Numerical investigations of the distributions of the longest excursions  
in tied down simple Random Walks and Brownian Bridges**

*Abstract:* We will study the distributions of the longest excursion in tied down simple random walks and the longest excursions in the Brownian bridge. New results are presented, numerically investigated and related to old results. The distributions for the longest excursions in the Brownian bridge are apprehended by passing to the limit in the random walk.

*Tid och plats:* Måndagen den 8 maj kl. 15.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**Boris Altshuler:**  
**Localization and Chaos in Mesoscopic Systems**

*Professor Boris Altshuler*, Princeton, is one of the best modern theoretical physicists and has many ideas useful for mathematicians whose area of research deals with classical and quantum dynamical systems.

He is going to visit the Department of Mathematics, KTH, during May 2000, and he will give a short course in *Localization and Chaos in Mesoscopic Systems*.

The first lecture will take place on Tuesday, May 2, at 10.15–12.00, in room F43, Sing-Sing, KTH, Lindstedtsvägen 30.

**Lecture 1**

This is an introductory lecture. We will discuss:

- Energy level statistics in quantum systems.
- Relations between behaviours of a classical dynamical system and of its quantum analogue.
- Motion of a single particle in a random potential.
- Anderson Localization.
- Dimensionless conductance as a main parameter in this problem.
- General connection between Quantum Chaos and Anderson Localization.

**Lecture 2**

**Scaling theory of localization and mesoscopic fluctuations**

In this lecture we will consider quantum effects in transport of particles in a random potential:

- Interference and quantum corrections to the Drude conductivity.
- Thouless energy and dimensionless conductance.
- Anomalous magnetoresistance.
- Different types of mesoscopic systems.
- Role of averaging and universal conductance fluctuations.

**Lecture 3**

**Interaction between electrons in mesoscopic systems, I**

We will apply the developed understanding of the one-particle quantum mechanics to the problem of a system of interacting quantum particles in a random potential:

- General properties of the spectra, one-particle wave functions, and matrix elements of the interactions.
- “Universal limit” and role of finite dimensionless conductance.
- Coulomb blockade in quantum dots.
- Interaction corrections to the conductivity.

**Lecture 4**

**Interaction between electrons in mesoscopic systems, II**

- Spin exchange and superconductivity in mesoscopic systems.
  - Phase relaxation time due to the interaction between particles.
  - Outstanding problems.
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## SEMINAR IN THEORETICAL AND APPLIED MECHANICS

**Bengt Enflo:**

### Nonlinear standing waves in closed tubes

*Abstract:* Nonlinear acoustic theory must be used when the amplitude of the oscillations of the medium is sufficiently great, so that the acoustical Reynolds number, a measure of the ratio between nonlinear and dissipative effects, is at least of the order of unity. In a closed tube the amplitude of the oscillations can be increased by choosing the frequency of the oscillator to be close to a resonance frequency of the tube. Like travelling waves, the standing waves in the tube may then develop shocks.

The tube in the present case is closed at one end and its medium is excited by a single-frequency piston motion at the other end. The amplitude of the piston motion is so small that the linear theory is sufficient for describing the acoustic field in the tube in the non-resonant case. Nonlinear effects, manifested in a sound field containing higher harmonics, then appear only for piston motion at or near a resonance frequency of the tube. The role of the small numbers in the problem is analysed: acoustical Reynolds number for the piston motion, dissipation parameter, ratio of piston displacement to pipe length and Mach number. The sound field is calculated using d'Alembert's equation, completed with nonlinear and dissipation contributions. Pictures are given of the sound field along the pipe at a given time and of the time dependence of the sound field at a given cross section of the pipe. Shocks are found in both cases. An experiment suitable for seeing the shocks is designed.

*Tid och plats:* Onsdagen den 3 maj kl. 16.15–17.00 i seminarierum 40, Institutionen för mekanik, KTH, Teknikringen 8, b.v.

## KOLLOKVIUM I FYSIK — DOCENTFÖRELÄSNING

**Vlad Korenivski:**

### Magneto-electronic device physics

*Abstract:* Spin polarization of conduction carriers in ferromagnetic materials gives rise to the now well-known effect of giant magnetoresistance and its relative tunnel junction magnetoresistance. The ability to produce thin and small, micro- and nano-sized laterally, magnetic layered structures (known as spin-valves) has been essential for today's advances in data storage. These new devices now claim space in dynamic and non-volatile memories.

High susceptibility to external fields makes soft ferromagnetic films good flux amplifiers, the property of interest for high-frequency inductive applications, such as recording heads and microelectronic inductors. In the GHz range, however, magnetization relaxation through various channels is the factor limiting the use of these materials. Understanding dissipation in magnetic films and multilayers will be the key to success for a number of modern technologies.

After briefly introducing the field of magneto-electronics and giving some device examples, physics and materials aspects of some model structures will be discussed.

*Tid och plats:* Fredagen den 5 maj kl. 9.00–10.00 i sal F01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v.