BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 1 **FREDAGEN DEN 9 JANUARI 2009**

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 15 januari kl. 13.00.

Disputation i matematik

Johan G. Granström skall disputera vid Uppsala universitet på avhandlingen *Reference and Computation in Intuitionistic Type Theory* fredagen den 16 januari kl. 13.15. Se sidan 2.

Money, jobs: Se sidorna 7 – 8.

SEMINARIER

On 01–14 kl. 10.15 – 12.00. Kombinatorikseminarium. Liza Huijse: *What can cohomology tell us about many-particle quantum systems?* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

To 01–15 kl. 13.15 – 14.15. DNA-seminariet Uppsala-KTH (Dynamical systems, Number theory, Analysis). *(Observera lokalen!)* Olof Sisask, University of Cambridge: *The minimal and maximal number of three-term progressions in dense subsets of* $\mathbb{Z}/p\mathbb{Z}$. Sal E32, KTH, Lindstedtsvägen 3, b.v. Se sidan 6.

To 01–15 kl. 15.15 – 16.15. AlbaNova and Nordita Colloquium in Physics. Kareljan Schoutens, University of Amsterdam: *Everything you always wanted to know about non-Abelian quantum Hall states but were afraid to ask.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 4.

Fr 01–16 kl. 12.15 – 13.00. GRU-seminarium i matematik. Anna-Karin Högfeldt och **Stefan Knutsson,** KTH Learning Lab: *Filmad undervisning.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Fortsättning på nästa sida.

Kurs

Sergei Merkulov: Introduction to the theory of spectral sequences. Se sidorna 6 – 7.

Minisymposium on Type Theory and Foundations

Detta skall äga rum i Uppsala torsdagen den 15 januari. Se sidan 3.

Seminarier (fortsättning)

Fr 01–16 kl. 13.15 – 14.15. Presentation av examensarbete i matematik. David Goldstein: *A Combinatorial Approach to Green's Hyperplane Restriction Theorem.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Må 01–19 kl. 15.15 – 17.00. Seminarium i matematisk statistik. Professor Stefan Arnborg, Avdelningen för teoretisk datalogi, Skolan för datavetenskap och kommunikation (CSC), KTH: *The legacy of Ed Jaynes.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.

To 01–22 kl. 10.30. Seminar in Fluid Mechanics. Professor Guido Buresti, Dipartimento di Ingeneria Aerospaziale, Università di Pisa, Italien: *Flow fluctuations and vorticity dynamics in the near wake of triangular prisms in cross-flow.* Seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8. Se sidan 5.

To 01–22 kl. 15.15 – 16.15. AlbaNova and Nordita Colloquium in Physics. Lars Bergström, Fysikum, SU: *Dark matter: Observational status and theoretical challenges.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.

DISPUTATION I MATEMATIK

Johan G. Granström

skall disputera på avhandlingen

Reference and Computation in Intuitionistic Type Theory

fredagen den 16 januari 2009 kl. 13.15 i Polhemsalen, Ångströmlaboratoriet, Lägerhyddsvägen 1, Uppsala universitet. Till opponent har utsetts *professor Peter Dybjer,* Institutionen för data- och informationsteknik, Chalmers tekniska högskola, Göteborg.

Abstract of the thesis

Three topics, namely, computer science, philosophical logic, and mathematics, meet in intuitionistic type theory, which thus simultaneously is a programming language, a philosophy of language, and a foundation of mathematics. The present thesis compares, relates, and equates two concepts, one from philosophical logic and one from computer science, viz., reference and computation. In mathematical practice, we are used to viewing mathematical expressions as referring to their value or object, as $2 + 2$ refers to 4: it is the responsibility of the foundations of mathematics to explain exactly what these objects are and how the expressions refer to them.

The nature of mathematics, and related issues, such as reference and computation, have been debated a long time, in particular around the turn of the last century. The position defended in this thesis is that intuitionism, i.e., the philosophy behind intuitionistic type theory, provides a satisfactory answer to these questions, with the additional benefit of increasing the applicability of mathematics. Of course, these benefits do not come for free: some modern mathematical practices have to be given up, most notably the non-constructive existence proofs.

In addition to critical discussions of the topics mentioned above, the main contributions of this thesis are that computations are brought into the language of intuitionistic type theory, and that intuitionistic type theory is adopted to eager evaluation. The latter contribution is of particular importance in computer science.

MINISYMPOSIUM ON TYPE THEORY AND FOUNDATIONS

Detta skall äga rum torsdagen den 15 januari 2009 i rum Å11167, Ångströmlaboratoriet, Uppsala universitet. Minisymposiet hålls inom ramen för Logikseminariet Stockholm-Uppsala i samband med Johan G. Granströms disputation (se sidan 2).

Program

9.30 – 10.45 **Maria Emilia Maietti:** *A two level theory for constructive mathematics.*
Abstract: In joint work with G. Sambin [1], when looking for a minimalist foundation for constructive mathematics, we ended up claiming the need of a two level theory for that. We give an example of such a two level foundation from [2] and we discuss its consistency with combinations of formal Church thesis, choice principles and Monotone Bar Induction by means of realizability models.

[1] "Toward a minimalist foundation for constructive mathematics", Maria Emilia Maietti and G. Sambin in "From Sets and Types to Topology and Analysis: Practicable Foundations for Constructive Mathematics", (L. Crosilla and P. Schuster editors), Oxford University Press, 2005.

[2] "A minimalist two-level foundation for constructive mathematics", Maria Emilia Maietti, to appear in APAL, 2009.

11.00 – 12.15 **Andreas Abel:** *Typed applicative structures and normalization by evaluation.*
Abstract: Normalization by evaluation is a technique to compute the full beta-normal form of lambda-terms. In the first step, terms are interpreted in some value domain, which corresponds to computing a semantic weak head normal form. In the second step, values are reified, i.e., converted back to terms which are actually normal forms. During reification, evaluation under binders takes place.

In this talk, I will give a tutorial on normalization by evaluation for the simply-typed lambda-calculus. I review interpretation of lambda-terms into an applicative structure and then define a simple type-directed reification which returns eta-long beta-normal forms. I sketch the proof of soundness and completeness which involves constructions of Kripke logical relations. The proof is generic enough to account for related results, like weak beta-(eta-)normalization.

13.45 – 15.00 **Peter Dybjer:** *Program testing and constructive validity.*
Abstract: In this talk I will discuss the connection between Martin-Löf's meaning explanations for intuitionistic type theory and program testing. First I give a short overview of the historical development of the ideas behind the meaning explanations. Then I explain the connection with program testing. Finally, I will mention the possibility of pursuing the testing point of view for some other logical systems.

15.15 – 16.30 **Olov Wilander:** *Another LCCC of partial setoids.*
Abstract: In a paper by Barthe, Capretta, and Pons, a seemingly exhaustive list of notions of partial setoids is investigated. One of the notions found unsuitable there is modified to yield an LCCC not equivalent to the category of (total) setoids, but where all the constructions are chosen. Time permitting, some investigation of the categorical logic will also be presented.

ALBANOVA AND NORDITA COLLOQUIUM IN PHYSICS

Kareljan Schoutens:
Everything you always wanted to know about non-Abelian quantum Hall states but were afraid to ask

Abstract: The colloquium is about what happens when electrons are subjected to the following extreme conditions: strictly two-dimensional geometry (flatland), ultra-low temperature (think mK), and very strong magnetic fields (think Tesla's). It is known that electrons can then form quantum liquids known as fractional quantum Hall states. It is expected that they can form even more remarkable liquids known as non-Abelian quantum Hall states. I will address the many questions one may have: What is special about these states? Why the name? How can they be detected? Can they be useful? Are they for real? Can they occur in atomic rather than electronic matter? When will we know?

Tid och plats: Torsdagen den 15 januari kl. 15.15 – 16.15 i Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.

GRU-SEMINARIUM I MATEMATIK

Anna-Karin Högfeldt och **Stefan Knutsson:**
Filmad undervisning

Sammanfattning: Talarna, som båda kommer från KTH Learning Lab, berättar om ett försöksprojekt med filmad undervisning som pågått under hösten. Det är i två av matematikkurserna vid KTH, en i envariabelanalys och en i linjär algebra, som filmade genomgångar och problemdemonstrationer har använts som komplement till den vanliga undervisningen. Filmerna har lagts ut på nätet i plattformen "Bilda", och studenterna har kunnat titta på dem när de vill. Under seminariet visas några filmer, och vi kommer också att diskutera olika sätt att använda den här typen av material i undervisningen. En utvärdering av detta försöksprojekt är på gång och en del av utvärderingens resultat kommer att redovisas.

Tid och plats: Fredagen den 16 januari kl. 12.15 – 13.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

David Goldstein:
A Combinatorial Approach to Green's Hyperplane Restriction Theorem

Abstract: For a generic linear form L in the polynomial ring $R = k[x_1, \ldots, x_n]$, and any $d \geq 1$, Green's hyperplane restriction theorem gives an upper bound for the codimension of a subspace of the d'th graded component of $R/(L)$. We show that when the field k has characteristic 0, the theorem can be reduced to a combinatorial inequality regarding monomials, namely, that in a strongly stable set B of monomials of degree d, the number of monomials in B that are not divisible by x_n is at least equal to the number of monomials in Λ that are not divisible by x_n, where Λ is the lex-segment of degree d satisfying $|\Lambda| = |B|$. We give an algorithmic proof of this inequality for $n \leq 4$ and sketch why the proof fails when $n \geq 5$.

Tid och plats: Fredagen den 16 januari kl. 13.15 – 14.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I MATEMATISK STATISTIK

Stefan Arnborg:
The legacy of Ed Jaynes

Abstract: Ed Jaynes (1922 – 1998) was a colourful proponent of Bayesian and Maximum Entropy methods in applied data analysis. His lecture notes *Probability Theory: The Logic of Science* were published by Cambridge University Press in 2003, but had worked as a powerful Samizdat for Bayesian underground fanatics for a decade. It is sometimes thought that his (and Lindley's) arrogant writing polarized the community unnecessarily and delayed the powerful syntheses advocated by, e.g., Andrew Gelman and his colleagues. But the main danger statistics runs is that it can become boring, and a good fight can thus have a direct economic value for science.

I will go through some threads in Jaynes' work and see how they were approached by later investigators. Of particular interest is his strong belief in the unconditional validity of Cox's logic-based 'derivation' of the inevitability of Bayesian analysis (a parallel to Lindley's 1982 paper), and also his rather fundamentalist approach to maximum entropy methods as more justified than the alternatives, often based on Dempster's, Shafer's or Walley's work. Some of the results I present are joint work with Gunnar Sjödin and Joel Brynielsson.

Tid och plats: Måndagen den 19 januari kl. 15.15 – 17.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINAR IN FLUID MECHANICS

Guido Buresti:
Flow fluctuations and vorticity dynamics
in the near wake of triangular prisms in cross-flow

Abstract: The main results are described of an investigation, carried out during the last years at the Department of Aerospace Engineering of the University of Pisa, on the characterization of the wake flow field of triangular prisms with moderate aspect ratio placed vertically on a plane. Attention is focused on the connection between the velocity fluctuations and the dynamics of different vorticity structures present in the wake, particularly as regards an equilateral prism having aspect ratio equal to 3 and the apex edge directed against the incoming flow. The research is mainly experimental, and was carried out using flow visualizations, hot-wire velocity surveys, pressure and force measurements; however, the results of a LES simulation were also synergically used to achieve a deeper understanding of the main flow features and to guide the experimental activity. The analysis of all the time-varying signals obtained during the investigation was carried out using recently-developed processing procedures based on the wavelet and Hilbert transforms. Models with geometrical modifications conceived in order to interfere with the dynamics of the different wake vorticity structures were also tested, and the obtained results, some of which unexpected, will be described and discussed.

Tid och plats: Torsdagen den 22 januari kl. 10.30 i seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8.

KOMBINATORIKSEMINARIUM

Liza Huijse:
What can cohomology tell us about many-particle quantum systems?

Abstract: We study a quantum mechanical model for fermions that live and move on a lattice. The particles are subject to strong interactions, which are tuned to make the model supersymmetric. Due to this, the states that minimize the energy of the system, i.e. the quantum ground states, are in one-to-one correspondence with cohomology classes of the so-called independence complex of the lattice. I will discuss various recent results and their implications in the physics context.

Tid och plats: Onsdagen den 14 januari kl. 10.15 – 12.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

DNA-SEMINARIET UPPSALA-KTH (DYNAMICAL SYSTEMS, NUMBER THEORY, ANALYSIS)

Olof Sisask:
The minimal and maximal number of three-term progressions in dense subsets of $\mathbb{Z}/p\mathbb{Z}$

Abstract: A famous theorem of Roth asserts that any dense subset of the integers $\{1, \dots, N\}$ must contain a three-term arithmetic progression, provided N is large enough in terms of the density of the set. This turns out to be equivalent to the statement that a subset of $\{1, \dots, N\}$ of positive density δ must actually contain a lot of three-term progressions: at least $c(\delta)N^2$ of them, in fact, where $c(\delta)$ is some positive constant depending only on the density δ. Similar statements exist in $\mathbb{Z}/p\mathbb{Z}$, the integers modulo a prime p, and I shall discuss the analogous problem in this setting: how many three-term progressions must A contain if A is a subset of $\mathbb{Z}/p\mathbb{Z}$ of density δ? In particular, I shall outline how one can obtain an exact answer for very large densities using some analytically-inspired ideas.

The talk is based on joint work with Ben Green.

Tid och plats: Torsdagen den 15 januari kl. 13.15 – 14.15 i sal E32, KTH, Lindstedtsvägen 3, b.v.

FÖRDJUPNINGSKURS I MATEMATIK

Sergei Merkulov:
Introduction to the theory of spectral sequences

A spectral sequence is one of the most powerful computational and theorem-proving tools of homological algebra that has many applications in algebra, geometry and topology. Despite the title, we shall treat spectral sequences in the course as a *tool* rather than a *theory* and concentrate, therefore, on teaching (via a selection of illustrative examples) on how to *use* it in applications rather than on how one might generalize it further.

We shall use the books by Charles Weibel, *An introduction to homological algebra*, CUP, 1994, and by John McCleary, *A User's Guide to Spectral Sequences*, CUP, 2000, but will attempt to make the course more elementary and self-contained and hence prepare during the course our own lecture notes which will be available to download from http://www2.math.su.se/~sm/.

(Continued on the next page.)

All the new information about the course will be available on the above web address.

The lectures will be given on Fridays at 13.15 – 15.00 in seminar room 306, house 6, Department of Mathematics, SU, Kräftriket, starting on January 23, 2009.

Welcome!
Sergei Merkulov

MONEY, JOBS

Columnist: Johannes Lundqvist, Department of Mathematics, Stockholm University. E-mail: johannes@math.su.se.

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 2009. 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.
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

Money to apply for

11. Vetenskapsrådet utlyser bidrag till anställning som postdok i Sverige. Bidraget skall ge möjlighet för forskare med svensk doktorsexamen eller med utländsk examen som bedöms motsvara doktorsexamen att vistas vid svensk högskola eller svenskt forskningsinstitut. Sista ansökningsdag är den 26 februari. Web-info: http://www.vr.se/huvudmeny/sokabidrag/vetenskapsradetsutlysningar/utlysningsvy.4.aad30e310abcb9735780004381.html?resourceId=-1873&languageId=1.
12. Vetenskapsrådet utlyser postdoktorsstipendium. Stipendierna skall ge möjlighet för forskare med svensk doktorsexamen eller examen från EUI (European University Institute) att vistas vid utländskt universitet eller forskningsinstitut. Sista ansökningsdag är den 26 februari. Web-info: http://www.vr.se/huvudmeny/sokabidrag/vetenskapsradetsutlysningar/utlysningsvy.4.aad30e310abcb9735780004381.html?resourceId=-1935&languageId=1.

(Continued on the next page.)

13. Svenska matematikersamfundet utlyser resestipendier (Knut och Alice Wallenbergs stiftelses resefond och Mats Esséns minnesfond) avsedda för forskare som ej ännu avlagt doktorsexamen. Wallenbergsstipendierna (högst 3000 kr/person) är till för att utnyttjas som delfinansiering för konferensresor och kortare utlandsvistelser. Esséns tipendierna (högst 6000 kr/person) är i första hand avsedda för deltagande i sommarskolor och liknande aktiviteter. Sista ansökningsdag är den 31 mars. Web-info: http://www.maths.lth.se/matematiklu/personal/dencker/resebidrag.html.

Old information

Money to apply for

14. Stiftelsen Anna-Greta och Holger Crafoords fond utlyser bidrag och anslag för att främja grundforskning inom matematik och vissa naturvetenskaper. Såväl enskilda som institutioner kan beviljas medel för bland annat vetenskaplig verksamhet, vetenskapliga konferenser och inbjudan av utländska gästforskare. Bidrag och anslag delas ut företrädesvis till unga forskare. Sista ansökningsdag är den 1 mars. Web-info: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=11&br=ns&ver=6up.

15. 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. Web-info: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=45.

Jobs to apply for

16. Lunds Tekniska Högskola söker minst två doktorander i matematik med inriktning mot bildanalys och datorseende. Sista ansökningsdag är den 19 januari. Web-info: http://www3.lu.se/info/lediga/admin/document/PA2008-4091.pdf.

17. Matematiska institutionen vid SU utlyser en postdoktorsanställning (ett år med möjlighet till ett års förlängning) i matematisk statistik med inriktning mot stokastiska modeller för sociala nätverk. Sista ansökningsdag är den 15 januari. Web-info: http://www.math.su.se/pub/jsp/polopoly.jsp?d=5982&a=28839. Klicka sedan på "Läs hela utlysningen här".

18. 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. Web-info: http://www.mittag-leffler.se/programs/0910/grants.php.