



**INSTITUT
MITTAG-LEFFLER**

THE ROYAL SWEDISH ACADEMY OF SCIENCES

Annual report 2010



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Cover photo: Maryke Devos

Photos in this report: Margareta Wiberg Roland, when nothing else is written.

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27 May 2011

Research programs

Programs 2010

- Dynamical Systems and PDEs, spring 2010
- Quantum Information Theory, fall 2010

During 2010 the Institute hosted 161 visiting researchers, who together spent 210 man-months working at the Institute.

The programs during the current 12-year period — past and future — are:

- Probability and Conformal Mappings, fall 2001 and spring 2002
- Partial Differential Equations and Spectral Theory, fall 2002
- Mathematical Control and Systems Theory, spring 2003
- Noncommutative Geometry, fall 2003 and spring 2004
- Queuing Theory and Teletraffic Theory, fall 2004
- Algebraic Combinatorics, spring 2005
- Wave Motion, fall 2005
- Algebraic Topology, spring 2006
- Moduli Spaces, fall 2006 and spring of 2007
- Stochastic Partial Differential Equations, fall 2007
- Complex Analysis of Several Variables, spring 2008
- Geometry, Analysis, and General Relativity, fall 2008
- Discrete Probability, spring 2009
- Mathematical Logic: Set theory and model theory, fall 2009

- Algebraic Geometry with a view to applications, spring 2011
- Complex Analysis and Integrable Systems, fall 2011
- Geometric and Analytic Aspects of Group Theory, spring 2012
- Hamiltonians in Magnetic Fields, fall 2012
- Inverse Problems and Applications, spring 2013

Activity report 2010

Institut Mittag-Leffler is an international research institute for mathematics with a Nordic basis. It was founded in 1916 by Professor Gösta Mittag-Leffler and his wife Signe, who donated their magnificent villa with its first-class library for the purpose of creating the Institute that bears their name.

The Institute is today an active international center for front-line research in the mathematical sciences, operating under the auspices of the Royal Swedish Academy of Sciences. It enjoys the economic support of national funding agencies from all the Nordic countries, as well as of some private foundations.

The main activities at the Institute are the research programs and the publication of two research journals.

The Institute conducts semester-long programs aimed at research in some area in pure or applied mathematics of current interest. Each research program is led by an organizing committee. Based on the recommendations of this committee the Institute invites senior and junior mathematicians to come and work together at the Institute. The senior participants are chosen among the internationally leading mathematicians in the given area. To the junior participants, typically recent Ph.D.s, we offer fellowships, open to everyone to apply for. Mathematicians from the Nordic countries are given a slight priority. We make, however, sure that scientific caliber and a good mixture of talents and backgrounds have top priority, to optimize the creative environment at the Institute.

Detailed reports and documentation on the 2010 programs can be found later in this report. See also our web pages at www.mittag-leffler.se.

An aspect of the programs that is emphasized is to provide good postdoctoral training to the junior participants. Special seminars and minicourses are given specifically for them. In addition to these area-specific research programs we have the *RIP program* (Research in Peace), which allows Nordic mathematicians to spend time at the Institute for independent research.



Deputy director Mikael Passare explains some mathematics to a visiting group of high school students.

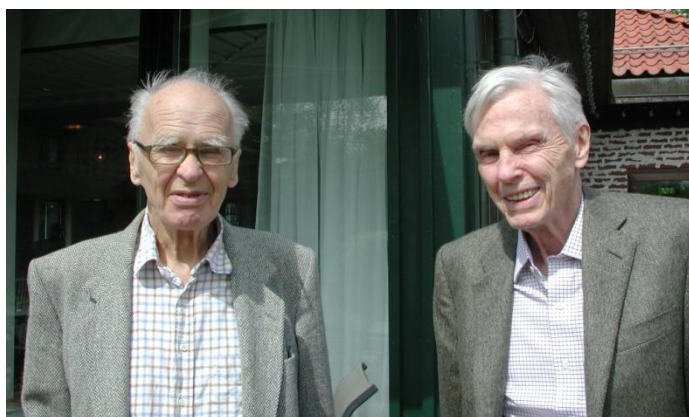
The Institute publishes two journals, **Acta Mathematica** (founded by Gösta Mittag-Leffler in 1882) and **Arkiv för matematik** (founded in 1903). Information about the journals is given later in this report, as well as on our web pages www.mittag-leffler.se/publications. Acta Mathematica is generally considered to be one of the leading international mathematics research journals. During 2010 we increased the number of pages of Acta Mathematica from 600 to 700 pages per year, in order to be able to publish more of the very excellent papers that are submitted to the journal.

Institut Mittag-Leffler is an active participant in international scientific life. It participates in international networks of mathematics research institutes. For instance, we belong to ERCOM (European Research Centers on Mathematics), a network of European sister institutes. We also belong to EPDI (European Post-Doctoral Institute), a collaboration between 9 institutes for jointly awarding postdoctoral fellowships to Europe's most promising young mathematicians.



Åsa Ericsson and Thomas Kahle, an EPDI scholarship holder spending one academic year at the Institute.

An international evaluation¹ of Swedish research in mathematics, sponsored by the Swedish Research Council (VR) and the Swedish Foundation for Strategic Research (SSF) was conducted in 2010. Institut Mittag-Leffler receives very positive mention. The importance of the Institute for Swedish mathematics is emphasized (see especially page 18 of the report), and the evaluation committee "most strongly recommends" VR and other Swedish and Nordic funding agencies to "act quickly to stabilize the current operating budget" (page 19).



The Abel Prize is an international prize in Mathematics at the Nobel Prize level which since 2003 is awarded by the Norwegian Academy of Science and Letters. The photo is taken when the 2006 and 2010 laureates, Lennart Carleson and John Torrence Tate met at Institut Mittag-Leffler in May 2010.

The Institute staff does a wonderful job. Visitors from abroad often express their admiration how such a many-faceted operation can be run, and run so well, by so few individuals. At the end of 2010 Marie-Louise Koskull retired, after working 22 years at the Institute. For the last decade she has managed brilliantly the administration of the research programs. We welcomed her successor, Inger Halvarsson, who joined us at the Institute in December. Mikael Rågstedt was duly celebrated for having served as technical editor and librarian for 25 years.

¹ The report "Evaluation of Swedish research in mathematics", VR and SSF, 2010, can be obtained at <http://www.vr.se/download/18.287e63c12e07f2d51780001353/Evaluation+of+Swedish+research+in+mathematics.pdf>

One of the scientific leaders of the spring program, Professor Jean Cristophe Yoccoz, was awarded the Erlander professorship by Vetenskapsrådet.

We were aided in the work of maintaining the historic main building by contributions from the Osher foundation (for maintenance of the old furniture) and from Professor Sigurdur Helgason (for new blackboards in the seminar room).

Institut Mittag-Leffler extends its warm gratitude to all organizations and individuals who via grants and contributions of various kinds have made the work of the Institute possible during the year 2010.



Anders Björner
Director

Contributors

The Institute is very grateful to the following organizations and individuals for contributions and support during 2010:

The Swedish Research Council, VR
Academy of Finland
Danish Agency for Science, Technology and Innovation
The Icelandic Mathematical Society
The Research Council of Norway

Acta Mathematicas fond
Erlanderprofessur, The Swedish Research Council (Jean-Christophe Yoccoz)
Fonden "Till bröderna Jacob och Marcus Wallenbergs minne"
KTH Royal Institute of Technology
Linköping University
Philip Leverhulme Trust via Andreas Winter
Professor Sigurdur Helgason, MIT
Stiftelsen G.S. Magnusons fond
The Anna-Greta and Holger Crafoord Fund



The first users of the new blackboards. September 2010. Made possible through a gift from Sigurdur Helgason

Dynamical Systems and PDEs

Scientific report 2010 spring

The program in Dynamical Systems and PDEs covered a large spectrum of the theory of modern dynamical systems ranging from chaotic behavior in low-dimensional systems over smooth and abstract ergodic theory to stability in PDEs and other infinite dimensional systems.

During almost every week two seminar talks were given each Tuesday and also each Thursday. Three weeks of more intensive seminar activities ("workshops") were given during the program: one concentrated on ergodic theory in February, one on non-uniform hyperbolicity and interval exchange maps in the beginning of April, and one concentrated on KAM-theory, Schrödinger operators and PDEs in the end of May. J.-C. Yoccoz gave a course on "Non-uniformly hyperbolic horseshoes" during two months and A. Katok gave a mini-course on "KAM and rigidity". The Gustafsson lectures by J. Bourgain also became a natural part of the activity though they took place at KTH.



Anatole Katok in action.



Lennart Carleson was an often seen guest this spring. Here together with Michael Benedicks and Ana Rodrigues.

The program gave rise to new collaborations or provided opportunity to continue existing ones. Many of these have already resulted in common works: Johansson, Pollicott and Öberg worked on Bernoulli g -measures; Färm and Person studied dimension theory of baker-like skew-transformations of beta-transformations; Nicol and Persson studied smooth Livsic regularity of piecewise expanding maps; Burns and Hasselblatt gave a new proof of the Sharkovsky theorem; Aspenberg and Perez studied the growth of binomial recursion; Fan, Schmeling and Troubetzkoy worked on a multifractal mass transference principle for Gibbs measures; Khanin and Teplinsky finished a work on renormalization of circle diffeomorphisms with break. Baladi and Liverani worked on a project on exponential decay of correlations for piecewise hyperbolic contact flows which is now almost completed.

Other collaborations will likely produce interesting results in the future: Eliasson and Matheus made progress on their work on the perturbation theory for the KP-equation and had occasion to discuss their approach with the one of Yuan; Kuksin and Kappeler exchanged their different points of view on the Birkhoff-coordinates for KdV; Eliasson, Fayad and Krikorian made progress on their work on Herman's problem and was able to give an infinitely differentiable counter-example to Herman's conjecture; Marmi and

Yoccoz continued their work on interval exchange maps and so did Benedicks and Rodrigues on double standard maps.

The program was followed by more than 90 participants from US, Canada, Brazil, China and different European countries - the participants from Sweden and France were particularly numerous. A number of postdocs and a few other participants stayed for the whole period. Most senior participants were able to stay for a month, but we noticed an important difficulty for many of them to stay for a month without interruption. In general the participants were extremely pleased and impressed by the facilities and the ambiance of the Institute.

On the non-mathematical side, the organizers arranged a trip to Uppsala at Walpurgis, a boat trip to Sandhamn end of May, and several parties during the semester. By initiative of some participants ice-swimming (at Hellasgården) and a weekend sailing trip in the Stockholm archipelago were organized. In May and June common barbecues were frequent by those living at the institute.



The Organizing committee gathered between two seminars.

Organizing committee:

Michael Benedicks, KTH Royal Institute of Technology, Stockholm

Håkan Eliasson, University Paris-Diderot

Jörg Schmeling, Lund University

Jean-Christophe Yoccoz, Collège de France

Dynamical Systems and PDEs

Participants 2010 spring

Name	University	City
Alves, José	Universidade do Porto	Porto
Anantharaman, Nalini	Ecole Polytechnique	Palaiseau
Andersson Forsman, Oscar	KTH	Stockholm
Anton, Ramona	Institut de Mathématiques Jussieu	Paris
Aspenberg, Magnus	--	Göteborg
Avila, Artur	Université Paris VI	Paris
Baladi, Viviane	ENS	Paris
Bambusi, Dario	Universita di Milano	Milano
Beck, Margaret	University of Boston	Boston
Benedicks, Michael	KTH	Stockholm
Benini, Anna	Stony Brook	Stony Brook
Berger, Pierre	Université Paris 13	Paris
Bjerklov, Kristian	KTH	Stockholm
Björklund, Michael	Hebrew University	Jerusalem
Bochi, Jairo	PUC	Rio de Janeiro
Bruin, Henk	University of Surrey	Guildford
Brännström, Niklas	University of Helsinki	Helsinki
Bufetov, Alexander	Steklov Institute of Mathematics	Moscow
Burns, Keith	Northwestern University	Evanston
Carleson, Lennart	KTH	Stockholm
Cerqueira, Aline	Collège de France	Paris
Chavaudret, Claire	Université Paris 7	Paris
Clack, Greg	University of Surrey	Guildford
Craig, Walter	McMaster University	Hamilton, Ontario
Crovisier, Sylvain	Institut Galilée	Villetaneuse
Damanik, David	Rice University	Houston
Denker, Manfred	Universität Göttingen	Göttingen
Diaz, Lorenzo	PUC	Rio de Janeiro
Dobbs, Neil	KTH	Stockholm
Einsiedler, Manfred	ETH	Zürich
Eliasson, Håkan	Université Paris 7	Paris
Enstedt, Mattias	Uppsala University	Uppsala
Fayad, Bassam	Univeritè Paris 13	Paris
Forni, Giovanni	University of Maryland	College Park
Färm, David	IM PAN, Institute of Mathematics of the Polish Academy of Sciences	Warszaw
Gaidashev, Denis	Uppsala University	Uppsala
Gourmelon, Nicolas	Universit'e de Bordeaux	Bordeaux
Grebert, Benoit	Université de Nantes	Nantes
Hasselblatt, Boris	Tufts University	Medford
Homburg, Ale Jan	University of Amsterdam	Amsterdam
Johnson, Tomas	Uppsala University	Uppsala
Kappeler, Thomas	Universität Zürich	Zürich
Katok A., Anatole	Penn State University	University Park
Khanin, Kostya	University of Toronto	Toronto
Knauf, Andreas	Friedrich-Alexander-Universität	Erlangen
Krikorian, Raphael	Université Paris 6	Paris
Kristensen, Simon	Aarhus universitet	Aarhus
Kruglikov, Boris	University of Tromsø	Tromsø

Kuksin, Sergei	Ecole Polytechnique	Paris
Lauterbach, Reiner	Universität Hamburg	Hamburg
Ledrappier, Francois	University of Notre Dame	Indiana
	Universita degli studi di Roma,Tor	
Liverani, Carlangelo	Vertaga	Rome
Llave, de la, Rafael	University of Texas	Austin
Marmi, Stefano	Scuola Normale Superiore	Pisa
Martens, Marco	Stony Brook University	Stony Brook
Matheus, Carlos	Collège de France	Paris
Melbourne, Ian	University of Surrey	Guildford
Melgaard, Michael	Dublin Institute of Technology	Dublin
Mihalache, Nicolae	Institut Mathématiques Jussieu	Paris
Nicol, Matthew	University of Houston	Houston
Nilsson, Lisa	Stockholm University	Stockholm
Perez, Rodrigo	Indiana University-Purdue University	Indianapolis
Persson, Tomas	IM PAN	Warsaw
Pesin, Yakov	Penn State University	University Park
Pollicott, Mark	University of Warwick	Coventry
Przytycki, Feliks	IMPAN	Warsaw
Rodrigues, Ana	Universidade do Porto	Porto
Saprykina, Maria	KTH	Stockholm
Schmeling, Jörg	Lund University	Lund
Schmidt, Klaus	University of Vienna	Vienna
Schnellmann, Daniel	KTH	Stockholm
	Universidade Federal do Rio de	
Senti, Samuel	Janeiro	Rio de Janeiro
Shamarova, Evelina	Universidade do Porto, CMUP	Porto
Steif, Jeff	Chalmers	Gothenburg
Stolovitch, Laurent	Université de Nice - Sophia Antipolis	Nice
Takahashi, Hiroki	Kyoto University	Kyoto
	National Academy of Sciences of	
Teplinsky, Alexey	Ukraine	Kiev
Thouvenot, Jean-Paul	Pierre & Marie Curie	Paris
Todd, Mike	University of Boston	Boston
Tsujii, Masato	Kyushu University	Fukuoka
Ulcigrai, Corinna	University of Bristol	Bristol
Wang, Wei-min	Université Paris Sud 11	Orsay
Wiegman, Igor	KTH	Stockholm
Winckler, Björn	KTH	Stockholm
Yoccoz, Jean-Christophe	Collège de France	Paris
Yuan, Xiaoping	Fudan University	Shanghai
Zmiaikou, David	Université Paris-Sud 11	Paris
Zongo, Frederic	University of Ouagadougou	Ouagadougou
Öberg, Anders	Uppsala University	Uppsala

Dynamical Systems and PDEs

Preprints 2010 spring

- 01 **Large intersection classes on fractals**
David Färm, Tomas Persson
- 02 **A quartic system with 26 limit cycles**
Tomas Johnson
- 03 **Linear response for smooth deformations of generic nonuniformly hyperbolic unimodal maps**
Viviane Baladi, Daniel Smania
- 04 **Unique Bernoulli g-measures**
Anders Johansson, Anders Öberg, Mark Pollicott
- 05 **Vanishing transverse entropy in smooth ergodic theory**
Francois Ledrappier, Jiang-Sheng Xie
- 06 **Typical points for one-parameter families of piecewise expanding maps of the interval**
Daniel Schnellmann
- 07 **Axiom A versus Newhouse phenomena for Benedicks-Carleson toy models**
Carlos Matheus, Carlos Gustavo Moreira, Enrique Pujals
- 08 **Martingale approximation and the central limit theorem for random dynamical systems of affine transformations**
Manfred Denker, Yukiko Iwata
- 09 **Dimension and measure of baker-like skew-products of beta-transformations**
David Färm, Tomas Persson
- 10 **Control of cancellations that restrain the growth of a binomial recursion**
Magnus Aspenberg, Rodrigo Perez
- 11 **The Sharkovsky Theorem: A natural direct proof**
Keith Burns, Boris Hasselblatt
- 12 **Extreme value theory and return time statistics for dispersing billiard maps and flows, Lozi maps and Lorenz-like maps**
Chinmaya Gupta, Mark Holland, Matthew Nicol
- 13 **A Borel-Cantelli lemma for non-uniformly expanding dynamical systems**
Chinmaya Gupta, Matthew Nicol, William Ott
- 14 **Smooth Livšic regularity for piecewise expanding maps**
Matthew Nicol, Tomas Persson
- 15 **Erdos Renyi laws for hyperbolic dynamical systems**
Manfred Denker, Matthew Nicol
- 16 **A note on Borel-Cantelli lemmas for non-uniformly hyperbolic dynamical systems**
Nicolai Haydn, Matthew Nicol, Tomas Persson, Sandro Vaienti

- 17 **Renormalization horseshoe and rigidity theory for circle diffeomorphisms with breaks**
Konstantin Khanin, Alexey Teplinsky
- 18 **A Multifractal Mass Transference Principle for Gibbs Measures with Applications to Dynamical Diophantine Approximation**
Ai-Hua Fan, Joerg Schmeling, Serge Troubetzkoy

Dynamical Systems and PDEs

Seminars 2010 spring

Maria Saprykina, KTH, Stockholm

Examples of Hamiltonian systems with Arnold diffusion

Boris Hasselblatt, Tufts University and European Doctoral College

Legendrian knots and nonalgebraic contact Anosov flows on 3-manifolds (with Patrick Foulon)

Jean-Christophe Yoccoz, Collège de France, Paris

COURSE: Non-uniformly hyperbolic horseshoes(continuation)

Jean Bourgain, IAS, Princeton

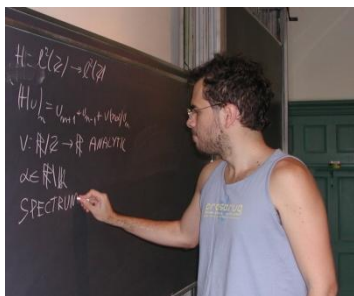
Toral eigenfunctions and distribution of lattice points on spheres

Michael Björklund, Jerusalem

Multiplicative combinatorics and dynamics

Artur Avila, Université Paris 6

KAM, Lyapunov exponents and the spectral dichotomy for one-frequency Schrödinger operators



Artur Avila giving a lecture



Jean-Christophe Yoccoz, Collège de France, Paris

COURSE: Non-uniformly hyperbolic horseshoes(continuation)

Yakov Pesin, Penn State University

Stable Ergodicity of Partially Hyperbolic Diffeomorphisms: The Dissipative Case

Pierre Berger, Université Paris 13

Abundance of one dimensional non-uniformly hyperbolic attractors for surface endomorphisms

Jean-Christophe Yoccoz, Collège de France, Paris

COURSE: Non-uniformly hyperbolic horseshoes(continuation)

Wei-min Wang, Université Paris Sud 11

Supercritical NLS: quasi-periodic solutions and almost global existence

Rafael de la Llave, University of Texas, Austin

Periodic and almost periodic breathers in Hamiltonian lattice systems

David Damanik, Rice University, Houston

What determines the spreading of a wavepacket?

Anders Szepessy, KTH, Stockholm

How accurate is molecular dynamics?

Yakov Pesin, Penn State University

Thermodynamics of Towers of Hyperbolic Type

Benoit Grebert, Université de Nantes

KAM for the semilinear quantum harmonic oscillators

Artur Avila, Université Paris 6

Absence of critical energies for typical one-frequency Schrödinger operators

Thomas Kappeler, Universität Zürich

On the asymptotics of the Birkhoff map

Walter Craig, McMaster University, Hamilton

Lagrangian invariant tori for Hamiltonian systems with infinitely many degrees of freedom

Alexander Bufetov, Institute of Mathematics, Moscow, and Rice University, Houston

Limit theorems for translation flows

Margaret Beck, University of Boston

Time-periodic parabolic PDEs on unbounded spatial domains: a method for understanding the linear non-autonomous operator and the full nonlinear dynamics

Håkan Eliasson, Université Paris 7

KAM for the KP equation

Jean-Paul Thouvenot, CNRS and UPMC, Paris

Another proof of the norm convergence of nonconventional ergodic averages for commuting transformations

Sergei Kuksin, CNRS and Ecole Polytechnique, Paris

Perturbed KdV: results and open problems

Jean-Christophe Yoccoz, Collège de France, Paris

COURSE: Non-uniformly hyperbolic horseshoes(continuation)

Anatole Katok, Penn State University

Anatole Katok's Course: KAM and rigidity - Lecture 6: Setting up of the KAM scheme for the parametric local differentiable rigidity of the unipotent action of \mathbb{R}^2 on $SL(2, \mathbb{R}) \times SL(2, \mathbb{R})/\Gamma$. Application of cocycle rigidity. and tame splitting

Bassam Fayad, Université Paris 13

Transitive dynamics in the solid torus

Nicolas Gourmelon, Université de Bordeaux

"Pathwise" perturbations of linear cocycles, and new examples of wild dynamics

Anatole Katok, Penn State University

Anatole Katok's Course: KAM and rigidity - Lecture 5: Cocycle rigidity and tame splitting for the unipotent action of \mathbb{R}^2 on $SL(2, \mathbb{R}) \times SL(2, \mathbb{R})/\Gamma$

Dario Bambusi, Università Statale di Milano

On dispersion of small energy solutions of the nonlinear Klein Gordon equation with a potential. (Joint work with Scipio Cuccagna(Modena))

Xiaoping Yuan, Fudan University, Shanghai

KAM theory for unbounded perturbation with application to PDEs

Anatole Katok, Penn State University

Anatole Katok's Course: KAM and rigidity - Lecture 4: Unitary representation of $SL(2, \mathbb{R})$ and solution of cohomological equations for the horocycle flow

Anatole Katok, Penn State University

Anatole Katok's Course: KAM and rigidity - Lecture 3: Realization of the KAM scheme for local differentiable rigidity for actions by commuting partially hyperbolic automorphisms of the torus

Michael Yampolsky, University of Toronto

Parabolic renormalization

Jean-Christophe Yoccoz, Collège de France, Paris

COURSE: Non-uniformly hyperbolic horseshoes(continuation)

Anatole Katok, Penn State University

Anatole Katok's Course: KAM and rigidity - Lecture 2: Local differentiable rigidity for actions by commuting automorphisms of the torus: 1. Hyperbolic case. A priori regularity of structural stability. 2. Partially hyperbolic case: setting up the KAM scheme

Nalini Anantharaman, Orsay

Semiclassical measures for the Schrödinger equation II : the case of negative curvature

Kostya Khanin, University of Toronto

Nonrigidity for circle maps with breaks

Anatole Katok, Penn State University

Absolutely continuous invariant measures for actions of higher-rank abelian groups

Kristian Bjerklöv, KTH, Stockholm

Quasi-periodic perturbations of some unimodal maps

Michael Benedicks, KTH, Stockholms

Moser's theorem on commuting circle diffeomorphisms. Two introductory lectures to the course of A. Katok

Anatole Katok, Penn State University

Anatole Katok's Course: KAM and rigidity - Lecture 1: Survey of rigidity properties for smooth actions of abelian groups: hyperbolic, partially hyperbolic, elliptic and parabolic. Methods used for establishing various flavors of rigidity. Cocycles, cohomological equations and time changes. General scheme of the KAM method for actions of higher-rank abelian groups

Michael Benedicks, KTH, Stockholms

Moser's theorem on commuting circle diffeomorphisms. Two introductory lectures to the course of A. Katok

Sylvain Crovisier, Université Paris 13, Villetaneuse

Strong homoclinic intersections inside hyperbolic attractors

Raphael Krikorian, Université Paris 6

Cocycles not homotopic to the identity

Jean-Christophe Yoccoz, Collège de France, Paris

Non-uniformly hyperbolic horseshoes.(Continuation of J.-C. Yoccoz' course)

Corinna Ulcigrai, University of Bristol

A Gauss map for symbolic sequences in the regular octagon

Lorenzo Diaz, PUC, Rio de Janeiro

C^1 -robust cycles

Carlos Matheus Santos, Collège de France, Paris

Axiom A versus Newhouse phenomena for Benedicks-Carleson toy models

Nalini Anantharaman, Ecole Polytechnique, Palaiseau

Semiclassical measures for the Schrödinger equation on the torus

Jean-Christophe Yoccoz, Collège de France, Paris

Non-uniformly hyperbolic horseshoes

Sylvain Crovisier, Université Paris 13, Villetaneuse

Partial hyperbolicity far from homoclinic tangencies

Ian Melbourne, University of Surrey, Guildford

Convergence of fast-slow ODEs to stochastic differential equations

Jean-Christophe Yoccoz, Collège de France, Paris

Non-uniformly hyperbolic horseshoes

Lorenzo J. Diaz, PUC, Rio de Janeiro

Porcupine-like transitive sets

Henk Bruin, University of Surrey, Guildford

Dynamics of some interval translation maps

Giovanni Forni, University of Maryland, College Park

The Kontsevich-Zorich exponents beyond the canonical measures

Keith Burns, Northwestern University, Evanston

Ergodicity of the Weil-Petersson flow

Corinna Ulcigrai, University of Bristol

Mixing time-changes of parabolic flows

Stefano Marmi, Scuola Normale Superiore, Pisa

Linearization of generalized Interval Exchange Maps

David Damanik, Rice University, Houston

Dynamical aspects of the spectral analysis of Schrödinger operators

Magnus Aspenberg, Gothenburg

Perturbations of rational Misiurewicz maps

Raphael Krikorian, Ecole Polytechnique, Paris

On a problem of Michel Herman

Mark Pollicott, University of Warwick, Coventry

Large circles on surfaces

Carlos Matheus Santos, Collège de France, Paris

Lyapunov spectrum of Kontsevich-Zorich cocycle over $SL(2, \mathbb{R})$ orbits of square-tiled cyclic covers

Alexey Teplinsky, National Academy of Sciences of Ukraine, Kiev

Hyperbolic horseshoe for renormalizations of circle diffeomorphisms with a break

Viviane Baladi, ENS. Paris

Anisotropic Sobolev spaces adapted to piecewise hyperbolic dynamics

Mark Pollicott, University of Warwick, Coventry

Factors of measures for shifts

Tomas Johnson, Uppsala University

Dynamics of the universal area-preserving map associated with period doubling I: Hyperbolicity

Denis Gaidashev, Uppsala University

Dynamics of the universal area-preserving map associated with period doubling II: Stability

Marco Martens, Stony Brook University

Henon renormalization II

Claire Chavaudret, Université Paris VII

Reducibility and almost reducibility of quasi-periodic cocycles

Marco Martens, Stony Brook University

Henon renormalization

Alexey Teplinsky, National Academy of Sciences of Ukraine, Kiev

Smooth conjugacy of circle diffeomorphisms

Sergey Dobrokhotov, A. Ishlinski Institute for Problems in Mechanics of Russian Academy of Sciences and Moscow Institute of Physics and Technology

Explicit asymptotics of localized solutions to linear hyperbolic systems

Rafael de la Llave, University of Texas, Austin

Invariant objects in coupled map lattices

Francois Ledrappier, University of Notre Dame

Entropies for covers of compact Riemannian manifolds Part I

Francois Ledrappier, University of Notre Dame

Entropies for covers of compact Riemannian manifolds Part II

Manfred Denker, Universität Göttingen

Erdős-Renyi Laws for Dynamical Systems

Andreas Knauf, Friedrich-Alexander-Universität, Erlangen

Hamiltonian motion in (non-)random potentials

Margaret Beck, University of Boston

Understanding metastability using invariant manifolds

Mike Todd, University of Boston

Transience in dynamical systems

Ana Rodrigues, Universidade do Porto

Background, kneading theory and quasisymmetric conjugacy

Michael Benedicks, KTH, Stockholm

Quasiconformal perturbations and Teichmüller theory. Extensions to k-fold standard maps

Boris Kruglikov, University of Tromsø

Dynamics of piece-wise affine maps and applications

Simon Kristensen, University of Aarhus

Rotations revisited

Carlangelo Liverani, Università degli studi di Roma, Tor Vergata

Something I learned from Dolgopyat (he claims is Varadhan's)

Ale Jan Homburg, University of Amsterdam

Forced circle diffeomorphisms

Klaus Sdmidt, University of Vienna

Entropy and periodic points

Mark Pollicott, University of Warwick, Coventry

Asymptotic escape rates for subshifts

Anatole Katok, Penn State University, University Park

From Pesin theory to measure rigidity to Zimmer's program

Carlangelo Liverani, Università degli studi di Roma, Tor Vergata

Concerning the derivation of the Fourier Law

Henk Bruin, University of Surrey, Guildford

Monotonicity of entropy for families of polynomials on the interval

Giovanni Forni, University of Maryland, College Park

Mixing for reparametrizations of Heisenberg nilflows

Feliks Przytycki, IMPAN, Warsaw

Analyticity of pressure for rational maps and maps of the interval

Ana Rodrigues, IUPUI, Indianapolis and Universidade do Porto

Simple conjugacy invariants for braids

Anders Öberg, Uppsala University

Uniqueness, mixing and Bernoullicity of g -measures

Viviane Baladi, ENS, Paris

Linear response for generic nonuniformly hyperbolic unimodal maps

Andreas Knauf, Friedrich-Alexander-Universität, Erlangen

Topological and geometric ideas in scattering theory

Matthew Nicol, University of Houston

Borel-Cantelli lemmas for nonuniformly expanding maps

Jeff Steif, Chalmers, Gothenburg

The very many different faces of the T T -inverse process

Francois Ledrappier, University of Notre Dame, Indiana

Entropies of covers for compact manifolds

José Alves, Universidade do Porto

From mixing rates to recurrence times

Jairo Bochi, PUC, Rio de Janeiro

Nonuniform hyperbolicity, global dominated splittings and generic properties of volume-preserving diffeomorphisms

Manfred Einsiedler, ETH, Zürich

An ergodic proof of Duke's theorem

Anders Karlsson, KTH, Stockholm and University of Geneva

Noncommutative ergodic theorems

Michael Melgaard, Dublin Institute of Technology/Uppsala University

Recent results on models of Quantum Chemistry, I

Mattias Enstedt, Uppsala University

Recent results on models of Quantum Chemistry, II

Reiner Lauterbach, Universität Hamburg

Some open problems in equivariant dynamics

Hiroki Takahasi, Kyoto University

Prevalent dynamics at the first bifurcation of the Henon family

Matthew Nicol, University of Houston

Extreme value theory and hitting time statistics for dynamical systems with some degree of hyperbolicity

Neil Dobbs, KTH, Stockholm

Phase transitions in unimodal dynamics

Masato Tsujii, Kyushu University, Fukuoka

Functional analytic methods in smooth ergodic theory (second lecture)

Masato Tsujii, Kyushu University, Fukuoka

Functional analytic methods in smooth ergodic theory (third lecture)

Ramona Anton, Mathématiques Jussieu, Paris

Global existence for Gross-Pitaevskii equation on three dimensional exterior domains

Evelina Shamarova, Universidade do Porto

Solutions of Navier-Stokes and Burgers equations via forward-backward SDEs (joint work with Ana Bela Cruzeiro)

Masato Tsujii, Kyushu University, Fukuoka

Functional analytic methods in smooth ergodic theory (a series of three lectures)

Niklas Brännström, University of Helsinki

Slow dynamics of a slow-fast Hamiltonian system

Joerg Schmeling, University of Lund

On the dimension of iterated sumsets

Tomas Persson Warsaw

Dimension of piecewise hyperbolic attractors with overlaps

Daniel Schnellmann, KTH, Stockholm

Absolutely continuous limit distributions of sums of point measures

Quantum Information Theory

Scientific Report 2010 fall

The fall, 2010 program on quantum information theory was intended to provide an extended and intensive opportunity for cross-fertilization between quantum information scientists and mathematicians, particularly those working on operator algebras, operator spaces, operator systems, and free probability. For this reason, the seminars held most Tuesdays and Thursdays included expository talks, as well as reports of recent research results and work in progress.

During the first month participants represented a broad range of interests, from entanglement theory to quantum lattice systems to random matrices and convex geometry. Starting in Oct. there was more emphasis on quantum Shannon theory and during Nov.-Dec. about half the participants were experts on some aspects of the operator structures mentioned above. However, these divisions were not rigid and diverse interests were represented throughout the semester.

Interactions between different groups enabled some participants to use new ideas to finish or improve existing work. In other cases, new collaborations were formed with plans to continue to work after the program.



The kitchen is a good place to interact.

One of the highlights was a pair of visits and talks by M. Musat who spoke about her work with U. Haagerup on factorizable maps, and its implications for the so-called "quantum Birkhoff conjecture" which they showed is false. The first talk generated so much excitement that questioning went on for over an hour, with enthusiastic longer discussions for the rest of Musat's stay. Some participants found connections to earlier results on quantum channels. During her second visit, she announced some additional results including an example that showed that a conjecture with implications for Connes' embedding problem was false, as well as a new reformulation of this problem. Further discussions led to additional results and new collaborations, which are still going on.

Several reformulations of Connes' embedding problem, including a connection to Tsirelson's problem, were discussed at various times. Most participants outside of operator algebras were not even familiar with these problems prior to the program. These reformulations are exciting; although the problem is still open, we now have several new approaches and people with different viewpoints interested in this long-standing question.



Other common ways to interact.

In contrast to classical information theory, most of the many types of capacity encountered in quantum information theory are not “additive” for memoryless channels (represented by tensor products) because entanglement can increase the capacity. In 2009, a long-standing group of conjectures regarding “additivity” was shown to be false by Hastings using a subtle extension of the standard concentration of measure argument. In 2010, G. Auburn, S. Szarek and E. Werner used an improvement of Dvoretzsky’s theorem in high dimensional convex geometry to resolve this conjecture in a different way. G. Aubrun gave an expository talk on this work followed by a talk by P. Hayden about ongoing work demonstrating its application to other problems in quantum information theory. I. Bjelaković and J. Nötzel found this useful in their work on quantum capacity of varying channels. Several participants explicitly mentioned their appreciation of exposure to this powerful new tool which they expect to use in future work.

Later in the program, B. Collins and I. Nechita gave a series of lectures on their approach to violations of additivity based on free probability (which D. Petz provided an introduction to early in the program) and a new graphical calculus. Earlier work on additivity used random unitary channels; their methods can be applied to arbitrary channels by choosing the matrix associated with the Stinespring representation randomly. They are still trying to improve some of their bounds on the size of violations. M. Fukuda, a postdoc, began to collaborate on this during the program and is continuing to do so. All of the above methods give only existence theorems. M. Horodecki and M.B. Ruskai began a program to construct explicit counter-examples using dual Young diagrams for representations of the symmetric group, and benefited from discussion with Aram Harrow about this.

Perhaps the most important new result of the program was a proof by F. Brandao, M. Christandl and J. Yard giving a lower bound to a quantity known as “squashed entanglement”. This resolved a long-standing question about this entanglement measure, showing that it has a unique combination of several desirable properties not known to hold simultaneously for any other quantity. These properties also lead to several new results in entanglement theory and quantum complexity. This includes shedding some light on the structure of states which almost satisfy equality in the strong subadditivity of quantum entropy, with important implications for complexity theory.

During the program, G. Aubrun showed that under certain conditions a typical bipartite random state has the so-called PPT property, i.e., its partial transpose is positive semi-definite. This result is surprising because it is well-known that the proportion of states which are entangled states increases rapidly with dimension (or, conversely, the volume of separable states decreases faster than exponentially). Thus, G. Aubrun’s result implies that although entangled states dominate in high dimensions, most of them have the property that no entanglement can be distilled. It is a long-standing open question whether or not states which do *not* have the PPT property always have distillable entanglement. This can be reformulated as a question about 2-positivity of tensor

products of certain maps. There was a lot of discussion about this problem, as well as how to formulate the class of maps known as “local operations and classical communication” (LOCC) used for distillation in operator theoretic language. However, we are still far from a resolution of this problem and a satisfactory translation of LOCC and distillation.

M. Junge has been particularly active in applying operator space methods to problems in quantum information theory. The seminars included talks by his collaborators on previous work on Tsirelson's problem and Bell inequalities. During the program, he and C. Palazuelos had extensive discussions with other participants about quantum capacity; they obtained a new bound in terms of CB norms, which they are continuing to study for particular channels.

The full list of talks and preprints posted to date are given separately. A few of these results and description of ongoing work are mentioned briefly below.

B. Nachtergaele and R. Werner obtained a complete classification of nearest neighbor interactions for translation invariant quantum spin chains that allow for frustration-free (i.e., zero-energy) ground states in a number of cases of interest. These ground states can be completely described in terms of an irreducible representation of a Clifford algebra. They are extending this work to other models with quantum group symmetry.

E. Störmer, E. Paulsen, L. Skowronek and others discussed mapping cones and operator systems, clarifying the connections between them and leading to improvements in ongoing work with others in Canada. Farenick and Paulsen studied operator system quotients of matrix algebras, obtaining a new proof of Kirchberg's theorem and a new relationship to Connes' embedding problem.

M.B. Ruskai asked when certain maps associated with “monotone metrics” are completely positive (CP); D. Petz found several new examples and a connection to “operator means”. F. Hiai then showed that his work with H. Kosaki could completely resolve this issue for all of the well-known families. They are continuing this work in the hope of finding a complete characterization of the convex subset of operator means associated with CP maps.



The yearly leaf raking day.
Photo Maryke Devos

Stimulated by discussions with D. Leung and T. Cubitt, Bjelaković and Nötzel extended their work on of capacity of varying channels from the arbitrarily small to the zero capacity situation.

M. Shirokov finished his paper “Entropy reduction of quantum measurements” after discussions with Effros and others helped him overcome a key stumbling block.

M.B. Ruskai and A. Winter collaborated on entropy inequalities, continuing an ongoing project with F. Matus (Prague) on the entropies of stabiliser states.

An unusual aspect of this program was formal, as well as informal, interactions with other groups in Stockholm. Early in the program, R. Werner introduced a Stockholm math colloquium audience to quantum information with a beautiful explanation of Bell inequalities. The first week of October, an International Conference on Quantum Information and Computation, October 4-8, 2010, was held in Stockholm in conjunction with both a Nordita Program on Quantum Information, and the Institut Mittag-Leffler program on Quantum Information Theory. Participants of the IML program, namely, C. Bennett, A. Holevo, R. Werner were plenary speakers invited by the Nordita organizers. In addition, P. Hayden, F. Verstraete, and M. Wolf gave invited talks in the Thursday program which the IML organizers were asked to plan as a showcase for the mathematical side of quantum information theory. There were many interactions between various groups during the rest of the conference, including contributed talks by IML participants E. Andersson, T. Heinosaari, and D. Leung. The highlight of joint activity during the other five weeks of the Nordita program was a visit to Institut Mittag-Leffler by A. Klyachko. In Nov.-Dec., Nordita held a program on random geometry with additional overlap of interests, particularly with those working on random matrices.

Organizing committee:



Alexander Holevo, Steklov Mathematical Institute, Moscow

Mary Beth Ruskai, Tufts University, USA

Erling Störmer, University of Oslo

Andreas Winter, University of Bristol, UK and National University of Singapore

Michael Wolf, University of Copenhagen

Quantum Information Theory

Participants 2010 fall

Name	University	City
Andersson, Erika	Heriot Watt University	Edinburgh
Aubrun, Guillaume	Université Claude Bernard, Lyon 1	Villeurbanne
Audenaert, Koenraad	University of London	Egham
Bae, Joonwoo	Korea Institute for Advanced Study	Seoul
Bennett, Charles	IBM TJ Watson Research Center	Yorktown Heights
Berta, Mario	LMU Munich	Munich
Bjelakovic, Igor	Technische Universität München	München
Brandão, Fernando	Univ. Federal de Minas Gerais	Belo Horizonte
Chitambar, Eric	University of Toronto	Toronto
Clark, Jeremy	University of Helsinki	Helsinki
Collins, Benoit	University of Ottawa	Ottawa
Cubitt, Toby	University of Bristol	Bristol
	Centre for Quantum Computation and Intelligent Systems	
Duan, Runyao		Broadway, Australia
Effros, Edward	UCLA	Los Angeles
Eisert, Jens	University of Potsdam	Postdam
Ericsson, Åsa	Perimeter Institute	Waterloo, Canada
Farenick, Douglas	University of Regina	Regina
Fukuda, Motohisa	Quantum Computing University of Waterloo	Waterloo, Canada
Giovannetti, Vittorio	Scuola Normale Superiore	Pisa
Gottesman, Daniel	Perimeter Institute for Theoretical Physics	Waterloo
Gross, David	Leibniz Universität	Hannover
Hamza, Eman	Cairo University	Cairo
Harrow, Aram	University of Bristol	Bristol
Hayden, Patrick	McGill University	Montreal
Heinosaari, Teiko	Niels Bohr Institut	Copenhagen
Hiai, Fumio	Tohoku University	Aoba-ku, Sendai
Holevo, Alexander	Steklov Mathematical Institute	Moscow
Horodecki, Karol	National quantum information centre of Gdansk	Sopot
Horodecki, Michal	National quantum information centre of Gdansk	Sopot
Junge, Marius	University of Illinois at Urbana-Champaign	Urbana
Kahle, Thomas	Max-Planck-Institut	Leipzig
Lahti, Pekka	University of Turku	Turku
Leung, Debbie	University of Waterloo	Waterloo
Lunemann, Carolin	Aarhus University	Aarhus
Markström, Klas	University of Umeå	Umeå
Matsumoto, Keiji	National Institute of Informatics	Tokyo
Mohari, Anilesh	The Institute of Mathematical Sciences	Chennai
Mosonyi, Milan	National University of Singapore	Singapore
Musat, Magdalena	University of Copenhagen	Copenhagen
Nachtergaele, Bruno	University of California	Davis
Nechita, Ion	University of Ottawa	Ottawa
Nordström, Kenneth	University of Oulu	Oulu
Nötzel, Janis	TU Berlin	Berlin
Oppenheim, Jonathan	University of Cambridge,DAMTP	Cambridge
Palazuelos, Carlos	University of Illinois at Urbana-Champaign	Urbana
Paulsen, Vern	University of Houston	Houston
Pérez-García, David	Universidad Complutense de Madrid	Madrid
Petz, Dénes	Alfred Renyi Inst of Math	Budapest

Ruskai, Beth	Tufts University	Medford
Scholz, Volkher	Leibniz Universität Hannover	Hannover
Schuch, Norbert	Max-Planck-Institut für Quantenoptik	Garching
Shirokov, Maksim	Steklov Mathematical Institute	Moscow
Shulman, Tatiana	University of Copenhagen	Copenhagen
Silvestrov, Sergei	Lund University	Lund
Skowronek, Lukasz	Jagiellonian University	Krakow
Smith, Graeme	IBM TJ Watson Research Center	Yorktown Heights
Størmer, Erling	Oslo University	Oslo
Szarek, Stanislaw	Case Western Reserve University	Cleveland
Turowska, Lyudmila	Chalmers	Gothenburg
Tyson, Jon	Harvard University	Cambridge
Verstraete, Frank	University of Vienna	Vienna
Wehner, Stephanie	Caltech	Pasadena
Werner, Reinhard	Leibniz Universität	Hannover
Winter, Andreas	University of Bristol	Bristol
Wolf, Michael	Niels Bohr Institute	Copenhagen
Xu, Quanhua	Universit'e de France-Comte	Besancon
Yard, Jon	Los Alamos National Laboratory	Los Alamos
Ylinen, Kari	University of Turku	Turku
Yuan, Haidong	MIT	Cambridge,US



Some of the participants on their way in the rain for lunch at Djursholms Vårdshus.

Quantum Information Theory

Preprints 2010 fall

- 01 **Local approximation of observables and commutator bounds**
Bruno Nachtergaele, Volkher B. Scholz, Reinhard F. Werner
- 02 **Hilbert's projective metric in quantum information theory**
David Reeb, Michael J. Kastoryano, Michael M. Wolf
- 03 **Telescopic Relative Entropy--II Triangle inequalities**
Koenraad M. R. Audenaert
- 04 **Telescopic Relative Entropy**
Koenraad M. R. Audenaert
- 05 **The monomial representations of the Clifford group**
D. M. Appleby, Ingemar Bengtsson, Stephen Brierley, David Gross, Jan-Ake Larsson
- 06 **Automorphic Equivalence within Gapped Phases of Quantum Lattice Systems**
Sven Bachmann, Spyridon Michalakis, Bruno Nachtergaele, Robert Sims
- 07 **Much Ado About Something: Why Lieb-Robinson bounds are useful**
Bruno Nachtergaele, Robert Sims
- 08 **No-signaling Principle Can Determine Optimal Quantum State Discrimination**
Joonwoo Bae, Won-Young Hwang, Yeong-Deok Han
- 09 **Pure inductive limit state and Kolmogorov's property-II**
Anilesh Mohari
- 10 **Tensor products of positive maps of matrix algebras**
Erling Størmer
- 11 **Arveson's criterion for unitary similarity**
Douglas Farenick
- 12 **Operator system quotients of matrix algebras and their tensor products**
Douglas Farenick, Vern I. Paulsen
- 13 **Completely positive mappings and mean matrices**
Adam Besenyei, Denes Petz
- 14 **On norm sub-additivity and super-additivity inequalities for concave and convex functions**
Koenraad M. R. Audenaert, Jaspal Singh Aujla
- 15 **In-betweenness: a geometric monotonicity property for operator means**
Koenraad M. R. Audenaert
- 16 **Entropy reduction of quantum measurements**
M. E. Shirokov
- 17 **Superactivation, unlockability, and secrecy distribution of bound information**
Giuseppe Pretico, Joonwoo Bae

- 18 **One-shot Multiparty State Merging**
Nicolas Dutil, Patrick Hayden
- 19 **Assisted Entanglement Distillation**
Nicolas Dutil, Patrick Hayden
- 20 **Locking classical information**
Frédéric Dupuis, Jan Florjanczyk, Patrick Hayden, Debbie Leung
- 21 **Partial transposition of random states and non-centered semicircular distributions**
Guillaume Aubrun
- 22 **Information propagation for interacting particle systems**
Norbert Schuch, Sarah K. Harrison, Tobias J. Osborne, Jens Eisert
- 23 **Exponential Quantum Speed-ups are Generic**
Fernando G. S. L. Brandao, Michal Horodecki
- 24 **From Low-Distortion Norm Embeddings to Explicit Uncertainty Relations and Efficient Information Locking**
Omar Fawzi, Patrick Hayden, Pranab Sen
- 25 **(Non-)Contextuality of Physical Theories as an Axiom**
Adan Cabello, Simone Severini, Andreas Winter
- 26 **Faithful Squashed Entanglement**
Fernando G. S. L. Brandao, Matthias Christandl, Jon Yard
- 27 **Quantum capacity under adversarial quantum noise: arbitrarily varying quantum channels**
Rudolf Ahlswede, Igor Bjelakovic, Holger Boche, Janis Noetzel
- 28 **Cones with a Mapping Cone Symmetry in the Finite-Dimensional Case**
Łukasz Skowronek
- 29 **On a question of R. Bhatia**
Koenraad M. R. Audenaert
- 30 **Quantum f-divergences and error correction**
F. Hiai, M. Mosonyi, D. Petz, C. Beny
- 31 **On the Choi-Jamiolkowski Correspondence in Infinite Dimensions**
A. S. Holevo
- 32 **From quasi-entropy**
Dénes Petz

Quantum Information Theory

Seminars 2010 fall

Douglas Farenick, University of Regina

Non-commutative convexity

Stanislaw Szarek, Case Western Reserve University

Generic quantum states

Kari Ylinen, University of Turku

Quantum instruments and harmonic analysis

Erling Støermer, University of Oslo

An informal talk on positive maps

Benoit Collins, University of Ottawa

Random matrix theory and quantum information theory

Ion Nechita, University of Ottawa

Graphical calculus for random quantum channels

David Perez-Garcia, Universidad Complutense de Madrid

Tensor network states

Vern Paulsen, University of Houston

Applications of abstract operator systems to entanglement theory

Marius Junge, University of Illinois at Urbana-Champaign

Superdense coding and teleportation from an operator algebra and operator space perspective

Andreas Winter, University of Bristol

1001 quantum channel capacities

Ed Effros, UCLA

When QFA met QIT

Magdalena Musat, University of Copenhagen

Factorizable maps and the asymptotic quantum Birkhoff property

Runyao Duan, University of Technology Sydney

On the perfect distinguishability of quantum operations

Koenraad Audenaert, University of London

On telescopes and cuckoo clocks

Runyao Duan, University of Technology Sydney

On the perfect distinguishability of quantum operations

Koenraad Audenaert, University of London

On telescopes and cuckoo clocks

Patrick Hayden, McGill University, Montreal

From low-distortion embeddings to information locking

Fumio Hiai, Tohoku University, Aoba-ku, Sendai

Operator log-convexity and its applications

Alexander Holevo, Steklov Mathematical Institute

Entanglement-breaking channels in infinite dimensions.

Debbie Leung, University of Waterloo

Entanglement can increase rates of zero-error classical communication over classical channels

Toby Cubitt, University of Bristol

Laying the quantum and classical embedding problems to rest

Igor Bjelakovic, Technische Universität Berlin

Communication under adversarial quantum noise

Fernando Brandao, Universidade Federal de Minas Gerais, Brasil

Faithful Squashed Entanglement

Milan Mosonyi, National University of Singapore

Operator distinguishability measures for information theory

Aram Harrow, University of Bristol

Schur-Weyl duality for fun and profit

Reinhard Werner, Leibniz Universität, Hannover

Quantum correlations - how to prove a negative from finitely many observations

Alexander Klyachko, Bilkent University, Ankara

Geometry and physics of invariant theory

Graeme Smith, IBM TJ Watson Research Center, Yorktown Heights

Superactivation of quantum channel capacities

Bruno Nachtergaele, University of California, Davis

Local perturbations perturb locally

Magdalena Musat, University of Copenhagen

On the asymptotic quantum Birkhoff conjecture

Volkher Scholz, Leibniz Universität

Tsirelson's problem and the QWEP conjecture

Denes Petz, Alfred Renyi Institute of Mathematics, Budapest

An introduction to free probability

Guillaume Aubrun, Université Claude Bernard, Lyon I

Dvoretzky's theorem and Hastings' additivity counterexample

Participants from the Nordic Countries

Denmark

Kristensen, Simon, Aarhus
Heinosaari, Teiko, Copenhagen
Lunemann, Carolin, Aarhus
Musat, Magdalena, Copenhagen
Shulman, Tatiana, Copenhagen
Wolf, Michael, Copenhagen

Finland

Brännström, Niklas, Helsinki
Lahti, Pekka, Turku
Nordström, Kenneth, Oulu
Ylinen, Kari, Turku

Norway

Kruglikov, Boris, Tromsø
Stoermer, Erling, Oslo

Sweden

Andersson Forsman, Oscar, Stockholm
Aspenberg, Magnus, Gothenburg
Benedicks, Michael, Stockholm
Bjerklöv, Kristian, Stockholm
Gaidashev, Denis, Uppsala
Johnson, Tomas, Uppsala
Nilsson, Lisa, Stockholm
Saprykina, Maria, Stockholm
Schmeling, Jörg, Lund
Schnellmann, Daniel, Stockholm
Steif, Jeff, Gothenburg
Wiegman, Igor, Stockholm
Winckler, Björn, Stockholm
Markström, Klas, Umeå
Silvestrov, Sergei, Lund
Turowska, Lyudmila, Gothenburg
Öberg, Anders, Uppsala

Research in Peace (RIP)

Bölling, Reinhard, Potsdam, Germany
Holmbom, Anders, Mid Sweden University, Östersund



Simon Kristensen in action



Tatiana Schulman, Kenneth Nordström and Kari Ylinen in discussion over a cup of coffee

Publications

Institut Mittag-Leffler publishes two research journals. *Acta Mathematica* was founded by Gösta Mittag-Leffler in 1882, while *Arkiv för matematik* traces its roots back to a journal founded in 1903 by the Royal Swedish Academy of Sciences.

Since January 1, 2006, Springer is handling printing, subscriptions and distribution of both journals. Naturally, the Institute retains full ownership and full editorial control of the journals. All back volumes of both journals have been digitized by Springer and are available on the web for subscribers.

The way in which scientific journals are purchased has changed significantly over the past few years. The traditional model of subscribing to printed publications is increasingly being replaced by individually negotiated agreements for online access, including consortia, multi-site licenses, and site licenses, all referred to as “online deals”. Overall this will lead to a wider exposure, as well as increased visibility and usage.

Acta Mathematica

2 volumes/year: 4 issues, totally 700 pp during 2010

During 2010 the issues 204:1-2 and 205:1-2 have appeared with in total 14 articles.

The influx of manuscripts has been very good.

Traditional institutional subscriptions have decreased to 405 copies.

Online deals have increased to 7 078. In this way the journal is reached by 58 African, 1 138 American, 1 745 Australasia and 4 137 European departments and institutions at different universities.

Through our agreement with Springer our subscribers have online access all the way back to the very first issue of *Acta Mathematica*, Vol 1, 1882.

Editorial Board:

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Federico Incitti, Sapienza University of Rome, Italy

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Margareta Wiberg Roland, Institut Mittag-Leffler



Acta Mathematica Editorial Board November 2010.
From the left upper row: J. C. Jantzen, K. Johansson,
A. Björn, H. Eliasson, J. Rognes, P. Koskela, K. Seip,
A. Björner, K. Grove and J. Sjöstrand

Arkiv för matematik

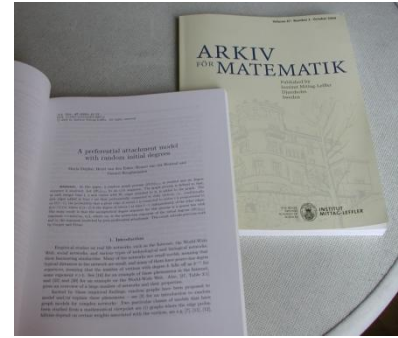
1 volume/year (2 issues, totally 400 pp)
The issues 48:1-2 have appeared during 2010
with in total 23 articles.

The influx of manuscripts has been sufficient.

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Online deals have increased to 6 914. In this way the
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Anders Björner, Editor-in-Chief, Institut Mittag-Leffler
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Ralf Fröberg, Stockholm University, Sweden, until 2010-06-30
Ari Laptev, KTH Royal Institute of Technology, Stockholm, Sweden
Mikael Passare, Stockholm University, Sweden
Peter Sjögren, Göteborg University, Sweden
Jeffrey Steif, Chalmers University of Technology, Göteborg, Sweden

Technical Editor:

Anders Björn, Linköping University, Sweden

Editorial Assistant:

Margareta Wiberg Roland, Institut Mittag-Leffler

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Ragnar Sigurdsson, University of Iceland, Reykjavik, from 2010-07-01 -
Anders Szepessy, Royal Institute of Technology, KTH, Stockholm
Hermann Thorisson, University of Iceland, Reykjavik, to 2010-06-30
Hans Wallin, Umeå University



Board meeting May 2010. From left back row: E. Saksman, H. Thorisson, B. Berndtsson, N. Dencker Second row: T. Ekedahl, A. Szepessy, H. Wallin, Front row: K. Johansson, B. Jahren, A. Björner and Gunnar Öquist, The Royal Swedish Academy of Sciences. Absent: Svante Janson, Jan-Erik Roos and Mikael Rørdam.

Administrative information 2010

Staff

Anders Björner	Director, 60%
Inger Halvarsson	Administrator of the scientific program, from 2010-12-01
Federico Incitti, Rome	Technical editor of Acta Mathematica, 50% from October 2010 75%
Alexander Koponen	Computer administrator, 80%
Marie-Louise Koskull	Administrator of the scientific program
Fawzi Mourou	Caretaker
Mikael Passare	Deputy Director, 40%, from 2010-09-01
Mikael Rågstedt	Librarian
Margareta Wiberg Roland	Head of administration and economy

Marie-Louise Koskull retired 31 December 2010 after 22 years at Institut Mittag-Leffler. Here together with Kjell-Ove Widman, Dan Laksov and Anders Björner, directors with whom she has been working.



After 25 years at Institut Mittag-Leffler Mikael Rågstedt receives a gold watch and is celebrated with a specially made cake.

Library and historical archive

The library subscribes to several electronic journals and to around 110 print journals. In addition, we receive some 70 journals in exchange for *Acta Mathematica* and *Arkiv för matematik*.

Information and copies from the historical archive are frequently requested, including visits by mathematical historians.



Eva Kaufholz, Johannes Gutenberg Universität, Mainz, Germany gets help from the librarian Mikael Rågstedt in her research for material about Sonja Kowalesky

Financial statement (kSEK)

	Result 2010	Result 2009
Income		
Contributions from Nordic countries	1 362	1 067
Contribution from the Swedish Research Council (VR)	2 500	1 100
Grant Income	1 424	1 260
Other Income	913	592
Total External Income	6 198	4 019
Journals net	672	495
Profit available for distribution from the Endowment	918	2 974
Exceeded withdrawal from the Endowment	1360	1 069
Total Income	9 148	8 558
Expenditure		
Grants	1 519	1 582
Offices and Lodging	2 980	2 256
Library	1 465	1 516
Administration	3 184	3 203
Total Costs	9 148	8 558