INSTITUT
MITTAG-LEFFLER
THE ROYAL SWEDISH ACADEMY OF SCIENCES

Annual Report 2021

Institut Mittag-Leffler

Institut Mittag-Leffler is an international center for research and postdoctoral training in the mathematical sciences. It was founded in 1916 by professor Gösta Mittag-Leffler and is the oldest mathematics research institute in the world. It operates under the auspices of the Royal Swedish Academy of Sciences and is governed by a board with representatives from all Nordic countries.

The premises of the institute encompass several buildings: the main building with library, work offices for staff and researchers, as well as discussion areas, a seminar room building, and five other buildings with housing and dining facilities for visiting researchers.

The mission of Institut Mittag-Leffler is to support international top-level research in mathematics, with special attention to the development in the Nordic countries. The institute is a hub for the international mathematical research community and for mathematicians in the Nordic countries.

The main activities include research programs, conferences, workshops, seminars and summer schools, that all aim to conduct and develop current mathematical research. Research programs and conferences have organizing committees approved by the IML board. Based on the recommendations of the organizing committees, senior and junior mathematicians are invited to stay and work at the institute. Junior program participants (postdocs or advanced PhD students) are offered fellowships to finance their stays. There are yearly calls, and fellowship recipients are chosen by the organizing committee together with the director. Although senior and junior mathematicians from the Nordic countries are given some priority, the institute works actively to ensure diversity among program participants.

The institute also publishes two mathematical journals, *Acta Mathematica* (founded by Gösta Mittag-Leffler in 1882) and *Arkiv för matematik* (founded in 1903). *Acta Mathematica* is one of a small number of exclusive world-leading international mathematics research journals and one of the highest rated journals in the mathematical world. All volumes of these journals are freely available online.

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Content

Annual Report 2021

Photo: Institut Mittag-Leffler

The Director of Institut Mittag-Leffler,

A BRIEF REVIEW OF 2021

During 2021, the institute has continued to attract world leading mathematicians to its reserach programs, and continued the dialogue with Nordic mathematics departments, other international mathematics research institutes, the Swedish Research Council, the Wallenberg Foundations, and the Verg Foundation. The editorial work with *Acta Mathematica* and *Arkiv för Matematik* has, during the year, been successful. Both journals perform well and continue to attract very good submissions. The cooperation with International Press continues.

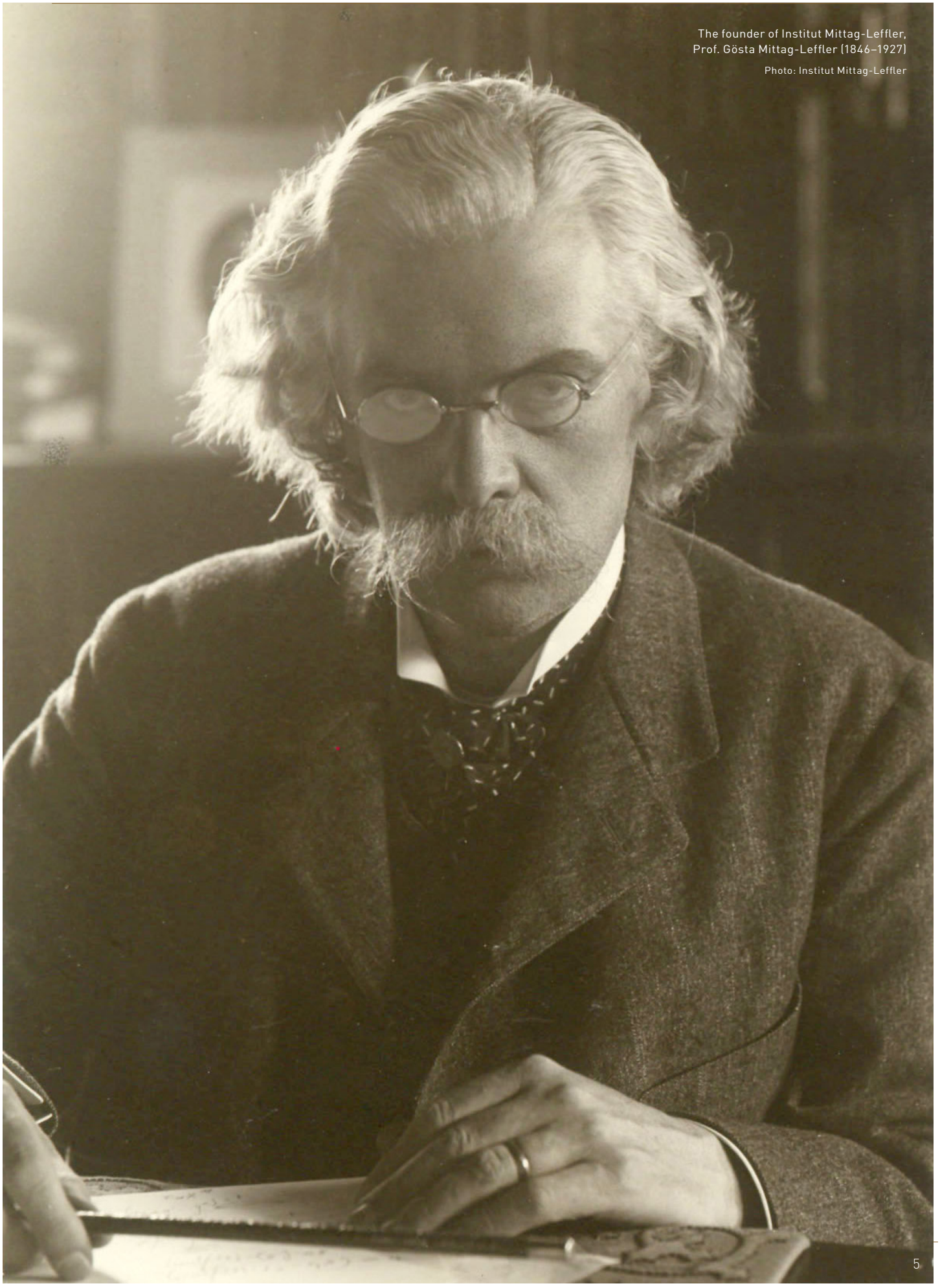
During 2021, the institute organized two research programs: *Number Theory* and *Moduli and Algebraic Cycles*.

Because of the Covid-19 pandemic, the year 2021 continued to be different from other years at IML. Following government restrictions, we had to hold all activities within the spring program and all summer conferences online. The institute managed the online work and activities using a project management tool, where program organizers and IML staff work together with the organization of all aspects of conferences and programs, as well as an event application for communication and interaction with and between program organizers, participants, and staff.

During the fall program, the seminar room equipped with advanced audiovisual technology to stream, record and publish seminars online, was frequently used allowing remote participants from all over the world to join and take part of the hybrid program activities. Also, the new apartments and dining hall on the premises, which were completely refurbished, were used for onsite participants during the fall program. The institute works in close cooperation with the Royal Swedish Academy of Sciences and is involved in different Nordic and international collaborations. In March, the institute participated virtually in the yearly meeting of ERCOM, a committee of the European Mathematical Society including around 30 European research institutes in mathematics.

Institut Mittag-Leffler is very grateful to all those who have contributed during 2021. First and foremost, to all mathematicians who choose to conduct their research at the institute and to contribute to its scientific environment, especially to our colleagues in Sweden and other Nordic countries. We also thank all organizations who has contributed to us financially: The Academy of Finland, The Acta Mathematica Foundation, Anna-Greta and Holger Crafoord Foundation, Brummer & Partners, Chalmers/Gothenburg University, The Danish Mathematical Society, G S Magnuson Foundation, Knut and Alice Wallenberg Foundation, Linköping University, Luleå University of Technology, Lund University, the Research Council of Norway, KTH Royal Institute of Technology, Simons Foundation, Jacob and Marcus Wallenberg's memorial foundation, Stockholm University, The Swedish Research Council, The Verg Foundation, Umeå University and Uppsala University.

Tobias Ekholm, *Director*

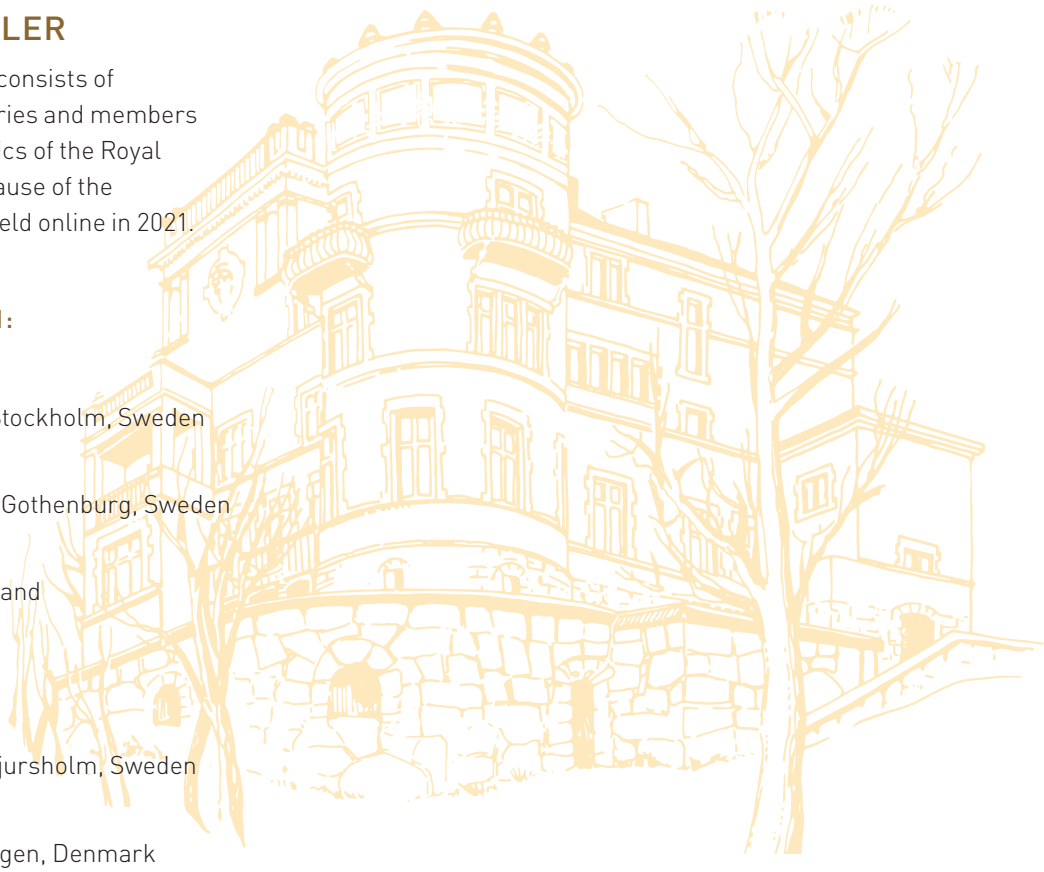


The founder of Institut Mittag-Leffler,
Prof. Gösta Mittag-Leffler (1846–1927)

Photo: Institut Mittag-Leffler

THE BOARD OF INSTITUT MITTAG-LEFFLER

The board of Institut Mittag-Leffler consists of representatives of the Nordic countries and members appointed by the class of mathematics of the Royal Swedish Academy of Sciences. Because of the pandemic, the board meeting was held online in 2021.



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JEFF STEIF
Chalmers University of Technology, Gothenburg, Sweden

MATHEMATICS DEPARTMENT CHAIRS

Institut Mittag-Leffler hosts a Nordic chair meeting yearly, inviting the heads of mathematical departments and the chairs of mathematical associations from the Nordic countries. Because of the pandemic, the chair meeting was cancelled in 2021.

PUBLICATIONS

Acta Mathematica

2 volumes/year (4 issues, totally around 800 pages).
The issues 226:1, 226:2, 227:1 and 227:2 were published including 9 articles in total.

EDITORIAL COMMITTEE

Editor-in-Chief:

Tobias Ekholm
Institut Mittag-Leffler, Djursholm and Uppsala University

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International Press of Boston, Inc.

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CNRS, Institut Fourier, Grenoble

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Jesper Grodal
University of Copenhagen

Helge Holden
NTNU – Norwegian University of Science and Technology, Trondheim

Kurt Johansson
KTH Royal Institute of Technology, Stockholm

Eero Saksman
University of Helsinki

Arkiv för matematik

1 volume/year (2 issues, around 400 pages)
The issues 59:1 and 59:2 were published including 16 articles in total.

EDITORIAL COMMITTEE

Editor-in-Chief:

Hans Ringström
Institut Mittag-Leffler, Djursholm and KTH Royal Institute of Technology, Stockholm

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Fredrik Viklund
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Erik Wahlén
Lund University

Genkai Zhang
Chalmers University of Technology, Gothenburg

FINANCIAL SUPPORT 2021

Supporting organizations

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THE ACTA MATHEMATICA FOUNDATION

ANNA-GRETA AND HOLGER CRAFOORD FOUNDATION

BRUMMER & PARTNERS

GOTHENBURG UNIVERSITY/CHALMERS UNIVERSITY OF TECHNOLOGY

THE DANISH MATHEMATICAL SOCIETY (INSTITUT FOR MATEMATIK/AARHUS UNIVERSITET)

G S MAGNUSON FOUNDATION

KNUT AND ALICE WALLENBERG FOUNDATION

LINKÖPING UNIVERSITY

LULEÅ UNIVERSITY OF TECHNOLOGY

LUND UNIVERSITY

JACOB AND MARCUS WALLENBERGS FOUNDATION

STOCKHOLM UNIVERSITY

THE RESEARCH COUNCIL OF NORWAY

KTH ROYAL INSTITUTE OF TECHNOLOGY

THE SWEDISH RESEARCH COUNCIL

THE VERG FOUNDATION

UMEÅ UNIVERSITY

UPPSALA UNIVERSITY

Research Programs

Number Theory

JANUARY 11–APRIL 30, 2021

Organizers:
Pär Kurlberg
KTH Royal Institute of Technology
Lilian Matthiesen
KTH Royal Institute of Technology
Damaris Schindler
Universität Göttingen

SCIENTIFIC REPORT

Description of scientific area

The program focused on three connected areas of number theory: analytic number theory, number theory and probability, and rational points. A central theme of analytic number theory is to count discrete objects (e.g., prime numbers) using analytic properties of associated generating functions (e.g., L-functions and Dirichlet series). Recent breakthroughs include work by Green and Tao on progressions in the primes, and Zhang's result on bounded gaps between primes. The introduction of modern probability theory into number theory has recently been very fruitful, and now random matrix theory, random fragmentation processes, Poisson branching processes, Stein's method and martingales play a key role – a recent key advance is Harper's proof of Helson's conjecture showing better than square root cancellation for sums of random multiplicative functions. Further, the introduction of random matrix theory allows for very precise conjectures regarding large values of the Riemann zeta function on the line Re(s) = 1/2. The study of rational points on varieties is connected to one of the oldest problems in number theory: the study of integral solutions to Diophantine equations. A central question is to understand the distribution of rational points, and here Manin's conjectures regarding counts of rational points on Fano varieties has been very influential. The topic has recently been pushed forward by advances in arithmetic geometry, along with the interplay between algebraic geometry and analytic methods from number theory (circle method, additive combinatorics), harmonic analysis, and ergodic theory/dynamical systems on the other side.

Milestones and achievements

Fiorilli and de la Bretèche each gave one talk on their recent very strong joint work on moments of prime counts in arithmetic progressions and short intervals, in particular giving essentially sharp lower bounds, beautifully matching conjectures by Montgomery and Soundararajan. Matomäki presented work in progress on unconditionally obtaining asymptotics for the eighth moment of Dirichlet L-functions averaged over primitive characters modulo $q \leq Q$; previous work in this direction was only conditional on the generalized Riemann hypothesis. Chow presented work in progress (preprint now available), with Dietman, on a 1936 conjecture by van der Waerden that asserts that polynomials with "small" Galois groups are rarer than reducible polynomials. Thanks to their work the conjecture is now essentially fully resolved, the only unknown remaining cases are alternating groups in degrees 7; 8; 10. Salberger announced very strong bounds on n-torsion in class groups of number fields, in particular improving on a breakthrough result by Bhargava, Shankar, Taniguchi, Thorne, Zimmerman and Zhao.

New directions

Running a thematic semester online was challenging, especially getting participants to meet in a relaxed setting in order to get to know each other less formally – this seems to be an essential precursor in order to start new research collaborations. In order to facilitate this, we ran "meet for coffee" biweekly for most of the program, as well as some social events after many of the talks. Running social activities online via Gather rather than on Zoom was a big improvement in that it allowed for easily forming smaller discussion groups. In order to facilitate collaborations in larger and newly formed groups (i.e., rather than having email discussions within already established groups) we set up a web-based collaboration tool ("Zulip"), which allowed any participant to "jump in". Two projects originating from the problem session were set up, generating a long discussion that included Granville, Maynard, Matomäki, Sofos and Teravainen.

Successful seminars and/or workshops

For most of the program there was a biweekly seminar, together with a mini workshop on analytic and probabilistic number theory and a mini conference on rational points (the latter two focusing on giving junior participants an opportunity to present their work.) We also ran a problem session that attracted many junior and senior participants.

Specially invited participants and/or speakers

Valentin Blomer
Tim Browning
John Friedlander
Roger Heath-Brown
Jonathan Keating
Emmanuel Kowalski
Andrew Granville
Adam Harper
Kaisa Matomäki
James Maynard
Philippe Michel
Igor Shparlinski

SEMINARS

JANUARY 18, 2021
Jonathan Keating
Oxford University
Joint moments

JANUARY 25, 2021
Emmanuel Kowalski
ETH Zürich
The shapes of exponential sums

FEBRUARY 1, 2021
Monday Seminar Series

FEBRUARY 8, 2021
Daniel Fiorilli
Université Paris-Sud
Higher moments of primes in intervals and in arithmetic progressions, I

FEBRUARY 8, 2021
Régis de la Bretèche
Université Paris Diderot, Paris 7
Higher moments of primes in intervals and in arithmetic progressions, II

FEBRUARY 10, 2021
Valentin Blomer
Universität Göttingen
Uniform Titchmarsh divisor problems

FEBRUARY 15, 2021
Joni Teräväinen
Oxford University
Sums of two almost twin primes

FEBRUARY 17, 2021
Alexander Mangerel
The Centre de recherches mathématiques (CRM)
Discrepancy Problems for Multiplicative Functions over F_q[t]

FEBRUARY 22, 2021
Adam Harper
University of Warwick
Large fluctuations of random multiplicative functions

>>

MARCH 1, 2021
Sandro Bettin
University of Genova
The distribution of the Estermann function and other quantum modular forms

MARCH 3, 2021
Steve Lester
Queen Mary University of London
Lattice points on hyperbolic circles

MARCH 8, 2021
Kaisa Matomäki
University of Turku
Moments of Dirichlet L-functions

MARCH 10, 2021
Sarah Peluse
Princeton University
Modular zeros in the character table of the symmetric group

MARCH 15, 2021
Aled Walker
University of Cambridge
Poissonian gap distributions of dilated sequences

MARCH 17, 2021
Anders Södergren
Chalmers/University of Gothenburg
Can a random lattice and its dual be independent?

MARCH 22, 2021
Andrew Granville
Université de Montréal
Exponential sums with multiplicative coefficients and applications

MARCH 24, 2021
Morten Risager
University of Copenhagen
Bounds on shifted convolution sums

MARCH 29, 2021
Rachel Newton
University of Reading
Evaluating the wild Brauer group

MARCH 31, 2021
Diego Izquierdo
Université Paris-Sud
Local-global principles for homogeneous spaces over some two-dimensional geometric global fields

APRIL 12, 2021
Mini-conference, day 1

APRIL 14, 2021
Mini-conference, day 2

APRIL 16, 2021
Mini-conference, day 3

APRIL 19, 2021
Ulrich Derenthal
University of Hannover
The distribution of rational points on some smooth spherical Fano varieties

APRIL 19, 2021
Jörg Brüdern
Universität Göttingen
The distribution of rational points on some smooth spherical Fano varieties

APRIL 21, 2021
Sho Tanimoto
Nagoya University
Some updates on thin exceptional sets in Manin's conjecture

APRIL 21, 2021
Pankaj Vishe
Durham University
On The Hasse Principal for Complete Intersections

APRIL 26, 2021
Christopher Frei
University of Manchester
Distribution of the number of ramified primes in certain cyclic extensions

>>

APRIL 26, 2021
Francesca Balestrieri
University of Oxford
Uniform bounds and effectivity results for singular K3 surfaces

APRIL 28, 2021
Per Salberger
Chalmers/University of Gothenburg
On n-torsion in class groups of number fields

Photo: Institut Mittag-Leffler

Statue of Ann Charlotte Leffler (1849–1892).

PARTICIPANTS

Ardavan Afshar
KTH Royal Institute of Technology, Stockholm, Sweden

Sandro Bettin
University of Genova, Genova, Italy

Valentin Blomer
University of Göttingen, Göttingen, Germany

Julia Brandes
Chalmers/University of Gothenburg, Göteborg, Sweden

Régis de la Bretèche
Université Paris Diderot, Paris 7, Paris, France

Martin Bright
Universiteit Leiden, Leiden, The Netherlands

Tim Browning
IST Austria, Klosterneuburg, Austria

Jörg Brüdern
University of Göttingen, Göttingen, Germany

Carlos Andrés Chirre Chávez
NTNU - Norwegian University of Science and Technology, Trondheim, Norway

Sam Chow
University of Warwick, Coventry, United Kingdom

Jean-Louis Colliot-Thélène
Université Paris-Sud, Orsay, France

Ulrich Derenthal
University of Hannover, Hannover, Germany

Sary Drappeau
Aix-Marseille University, Marseille, France

Alexander Dunn
California Institute of Technology, Caltech, Pasadena, United States

Dennis Eriksson
Chalmers/University of Gothenburg, Göteborg, Sweden

Anne-Maria Ernvall-Hytönen, University of Helsinki, Helsinki, Finland

Daniel Fiorilli
Université Paris-Sud, Orsay, France

Kevin Ford
University of Illinois at Urbana-Champaign, Urbana, United States

Christopher Frei
University of Manchester, Manchester, United Kingdom

John Friedlander
University of Toronto, Toronto, Canada

Maxim Gerspach
ETH Zürich, Zürich, Switzerland

Andrew Granville
Université de Montréal, Montreal, Canada

David Harari
Université Paris-Sud, Orsay, France

Adam Harper
University of Warwick, Coventry, United Kingdom

Roger Heath-Brown
Oxford University, Oxford, United Kingdom

>>

Diego Izquierdo
Université Paris-Sud, Orsay France

Florent Jouve
Université de Bordeaux, Bordeaux, France

Jonathan Keating
Oxford University, Oxford, United Kingdom

Oleksiy Klurman
Max Planck Institute for Mathematics, Bonn, Germany

Dimitris Koukoulopoulos
Université de Montréal, Montreal, Canada

Emmanuel Kowalski
ETH Zürich, Zürich, Switzerland

Pär Kurlberg,
KTH Royal Institute of Technology, Stockholm, Sweden

Erik Landstedt
KTH Royal Institute of Technology, Stockholm, Sweden

Steve Lester
Queen Mary University of London, London, United Kingdom

Daniel Loughran
University of Bath, Bath, United Kingdom

Julian Lyczak
IST Austria, Klosterneuburg, Austria

André Macedo
University of Reading, Reading United Kingdom

Alexander Mangerel
The Centre de recherches, mathématiques (CRM), Montréal (Québec), Canada

Jens Marklof
University of Bristol, Bristol, United Kingdom

Oscar Marmon
Lund University, Lund, Sweden

Daniele Mastrostefano
University of Warwick, Coventry, United Kingdom

Kaisa Matomäki
University of Turku, Turku, Finland

Lilian Matthiesen
KTH Royal Institute of Technology, Stockholm, Sweden

James Maynard
Oxford University, Oxford, United Kingdom

Patrick Meisner
KTH Royal Institute of Technology, Stockholm, Sweden

Philippe Michel
École Polytechnique Fédérale de Lausanne, EPFL, Lausanne, Switzerland

Vladimir Mitankin
Max Planck Institute for Mathematics, Bonn, Germany

Rachel Newton
University of Reading, Reading, United Kingdom

Jennifer Park
Ohio State University, Columbus, United States

Fabien Pazuki
University of Copenhagen, Copenhagen, Denmark

Sarah Peluse
Princeton University, Princeton, United States

Ian Petrow
University College London, London, United Kingdom

Lillian Pierce
Duke University, North Carolina, United States

Carl Pomerance
Dartmouth College, Hanover, Germany

Maksym Radziwill
California Institute of Technology, Caltech, Pasadena, United States

Olivier Ramaré
Aix-Marseille University, Marseille, France

Martin Raum
Chalmers/University of Gothenburg, Göteborg, Sweden

Morten Risager
University of Copenhagen, Copenhagen, Denmark

Nick Rome
University of Bristol, Bristol, United Kingdom

Zeev Rudnick
Tel Aviv University, Tel Aviv, Israel

Per Salberger
Chalmers/University of Gothenburg, Göteborg, Sweden

Damaris Schindler
Universität Göttingen, Göttingen, Germany

Kristian Seip
NTNU - Norwegian University of Science and Technology, Trondheim, Norway

Igor Shparlinski
University of New South Wales, Sydney, Australia

Alexei Skorobogatov
Imperial College London, London, United Kingdom

Efthymios Sofos
University of Glasgow, Glasgow, United Kingdom

Andreas Strömbergsson
Uppsala University, Uppsala, Sweden

Anders Södergren
Chalmers/University of Gothenburg, Göteborg, Sweden

Ramin Takloo-Bighash
University of Illinois at Chicago, Chicago, United States

Sho Tanimoto
Nagoya University, Nagoya, Japan

Joni Teräväinen
Oxford University, Oxford, United Kingdom

Jesse Thorner
University of Illinois at Urbana-Champaign, Urbana, United States

Pankaj Vishe
Durham University, Durham, United Kingdom

Aled Walker
University of Cambridge, Cambridge, United Kingdom

Igor Wigman
King's College London, London, United Kingdom

Olivier Wittenberg
Université Paris-Sud, Orsay, France

Research Programs

Moduli and Algebraic Cycles

AUGUST 30–DECEMBER 10, 2021

Organizers:
John Christian Ottem
University of Oslo
Dan Petersen
Stockholm University
David Rydh
KTH Royal Institute of Technology

SCIENTIFIC REPORT

Description of scientific area

The program aimed to bring together leading researchers in algebraic geometry, and to explore the central questions related to moduli spaces and algebraic cycles. Most areas of modern algebraic geometry were represented, including both complex, arithmetic and birational geometry, as well as interactions with other subjects such as homotopy theory, string theory, and number theory.

Some of the key topics in the program were Hodge theory and period domains, intersection theory on moduli stacks, the geometry of stability conditions for moduli of sheaves, logarithmic geometry, rationality problems, Griffiths groups, and Hyperkähler manifolds.

Milestones and achievements

In one sense, the timing of the program was unfortunate: several invited participants had to cancel on short notice due to the pandemic, and many who would otherwise have been eager to participate had to decline the invitation. But in another sense the timing was excellent. Nearly everyone who attended commented how great it felt to be around other mathematicians, having lively discussions and collaborating in person; most had not gone to conferences or even in-person seminars in over a year and a half. In particular, this provided a long needed fruitful environment for the postdocs and PhD students (both local and invited).

There was a collaborative and creative atmosphere during the program, particularly during the workshops; open problems were solved during both workshops. On multiple occasions participants commented how fortunate it was to have experts in precisely the right area at the program. Currently there are nine preprints posted online from the program and several more are forthcoming.

New directions

While the program aimed for a broad audience in algebraic geometry, the program also put special focus on several new and current directions, especially in the two workshops.

One theme revolved around the unreasonable effectiveness of equivariant intersection theory for practical computations. Calculations previously thought intractable can often be carried out by cleverly setting up a suitable equivariant problem tailored to the geometry at hand. This has led to many new calculations of Chow rings of moduli stacks, both integrally and rationally, e.g., in the work of Samir Canning, Dan Edidin, Zhengning Hu, Andrea Di Lorenzo, and Angelo Vistoli, all of whom participated in the program.

There were also several talks related to the study of special algebraic cycles. For instance, the talks of Beauville, Schreieder and de Jong revolved around new developments on the Ceresa cycle, an algebraic cycle on

the Jacobian of a curve, which plays an important role in the study of Griffths groups, as well as the rationality problems of hypersurfaces.

In addition to this, recent advances in classical topics such as stability conditions and variation of GIT and moduli spaces of sheaves, were presented in talks by Aaron Bertram, Soheyla Feyzbakhsh, Martin Gulbrandsen, Lars Halle, Tuomas Tajakka and Richard Thomas.

There were also seminar talks by several emerging talents working in the field of motivic homotopy theory, such as Elden Elmanto, Ryomei Iwasa and Maria Yakerson (as well as several speakers in the first workshop). We wish to highlight Elmanto's joint work with Morrow, making decisive progress on the problem of setting up a well-behaved intersection theory on singular schemes using prismatic techniques.

Successful seminars and/or workshops

The program had the main structure of four one-hour talks per week and occasionally more. This gave nearly all participants in the program the opportunity to present a lecture.

We also organized two week-long workshops: "Motives and Hodge theory" and "Moduli spaces and logarithmic geometry". These were more focused and brought together several of the world experts in Hodge theory and logarithmic geometry, respectively.

Some highlights of the first workshop were Esnault's lecture on her contribution to last year's proof of the André–Oort conjecture by Pila–Shankar–Tsimerman, and Fresán's lecture on his recent spectacular work with Jossen, using the theory of exponential motives and tannakian Galois theory to construct an E-function which is not a polynomial expression in hypergeometric functions, settling an open question posed by Siegel in 1929.

The second workshop included several talks on the links between double ramification cycles, compactified Jacobians and logarithmic geometry, areas that have been heavily studied in the past 5–10 years, with lectures by Samouil Molcho, Nicola Pagani, Michael Temkin, Orsola Tommasi, and Filippo Viviani. One highlight in a very different direction was the lecture of Dmitry Vaintrob, explaining that logarithmic geometry can be used to give a purely algebro-geometric construction of a Drinfeld associator, something which had widely been believed to be impossible ever since Drinfeld's original work.

Specially invited participants and/or speakers

We were fortunate to have several highly distinguished long-time visitors, contributing both mathematically and to the sense of community among the participants. Let us in particular mention Dan Abramovich, who attended as Wallenberg visiting professor, and Aaron Bertram, Gerard van der Geer, Jochen Heinloth, Klaus Hulek, Eduard Looijenga, and Angelo Vistoli.

Other participants we would like to highlight are Hélène Esnault and Joseph Ayoub (speakers in the first workshop), Claire Voisin (speaker in the second workshop), and Bruno Klingler.

SEMINARS

AUGUST 31, 2021
Ana-Maria Castravet
University of Versailles Saint-Quentin-en-Yvelines
Blown-up toric surfaces with non-polyhedral effective cone and applications to moduli spaces

SEPTEMBER 2, 2021
Lars Halvard Halle
University of Bologna
Degenerations of Hilbert schemes and relative VGIT

SEPTEMBER 2, 2021
Johannes Nicaise
Imperial College London
Variation of stable birational type and bounds for complete intersections

SEPTEMBER 7, 2021
Angela Ortega
Humboldt-Universität zu Berlin
Generically finite Prym maps

>>

SEPTEMBER 7, 2021
Richard Thomas
Imperial College London
Nonabelian DT theory from abelian DT theory

SEPTEMBER 9, 2021
Nikolas Kuhn
Stanford University
Blowup formulas for virtual sheaf-theoretic invariants on projective surfaces

SEPTEMBER 9, 2021
Klaus Hulek
University of Hannover
Elliptic K3 surfaces: monodromy versus Shimada strata

SEPTEMBER 14, 2021
Andrea Di Lorenzo
Humboldt-Universität zu Berlin
The integral Chow ring of the stack of stable 1-pointed curves of genus two

SEPTEMBER 14, 2021
Jarod Alper
University of Washington
The local structure and coherent completeness of algebraic stacks

SEPTEMBER 16, 2021
Matthias Paulsen
Leibniz Universität
The degree of algebraic cycles on hypersurfaces

SEPTEMBER 16, 2021
Carel Faber
Mathematisch Instituut
On the cohomology of moduli spaces of stable pointed curves: genus 4 and small n, and the vanishing of H^7 and H^9

SEPTEMBER 21, 2021
Siddharth Mathur
Heinrich Heine University Düsseldorf
Searching for the impossible Azumaya algebra

SEPTEMBER 21, 2021
Roy Skjelnes
KTH Royal Institute of Technology
Smooth Hilbert schemes, a classification

SEPTEMBER 23, 2021
Jack Hall
University of Melbourne
Lefschetz theorems via localization

SEPTEMBER 23, 2021
Borislav Mladenov
Imperial College London
Degeneration of spectral sequences and formality of DG algebras associated to Lagrangians in hyperkähler varieties

SEPTEMBER 28, 2021
Daniel Huybrechts
University of Bonn
Nodal quintic surfaces and lines on cubic fourfolds

SEPTEMBER 28, 2021
Georg Oberdieck
University of Bonn
A note on Hilbert schemes of points of K3 surfaces

SEPTEMBER 30, 2021
Stefan Schreider
Leibniz Universität
Higher Abel—Jacobi invariants of torsion cycles modulo algebraic equivalence

SEPTEMBER 30, 2021
Zhengning Hu
University of Missouri
A computation of Sym^2(\Pic(\Hbar_g))

OCTOBER 5, 2021
Kieran O'Grady
Sapienza University of Rome
Theta groups and projective models of HK varieties

OCTOBER 5, 2021
Kai Behrend
University of British Columbia
Donaldson-Thomas theory of the quantum Fermat quintic

>>

OCTOBER 7, 2021
Gavril Farkas
Humboldt-Universität zu Berlin
Koszul modules in algebraic geometry

OCTOBER 7, 2021
Ming Hao Quek
Brown University
Logarithmic resolution of singularities via multi-weighted blow-ups

OCTOBER 8, 2021
Emanuele Macrí
Université Paris-Saclay
Antisymplectic involutions on projective hyperkähler manifolds

OCTOBER 12, 2021
Bruno Klingler
Humboldt-Universität zu Berlin
On the algebraicity of the Hodge locus

OCTOBER 12, 2021
Laure Flapan
Michigan State University
Product identities in the Chow rings of hyperkähler manifolds

OCTOBER 14, 2021
Bjørn Skauli
University of Oslo
Stable irrationality of a (2,3)-complete intersection fourfold

OCTOBER 14, 2021
Angelo Vistoli
Scuola Normale Superiore
An arithmetic valuative criterion for properness for tame stacks, and applications

OCTOBER 14, 2021
Dan Edidin
University of Missouri
The integral Chow ring of the stack of hyperelliptic Weierstrass points

OCTOBER 26, 2021
Jørgen Rennemo
University of Oslo
K-theoretic sheaf counting invariants on C^4

OCTOBER 26, 2021
Martin Gulbrandsen
University of Stavanger
Geometry of wall crossings for the Hilbert scheme of skew lines

OCTOBER 28, 2021
Dirk van Bree
Utrecht University
Virasoro constraints for moduli spaces of sheaves on surfaces

OCTOBER 28, 2021
Maria Yakerson
ETH Zürich
Twisted K-theory in motivic homotopy theory

NOVEMBER 2, 2021
Oliver Leigh
Uppsala University
r-Spin Hurwitz numbers via Stable Maps with Divisible Ramification

NOVEMBER 2, 2021
Martin Raum
Chalmers/University of Gothenburg
An alternative way to compute modular forms

NOVEMBER 4, 2021
Claudio Onorati
Universita di Roma Tor Vergata
Remarks on bundles on hyper-Kahler manifolds

NOVEMBER 4, 2021
Matt Kerr
Washington University in St. Louis
K_2 and quantum curves

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NOVEMBER 9, 2021
Robin de Jong
Universiteit Leiden
Asymptotic properties of the Ceresa cycle

NOVEMBER 9, 2021
Sofia Tirabassi
Stockholm University
On the Brauer group of bielliptic surfaces

NOVEMBER 11, 2021
Ryomei Iwasa
University of Copenhagen
Algebraic K-theory and projective bundle formula

NOVEMBER 11, 2021
Gabriela Guzman
IM PAN, Institute of Mathematics of the Polish Academy of Sciences
Rational homotopy theory in A1-algebraic topology

NOVEMBER 23, 2021
Kristian Ranestad
University of Oslo
Power sum varieties of quaternary quartics

NOVEMBER 23, 2021
Tuomas Tajakka
Stockholm University
Uhlenbeck compactification as a Bridgeland moduli space

NOVEMBER 25, 2021
Erik Lindell
Stockholm University
Abelian cycles in the homology of Torelli groups

NOVEMBER 25, 2021
Jeroen Hekking
KTH Royal Institute of Technology
Graded algebras, projective spectra and blow-ups in derived algebraic geometry

NOVEMBER 30, 2021
Dennis Eriksson
Chalmers/University of Gothenburg
Refined Riemann-Roch for degenerations of Calabi-Yau manifolds and a mirror symmetry-conjecture

NOVEMBER 30, 2021
Gerard Freixas i Montplet
Institut de Mathématiques de Jussieu - Paris Rive Gauche
Functorial intersection theory and moduli spaces of flat vector bundles on curves

DECEMBER 2, 2021
Kris Shaw
University of Oslo
Oriented matroids and real toric varieties

DECEMBER 2, 2021
Christian Johansson
Chalmers/University of Gothenburg
Endoscopic p-adic modular forms for SL(2)

DECEMBER 7, 2021
Josefien Kuijper
Stockholm University
A general blowup-principle for compact support extensions of functors

DECEMBER 7, 2021
Elden Elmanto
Harvard University
Motivic cohomology reimagined

DECEMBER 9, 2021
Olivier Martin
Stony Brook University
Measures of association for algebraic varieties

DECEMBER 9, 2021
Kęstutis Česnavičius
Université Paris-Saclay
Grothendieck--Serre in the quasi-split unramified case

PARTICIPANTS

Dan Abramovich
Brown University, Rhode Island, United States

Piotr Achinger
Institute of Mathematics, Warsaw, Warsaw, Poland

Eric Ahlqvist
KTH Royal Institute of Technology, Stockholm, Sweden

Jarod Alper
University of Washington, Seattle, United States

Joseph Ayoub
University of Zurich, Zürich, Switzerland

Arnaud Beauville
Université Côte d'Azur, Nice, France

Kai Behrend
University of British Columbia, Vancouver, Canada

Pieter Belmans
University of Luxembourg, Luxembourg, Luxembourg

Gergely Berczi
Aarhus University, Aarhus, Denmark

Jonas Bergström
Stockholm University, Stockholm, Sweden

Olof Bergvall
University of Gävle, Gävle, Sweden

Aaron Bertram
University of Utah, Salt Lake City, United States

Yohan Brunebarbe
Université de Bordeaux, Bordeaux, France

Jim Bryan
University of British Columbia, Vancouver, Canada

Rikard Bögvad
Stockholm University, Stockholm, Sweden

Samir Canning
University of California, San Diego, La Jolla, United States

Magnus Carlson
Stockholm University, Stockholm, Sweden

Ana-Maria Castravet
University of Versailles Saint-Quentin-en-Yvelines, Versailles, France

Melody Chan,
Brown University, Rhode Island, United States

François Charles
Orsay University, Paris, France

Qile Chen
Boston College, Chestnut Hill, United States

Simon Cooper
Stockholm University, Stockholm, Sweden

David Corwin
Massachusetts Institute of Technology, MIT, Cambridge, United Kingdom

Ben Davison
University of Edinburgh, Edinburgh, United Kingdom

Mark De Cataldo
Stony Brook University, Stony Brook, United States

Neeraj Deshmukh
University of Zurich, Zurich, Switzerland

Andrea Di Lorenzo
Humboldt-Universität zu Berlin, Berlin, Germany

Sandra Di Rocco
KTH Royal Institute of Technology, Stockholm, Sweden

Dan Edidin
University of Missouri, Columbia, United States

Elden Elmanto
Harvard University, Cambridge, United States

Dennis Eriksson
Chalmers/University of Gothenburg, Göteborg, Sweden

Hélène Esnault
Freie Universität Berlin, Berlin, Germany

Carel Faber
Mathematisch Instituut, Utrecht, Germany

Barbara Fantechi
The International School for Advanced Studies (SISSA), Trieste, Italy

Gavril Farkas
Humboldt-Universität zu Berlin, Berlin, Germany

Soheyla Feyzbakhsh,
Imperial College, London, United Kingdom

Laure Flapan,
Michigan State University, East Lansing, United States

Gerard Freixas i Montplet
Institut de Mathématiques de Jussieu – Paris Rive Gauche, Paris, France

Javier Fresán
École Polytechnique, Palaiseau, France

Wushi Goldring
Stockholm University, Stockholm, Sweden

Frank Gounelas
University of Göttingen, Göttingen, Germany

Daniel Greb
University of Duisburg-Essen, Duisburg, Germany

Samuel Grushevsky,
Stony Brook University, Stony Brook, United States

Martin Gulbrandsen
University of Stavanger, Stavanger, Norway

Lukas Gustafsson
KTH Royal Institute of Technology, Stockholm, Sweden

Gabriela Guzman
IM PAN, Institute of Mathematics of the Polish Academy of Sciences, Warszaw, Poland

Richard Hain
Duke University, Durham, United States

Louis Hainaut
Stockholm University, Stockholm, Sweden

Jack Hall
University of Melbourne, Melbourne, Australia

Lars Halvard Halle
University of Bologna, Bologna, Italy

Daniel Halpern-Leistner,
Cornell University, Ithaca, United States

Isac Hedén
KTH Royal Institute of Technology, Stockholm, Sweden

Jochen Heinloth
Universität Duisburg-Essen, Essen, Germany

>>

Jeroen Hekking
KTH Royal Institute of Technology, Stockholm, Sweden

David Holmes
Universiteit Leiden, Leiden, The Netherlands

Tim Hosgood
Stockholm University, Stockholm, Sweden

Victoria Hoskins
Radboud University, Nijmegen, The Netherlands

Marc Hoyois
Universität Regensburg, Regensburg, Germany

Zhengning Hu
University of Missouri, Columbia, United States

Klaus Hulek
University of Hannover, Hannover, Germany

Daniel Huybrechts
University of Bonn, Bonn, Germany

Ryomei Iwasa
University of Copenhagen, Copenhagen, Denmark

Felix Janda
Michigan State University, East Lansing, United States

Ariyan Javanpeykar
Johannes Gutenberg-Universität Mainz, Mainz, Germany

Christian Johansson
Chalmers/University of Gothenburg, Göteborg, Sweden

Matt Kerr
Washington University in St. Louis, St. Louis, United States

Adeel Khan
Academia Sinica, Taipei, Taiwan

Maryam Khaqan
Stockholm University, Stockholm, Sweden

Frances Kirwan
Oxford University, Oxford, United Kingdom

Bruno Klingler
Humboldt-Universität zu Berlin, Berlin, Germany

János Kollár
Princeton University, Princeton, United States

Martijn Kool
Utrecht University, Utrecht, The Netherlands

Sándor Kovács
University of Washington, Seattle, United States

Andrew Kresch
University of Zurich, Zürich, Switzerland

Nikolas Kuhn
Stanford University, Stanford, United States

Josefien Kuijper
Stockholm University, Stockholm, Sweden

Rolf Källström
University of Gävle, Gävle, Sweden

Aaron Landesman
Harvard University, Cambridge, United States

Lionel Lang
University of Gävle, Gävle, Sweden

Brian Lawrence
The University of Chicago, Chicago, United States

Radu Laza
Stony Brook University, Stony Brook, United States

Oliver Leigh
Uppsala University, Uppsala, Sweden

Zhiyuan Li
Fudan University, Shanghai, China

Max Lieblich
University of Washington, Seattle, United States

Christian Liedtke
Technical University of Munich, Munich, Germany

Erik Lindell
Stockholm University, Stockholm, Sweden

Daniel Litt
The University of Georgia, Athens, United States

Wanmin Liu
KTH Royal Institute of Technology, Stockholm, Sweden

Eduard Looijenga
Mathematisch Instituut, Utrecht, The Netherlands

Emanuele Macrí
Université Paris-Saclay, Paris, France

Olivier Martin
Stony Brook University, Stony Brook, United States

Siddharth Mathur
Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Borislav Mladenov
Imperial College London, London, United Kingdom

Samouil Molcho
The Hebrew University of Jerusalem, Jerusalem, Israel

Ben Moonen
Radboud University, Nijmegen, The Netherlands

Johannes Nicaise
Imperial College London, London, United Kingdom

Kieran O'Grady
Sapienza University of Rome, Roma, Italy

Georg Oberdieck
University of Bonn, Bonn, Germany

Ludvig Olsson
Stockholm University, Stockholm, Sweden

Claudio Onorati
Universita di Roma Tor Vergata, Rome, Italy

Angela Ortega
Humboldt-Universität zu Berlin, Berlin, Germany

John Christian Ottem
University of Oslo, Oslo, Norway

Nicola Pagani
University of Liverpool, Liverpool, United Kingdom

Matthias Paulsen
Leibniz Universität, Hannover, Germany

Sam Payne
University of Texas at Austin, Austin, United States

Fabien Pazuki
University of Copenhagen, Copenhagen, Denmark

Simon Pepin Lehalleur
Radboud University, Nijmegen, The Netherlands

Dan Petersen
Stockholm University, Stockholm, Sweden

Ragni Piene
University of Oslo, Oslo, Norway

>>

Roberto Pirisi
University of Pisa, Pisa, Italy

Aaron Pixton
University of Michigan, Ann Arbor, United States

Mihnea Popa
Northwestern University, Evanston, United States

Elisa Postinghel
University of Trento, Trento, Italy

Ming Hao Quek
Brown University, Rhode Island, United States

Mohammad Reza Rahmati
Parque de innovacion De La Salle, León, Mexico

Kristian Ranestad
University of Oslo, Oslo, Norway

Martin, Raum
Chalmers/University of Gothenburg, Göteborg, Sweden

Jørgen Rennemo
University of Oslo, Oslo, Sweden

Stefan Reppen
Stockholm University, Stockholm, Sweden

Andrea Ricolfi
The International School for Advanced Studies (SISSA), Trieste, Italy

David Rydh
KTH Royal Institute of Technology, Stockholm, Sweden

Anna-Laura Sattelberger
Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany

Luca Schaffler
KTH Royal Institute of Technology, Stockholm, Sweden

Stefan Schreider
Leibniz Universität, Hannover, Germany

Vahid Shahverdi
KTH Royal Institute of Technology, Stockholm, Sweden

Boris Shapiro
Stockholm University, Stockholm, Sweden

Kris Shaw
University of Oslo, Oslo, Norway

Junliang Shen
Massachusetts Institute of Technology, MIT, Cambridge, United States

Evgeny Shinder
University of Sheffield, Sheffield, United Kingdom

Farbod Shokrieh
University of Washington, Seattle, United States

Bjørn Skauli
University of Oslo, Oslo, Norway

Roy Skjelnes
KTH Royal Institute of Technology, Stockholm, Sweden

Ernest Specka
ENS de Lyon, Lyon, France

Fumiaki Suzuki
University of California, UCLA, Los Angeles, United States

Tuomas Tajakka
Stockholm University, Stockholm, United States

Mattia Talpo
University of Pisa, Pisa, Italy

Michael Temkin
The Hebrew University of Jerusalem, Jerusalem, Israel

Richard Thomas
Imperial College London, London, United Kingdom

Sofia Tirabassi
Stockholm University, Stockholm, Sweden

Orsola Tommasi
University of Padova, Padova, Italy

Burt Totaro
University of California, UCLA, Los Angeles, United States

Yuri Tschinkel
Courant Institute of Mathematical Sciences, New York, United States

Hsian-Hua Tseng
Ohio State University, Columbus, United States

Dmitry Vaintrob
University of California, Berkeley, Berkeley, United States

Ravi Vakil
Stanford University, Stanford, United States

Srinivas Vasudevan
TIFR, Tata Institute of Fundamental, Research, India, Mumbai, India

Angelo Vistoli
Scuola Normale Superiore, Pisa, Italy

Filippo Viviani
Universita Roma Tre, Rome, Italy

Claire Voisin
CNRS – Centre national de la recherche, scientifique, Paris, France

Cong Wen
Boston University, Boston, United States

Simen Westbye Moe
Imperial College London, London, United Kingdom

Jonathan Wise
University of Colorado at Boulder, Boulder, United States

Jaroslaw Wlodarczyk
Purdue University, West Lafayette, United States

Chenyang Xu
Massachusetts Institute of Technology, MIT, Cambridge, United States

Maria Yakerson
ETH Zürich, Zürich, Switzerland

Qizheng Yin
Beijing International Center for Mathematical, Research, Beijing, China

Robin de Jong
Universiteit Leiden, Leiden, The Netherlands

Sjoerd de Vries
Stockholm University, Stockholm, Sweden

Gerard van der Geer
Korteweg-de Vries Institute for Mathematics, Amsterdam, The Netherlands

Kęstutis Česnavičius
Université Paris-Saclay, Paris, France

Conferences

Arithmetic (and) Harmonic Analysis
Online conference

MAY 31–JUNE 4, 2021

Organizers:
Julia Brandes
Chalmers/University of Gothenburg
Shaoming Guo
University of Wisconsin-Madison

SCIENTIFIC REPORT

Description of scientific area

The workshop *Arithmetic (and) Harmonic Analysis* concerned Fourier-theoretic tools in analytic number theory and decoupling theory and Fourier restriction theory in harmonic analysis. Recently, simultaneous proofs of a cornerstone result (main conjecture in Vinogradov's mean value theorem) in both harmonic analysis and analytic number theory have increased the momentum of the transfer of technologies in both fields. In harmonic analysis, Bourgain, Demeter and Guth resolved the conjecture using tools from decoupling theory, which is about decompositions functions whose Fourier transforms are supported near curved manifolds. In analytic number theory, Wooley resolved the conjecture using efficient congruencing, a powerful tool he and his collaborators have been developing in recent years to count integral solutions to Diophantine systems of equations.

Milestones and achievements

The main purpose of the workshop was to bring together experts from either field, both to give them a chance to learn about recent developments on the other side, and to develop new synergies. In order to achieve the first goal, we had arranged two lecture series from key figures from either field, Ciprian Demeter in harmonic analysis and Trevor Wooley in analytic number theory. These lecture series have been instrumental in providing the common mathematical background and served as a starting point for further discussions. To complement this, we also invited a selection of speakers both in harmonic analysis and analytic number theory for stand-alone talks. These talks were of a very high quality and have illustrated the connections between both fields.

In order to work towards our second goal and develop new joint directions, we organized collaborative sessions, for which participants were able to work together to explore future directions and/or achieve a deeper understanding of how the two approaches

compare and might be translated into one another. We got several collaborations going and hope to see results in the future. In particular, several of these problems are being considered by exponents coming from either field, thus fulfilling our ambition to further an exchange of expertise between the two approaches.

Overall, we have received enthusiastic feedback from our participants. They have been very satisfied with the scientific program as well as the new impulses they received during the workshop.

New directions

During the workshop, we have set aside time for collaborative work, in order to encourage discussion between the participants and further explore how Fourier analytic methods underpin the fields of discrete harmonic analysis and analytic number theory. In particular, we have started working groups on the following topics:

- Translating early versions of efficient congruencing into the language of decoupling.
- Counting solutions to Diophantine systems that are not translation-invariant.
- Small cap decoupling inequalities and their potential applications to the Lindelof Hypothesis.
- Rational points near manifolds and possible connections to decoupling and efficient congruencing.
- Using mean value estimates to derive pointwise bounds on exponential sums.

We are confident that there will be positive research outcomes on at least some of these in the future. Moreover, the collaborative nature of these sessions has certainly contributed to closer contacts between the exponents of both fields, which can be expected to lead to future collaborations and the general advance of the area in the longer term.

PARTICIPANTS

Theresa Anderson
Purdue University, West Lafayette, United States

Kirsti Biggs
Chalmers/University of Gothenburg, Göteborg, Sweden

Julia Brandes
Chalmers/University of Gothenburg, Göteborg, Sweden

Tony Carbery
University of Edinburgh, Edinburgh, United Kingdom

Emanuel Carneiro
ICTP, Trieste, Italy

Mei-Chu Chang
University of California, Riverside, California, United States

Ciprian Demeter
Indiana University Bloomington, Bloomington, United States

Shaoming Guo
University of Wisconsin-Madison, Madison, United States

Brandon Hanson
The University of Georgia, Georgia, United States

Roger Heath-Brown
University of Oxford, Oxford, United Kingdom

Kevin Hughes
University of Bristol, Bristol, United Kingdom

Marina Iliopoulou
University of Kent, Kent, United Kingdom

Angel Kumchev
Towson University, Towson, United States

Zane Li
Indiana University Bloomington, Bloomington, United States

Yu-ru Liu
University of Waterloo, Waterloo, Canada

Akos Magyar
University of Georgia, Athens, Georgia

Akshat Mudgal
Purdue University, West Lafayette, United States

Simon Myerson
Universität Göttingen, Göttingen, Germany

Changkeun Oh
University of Wisconsin-Madison, Madison, United States

Scott Parsell
West Chester University, West Chester, United States

Sarah Peluse
Princeton University, Princeton, United States

Lillian Pierce
Duke University, North Carolina, United States

Javier Pliego
Purdue University, West Lafayette, United States

Sean Prendiville
University of Lancaster, Lancaster, United Kingdom

>>

Olivier Robert
Université Jean Monnet, Saint-Étienne, France

Igor Shparlinski
University of New South Wales, Sydney, Australia

Olof Sisask
Uppsala University, Uppsala, Sweden

Hong Wang
Institute for Advanced Study, IAS, New Jersey, United States

Trevor Wooley
Purdue University, West Lafayette, United States

Po-Lam Yung
Australian National University, Australian, National University, Australia

Ruixiang Zhang
University of Wisconsin-Madison, Madison, United States

Lilu Zhao
Shandong University, Shandong, China

Pavel Zorin-Kranich
University of Bonn, Bonn, Germany

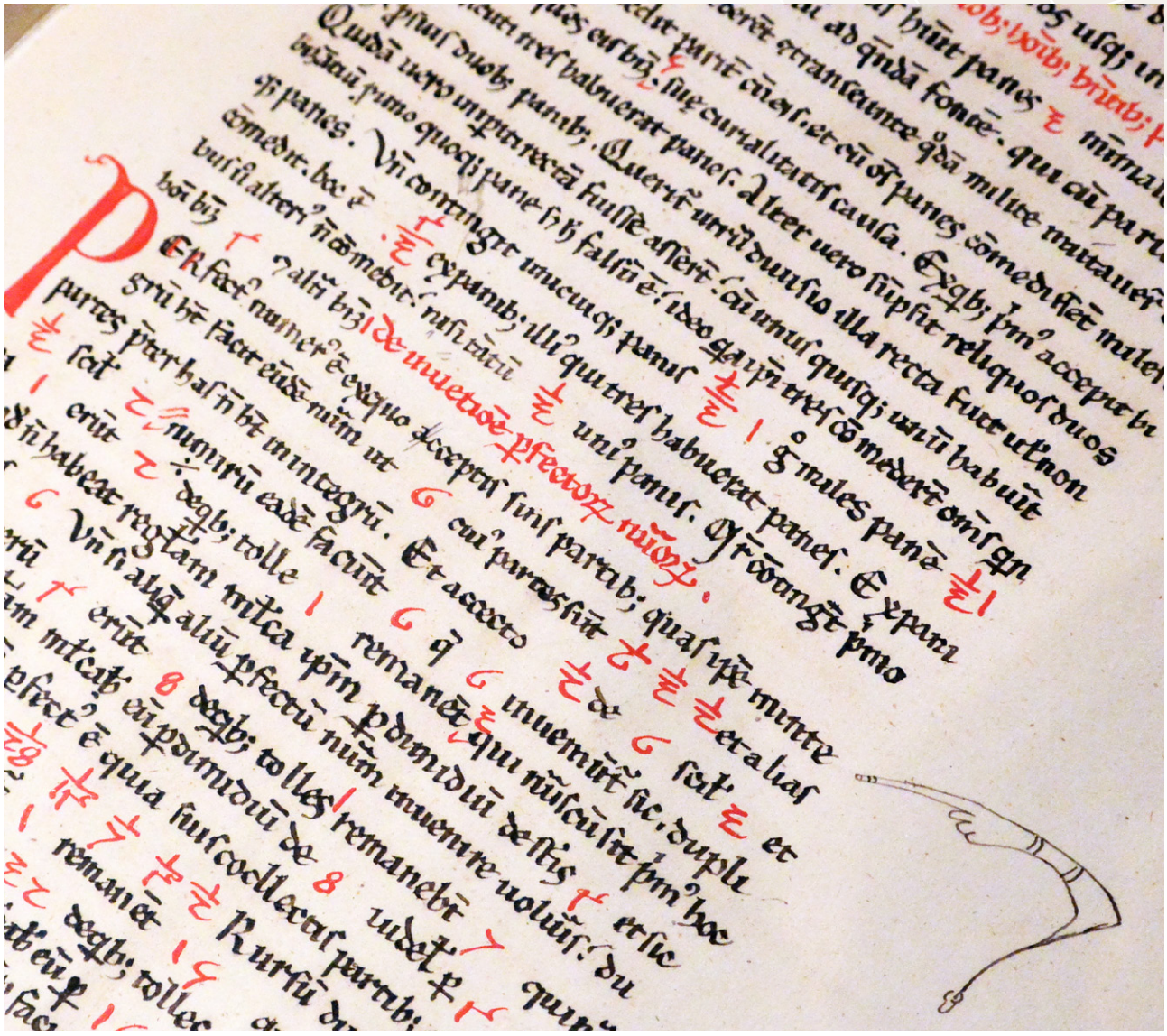


Photo: Institut Mittag-Leffler

Facsimile from the work of Fibonacci.

New frontiers in dimension theory of dynamical systems – Applications in metric number theory
Online conference

JUNE 7–JUNE 11, 2021

Organizers:
Michael Benedicks
KTH Royal Institute of Technology
Boris Hasselblatt
Tufts University
Sabrina Kombrink
University of Birmingham
Yakov Pesin
Penn State University
Tony Samuel
University of Birmingham

SCIENTIFIC REPORT

Description of scientific area

Recent progress demonstrates that results in dimension theory and geometry combined with contemporary techniques in dynamics lead to exiting results in number theory. Examples include Furstenberg's proof of Semeredi's theorem, Margulis' work on group actions on homogeneous spaces and Ratner's work on actions of groups generated by unipotent elements which led to a solution of Oppenheim's conjecture, as well as Lindenstrauss' work on quantum unique ergodicity and (jointly with Weiss) on Gromov's mean dimension.

In another direction, recent results of Hochman, Shmerkin, Solomyak, Peres and Wu on the dimension of self-similar sets and measures associated with conformal iterated function systems with overlaps introduced powerful new methods which helped settle several major open problems such as:

- Furstenberg's conjecture on the dimension of mixed sums of two Cantor sets in R that are invariant under translations by rationally independent numbers.
.
- Dimensions of projections of self-similar Cantor sets.
- Dimensions of Bernoulli convolutions.

These are just some of the scientific topics discussed during the workshop *New frontiers in dimension theory of dynamical systems* held at Institut Mittag-Leffler.

Milestones and achievements

Specific recent breakthroughs in the above scientific areas, which were discussed during the workshop, include:

- Sharp bounds on dimensions of non-conformal repellers, substantially improving earlier results, obtained by applying powerful approximation techniques from non-uniformly hyperbolic systems.
- Existence and uniqueness of equilibrium measures for systems beyond uniformly hyperbolic ones via applications of methods from geometric measure theory.
- Results on multiplicative ergodic averages which have led to substantial progress in computing the Hausdorff and Minkowski dimensions of fractals defined via the semigroup generated by times 2 and times 3.

New directions

New directions of research which resulted from the workshop include:

- Computing the dimension of multifractal level-sets associated with equilibrium measures for systems beyond uniformly hyperbolic ones.
- Developing new techniques in fractal geometry in order to improve the state of the art on Furstenberg type slicing theorems.
- New investigations into the Fourier decay of self-affine sets.

Successful seminars and/or workshops

During the workshop 16 seminar talks were given by world renowned dynamicists as well as young promising talents from, for instance, Canada, China, France, Finland, Israel, Germany, Sweden, Uruguay, the United States and the United Kingdom.

Specially invited participants and/or speakers

Kenneth Falconer
De-Jun Feng
Esa Järvenpää
Stephane Seuret
Pablo Shmerkin
Boris Solomyak
Meng Wu

The workshop was attended by 57 participants (12 female and 45 male) of which 11 were from Scandinavia. Specially invited particiapants for the workshop included:

Viviane Baladi
Michael Hochman
Francois Ledrappier
Mark Pollicott
Benoit Saussol
Jörg Schmeling
Serge Troubetzkoy

Photo: Institut Mittag-Leffler

Ur lifvet, Anne Charlotte Leffler (published 1882–1893).

PARTICIPANTS

Demi Allen
University of Bristol, Bristol, United Kingdom

Simon Baker
University of Birmingham, Birmingham, United Kingdom

Viviane Baladi
CNRS, Paris, France

Amlan Banaji
University of St Andrews, St Andrews, United Kingdom

Christoph Bandt
Ernst Moritz Arndt University of Greifswald, Greifswald, Germany

Michael Benedicks
KTH Royal Institute of Technology, Stockholm, Sweden

Kristian Bjerklöv
KTH Royal Institute of Technology, Stockholm, Sweden

Mats Bylund
Lund University, Lund, Sweden

Danijela Damjanovic
KTH Royal Institute of Technology, Stockholm, Sweden

Manfred Denker
Georg-August-Universität Göttingen, Göttingen, Germany

Kenneth Falconer
University of St Andrews, St Andrews, United Kingdom

Kurt Falk
Christian-Albrechts-Universität zu kiel, Kiel, Germany

Aihua Fan
Université de Picardie Jules Verne, Amiens, France

De-Jun Feng
The Chinese University of Hong Kong, Hong Kong, Hong Kong

Jonathan Fraser
University of St Andrews, St Andrews, United Kingdom

Chris Good
University of Birmingham, Birmingham, United Kingdom

Boris Hasselblatt
Tufts University, Medford, United States

Michael Hochman
The Hebrew University of Jerusalem, Jerusalem, Israel

Johannes Jaerisch
Nagoya University, Nagoya, Japan

Esa Järvenpää
University of Oulu, Oulu, Finland

Maarit Järvenpää
University of Oulu, Oulu, Finland

Charlene Kalle
Leiden University, Leiden, The Netherlands

Marc Kesseböhmer
Universität Bremen, Bremen, Germany

Maxim Kirsebom
Universität Hamburg, Hamburg, Germany

Istvan Kolossvary
University of St Andrews, St Andrews, United Kingdom

Sabrina Kombrink
University of Birmingham, Birmingham, United Kingdom

>>

Tamara Kucherenko
The City College of New York, New York, United States

Francois Ledrappier
CNRS, Paris, France

Jungwoon Lee
WMI, Warwick, United Kingdom

Pablo Lessa
University of the Uruguay Republic, Montevidea, Uruguay

Bing Li
South China University of Technology, Guangzhou, China

Andrew Mitchell
University of Birmingham, Birmingham, United Kingdom

Tuomas Orponen
University of Jyväskylä, Jyväskylä, Finland

Erin Pearse

Tomas Persson
Lund University, Lund, Sweden

Yakov Pesin
Penn State University, University Park, United States

Anke Pohl
California Polytechnic State University, San Luis Obispo, United States

Mark Pollicott
University of Warwick, Coventry, United Kingdom

Dan Rust
Bielefeld University, Bielefeld, Germany

Alex Rutar
University of St Andrews, St Andrews, United Kingdom

Tony Samuel
University of Birmingham, Birmingham, United Kingdom

Maria Saprykina
KTH Royal Institute of Technology, Stockholm, Sweden

Omri Sarig
The Weizmann Institute of Science, Rehovot, Israel

Benoit Saussol
Université de Bretagne Occidentale, Brest, France

Jörg Schmeling
Lund University, Lund, Sweden

Lucas Schmidt
University of Birmingham, Birmingham, United Kingdom

Stephane Seuret
Université Paris-Est Créteil Val-de-Marne, Créteil, France

Pablo Shmerkin
Universidad Torcuato Di Tella, Buenos Aires, Argentina

Boris Solomyak
Bar-Ilan University, Ramat-Gan, Israel

Örjan Stenflo
Uppsala University, Uppsala, Sweden

Liam Stuart
University of St Andrews, St Andrews, United Kingdom

Krystal Taylor
Ohio State University, Columbus, United States

Dan Thompson
Ohio State University, Columbus, United States

Serge Troubetzkoy
Aix-Marseille University, Marseille, France

Meng Wu
University of Oulu, Oulu, Finland

Alexia Yavicoli
University of St Andrews, St Andrews, United Kingdom

Agnieszka Zelerowicz
University of Maryland, College Park, United States

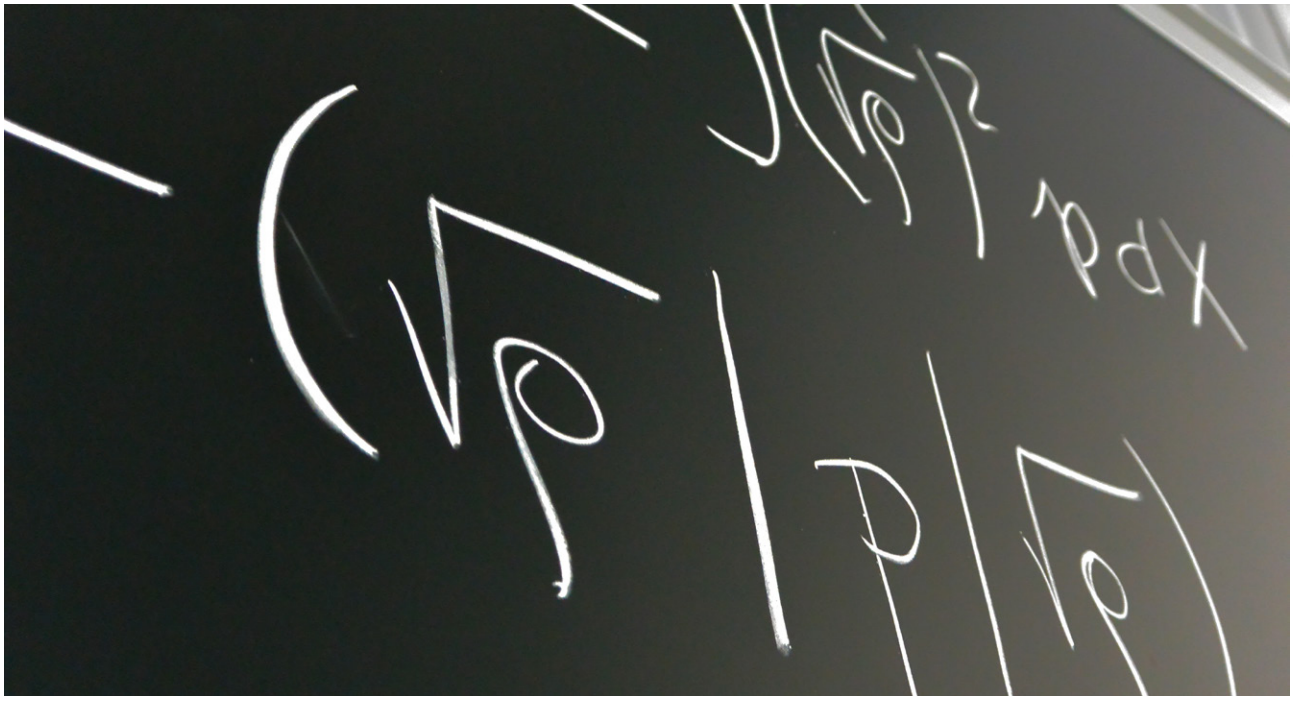


Photo: Institut Mittag-Leffler

Calculation during workshop at Institut Mittag-Leffler.

EWM-EMS Summer School on on Tropical Moduli Spaces
Online conference

JUNE 28–JULY 2, 2021

Organizers:
Diane Maclagan
University of Warwick
Hannah Markwig
Universität Tübingen

SCIENTIFIC REPORT

Description of scientific area

Tropical geometry is a combinatorial shadow of algebraic geometry, obtained by degeneration of an algebraic variety. Tropicalized algebraic varieties are certain weighted polyhedral complexes that retain much of the information about the original variety.

Tropical geometry has had multiple successes, both inside and outside algebraic geometry, since its inception at the start of the century. This includes enumerative geometry, mirror symmetry, Brill Noether theory inside algebraic geometry, numerical solutions to polynomial equations, optimization, phylogenetics, and economics outside the field.

In this workshop we focused on the tropical aspects of moduli spaces. Moduli spaces arise naturally in enumerative geometry as the parametrizing spaces for the objects to be counted. Consequently, the interest in the interplay of algebraic and tropical moduli spaces of curves has grown tremendously over the last few decades.

Milestones and achievements

The first goal of this workshop was to highlight the work of women working in tropical geometry, and foster the next generation in this field. A secondary goal, forced by the pandemic, was to develop a virtual workshop that would share some of the interactivity of an in-person workshop. Both of these goals were achieved.
In order to allow participation from multiple time zones, and to prevent Zoom fatigue, activities were scheduled from 14:00-17:00 CEST. As this required scaling down the activities from a usual summer school, we scheduled only 3 courses, each consisting of one lecture of an hour, and an exercise session of one and a half hours. In addition, we had a final colloquium talk, a session with participant talks, a panel discussion on professional development, and numerous social meetings on Gather. During the talks, we had up to 60 participants. For the exercise sessions and the other activities, a core of about 20 - 35 participants stayed on. We felt that the virtual social activities together with the interaction among the participants that was required during the exercise sessions created an atmosphere that allowed the next generation to get started with networking in the area.

New directions

The three courses outlined related but distinct prominent topics in the area. Enrica Mazzon introduced skeleta and their relations to Berkovich spaces and degenerations. Margarida Melo focused on moduli spaces of tropical curves and Jacobians, with an outline of the very recent activities around compactifications of the universal Jacobian. Melody Chan introduced the homology of tropical moduli spaces and prominent relations to their algebraic counterparts. With these topics, the school was at the forefront of modern research in the area of tropical moduli spaces and provided the participants with background and new ideas for further research directions.

During the session with participant talks, we had the following speakers and titles:

(1) Ana Maria Botero
Volumes of moduli spaces and sums of areas of triangles

(2) Alheydis Geiger
Counting tropical binodal surfaces

(3) Felix Rohrle
Realizability of tropical pluri-canonical divisors

(4) Olga Kuznetsova
The Algebraic degree of optimisation over a variety

(5) Angela Hanson
Surjectivity of the Wahl Map

(6) Courtney George
A Tropical Approach for Identifying Mori Dream Spaces

(7) Yuto Yamamoto
Tropical contractions to integral affine manifolds with singularities

(8) Arina Voorhaar
The Newton Polytope of the Morse Discriminant of a Univariate Polynomial

(9) Victoria Schleis
Faithful tropicalization of hyperelliptic curves

(10) Song JuAe
Self-introduction and Tropical curves with finite group actions and related topics

(11) Claudia Yun
Computing homology representations of Δ_(g,n) through configuration spaces of graphs

(12) Benjamin Schroter
The moduli space of lines contained in a planes is linear

This was a beautiful display of future research directions of the new generation. The discussions after the talks also led to new suggestions, for example, Olga Kuznetsova aims at trying tropicalization as a method for the further study of the algebraic degree of optimization.

Successful seminars and/or workshops

In order to end the summer school with a very special lecture, we managed to recruit Alicia Dickenstein as speaker for our final colloquium. Alicia's research covers a broad range of topics including algebraic geometry, toric geometry, applications in chemistry and biology, and tropical geometry. Her honors are numerous: in 2021, she received the UNESCO-L'Oreal-Prize, in 2015, the TWAS Prize. She is a Fellow of the American Mathematical Society and a SIAM Fellow. From 2015-2018, she was Vice President of the International Mathematical Union. With her experience and international visibility, she serves as an admirable role model for minorities in mathematics. In her talk, she presented how tropical geometry can be used for solving systems of polynomial equations, or, more precisely, as a tool for implicitization.

Specially invited participants and/or speakers

The three lecturers for the school, ordered chronologically, were as follows:

(1) Enrica Mazzon is a young researcher with a high potential. She finished her PhD only in 2019. She spent a Postdoc at the prestigious MPI in Bonn and is now about to move for a Postdoc to the University of Michigan in Ann Arbor. Her research on skeleta and their relation to mirror symmetry caught the attention of the international community early. She gave a beautiful talk, displaying many examples and making this difficult area accessible for the next generation.

(2) Margarida Melo is an expert on moduli theory in algebraic and tropical geometry. Her earlier works deal with moduli spaces of curves, Teichmuller spaces and the tropical Torelli map. She is also involved in a program on compactified Jacobians, and on moduli spaces of spin curves. She gave a concise and steep lecture in which the audience learned about tropicalization and compactifications of moduli spaces, with a particular focus on Jacobians.

(3) Melody Chan is an algebraic geometer and combinatorialist with special interest in tropical moduli spaces. In recent work with Søren Galatius and Sam Payne she disproved a 25-year-old conjecture of Kontsevich concerning the cohomology of moduli spaces of curves using tropical methods. She is the 2020 winner of the *AWM-Microsoft Research Prize in Algebra and Number Theory*, and holds a Career grant from the US National Science Foundation. She gave an inspiring lecture starting with examples and pictures of the very basic moduli spaces of tropical curves and ending with deep results on the homology of moduli spaces in the tropical world and in algebraic geometry. All three lecturers also actively supervised the exercise session and gave the various working groups discussing in breakout rooms valuable advice for their discussions.

PARTICIPANTS

Nachiketa Adhikari
University of Illinois at Urbana-Champaign, Urbana, United States

Rizal Afgani
Bandung Institute of Technology, Jawa Barat, Indonesia

Danny Ariel Flores Taboada

Ahmed Ashraf
University of Manitoba, Winnipeg, Canada

Joseph Atalaye
African Institute for Mathematical Sciences, Cape Town, South Africa

Fereshteh Bahadorykhalily
Institute for Advanced Studies in Basic Sciences, Zanjan, Iran

Alessio Borzì
University of Warwick, Coventry, United Kingdom

Lara Bossinger
UNAM, Mexico City, Mexico

Ana Maria Botero
Berlin Mathematical School, Berlin, Germany

Madeline Brandt
Brown University, Rhode Island, United States

Juliette Bruce
University of California, Berkeley, Berkeley, United States

Alberto Cobos Rabano
University of Sheffield, Sheffield, United Kingdom

Boulos El Hilany
Max Planck Institute for Mathematics, Bonn, Germany

Kamillo, Ferry
Leibniz University, Hannover, Germany

Tara Fife
Lousiana State University, Baton Rouge, United States

Alheydis Geiger
Eberhard Karls University of Tübingen, Tübingen, Germany

Courtney George
University of Kentucky, Lexington, United States

Arka Ghosh
University of Deusto, Bilbo, Spain

Evgeny Goncharov
University of Cambridge, Cambridge, United Kingdom

Louis Hainaut
Stockholm University, Stockholm, Sweden

Angela Hanson
University of Kentucky, Lexington, United States

David Hui
University of New Orleans, New Orleans, United States

Natalia Iyudu
Lancaster University, Lancaster, United Kingdom

Andrés Jaramillo Puentes
University of Duisburg-Essen, Duisburg, Germany

Sam Johnston
University of Bath, Bath, United Kingdom

Song JuAe
Tokyo Metropolitan University, Tokyo, Japan

Enis Kaya
University of Groningen, Groningen, The Netherlands

Myrla Kedynna Barbosa
Università Degli Studi Roma Tre, Rome, Italy

Ayush Kumar Tewari
Ghent University, Ghent, Belgium

Sandeep Kumar
University College Dublin, Dublin, Ireland

Olga Kuznetsova
Aalto University, Espoo, Finland

Yoav Len
University of St Andrews, St Andrews, United Kingdom

Niccolò Maccarini
Leiden University, Leiden, The Netherlands

Diane Maclagan
University of Warwick, Coventry, United Kingdom

Matilde Manzaroli
Eberhard Karls University of Tübingen, Tübingen, Germany

Hannah Markwig
Universität Tübingen, Tübingen, Germany

Diletta Martinelli
University of Amsterdam, Amsterdam, The Netherlands

Nina Morishige
Université du Luxembourg, Luxembourg, Luxembourg

Benjamin Nativi
The University of Texas at Austin, Austin, United States

Loc Nguyen
University of North Carolina Charlotte, Charlotte, United States

Rohini Ramadas
Brown University, Rhode Island, United States

Kemal Rose
Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany

Felix Röhrle
Johann Wolfgang Goethe-Universität, Frankfurt, Germany

Victoria Schleis
University of Tübingen, Tübingen, Germany

Benjamin Schröter
KTH Royal Institute of Technology, Stockholm, Sweden

Rosa Schwarz
Leiden University, Leiden, The Netherlands

Uriel Sinichkin
Tel Aviv University, Tel Aviv, Israel

Pedro Souza,
Johann Wolfgang Goethe-Universität, Frankfurt, Germany

Shlokam Srivastava
Vikram University, Ujjain, India

Kaiwen Sun
KIAS, Korea Institute for Advanced Study, Seoul, South Korea

Dmitry Sustretov
KU Leuven, Leuven, Belgium

Zeinab Toghani
Queen Mary University of London, London, United Kingdom

Daniele Turchetti
Durham University, Durham, United Kingdom

Arina Voorhaar
University of Geneva, Geneva, Switzerland

Brikena Vrioni
American College of Middle East, Kuwait, Kuwait

Longting Wu
Southern University of Science and Technology, Shenzhen, China

Yuto Yamamoto
IBS Center for Geometry and Physics, Pohang, South Korea

Claudia Yun
Brown University, Rhode Island, United States

Manoel Zanoelo Jarra
IMPA, Rio de Janeiro, Brazil

Wanlong Zheng
University of Cambridge, Cambridge, United Kingdom

Bourzik Charif
Cadi Ayyad University, Marrakesh, Morocco

Recep Özkan
Middle East Technical University, Ankara, Turkey

New trends in numerical multiscale methods and beyond
Online conference

JULY 12–JULY 16, 2021

Organizers:
Assyr Abdulle
Ecole Polytechnique Fédérale de Lausanne
Patrick Henning
KTH Royal Institute of Technology
Richard Tsai
University of Texas at Austin
Olof Runborg
KTH Royal Institute of Technology

SCIENTIFIC REPORT

Description of scientific area

The workshop was concerned with the field of multiscale methods, i.e., the numerical treatment of phenomena that involve a wide range of vitally different space and time scales. Such multiscale phenomena pose computational challenges, as they can typically not be correctly captured with traditional numerical methods, hence, demanding new kinds of approaches: multiscale methods. In the past few years, the field of multiscale methods has gone through an enormous transition, where the efficiency and the reliability of multiscale methods, as well as its range of applications, were significantly improved.

At this event, we took another step by finding and establishing new links to emerging disciplines in the fields of model order reduction and data sciences.

Milestones and achievements

Important new findings were already presented in the first talk by Peterseim who presented new localization results for multiscale basis functions with a super-exponential decay. In terms of computational complexity, this improves previous constructions significantly and opens up new possibilities for various types of multiscale problems. Another interesting new result was presented by Szepessy who introduced a mean-field molecular dynamics that approximates canonical quantum correlation observables, including coinciding electron eigenvalues and a path integral alternative to the well-known electron eigenvalue computational bottleneck. The presentation by Luskin was devoted to mathematical and computational models to predict and gain insights into new physical phenomena at the moiré scale, such as twisted tri-layer graphene.

New directions

A new direction for multiscale methods was proposed in the talk by Dong who talked about how to tackle inverse problems by designing transparent deep convolutional networks to uncover hidden PDE models from observed dynamical data and who discussed how deep learning may improve numerical PDE solvers. This strategy might also turn out to be useful in the future for designing suitable auto-encoder-decoders, to identify unknown coarse variables or hidden dynamics in a multiscale model. Another exciting new direction was addressed in the talk by Owhadi who described how differential equations can be solved/learned with kernels. A new problem for applying multiscale methods was posed by Målqvist who talked about a collaboration with the Fraunhofer-Chalmers Centre on the numerical homogenization of discrete network models as they appear in the fabrication of paper-based materials. An interesting new approach for the construction of coarse approximations for elliptic multiscale problems using the Arlequin coupling method was presented in the talk by Legoll. The approach is based on optimizing a homogenized coefficient (representing a purely homogeneous medium) to best fit the effective response in the original multiscale medium.

Successful seminars and/or workshops

Despite being online, there were plenty of fruitful discussions among the participants through the Gather platform, which was well-visited and well-received by the participants.

Specially invited participants and/or speakers

During the workshop, there was also the opportunity for younger participants (such as PhD students and PostDocs) to present their results in shorter talks to the audience of leading experts, in order to get helpful feedback, new input for ideas and to potentially initiate future collaborations.

PARTICIPANTS

Assyr Abdulle
EPFL Lausanne, Lausanne, Switzerland

Robert Altmann
University of Augsburg, Augsburg, Germany

Doghonay Arjmand
Mälardalens högskola, Västerås, Sweden

Weizhu Bao
National University of Singapore, Singapore, Singapore

Eric Chung
Chinese University of Hong Kong, Hong Kong, Hong Kong

Bin Dong
Peking University, Peking, China

Björn Engquist
University of Texas at Austin, Austin, United States

Fredrik Hellman
Chalmers, Gothenburg, Sweden

Patrick Henning
Ruhr-University Bochum and KTH Stockholm, Bochum / Stockholm, Germany / Sweden

Federico Izzo
KTH Royal Institute of Technology, Stockholm, Sweden

Matthew Jacobs
University of California, LA, Los Angeles, United States

Tim Keil
University of Münster, Münster, Germany

Claude Le Bris
Ecole Nationale des Ponts et Chaussées, Paris, France

Frédéric Legoll
Ecole des Ponts ParisTech, Paris, France

Zhang Lei
Shanghai Jiao Tong University, Shanghai, China

Lena Leitenmaier
KTH Royal Institute of Technology, Stockholm, Sweden

Mitchell Luskin
University of Minnesota, Minnesota, United States

Roland Maier
University of Gothenburg, Gothenburg, Sweden

Axel Målqvist
Chalmers and University of Gothenburg, Gothenburg, Sweden

Adrian Muntean
University of Karlstad, Karlstad, Sweden

Hieu Nguyen
University Basel, Basel, Switzerland

Houman Owhadi
California Institute of Technology, Pasadena, United States

Greg Pavliotis
Imperial College London, London, United Kingdom

Anna Persson
KTH Royal Institute of Technology, Stockholm, Sweden

Daniel Peterseim
University of Augsburg, Augsburg, Germany

Olof Runborg
KTH Royal Institute of Technology, Stockholm, Sweden

Felix Schindler
University of Münster, Münster, Germany

Julia Schleuß
University of Münster, Münster, Germany

Kathrin Smetana
University of Twente, Enschede, Netherlands

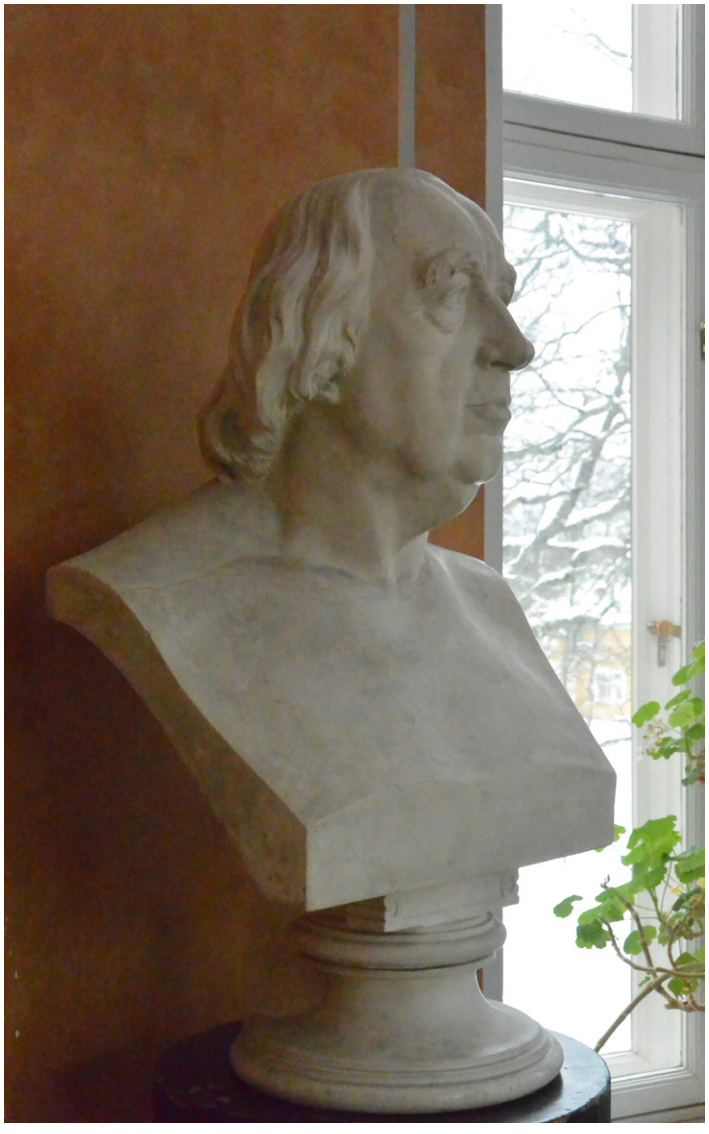
Anders Szepessy
KTH Royal Institute of Technology, Stockholm, Sweden

Richard Tsai
University of Texas at Austin, Austin, United States

Barbara Verfürth
Karlsruhe Institute of Technology, Karlsruhe, Germany

Johan Wärnegård
KTH Royal Institute of Technology, Stockholm, Sweden

Photo: Institut Mittag-Leffler



Bust of Karl Weierstrass (1815–1897).

EWM-EMS Summer School on Multi-scale Modeling for Pattern Formation in Biological Systems
Online conference

JULY 19–JULY 23, 2021

Organizers:
Chloé Audebert
Sorbonne University
Diane Peurichard
Sorbonne University, INRIA
Nastassia Pouradier Duteil
Sorbonne University, INRIA

SCIENTIFIC REPORT

Description of scientific area

Our ambition was to open the field of Mathematical Biology to new young researchers (PhD students and post-docs) and to gather applied mathematicians from different communities and from various geographical locations. More specifically, the main idea of the school was to bring together the participants around the topics of partial differential equations (PDEs) and numerical analysis to model pattern formation at different scales in biological systems.

Biological systems exhibit complex behaviors, and can naturally lead to fascinating patterns. For example, in developmental biology, pattern formation may refer to the generation of complex organization of cell fates in space and time. Phenotypic structures can be explained by the interaction and diffusion of morphogens. On a larger scale, groups of autonomous agents exhibit strong coordination in their movements, which also leads to the creation of patterns (lines of ants, murmuration in flocks of starlings, collective evasion in schools of fish, etc.). In this case, the global behavior of the system emerges from local interactions between individuals, a phenomenon referred to as self-organization.

One of the main mathematical challenges related to pattern formation is the necessity to combine different modeling scales. Indeed, despite increasingly powerful computing tools, simulating systems of millions of interacting particles often remains unfeasible. A possible alternative is to model the evolution of the density of the group, instead of the position and velocity of each individual particle. This solution raises many new questions such as: When is the approximation of the population by its density valid? Under what conditions on the system can this limit process be rigorously done? What numerical tools can be used to simulate the resulting system? Do the patterns observed in a multi-particle system remain in the limiting approximation? How do we link the theoretical solution back to the biological data?

Milestones and achievements

There is a rich diversity in the mathematical community working on providing answers to these central questions. Researchers explore topics as varied as data-driven modeling, theoretical analysis of the models, and the development of numerical methods. Our initiative was to encourage interactions between researchers addressing these common questions from various angles. With this aim in mind, we planned a series of lectures on PDEs and modeling, and another one on numerical analysis. In addition to the main lectures, all participants presented their research.

Our summer school gathered the participants around the themes of partial differential equations and numerical analysis applied to biological systems. The school was composed of two courses of five hours each, one on partial differential equations and modeling of biological systems (taught by Marie-Therese Wolfram), and one on numerical analysis (taught by Magali Ribot). The rest of the school was organized in themed mini-symposia by all participants with the following titles: Heterogeneous cell populations, Cell proliferation, Kinetic approaches in biological systems, Interacting systems, Chemotaxis and collective cell behavior and Collective dynamics.

We also proposed an informal session entitled "Short stories of failures that ended well (...or not)"and we organized we organized two round tables around the themes of "Backpacking mathematicians" and "Women in science".

New directions

Here is a non-exhaustive list of new directions of research that have been brought up during the summer school:

Interacting particle systems in data science

In her final lecture, M.-T. Wolfram gave an overview on particle methods and how they can be used within the Bayesian framework for inverse problems as well as global optimization. She discussed the corresponding optimisation problems and outlined the challenges related to them.

Well-adapted numerical schemes for biological modeling

M. Ribot explained the challenges raised by the simulation of biological systems. Most biological systems have the following common three characteristics: time and space-dependency (and sometimes on other variables as well); a huge number of organisms and of the interactions between them; a coupling between the system and its environment. Developing well-adapted numerical schemes to solve the corresponding equations is still very much an ongoing research direction.

Collective dynamics and topology

P. Degond and A. Frouvelle presented their work on collective dynamics in systems with non-trivial topology, for instance when the interacting agents are not modelled as point masses, but as rigid bodies with many degrees of freedom. This direction of research is new and promising.

Successful seminars and/or workshops

Course by Magali Ribot, Université d'Orléans
Numerical studies of various models for biology

In this course, M. Ribot presented a few examples of mathematical PDE models for biology, describing the evolution in time of a population of organisms (cells, bacteria, algae...) in interaction and in interaction with its environment. All these models are based on conservation laws and need adapted numerical schemes to be efficiently solved at the numerical level.

Course by Marie-Therese Wolfram, University of Warwick
PDE models for aggregation and segregation dynamics

In this short course we discussed different microscopic modelling approaches to describe the dynamics of large interacting particle systems that like to 'stick together'. We started by considering different mechanisms which lead to such aggregation and segregation dynamics and discussed how they translate in different microscopic approaches. Hereby we focused on single as well as multiple species and presented how volume constraints can be included. Next, we considered the corresponding mean-field models and used PDE techniques to analyse aggregation and segregation dynamics. We focused on different applications - in the life, social and data sciences.

ROUND TABLES

Backpacking mathematicians: we encouraged participants to share on the accessibility of careers and jobs in their countries of origin, and about the integration of foreign researchers in their institutions. What are the available tools and what tools can be developed to encourage international collaborations, worldwide scientific education and job accessibility, in particular for women? How has the absence of on-site conferences and research visits (due to the covid crisis) affected our research?

Women in science: we discussed around women's representation and participation in national science academies, and raise questions and issues such as "How much of a role does unconscious bias play in academies' election or selection as members?"; "Are the criteria for membership limiting women's chances?"; "What about socio-cultural aspects?" etc.

Specially invited participants and/or speakers

The school was composed of two courses of five hours each: Marie-Therese Wolfram gave a course on partial differential equations and modeling of biological systems. Magali Ribot gave a course on numerical analysis.

Photo: Institut Mittag-Leffler

Door to the upper gallery of the library at Institut Mittag-Leffler.

PARTICIPANTS

Cecilia Berardo
Helsinki University, Helsinki, Finland

Samuel Bernard
Université Claude Bernard, Lyon 1, France

Vasiliki Bitsouni
Cardiff University, Cardiff, United Kingdom

Maria Caceres
University of Granada, Granada, Spain

Valeria Caliaro
Sorbonne Université, Paris, France

Pierre Degond
Imperial College London, London, United Kingdom

Mete Demircigil
Université Claude Bernard Lyon 1, Lyon, France

Gissel Estrada Rodriguez
Sorbonne Université, Paris, France

Michael Fischer
Warwick University, Warwick, United Kingdom

Amic Frouvelle
Dauphine University, Paris, France

Simon Girel
Univ. Nice Sophia Antipolis, Nice, France

Jules Guilberteau
Sorbonne Université, Paris, France

Sophie Hecht
Sorbonne Université, Paris, France

Maxime Herda
Inria Lille-Nord Europe, Lille, France

Hui Huang
Technische Universität München, Munich, Germany

Laura Kanzler
Sorbonne Université, Paris, France

Emma Leschiera
Sorbonne Université, Paris, France

Angelika Manhart
University College London, London, United Kingdom

Hugo Martin
Inserm, Villejuif, France

Mathieu Mezache
Institut Mathématiques de Marseille, CNRS, Marseille, France

Alexandre Poulain
Sorbonne Université, Paris, France

Magali Ribot
Université d'Orléans, Orléans, France

Markus Schmidtchen
Technical University Dresden, Dresden, Germany

Ariane Trescases
Institut de Mathématiques de Toulouse, Toulouse, France

Marie-Therese Wolfram
University of Warwick, Warwick, United Kingdom

Havva Yoldaş
ICJ-Université Claude Bernard Lyon 1, Lyon, France

Other Activities

Kleindagarna

AUGUST 16-18, 2021

For three days, high school teachers of mathematics were invited to Institut Mittag-Leffler together with mathematics professors and university teachers. They inspire each other and develop tomorrow's mathematics lessons for high school students, by combining the pedagogical expertise of high school teachers with the advanced subject knowledge of higher mathematics.

The purpose of Kleindagarna is to fill the gap between the knowledge and learning within mathematics in upper secondary schools in Sweden and the university level of mathematics by giving insight into the respective mathematical approaches and teaching situations.

Kleindagarna is an appreciated learning and development opportunity aiming to create lessons in mathematics with an instant impact on high school students all around Sweden.

Organizer:

Mats Boij
Chair of The Swedish National Committee for Mathematics and professor in mathematics at KTH Royal Institute of Technology, Stockholm

Supporting organization:

Brummer & Partners

REPORT

With a reduced number of participants and a requirement for full vaccination, it was possible to run the program Kleindagarna for the first time in one and a half years.

Lesson pilots who could not participate because of the vaccination policy were luckily replaced by Laura Fainsilber and Samuel Bengmark.

The program was based on inspirational lectures by university professors, followed by work in groups, with the goal to develop lesson plans that can be implemented in high school teachers' classrooms. The program was as always very appreciated.

LECTURERS

Joakim Arnlind
Linköpings universitet, Linköping

Sofia Tirabassi
Stockholms universitet, Stockholm

Frank Wikström
LTH, Lund

LESSON PILOTS

Samuel Bengmark
Chalmers/Göteborgs universitet, Göteborg

Mats Boij
KTH Royal Institute of Technology, Stockholm

Laura Fainsilber
Chalmers/Göteborgs universitet, Göteborg

PARTICIPANTS

Mattias Ahlén
Nacka Gymnasium, Stockholm

Erik Backlund
Eksjö Gymnasium, Stockholm

David Delgado
Bernadottegymnasiet, Stockholm

Sine Engborg
Eksjö Gymnasium, Stockholm

Johan Falk
Skolverket, Stockholm

Beata-Jasmin Hussain
Rinmangymnasiet, Eskilstuna

Karen Johansson
NTI gymnasiet, Stockholm

Margareta Lenberg
Elof Lindälvsgymnasium, Kungsbacka

Vera Lundström
Umeå Elitidrottsgymnasium på Maja Beskow skolan, Umeå

Gustav Olsson
Campus manilla gymnasium, Stockholm

Karan Partovi
Blackebergs gymnasium, Stockholm

Matthias Rezac
Viskastrandsgymnasiet, Borås

Måns Svensson
LBS Göteborg, Göteborg

Qian Zhao
Södra Latins gymnasium, Stockholm

Participants of Kleindagarna January 2021.
Photo: Julia Sixtensson, HolyComms

Financial Report

Förvaltningsberättelse

MAKARNA MITTAG-LEFFLERS MATEMATISKA STIFTELSE
Org.nr 802408-0890

VERKSAMHETEN

Allmänt om verksamheten

Makarna Mittag-Lefflers matematiska stiftelse har sitt säte i Stockholm. Stiftelsens ändamål är att inom de fyra nordiska länderna, Sverige, Danmark, Finland och Norge, och alldeles särskilt Sverige, för framtiden uppehålla och ytterligare utveckla den ställning, vilken den rena matematiken i dessa länder numera intager, samt att härvid även bereda aktning och rättvist uppskattande utom Nordens gränser för dessa länders insats inom tankelivets högsta område. Makarna Mittag-Lefflers matematiska stiftelse bedriver verksamhet bl.a., i form av tidskriftsutgivning varför alla uttag redovisas över resultaträkningen som kostnader för drift av stiftelsen.

KVA förvaltar ett kapital med ett marknadsvärde som per 2021-12-31 uppgår till 2 840 mkr via sina anknutna stiftelser. KVA och dess anknutna stiftelsers kapital (exklusive Stiftelsen Anna-Greta och Holger Crafoords fond) förvaltas av Carnegie enligt av akademistyrelsen fastställda riktlinjer.

Makarna Mittag-Lefflers matematiska stiftelses andel uppgår till 11,63%.

Stiftelsen har inte haft några anställda och inga löner och ersättningar har utbetalats under året.

Främjande av ändamålet

Resultatet från stiftelsens verksamhet exklusive de finansiella posterna uppgår till -3 610 084 kr som därmed tas från fonden för att driva Institut Mittag-Leffler och utge tidskrifterna Acta Mathematica och Arkiv för Matematik. Eftersom Makarna Mittag-Lefflers matematiska stiftelse bedriver verksamhet, och därmed är klassad som näringsdrivande, redovisas alla uttag som kostnader för drift av stiftelsen.

Väsentliga händelser under räkenskapsåret

Inga väsentliga händelser finns att rapportera.

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Flerårsöversikt

	2021	2020	2019	2018	2017
Huvudintäkter	7 817 711	25 525 568	25 529 537	14 205 623	14 939 124
Årets resultat	22 417 021	11 374 962	16 933 114	-6 556 296	20 279 793
Ingående kapital	201 717 888	190 342 926	173 409 812	179 966 108	159 686 315
Utgående kapital	224 134 909	201 717 888	190 342 926	173 409 812	179 966 108
Årlig förändring i %	11,11%	5,98%	9,76%	-3,64%	12,70%

Vad beträffar stiftelsens resultat och ställning i övrigt, hänvisas till efterföljande resultat- och balans räkningar med tillhörande noter.

RESULTATRÄKNING

	Not	2021	2020
Stiftlesens intäkter			
Bidrag		6 596 758	21 764 904
Nettoomsättning		3 111	350 000
Övriga stiftelseintäkter		1 217 842	3 410 664
		7 817 711	**25 525 568**
Stiftelsens kostnader			
Övriga externa kostnader	2	-10 024 120	-23 420 004
Av- och nedskrivningar av materiella anläggninstillgångar		-427 250	-323 035
Övriga stiftelserkostnader		-976 425	-819 537
		-11 427 795	**-24 562 576**
Rörelseresultat		**-3 610 084**	**962 992**
Finansiella poster			
Resultat från övriga finansiella anläggningstillgångar	3	25 417 166	9 985 971
Övriga ränteintäkter och liknande resultatposter	4	609 939	425 999
		26 027 105	**10 411 970**
Årets resultat		**22 417 021**	**11 374 962**

>>

BALANSRÄKNING

Tillgångar		2021	2020
Anläggningstillgångar			
Materiella anläggningstillgångar			
Inventarier, verktyg och installationer	5	338 689	215 804
Förbättringsutgifter på annans fastighet	6	13 687 323	2 774 346
Pågående nyanläggning		2 642 531	11 462 671
		16 668 543	14 452 821
Finansiella anläggningstillgångar			
Andra långfristiga värdepappersinnehav	7	224 572 547	199 486 067
		224 572 547	199 486 067
Summa anläggningstillgångar		**241 241 090**	**213 938 888**
Omsättningstillgångar			
Kortfristiga fordringar			
Övriga fordringar		7 358 156	7 990 187
Förutbet. kostnader och uppl. intäkter		2 607 313	205 131
		9 965 469	8 195 318
Kassa och bank		2 487 102	2 159 161
Summa omsättningstillgångar		12 452 571	10 354 479
Summa tillgångar		**253 693 661**	**224 293 367**

Eget kapital och skulder			
Bundet eget kapital			
Bundet eget kapital vid räkenskapsårets början		191 801 952	187 297 309
Förändringar av bundet kapital		19 375 261	4 504 643
Bundet eget kapital vid räkenskapsårets slut		211 177 213	191 801 952
Fritt eget kapital			
Fritt eget kapital vid räkenskapsårets början		9 915 936	3 045 617
Överfört till och från bundet eget kapital		-19 375 261	-4 504 643
Lämnade och återförda anslag		-	-
Årets resultat		22 417 021	11 374 962
Fritt eget kapital vid räkenskapsårets slut		12 957 696	9 915 936
Summa eget kapital		**224 134 908**	**201 717 888**
Kortfristiga skulder			
Leverantörsskulder		615 427	462 695
Övriga skulder		-	-
Uppl. kostnader och förutbet. intäkter		28 943 326	22 112 784
		29 558 753	22 575 479
Summa skulder		**29 558 753**	**22 575 479**
Summa tillgångar		**253 693 661**	**224 293 367**

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NOTER

Not 1 – Redovisnings- och värderingsprinciper

Allmänna redovisningsprinciper
Årsredovisningen har upprättats i enlighet med Årsredovisningslagen och Bokföringsnämndens allmänna råd (BFNAR 2016:10) Årsredovisning i mindre företag.

Avskrivningsprinciper för anläggningstillgångar
Följande avskrivningstider tillämpas

Materiella anläggningstillgångar

Inventarier, verktyg och installationer	3–5 år
Förbättringsutgifter på annans fastighet	10–40 år

Eget kapital
Bundet eget kapital består dels av det ursprungliga donationskapitalet, dels av rearesultat som förs direkt mot bundet eget kapital. Utöver detta ingår även kapitaliseringar, årlig avsättning om 10 % på räntor och utdelningar. Fritt kapital avser den del av kapitalet som kan disponeras för utdelningar.

Not 2 – Övriga externa kostnader

	2021	2020
Lokalkostnader	-3 630 846	-3 293 436
Projektkostnader	-2 546 976	-15 114 808
IT-kostnader	-565 737	-834 585
Personalkostnader	-2 591 936	-2 397 192
Övrigt	-688 623	-1 779 983
	-10 024 120	-23 420 004

Not 3 – Resultat från övriga finansiella anläggningstillgångar

Utdelningar	6 047 162	5 154 201
Ränteintäkter	730 663	983 497
Realisationsresultat	18 639 341	3 848 273
Återföring nedskrivning / Nedskrivning värdepapper	0	0
	25 417 166	9 985 971

Not 4 – Övriga ränteintäkter och liknade resultatposter

Fondrabatter	581 374	425 999
Kursvinst	28 565	-
	609 939	425 999

Not 5 – Inventarier, verktyg och installationer

Ackumulerade anskaffningsvärden		
Vid årets början	1 637 363	1 429 985
Nyanskaffningar	185 470	207 378
Vid årets slut	1 822 833	1 637 363
Netto anskaffningsvärde	1 822 833	1 637 363
Ackumulerade avskrivningar enligt plan		
Vid årets början	-1 421 559	-1 396 463
Årets avskrivning på anskaffningsvärden	-62 585	-25 096
Vid årets slut	-1 484 144	-1 421 559
Redovisat värde vid årets slut	**338 689**	**215 804**

Not 6 - Förbättringsutgifter på annans fastighet

	2021	2020
Ackumulerade anskaffningsvärden		
Vid årets början	5 760 419	4 531 896
Nyanskaffningar	11 277 642	1 228 523
Vid årets slut	17 038 061	5 760 419
Netto anskaffningsvärde	17 038 061	5 760 419
Ackumulerade avskrivningar enligt plan		
Vid årets början	-2 986 073	-2 688 134
Årets avskrivning på anskaffningsvärden	-364 665	-297 939
Vid årets slut	-3 350 738	-2 986 073
Redovisat värde vid årets slut	**13 687 323**	**2 774 346**

Not 7 – Andra långfristiga värdepappersinnehav

Ackumulerade anskaffningsvärden		
Vid årets början	199 486 067	188 994 071
Köp	54 369 488	23 041 385
Försäljning	-29 283 007	-12 549 389
Utgående anskaffningsvärden	224 572 547	199 486 067
Bokfört värde	224 572 547	199 486 067
Marknadsvärde	329 063 825	236 406 913

Stockholm den 10 maj 2022

Hans Ellegren
Ständig sekreterare

Min revisionsberättelse har avgivits den ´

Magnus Prööm
Auktoriserad revisor

INSTITUT MITTAG-LEFFLER
THE ROYAL SWEDISH ACADEMY OF SCIENCES
AURAVÄGEN 17, SE-182 60, DJURSHOLM, SWEDEN

PHONE +46 8 622 05 60
E-MAIL INFO@MITTAG-LEFFLER.SE
WEB WWW.MITTAG-LEFFLER.SE
VAT: 262000 –1129

INSTITUT
MITTAG-LEFFLER
THE ROYAL SWEDISH ACADEMY OF SCIENCES