BIRS-CMO 2020 Annual Report

Banff International Research Station
for Mathematical Innovation and Discovery

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BIRS 2020 Program

5-Day Workshops 2020

Jan 12	Jan 17	Mathematical Modelling in Glaciology
Jan 19	Jan 24	Proof Complexity
Jan 26	Jan 31	Fractons and Beyond
Feb 2	Feb 7	Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence
Feb 9	Feb 14	Geometric Tomography
Feb 16	Feb 21	Advances in Theoretical and Experimental Methods for Analyzing Complex Regulatory Networks
Feb 23	Feb 28	Use of Wearable and Implantable Devices in Health Research
Mar 1	Mar 6	Equivariant Stable Homotopy Theory and p-adic Hodge Theory
Mar 8	Mar 13	The Interface Between Selective Inference and Machine Learning (Cancelled)
Mar 15	Mar 20	New Perspectives in Colouring and Structure (Online)
Mar 22	Mar 27	Stochastic Mass Transports (Cancelled)
Mar 29	Apr 3	New Directions in Geometric Flows (Cancelled)
Apr 5	Apr 10	Analysis and Geometry of Metric Spaces - a Bridge between Smooth and Fractal Views (Cancelled)
Apr 12	Apr 17	Almost-Periodic Spectral Problems (Cancelled)
Apr 19	Apr 24	Statistical Methods for Computational Advertising (Cancelled)
Apr 26	May 1	Restriction, Kakeya, and Carleson-Type Problems (Cancelled)
May 3	May 8	Mathematical Questions in Wave Turbulence (Online)
May 10	May 15	Optimal Transport and Analysis for Machine Learning (Cancelled)
May 17	May 22	Connections in Infinite Dimensional Dynamics (Online)
May 17	May 22	A Convergence of Computable Structure Theory, Computable Analysis, and Randomness (Cancelled)
May 24	May 29	Stochastic Analysis, Mathematical Finance and Economics (Cancelled)
May 31	Jun 5	Model Theory of Differential Equations, Algebraic Geometry, and their Applications to Modeling (Online)
Jun 7	Jun 12	Interactions of Gauge Theory with Contact and Symplectic Topology in dimensions 3 and 4 (Online)
Jun 14	Jun 19	Mathematical Frameworks for Integrative Analysis of Emerging Biological Data Types (Online)
Jun 21	Jun 26	Algorithms for Linear Groups (Cancelled)
Jun 28	Jul 3	Modeling, Learning and Understanding: Modern Challenges between Financial Mathematics, Financial Technology and Financial Economics (Cancelled)
Jul 5	Jul 10	Moving Frames and their Modern Applications (Cancelled)
Jul 12	Jul 17	Markov Chains with Kinetic Constraints and Applications (Cancelled)
Jul 12	Jul 17	New Developments in Quantum Machine Learning (Cancelled)
Jul 19	Jul 24	Singularity Formation in Nonlinear PDEs (Cancelled)
Jul 26	Jul 31	Mathematical Models in Biology: from Information Theory to Thermodynamics (Online)
Aug 2	Aug 7	Interfacial Phenomena in Reaction-Diffusion Systems (Online)
Aug 9	Aug 14	Applied and Computational Differential Geometry and Geometric PDEs (Cancelled)
Aug 16	Aug 21	Causal Inference with Big Data (Cancelled)
Aug 23	Aug 28	The Mathematics of Microbial Evolution: Beyond the Limits of Classical Theory (Cancelled)
Aug 30	Sep 4	Modern Breakthroughs in Diophantine Problems (Online)
Sep 8	Sep 9	Arithmetic Aspects of Algebraic Groups (Online)
Sep 15	Sep 17	Permutations and Probability (Online)
Sep 21	Sep 22	Women in Mathematical Physics (Online)
Sep 30	Oct 2	Combinatorial and Geometric Discrepancy (Online)
Oct 4	Oct 9	Biological Active Porous Materials: Modeling, Simulation and Experimentation (Cancelled)
Oct 11	Oct 16	Statistical Modeling for Large Complex Time Dependent Systems (Cancelled)
Oct 18	Oct 23	Mathematical Approaches for Data Assimilation of Atmospheric Constituents and Inverse Modeling (Cancelled)
Oct 19	Oct 30	Dynamical Algebraic Combinatorics (Online)
Nov 1	Nov 6	Derived, Birational, and Categorical Algebraic Geometry (Online)

Nov 8	Nov 13	Algebraic Dynamics and its Connections to Difference and Differential Equations (Online)
Nov 15	Nov 20	WIN5: Women in Numbers 5 (Cancelled)
Nov 22	Nov 27	Multiscale Models for Complex Fluids: Modeling and Analysis (Online)
Nov 29	Dec 4	Interactions Between Topological Combinatorics and Combinatorial Commutative Algebra (Cancelled)
Nov 29	Dec 4	Topology and Entanglement in Many-Body Systems (Cancelled)
Dec 6	Dec 11	Foundations for a Distributed Ledger (Cancelled)

2-Day Workshops 2020

Mar 13	Mar 15	Data Science on Blockchains
Mar 27	Mar 29	Creating Authentic Experiences in Mathematics Courses (Cancelled)
Apr 3	Apr 5	Scientific Workshop for Graduate Students in Mathematical Biology (Cancelled)
Apr 17	Apr 19	Ted Lewis SNAP Math Fair Workshop 2020 (Cancelled)
Apr 24	Apr 26	Mathematical Constitutive Models and Numerical Methods to Simulate Soft Tissue Under Impact Loading (Cancelled)
May 1	May 3	Alberta Number Theory Days XII (Online)
May 8	May 10	Canadian Abstract Harmonic Analysis Symposium (Cancelled)
May 22	May 24	Alberta-Montana Combinatorics and Algorithms Day (Cancelled)
May 29	May 31	Multiplex Brain Networks (Cancelled)
Jun 12	Jun 14	Recent progress in detection and prediction of epilepsy (Cancelled)
Jul 24	Jul 26	Almost Periodicity in Aperiodic Order (Cancelled)
Aug 7	Aug 9	Canadian Math Kangaroo Contest Meeting (Cancelled)
Aug 14	Aug 16	Mathematical Challenges in Computational Chemistry: Multiscale, Multiconfigurational Approaches, Machine Learning (Cancelled)
Aug 21	Aug 22	Canadian Queueing Theorists and Practitioners Conference (Online)
Sep 4	Sep 6	Multitaper Spectral Analysis (Cancelled)

Focused Research Groups

Mar 1	Mar 8	Noncommutative Boundaries for Tensor Algebras
Apr 19	Apr 26	Mathematical Modelling and Machine Learning for Phonetics (Cancelled)
May 10	May 17	Predicting and Preventing Wellbore Leakage (Cancelled)
May 31	Jun 7	Novel fluid/structure/field (FFSI) modeling framework in the context of ion channels (Cancelled)
Jul 19	Jul 26	Dynamics of Biopolymers across Multiple Scales (Cancelled)
Jul 26	Aug 2	Studying PDE Dynamics via Optimization with Integral Inequality Constraints (Cancelled)

Summer School

May 18	Aug 13	Online Open Probability School

Banff International Research Station

2020

5-Day Workshops

Mathematical Modelling in Glaciology
January 12 - 17, 2020

Organizers:

Ian Hewitt (University of Oxford)
Omar Ghattas (University of Texas at Austin)
Sophie Nowicki (NASA Goddard Space Flight Center)
Christian Schoof (University of British Columbia)

The melting of glaciers and ice sheets in response to climate change has major and uncertain impacts: sea-level rise, changes to ocean currents, and changes in water availability. Mathematical models are increasingly called upon to forecast and measure the environmental and societal cost of these changes. Recent monitoring of the ice masses has created an explosion of new data that has exposed important dynamics that are poorly understood. New mathematical and computational tools are required to deal with the increased complexity that these observations reveal. This workshop will bring together mathematicians, computational scientists, and glaciologists, with a variety of skills and experience, to share ideas, stimulate discussion, and foster new collaborations.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5198

Participants:

Ahlkrona, Josefin (Stockholm University)
Asay-Davis, Xylar (Los Alamos National Laboratory)
Bassis, Jeremy (University of Michigan)
Brinkerhoff, Douglas (University of Montana)
Bueler, Ed (University of Alaska Fairbanks)
Felikson, Denis (NASA Goddard Space Flight Center)
Fowler, Andrew (University of Oxford)
Gagliardini, Olivier (University of Grenoble Alpes)
Ghattas, Omar (University of Texas at Austin)
Goldberg, Daniel (University of Edinburgh)
Gudmundsson, Hilmar (Northumbria University)
Haseloff, Marianne (University of Oxford)
Heimbach, Patrick (University of Texas at Austin
Hewitt, Ian (University of Oxford)
Jenkins, Adrian (Northumbria University)
Kowal, Katarzyna (University of Cambridge)
Mantelli, Elisa (Princeton University)
Meyer, Colin (Dartmouth College)
Minchew, Brent (MIT)
Morlighem, Mathieu (UC Irvine)
Neufeld, Jerome (University of Cambridge)
Nias, Isabel (NASA Goddard)
Perego, Mauro (Sandia National Laboratories)
Petra, Noemi (University of California - Merced)
Pollard, David (Pennsylvania State University)
Price, Stephen (Los Alamos National Laboratory)
Racz, Gabriela (UBC)
Raess, Ludovic (ETHZ)
Robel, Alexander (Georgia Tech)
Schoof, Christian (University of British Columbia)
Sergienko, Olga (Princeton University)
Seroussi, Helene (Caltech JPL)
Stadler, Georg (New York University)
Suckale, Jenny (Stanford University)
Tezaur, Irina (Sandia National Laboratories)
Todd, Joe (University of St Andrews)
Ultee, Lizz (MIT)
Wells, Andrew (University of Oxford)
Zwinger, Thomas (CSC-IT Center for Science Ltd.)

Proof Complexity
January 19 - 24, 2020

Organizers:

Jakob Nordström (University of Copenhagen)
Albert Atserias (Universitat Politecnica de Catalunya)
Pavel Pudlak (Mathematical Institute of the Czech Academy of Sciences)
Rahul Santhanam (University of Oxford)

The study of proof complexity was initiated by Cook and Reckhow in 1979 as a way to attack the famous P vs. NP problem (now known as one of the Millennium Prize Problems), and in the ensuing decades many powerful techniques have been discovered for analyzing different proof systems. During the last 10-15 years the area of proof complexity has seen a revival with many exciting results, and new connections have also been revealed with other areas such as, e.g., cryptography, algebraic complexity theory, communication complexity, and combinatorial optimization. While many longstanding open problems from the 1980s and 1990s still remain unsolved, recent breakthroughs give hope that some of these problems might now be within reach. In this workshop, we aim to bring together the whole proof complexity community spanning all of the subareas outlined above. We believe that such a workshop could serve as a powerful stimulus for further progress.

For details, please refer to the workshop webpage:
http://www.birs.ca/events/2020/5-day-workshops/20w5144

Participants:

Atserias, Albert (Universitat Politecnica de Catalunya)
Beame, Paul (University of Washington)
Beckmann, Arnold (Swansea University)
Berkholz, Christoph (Humboldt University Berlin)
Beyersdorff, Olaf (University of Jena)
Bonacina, Ilario (UPC Universitat Politècnica de Catalunya)
Carboni Oliveira, Igor (University of Oxford)
Carmosino, Marco (Simon Fraser University)
Das, Anupam (University of Birmingham)
de Rezende, Susanna (Czech Academy of Sciences)
Filmus, Yuval (Technion)
Fleming, Noah (University of Toronto)
Folwarczný, Lukáš (Mathematical Institute of the Czech Academy of Sciences)
Galesi, Nicola (Università degli Studi di Roma La Sapienza)
Garlík, Michal (Universitat Politecnica de Catalunya)
Goos, Mika (Stanford University)
Hakoniemi, Tuomas (Universitat Politècnica de Catalunya)
Hirsch, Edward (Steklov Institute of Mathematics at St. Petersburg)
Hrubes, Pavel (Czech Academy of Sciences)
Itsykson, Dmitry (Steklov Institute of Mathematics at St. Petersburg)
Kabanets, Valentine (Simon Fraser University)
Knop, Alexander (UC San Diego)
Kolodziejczyk, Leszek (University of Warsaw)
Kolokolova, Antonina (Memorial University of Newfoundland)
Koroth, Sajin (Simon Fraser University)
Lauria, Massimo (Università degli studi di Roma - La Sapienza)
Mahajan, Meena (The Institute of Mathematical Sciences - Chennai)
Mouli, Sasank (UC San Diego)
Nordström, Jakob (University of Copenhagen)
Pang, Shuo (University of Chicago)
Pich, Jan (University of Oxford)
Potechin, Aaron (University of Chicago)
Pudlak, Pavel (Mathematical Institute of the Czech Academy of Sciences)
Razborov, Alexander (University of Chicago)
Risse, Kilian (KTH Royal Institute of Technology)
Santhanam, Rahul (University of Oxford)
Sokolov, Dmitry (Lund University)
Toran, Jacobo (University of Ulm)
Tzameret, Iddo (Royal Holloway, University of London)
Vinyals, Marc (Technion)

Fractons and Beyond
January 26 - 31, 2020

Organizers:

Xie Chen (Caltech)
Rahul Nandkishore (University of Colorado at Boulder)
Yong Baek Kim (University of Toronto)
Zhenghan Wang (Microsoft Research)

Recent developments at the interface between quantum information theory and condensed matter theory have led to the discovery of fracton states, which constitute a new phase of quantum matter. Fracton matter is characterized by the existence of excitations with `fractionalized mobility' - i.e. excitations that cannot move in isolation. This fractionalized mobility is tied to the intricate pattern of quantum entanglement in these phases, and gives hope for constructing new classes of quantum memory.

Recent years have witnessed an explosion of interest in fracton matter, across a range of subfields in theoretical physics. This workshop constitute the first ever weeklong meeting designed to bring together experts from a range of relevant disciplines to discuss this new phase of quantum matter, to help establish a common language, and to chart a path forward for the field.

For details, please refer to the workshop webpage:
http://www.birs.ca/events/2020/5-day-workshops/20w5064

Participants:

Aasen, David (KITP + Microsoft Station Q)
Assaad, Fakher (U. Wurzburg)
Barkeshli, Maissam (University of Maryland)
Bernevig, Andrei (Princeton University)
Bradlyn, Barry (University of Illinois)
Bulmash, Daniel (University of Maryland)
Chen, Xie (Caltech)
de Roeck, Wojciech (KU Leuven)
Dua, Arpit (Yale University)
Else, Dominic (MIT)
Garrahan, Juan P. (University Of Nottingham)
Gromov, Andrey (Brown University)
Haah, Jeongwan (Microsoft Research)
Hermele, Michael (University of Colorado Boulder)
Huang, Sheng-Jie (University of Maryland)
Hughes, Taylor (University of Illinois)
Kim, Yong-Baek (University of Toronto)
Lake, Ethan (Massachusetts Institute of Technology)
Lesanovsky, Igor (University of Tübigen)
Ma, Han (Univ of Colorado - Boulder)
Pollmann, Frank (Technical University of Munich)
Pretko, Michael (University of Colorado Boulder)
Radzihovsky, Leo (University of Colorado at Boulder)
Regnault, Nicolas (Ecole Normale Superieure Paris CNRS)
Shirley, Wilbur (Caltech)
Slagle, Kevin (Caltech)
Song, Hao (Universidad Complutense de Madrid)
Tantivasadakarn, Nathanan (Harvard University)
Vijay, Sagar (Harvard University)
Wang, Zhenghan (Microsoft Research)
Wang, Juven (Harvard University)
Williamson, Dominic (Yale University)
Xu, Cenke (University of California, Santa Barbara)
You, Yizhi (Princeton University)

Dynamics in Geometric Dispersive Equations and the Effects of Trapping, Scattering and Weak Turbulence
February 02 - 07, 2020

Organizers:

Jeremy Marzuola (University of North Carolina at Chapel Hill)
Stephen Gustafson (University of British Columbia)
Daniel Tataru (University of California, Berkeley)

The advances and methods of late in the mathematical analysis of General Relativity, Schroedinger/Wave Maps, Nonlinear Bound States, Water Waves, Optics, and the evolution of dispersive equations on curved surfaces, have been quite rapid. Geometry has taken a larger and larger role in areas of mathematical physics as analytical techniques become more and more advanced to deal with the complexity of nonlinear equations on non-flat background geometries. In some cases, such as general relativity and electromagnetism, the geometry plays a major role in the underlying theory. In other cases such as optics, generalizing the equations geometrically can give insight into how well the model equations work on finite systems, and clarify whether any new physics can be discovered in more complex models. While many mathematicians are working in these areas, often they tend to work on specialized equations and hence rarely have the opportunity to come together and learn about other related topics in analysis where advances could be made or techniques shared and/or modified through collaboration and communication.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5013

Participants:

Ai, Albert (University of Wisconsin-Madison)
Alazard, Thomas (ENS Paris-Saclay)
Banica, Valeria (Sorbonne Université)
Booth, Robert (Texas A&M)
Burq, Nicolas (Université Paris-Saclay)
Camassa, Roberto (University of North Carolina)
Compaan, Erin (Draper)
Czubak, Magdalena (University of Colorado Boulder)
de Poyferré, Thibault (University of California Berkeley)
Disconzi, Marcelo (Vanderbilt University)
Gustafson, Stephen (University of British Columbia)
Hani, Zaher (University of Michigan)
Harrop-Griffiths, Benjamin (UCLA)
Ibrahim, Slim (University of Victoria)
Ifrim, Mihaela (University of Wisconsin-Madison)
Jao, Casey (University of Toronto)
Koch, Herbert (University of Bonn)
Lenzmann, Enno (Universität Basel)
Luhrmann, Jonas (Texas A&M University)
Marzuola, Jeremy (University of North Carolina at Chapel Hill)
Metcalfe, Jason (University of North Carolina)
Morgan, Katrina (Northwestern University)
Nachman, Adrian (University of Toronto)
Ntekoume, Maria (UCLA)
Oh, Sung-Jin (University of California - Berkeley)
Oh, Tadahiro (Choonghong) (The University of Edinburgh)
Pausader, Benoit (Brown University)
Pillai, Mohandas (University of California at Berkeley)
Schlag, Wilhelm (Yale University)
Schörkhuber, Birgit (Karlsruhe Institute of Technology)
Shahshahani, Sohrab (University of Massachussetts Amherst)
Sparber, Christof (University of Illinois Chicago)
Tataru, Daniel (University of California, Berkeley)
Toprak, Ebru (Rutgers University)
Wang, Li (University of British Columbia)
Wilkening, Jon (University of California)
Zeng, Chongchun (Georgia Tech)

Geometric Tomography
February 9 - 14, 2020

Organizers:

Vladyslav Yaskin (University of Alberta)
Alexander Koldobsky (University of Missouri)
Dmitry Ryabogin (Kent State University)
Artem Zvavitch (Kent State Univeristy)

Geometric tomography is the area of Mathematics dealing with the retrieval of information about convex bodies (or other objects) based on lower dimensional data, such as the size of sections or projections. The area lies at the intersection of several branches of mathematics: functional analysis, harmonic analysis, convex geometry, differential geometry, integral geometry etc. Apart from purely theoretical aspects, geometric tomography finds real-world applications in science and engineering. One of the most well-known applications is computerized tomography, which allows to generate images from X-rays of human patients. The aim of the proposed meeting is to discuss most recent developments in geometric tomography, as well as closely related areas of convex geometry and geometric functional analysis.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5037

Participants:

Agranovsky, Mark (Bar-Ilan University)
Alesker, Semyon (Tel Aviv University)
Alfonseca-Cubero, Maria de los Angeles (North Dakota State University)
Artstein, Shiri (Tel-Aviv University)
Boman, Jan (Stockholm University)
Chasapis, Giorgos (Kent State University)
Dann, Susanna (Universidad de los Andes)
Garcia-Lirola, Luis C. (Universidad de Zaragoza)
Giannopoulos, Apostolos (National and Kapodistrian University of Athens)
Gordon, Yehoram (Technion)
Henk, Martin (Technische Universität Berlin)
Hosle, Johannes (UCLA)
Koenig, Hermann (Universitaet Kiel)
Koldobsky, Alexander (University of Missouri)
Latala, Rafal (University of Warsaw)
Litvak, Alexander (University of Alberta)
Livshyts, Galyna (Georgia Institute of Technology)
Ludwig, Monika (Technische Universität Wien)
Marsiglietti, Arnaud (University of Florida)
Myroshnychenko, Sergii (University of Alberta)
Nayar, Piotr (University of Warsaw)
Oleszkiewicz, Krzysztof (University of Warsaw)
Ortega Moreno, Oscar Adrian (Technische Universität Wien)
Paouris, Grigoris (Texas A&M University)
Pivovarov, Peter (University of Missouri)
Putterman, Eli (Tel Aviv University)
Rotem, Liran (Technion)
Roysdon, Michael (Tel Aviv University)
Rudelson, Mark (University of Michigan, Ann Arbor)
Ryabogin, Dmitry (Kent State University)
Schechtman, Gideon (Weizmann Institute)
Schütt, Carsten (Christian-Albrechts-Universitaet)
Shenfeld, Yair (Princeton University)
Tatarko, Kateryna (University of Alberta)
Tkocz, Tomasz (Carnegie Mellon University)
Tomczak-Jaegermann, Nicole (University of Alberta)
Valettas, Petros (Universtiy of Missouri)
Werner, Elisabeth (Case Western Reserve University)
Xing, Sudan (University of Alberta)
Yaskin, Vladyslav (University of Alberta)
Zvavitch, Artem (Kent State Univeristy)

Advances in Theoretical and Experimental Methods for Analyzing Complex Regulatory Networks
February 16 - 21, 2020

Organizers:

Elijah Roberts (Johns Hopkins University)
Michael Assaf (Hebrew University of Jerusalem)
Andreas Hilfinger (University of Toronto)

The process of expressing genes in a cell is noisy and random. A colony of bacteria grown from a single cell will show remarkable differences in the number of copies per cell of all proteins after only a few generations. Variation in these copy numbers can lead to dramatic differences in decisions made by the individual cells, such as which types of food they should look for or if they should prepare against an attack of antibiotics. Here we propose to assemble leading theoretical, computational and experimental biological physicists in order to review recent advances in mathematical and computational models as well as experiments, of how the variation or "noise" in the protein copy numbers affects these decisions. We believe that these types of models and experiments are critical to the understanding at a fundamental level of how cells make decisions. The fundamental concepts we will review regarding noise in genetic systems have many practical implications for engineering new or existing genetic systems for societal needs, such as biofuel production and improving human health.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5162

Participants:

Abel, Steve (University of Tennessee, Knoxville)
Assaf, Michael (Hebrew University of Jerusalem)
Basan, Markus (Harvard Medical School)
Brunner, Jim (Mayo Clinic)
Charlebois, Daniel (University of Alberta)
Hilfinger, Andreas (University of Toronto)
Johnston, Robert (Johns Hopkins University)
Julou, Thomas (University of Basel)
Kaern, Mads (University of Ottawa)
Kafri, Ran (The Hospital for Sick Children)
Karr, Jonathan (Icahn School of Medicine at Mount Sinai)
Lu, Ting (University of Illinois at Urbana-Champaign)
McCallum, Giselle (Concordia University)
Mugler, Andrew (Purdue University)
Munsky, Brian (Colorado State University)
Murugan, Arvind (University of Chicago)
Nemenman, Ilya (Emory University)
Newby, Jay (University of Alberta)
Papin, Jason (University of Virginia)
Potvin-Trottier, Laurent (Concordia University)
Qian, Hong (University of Washington)
Read, Elizabeth (UC Irvine)
Roussel, Marc (University of Lethbridge)
Sivak, David (Simon Fraser University)
ten Wolde, Pieter Rein (AMOLF)
van Nimwegen, Erik (University of Basel)
Weinberger, Leor (UCSF)
Wittenstein, Timon (University of Mainz)
Wytock, Thomas (Northwestern University)
Zechner, Christoph (Max Planck Institute of Molecular Cell Biology and Genetics (Dresden))

Use of Wearable and Implantable Devices in Health Research
February 23 - 28, 2020

Organizers:

Ashkan Ertefaie (University of Rochester)
Ciprian Crainiceanu (Johns Hopkins University)
Max Little (University of Birmingham)
Susan Murphy (Harvard University)

The use of wearable and implantable devices in health research and clinical practice is exploding due to rapid advances in sensor technology, widespread user adoption, and data richness. Indeed, technological advances in sensor technology have far outstripped the development of new analytical methods that could transform this high-volume, high complexity data into clinically useful information. This workshop will bring together statisticians, mathematicians, clinicians and data scientists to tackle emerging and existing problems in health research. Specifically, the overarching goal is to present the real-world clinical questions, existing state-of-the-art methods and build scientifically-aware analytical groups dedicated to answering the most important scientific problems in health applications of wearable and implantable computing. This workshop is a timely event to capitalize on this momentum.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5109

Participants:

Bai, Jiawei (Johns Hopkins University)
Bent, Brinnae (Duke University)
Bidargaddi, Niranjan (Flinders University)
Carroll, Raymond (Texas A&M University)
Cui, Erjia (Johns Hopkins University)
Dunn, Jessilyn (Duke University Med Center)
Dunson, David (Duke University)
Ertefaie, Ashkan (University of Rochester)
Fletcher, Richard (Massachusetts Institute of Technology)
Gaynanova, Irina (Texas A&M University)
Goldsmith, Jeff (Columbia University)
Harezlak, Jaroslaw (Indiana University School of Public Health-Bloomington)
Herring, Amy (Duke University)
Jaimes, Luis (Florida Polytechnic University)
Karas, Marta (Johns Hopkins University)
Kozey-Keadle, Sarah (California Polytechnic State University)
Laber, Eric (North Carolina State University)
Little, Max (University of Birmingham)
Lyden, Kate (KAL Research|Consulting)
Mintz, Yonatan (Georgia Institute of Technology)
Murphy, Susan (Harvard University)
Muschelli, John (Johns Hopkins University)
Natarajan, Loki (University of California San Diego)
Omberg, Larsson (Sage Bionetworks)
Qian, Min (Columbia University**)**
Rehg, James (Georgia Tech)
Schrack, Jennifer (Johns Hopkins University)
Shou, Haochang (University of Pennsylvania)
Smirnova, Ekaterina (Virginia Commonwealth University)
Staudenmayer, John (University of Massachusetts)
Troiano, Richard (National Cancer Institute)
Urbanek, Jacek (Johns Hopkins University)
Wilson, Andrew (NYU Courant Institute and Center for Data Science)
Wrobel, Julia (Columbia University)
Wu, Zhenke (University of Michigan, Ann Arbor)
Wu, Hau-Tieng (Duke University)
Ying Kuen, Cheung (Columbia University)

Equivariant Stable Homotopy Theory and p-adic Hodge Theory
March 01 - 06, 2020

Organizers:

Andrew Blumberg (University of Texas, Austin)
Teena Gerhardt (Michigan State University)
Michael Hill (University of California, Los Angeles)

Algebraic topology has had a long and fruitful collaboration with algebraic geometry, with each providing techniques and problems to the other. This workshop is aimed at an exciting, evolving incarnation of this story: applications of equivariant stable homotopy to number theory.
New foundations in this area have been spectacularly applied to phenomena seen in the trace methods approach to computing algebraic K-theory. For instance, although the theory of equivariant commutative ring spectra was described decades ago, few of the subtleties in the theory were understood or explored. This workshop, at the vanguard of work in this area, seeks to bring together experts in algebraic topology, (derived) algebraic geometry, and number theory to explore these exciting new connections.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5217

Participants:

Angelini-Knoll, Gabriel (Freie Universitaet Berlin)
Angeltveit, Vigleik (Australian National University)
Beaudry, Agnes (University of Colorado Boulder)
Behrens, Mark (University of Notre Dame)
Blumberg, Andrew (University of Texas, Austin)
Bobkova, Irina (IAS)
Bohmann, Anna Marie (Vanderbilt University)
Bonventre, Peter (University of Kentucky)
Carrick, Christian (UCLA)
Dugger, Daniel (University of Oregon)
Dundas, Bjorn (University of Bergen)
Gaisin, Ildar (University of Tokyo)
Gerhardt, Teena (Michigan State University)
Greenlees, John (University of Warwick)
Guillou, Bert (University of Kentucky)
Hahn, Jeremy (MIT)
Hazel, Christy (University of Oregon)
Heller, Jeremiah (UIUC)
Hesselholt, Lars (Nagoya University and University of Copenhagen)
Hill, Michael (University of California, Los Angeles)
Isaksen, Dan (Wayne State University)
Kong, Hana Jia (University of Chicago)
Krause, Achim (University of Munster)
Lawson, Tyler (University of Minnesota)
Mandell, Michael A. (Indiana University)
Mathew, Akhil (University of Chicago)
May, Clover (UCLA)
McCandless, Jonas (Westfälische Wilhelms-Universität Münster)
Meier, Lennart (Universiteit Utrecht)
Merling, Mona (University of Pennsylvania)
Nikolaus, Thomas (Universitat Munster)
Quigley, J.D. (Cornell University)
Ravenel, Douglas (University of Rochester)
Shah, Jay (WWU Münster)
Shi, XiaoLin Danny (University of Chicago)
Speirs, Martin (UC Berkeley)
Stojanoska, Vesna (University of Illinois - Urbana Champaign)
Sulyma, Yuri (Brown University)
Williams, Ben (University of British Columbia)
Wilson, Dylan (Harvard University)
Xu, Zhouli (MIT)

New Perspectives in Colouring and Structure
March 15 - 20, 2020 (Online)

Organizers:

Alex Scott (University of Oxford)
Bojan Mohar (Simon Fraser University)
Paul Seymour (Princeton)

The study of graph colouring is a central theme in combinatorics. Calculating the chromatic number of a graph is well-known to be NP-hard (indeed it is NP-hard even to approximate the chromatic number), and so it is perhaps not surprising that graph colouring has a rich theory, with many important open problems. The colouring of graphs, and more generally of directed graphs and hypergraphs, also has connections and applications in many other areas, including algorithm design, scheduling and resource allocation, statistical physics, and social choice theory.

A common theme in colouring problems is the relationship between chromatic number and graph structure. For instance, one of the oldest problems in graph theory was the celebrated Four Colour Conjecture on colouring planar graphs, which was raised in 1852 and only proved in 1976. A vastly more general conjecture made by Hadwiger in 1943 is still open: if a graph cannot be properly coloured with k−1 colours then it must contain the complete graph on k vertices as a minor. In the last few years, there have been some important steps forward on Hadwiger's Conjecture, and major progress on some of the many other important questions on graph and digraph colouring. This workshop brings together the originators of these new developments, as well as both junior and senior researchers with interests in the field, to explore these new breakthroughs and the new territory they have opened up.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5143

Participants:

Bradshaw, Peter (Simon Fraser University)
Chudnovsky, Maria (Princeton University)
Conlon, David (California Institute of Technology)
DeVos, Matt (Simon Fraser University)
Dibek, Cemil (Princeton University)
Dujmović, Vida (University of Ottawa)
Fox, Jacob (Stanford University)
Groenland, Carla (University of Oxford)
Haxell, Penny (University of Waterloo)
Johnston, Tom (University of Oxford)
Liu, Chun-Hung (Texas A&M University)
Masařík, Tomáš (Simon Fraser University)
Mohar, Bojan (Simon Fraser University)
Morrison, Natasha (Cambridge University)
Narayanan, Bhargav (Rutgers University)
Noel, Jonathan (University of Warwick)
Norin, Sergey (McGill University)
Oum, Sang-il (Institute for Basic Science)
Postle, Luke (University of Waterloo)
Roberts, Alexander (Oxford University)
Samal, Robert (Charles University)
Scott, Alex (University of Oxford)
Seymour, Paul (Princeton)
Sivaraman, Vaidy (Mississippi State University)
Stein, Maya (Universidad de Chile)
Tan, Jane (University of Oxford)
Thomason, Andrew (University of Cambridge)
Trotignon, Nicolas (CNRS - École Normale Supérieure de Lyon)
Trotter, William (Georgia Tech)
Walczak, Bartosz (Jagiellonian University)
Wood, David (Monash University)

Mathematical Questions in Wave Turbulence
May 04 - 06, 2020 (Online)

Organizers:

Jalal Shatah (Courant Institute, New York University)
Tristan Buckmaster (Princeton University)
Pierre Germain (New York University)
Zaher Hani (University of Michigan)

Wave turbulence is a universal phenomenon describing the chaotic behaviors of systems as diverse as the atmosphere, the ocean, plasmas (and thus astrophysics), quantum dynamics, etc... in certain regimes where the nonlinear effects are weak. Understanding this phenomenon rigorously would be of great interest in all these physical disciplines ; it is also a fascinating mathematical challenge, bringing together many domains of research: partial differential equations, probabilty, mathematical physics, and harmonic analysis.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5025

Participants:

Ampatzoglou, Ioakeim (The University of Texas at Austin)
Bambusi, Dario (Università degli studi di Milano)
Banks, Jeffrey (Rensselaer Polytechnic Institute)
Bedrossian, Jacob (University of Maryland)
Bejenaru, Ioan* (University of California, San Diego)
Berti, Massimiliano (Sissa)
Bizon, Piotr (Jagiellonian University)
Bringmann, Bjoern (University of California, Los Angeles)
Buckmaster, Tristan (Princeton University)
Buhler, Oliver (Courant Institute of Mathematical Sciences)
Burq, Nicolas (Université Paris-Saclay)
Chevillard, Laurent* (ENS Lyon)
Childress, William (1934)
Collot, Charles (Cergy Paris Université)
Dai, Mimi (University of Illinois at Chicago)
Dauxois, Thierry (CNRS & ENS Lyon)
de la Llave, Rafael (Georgia Inst. of Technology)
de Poyferré, Thibault (University of California Berkeley)
Deng, Yu (University of Southern California)
Dodson, Benjamin (Johns Hopkins)
Doering, Charles R. (University of Michigan)
Donninger, Roland (University of Vienna)
Faou, Erwan (INRIA)
Gallagher, Isabelle ENS Paris
Gérard, Patrick (Univ. Paris Sud)
Germain, Pierre (New York University
Grellier, Sandrine (Université d'Orléans)
Guo, Zihua (Monach U.)
Gustafson, Stephen (University of British Columbia)
Hani, Zaher (University of Michigan)
Harrop-Griffiths, Benjamin (UCLA)
Haus, Emanuele (Università degli Studi Roma Tre)
Hrabski, Alexander (University of Michigan)
Ibrahim, Slim (University of Victoria)
Ionescu, Alexandru (Princeton University)
Jin, Kexin (Princeton university)
Kappeler, Thomas (University of Zurich)
Kirkpatrick, Kay* (University of Illinois)
Kleiner, Bruce (New York University)
Koch, Herbert (University of Bonn)
Korotkevich, Alexander (University of New Mexico)
Kovacic, Gregor * (RPI)

Krstulovic, Giorgio (Université Côte d'Azur)
Latocca, Mickaël (Ecole Normale Supérieur in Paris)
Lenzmann, Enno (Universität Basel)
Lin, Fang-Hua (New York University)
Luhrmann, Jonas (Texas A&M University)
Marzuola, Jeremy (University of North Carolina at Chapel Hill)
Masmoudi, Nader (Courant Institute)
Maspero, Alberto (SISSA Trieste)
Mattingly, Jonathan (Duke University)
McLaughlin, David (New York University)
Mendelson, Dana (University of Chicago)
Merle, Frank (Cergy-Pontoise and ihes)
Miller, Peter (University of Michigan)
Mordant, Nicolas (Univ. Grenoble)
Nahmod, Andrea (University of Massachusetts)
Nakanishi, Kenji (Kyoto University)
Nazarenko, Sergey (Universite Cote d'Azur)
Ng, Ren (UC Berkeley)
Ntekoume, Maria (UCLA)
Oh, Sung-Jin (University of California - Berkeley)
Onorato, Miguel (University of Torino)
Pan, Yulin (University of Michigan)
Pausader, Benoit (Brown University)
Pavlovic, Natasa (University of Texas at Austin)
Pelinovski, Dmitry* (McMaster University)
Phan, Tuoc-Van (University of Tennessee)
Procesi, Michela (Roma Tre)
Pusateri, Fabio (University of Toronto)
Roudenko, Svetlana (Florida International University)
Rydin Myerson, Simon (University of Göttingen)
Sagiv, Amir (Columbia University)
Schlag, Wilhelm (Yale University)
Schotland, John (University of Michigan, USA)
Shahshahani, Sohrab (University of Massachussetts Amherst)
Shatah, Jalal (Courant Institute, New York University)
Sohinger, Vedran (University of Warwick)
Staffilani, Gigliola (Massachusetts Institute of Technology)
Strain, Robert (University of Pennsylvania at Philadelphia)
Sulem, Catherine (University of Toronto)
Tataru, Daniel (University of California, Berkeley)
Thomann, Laurent (Université de Lorraine)
Tran, Minh-Binh (Southern Methodist University)
Tsutsumi, Yoshio (Kyoto University)
Tzvetkov, Nikolay* (Lille)
Vanden-Eijnden, Eric (Courant Institute)
Varadhan, Srinivasa (New York University)
Vicol, Vlad (Courant Institute)
Vilaça da Rocha, Victor (Georgia Tech)
Weinstein, Michael (Columbia University)
Wilkening, Jon (University of California)
Wu, Sijue (University of Michigan)
Zeng, Chongchun (Georgia Institute of Technology)

Connections in Infinite Dimensional Dynamics
May 17 - 22, 2020 (Online)

Organizers:

Jan Bouwe van den Berg (Vrije Universiteit Amsterdam)
Jean-Philippe Lessard (McGill University)
Jason Mireles James (Florida Atlantic University)
Konstantin Mischaikow (Rutgers University)

Changes in dynamics define many of the important phenomena we see around us, such as the passage from normal heart beat to arrhythmia, the collapse of the stock market, and the shedding of vortices from airplane wings. Mathematically such dynamic transitions are modelled by connections in nonlinear dynamical systems, mainly in the form of ordinary differential equations, partial differential equations and delay differential equations. This workshop focuses on combining computational techniques with abstract mathematics to improve our fundamental understanding of transitions in dynamical systems.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5145

Participants:

Akitoshi, Takayasu (University of Tsukuba)
Barker, Blake (Brigham Young University)
Beck, Margaret (Boston University)
Breden, Maxime (Ecole Polytechnique)
Church, Kevin (McGill University)
Duchesne, Gabriel William (McGill University)
Gameiro, Marcio (Rutgers University)
Hénot, Olivier (McGill University)
Hetebrij, Wouter (Vrije Universiteit Amsterdam)
Jaquette, Jonathan (Boston University)
Kepley, Shane (Rutgers University)
Lessard, Jean-Philippe (McGill University)
Mireles James, Jason (Florida Atlantic University)
Mischaikow, Konstantin (Rutgers University)
Murray, Maxime (Florida Atlantic University)
Plum, Michael (Karlsruhe Institute of Technology)
Queirolo, Elena (Rutgers University)
Spendlove, Kelly (Oxford University)
van den Berg, Jan Bouwe (Vrije Universiteit Amsterdam)
Vandervorst, Robert (Vrije Universiteit Amsterdam)
Williams, JF (Simon Fraser University)

Model Theory of Differential Equations, Algebraic Geometry, and their Applications to Modeling
May 31 - June 05, 2020 (Online)

Organizers:

Gleb Pogudin (École Polytechnique)
Marisa Eisenberg (University of Michigan)
Rahim Moosa (University of Waterloo)
Thomas Scanlon (University of California, Berkeley)

The workshop has a focus on both already existing and potential new connections between differential algebra, applied algebraic geometry, model theory, and modeling. Many of the recent fruitful and striking applications of differential algebra, applied algebraic geometry, and model theory became possible as a result of interaction between these fields. Informally speaking, this interaction works as follows. Differential algebra provides a rich variety of techniques to transform analytic problems arising in modeling to algebraic problems. These algebraic problems can then be efficiently solved using methods and algorithms from applied algebraic geometry. Model theory provides a powerful language to describe both differential algebra and algebraic geometry, which has recently given many important and exciting insights into these areas. Moreover, model theory has its own well-developed algorithmic techniques such as quantifier elimination.

The goals of this workshop include bringing together researchers who work with actual modelers and modeling problems and researchers working more on the theoretical side. This will stimulate interactions resulting in the emergence of new and significant improvement in existing applications of differential algebra, applied algebraic geometry, and model theory to modeling.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5204

Participants:

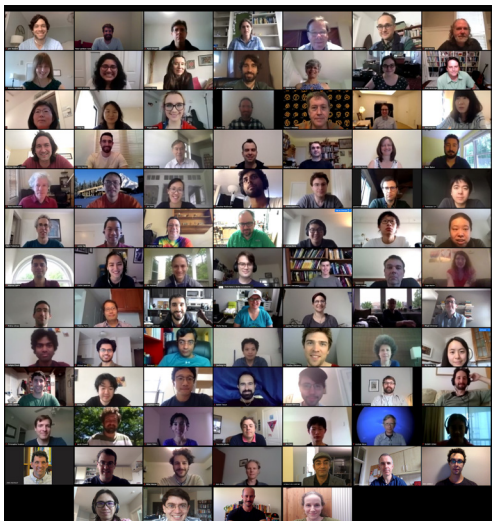
Ait El Manssour, Rida (SISSA)
Aliyari, Saba (Heinrich Heine Universität Dusseldorf)
Allman, Elizabeth (University of Alaska Fairbanks)
Amzallag, Eli (CUNY)
Anderson, Aaron (UCLA)
Andrews, Uri (University of Wisconsin--Madison)
Arenas, Alejandro (Universidad Nacional de Colombia)
Aroca, Fuensanta (Universidad Nacional Autónoma de México)
Aslanyan, Vahagn (University of East Anglia)
Bautista, José Leonardo Ángel (Universidad de los Andes-Colombia)
Bell, Jason (University of Waterloo)
Bhardwaj, Neer (University of Illinois at Urbana-Chmapaign)
Block Gorman, Alexi (University of Illinois at Urbana-Champaign)
Blum, Lenore (Carnegie Mellon University)
Boros, Balázs (University of Wisconsin-Madison)
Bortner, Cash (North Carolina State University)
Bradley-Williams, David
Brouwer, Andrew (University of Michigan)
Casale, Guy (University of Rennes)
Castrillo, Juan Felipe Rui (National University of Colombia)
Caulfield, Erin (McMaster University)
Chatzidakis, Zoe (Ecole Normal Superieure)
Chernikov, Artem (UCLA)
Craciun, Gheorghe (University of Wisconsin

Madison)
Delcourt, Michelle (Ryerson)
Dickenstein, Alicia (Universidad de Buenos Aires)
DiStefano III, Joseph (Biocybernetics Publishing)
Du, Lixin (Johannes Kepler University Linz)
Dufresne, Emilie (University of York)
Efem, Ugur (University of Oxford)
Eisenberg, Marisa (University of Michigan)
Eterović, Sebastian (UC Berkeley)
Feliu, Elisenda (University of Copenhagen)
Forey, Arthur (ETH)
Freitag, James (University of Illinois at Chicago)
Fu, Lei (Chinese Academy of Sciences)
Fu, Yayi (University of Notre Dame)
Gabrielov, Andrei (Purdue)
Garay López, Cristhian (CIMAT)
Görlach, Paul (U Chemniz)
Gross, Elizabeth (University of Hawaii at Manoa)
Gustavson, Richard (Manhattan College)
Haiech, Mercedes (University of Rennes 1)
Hanson, James (University of Wisconsin-Madison)
Hardouin, Charlotte (Institut de mathématiques de Toulouse)
Hart, Bradd (McMaster University)
Haskell, Deirdre (McMaster University)
Hasson, Assaf (Ben Gurion University of the Negev)
Henson, Ward (University of Illinois)
Hoffmann, Daniel Max (University of Notre Dame)
Hong, Hoon (North Carolina State University)
Hrushovski, Ehud (University of Oxford)
Huang, Bo (New York University)
Jaoui, Remi (University of Notre Dame)
Jeronimo, Gabriela (Universidad de Buenos Aires)
Jimenez, Leo (University of Notre Dame)
Johnson, Will (Fudan University)
Joubert, Dominique (Wageningen University)
Kaihnsa, Nidhi (Brown University)
Kaiser, Tobias (University of Passau)
Kamensky, Moshe (Ben Gurion University)
Kaplan, Elliot (University of Illinois at Urbana-Champaign)
Kawaguchi, Shu (Doshisha University)
Kepley, Shane (Rutgers University)
Khalilian, Hamed (Heinrich Heine Universität Dusseldorf)
Kovacsics, Pablo Cubides (HHU Düsseldorf)
Kuhlmann, Salma (Universität Konstanz)
Laskowski, Chris (University of Maryland)
Laubenbacher, Reinhard (University of Connecticut School of Medicine)
Lee, Sung Hyup (UC Berkeley)
Leon Sanchez, Omar (University of Manchester)
Li, Wei (Chinese Academy of Sciences)
Malliaris, Maryanthe (University of Chicago)
Mantova, Vincenzo (University of Leeds)
Mariaule, Nathanaël (Université de Mons)
Marker, David (University of Illinois at Chicago)
Menezes, Dean (UCLA)
Meretzky, David (The University of Notre Dame)
Mermelstein, Omer (University of Wisconsin-Madison)
Meshkat, Nicolette (Santa Clara University)
Mirabi, Mostafa (Wesleyan University)
Mischaikow, Konstantin (Rutgers University)
Mochizuki, Atsushi (Kyoto University)
Mojarrad, Hossein (New York University)
Moosa, Rahim (University of Waterloo)
Mutlu, Dicle (McMaster University)
Nagloo, Joel (City University of New York)
Nguyen, Dang Khoa (University of Calgary)
O'Gorman, Ronan (University of Oxford)
Obatake, Nida (Texas A&M University)
Ovchinnikov, Alexey (City University of New York)
Pearce, Kate (North Carolina State University)
Pereira, Jorge Vitório (IMPA (Brazil))
Pierce, David (Mimar Sinan Fine Arts University)
Pillay, Anand (University of Notre Dame)
Platzer, Andre (Carnegie Mellon University)
Pogudin, Gleb (École Polytechnique)
Point, Francoise (Mons)
Pourmahdian, Massoud (IPM)
Ren, Yue (Swansea University)
Rhodes, John (University of Alaska Fairbanks)
Rideau-Kikuchi, Silvain (CNRS, Paris Diderot)
Rolin, Jean-Philippe (Universite de Bourgogne)
Saccomani, Maria Pia (University of Padova)
Scanlon, Thomas (University of California, Berkeley)
Seiler, Werner (Kassel University)
Seiss, Matthias (Uni Kassel)
Sengupta, Sonal (Radboud University)
Servi, Tamara (Université Paris Diderot Paris 7)
Singer, Michael (North Carolina State University)
Singh, Sudhir (National Institute of Technology)
Solanki, Nikesh (University of Manchester)
Sorea, Miruna-Stefana (MPI MiS, Leipzig)
Speissegger, Patrick (McMaster University)
Sturmfels, Bernd (Max Planck Institute for Mathematics in the Sciences)
Swigon, David (University of Pittsburgh)
Tang, Xiaoxian (Beihang University)
Timme, Sascha (TU Berlin)
Towsner, Henry (University of Pennsylvania)
Transturm, Mark (Brigham Young University)
Tribastone, Mirco (IMT School for Advanced Studies Lucca)
Tschaikowski, Max (Aalborg University)
Tyrrell, Brian (University of Oxford)
van der Hoeven, Joris (Simon Fraser University)
Villaverde, Alejandro F. (Consejo Superior de Investigaciones Científicas (CSIC))
Vo, Thieu (Ton Duc Thang University)
Walker, Roland (University of Illinois at Chicago)
Whyte, Jason M. (University of Melbourne)
Wibmer, Michael (Graz University of Technology)
Wood, Carol (Wesleyan University)
Yap, Chee (New York University, Courant Institute)
Yu, Polly (University of Wisconsin-Madison)
Zhu, Shaopeng (University of Maryland)

Interactions of Gauge Theory with Contact and Symplectic Topology in dimensions 3 and 4
June 07 - 12, 2020 (Online)

Organizers:

Hans Boden (McMaster University)
John Baldwin (Boston College)
John Etnyre (Georgia Institute of Technology)
Liam Watson (University of British Columbia)



This workshop highlights new results in low-dimensional topology coming from a wide range of geometric methods. Low-dimensional topology studies the global properties of geometric spaces in dimensions 3 and 4, such as 3-dimensional space and 4-dimensional space-time. The study of spaces in dimensions 3 and 4 is more challenging than in higher dimensions: for instance, the famous Poincaré conjecture, which gives an intrinsic topological characterization of the sphere, was solved recently by Perelman in dimension 3, and has not yet been completely settled in dimension 4, while its higher dimensional generalizations were previously known. Studying 3- and 4-dimensional spaces requires combining a variety of different approaches, many of which are geometric in nature and have their roots in theoretical physics. Much of the recent progress in this extremely active area of mathematics makes use of the interplay between sophisticated mathematical invariants (quantities that can be used to distinguish one space from another) coming from gauge theory and from contact and symplectic geometry, and new cut-and-paste constructions that modify known spaces in surprising ways.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5088

Participants:

Adam, Levine (Duke University)
Alfieri, Antonio (UBC)
Alishahi, Akram (University of Georgia)
Armitage, Ethan (Melbourne)
Auckly, David (Kansas State University)
Baker, Kenneth (University of Miami)
Baldridge, Scott (Louisiana State University)
Baldwin, John (Boston College)
Baykur, Inanc (University of Massachusetts)
Binns, Fraser (Boston College)
Boden, Hans (McMaster University)
Bodish, Holt (University of Oregon)
Boileau, Michel (Aix Marseille Université)
Boyer, Steven (Université du Québec à Montréal)
Boyle, Keegan (University of British Columbia)
Cahn, Patricia (Smith College)
Casals, Roger (UC Davis)
Castro, Nick (University of Arkansas)
Caudell, Jacob (Boston College)
Cazassus, Guillem (Indiana University)
Chen, Jie (McMaster University)
Chrisman, Micah (Ohio State University)
Cohen, Jesse (University of Oregon)
Conway, Anthony (Max Plank Institute für Mathematik)
Conway, Jamie (UC Berkeley)
Curtis, Cynthia (College of New Jersey)
Daemi, Aliakbar (Washington University)
Dai, Irving (MIT)
Dunfield, Nathan (University of Illinois (Urbana-Champaign))
Etnyre, John (Georgia Institute of Technology)
Feehan, Paul (Rutgers, The State University of New Jersey)
Feher, Zsombor (University of Oxford)
Feller, Peter (ETH Zurich)
Garbuz, Ben (University of British Columbia)
Gay, Dave (University of Georgia / MPIM)
Gerig, Chris (Harvard University)
Ghaswala, Tyrone (Université du Québec à

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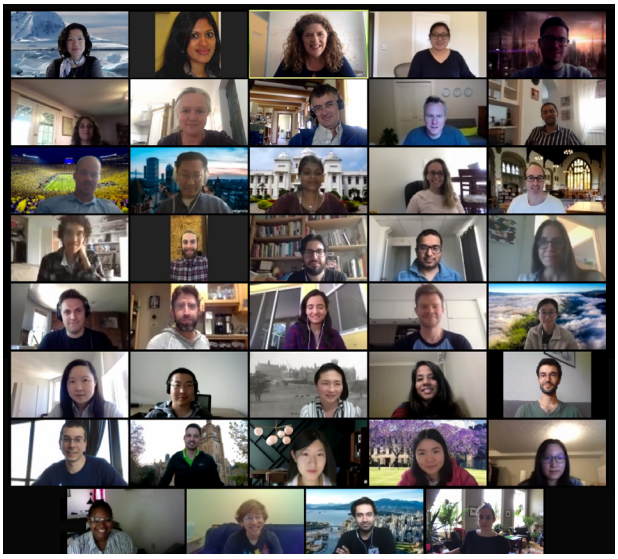
Ghiggini, Paolo (CNRS - Laboratoire Jean Leray (Nantes))
Ghosh, Sudipta (Louisiana State University)
Golla, Marco (CNRS and Université de Nantes)
Gong, Sherry (UCLA)
Gordon, Cameron (University of Texas at Austin)
Gorsky, Evgeny (UC Davis)
Greene, Josh (Boston College)
Grigsby, Elisenda (Boston College)
Hambleton, Ian (McMaster University)
Hanselman, Jonathan (Princeton University)
Harvey, Shelly (Rice University)
Hayden, Kyle (Columbia University)
Hedden, Matthew (Michigan State University)
Hendricks, Kristen (Rutgers University)
Herald, Chris (University of Nevada, Reno)
Hogancamp, Matthew (Northeastern University)
Hom, Jennifer (Georgia Institute of Technology)
Hu, Ying (University of Nebraska Omaha)
Huber, Marius (Boston College)
Hughes, Mark (Brigham Young University)
Islambouli, Gabriel (University of Waterloo)
Issa, Ahmad (University of British Columbia)
Jabuka, Stanislav (University of Nevada Reno)
Juhasz, Andras (University of Oxford)
Karakurt, Cagri (Bogazici University)
Karimi, Homayun (McMaster University)
Kauffman, Louis (University of Illinois at Chicago)
Kawamuro, Keiko (University of Iowa)
Khovanov, Mikhail (Columbia University)
Kim, Hee Jung (Western Washington University)
Kirk, Paul (Indiana University)
Kjuchukova, Alexandra (Max Plank Institute for Mathematics)
Kotelskiy, Artem (Indiana University)
Krishna, Siddhi (Boston College)
Kronheimer, Peter (Harvard University)
Krumpak, McKee (Brandeis University)
Kutluhan, Cagatay (University at Buffalo)
Kuzbary, Miriam (Georgia Institute of Technology)
Lambert-Cole, Peter (Georgia Institute of Technology)
Lee, Yi-Jen (Chinese University of Hong Kong)
Leness, Tom (Florida International University)
Leverson, Caitlin (Georgia Tech/Bard College
Lewark, Lukas (Regensburg)
Li, Zhenkun (MIT)
Li, Jiakai (Harvard University)
Licata, Joan (Australian National University)
Lin, Francesco (Columbia University)
Lin, Jianfeng (MIT)
Lipshitz, Robert (University of Oregon)
Liu, Beibei (University of California - Davis)
Livingston, Charles (Indiana University)
Lobb, Andrew (Durham University)
Lowrance, Adam (Vassar College)
Ma, Langte (Brandeis University)
Marengon, Marco (UCLA)
Marian, Mihai (University of British Columbia)
Martin, Gage (Boston College)
Mathews, Daniel (Monash University)
Matic, Gordana (University of Georgia)
McCarty, Ben (University of Memphis)
McCoy, Duncan (Université du Québec à Montréal)
Meier, Jeffrey (Western Washington University)
Miller, Maggie (Princeton University)
Miller, Allison (Rice University)
Montague, Ian (Brandeis University)
Moore, Allison (Virginia Commonwealth University)
Mrowka, Tom (Massachusetts Institute of Technology)
Nagel, Matthias (ETH Zurich)
Naik, Swatee (National Science Foundation)
Ng, Lenny (Duke University)
Ni, Yi (Caltech)
Nicas, Andrew (McMaster University)
Orson, Patrick (Boston College)
Owens, Brendan (University of Glasgow)
Pan, Yu (Massachusetts Institute of Technology)
Park, JungHwan (Georgia Tech)
Park, B. Doug (University of Waterloo)
Petkova, Ina (Dartmouth)
Piccirillo, Lisa (Brandeis University)
Pinzon-Caicedo, Juanita (University of Notre Dame)
Plamenevskaya, Olga (Stony Brook University)
Raoux, Katherine (Michigan State University)
Raphael, Zentner (University of Regensburg)
Rasmussen, Jacob (University of Cambridge)
Rasmussen, Sarah (Cambridge University)
Ray, Arunima (Max-Planck-Institut für Mathematik)
Reinoso, Braeden (Boston College)
Roberts, Rachel (Washington University in St Louis)
Rolfsen, Dale (University of British Columbia)
Ruberman, Daniel (Brandeis University)
Rushworth, Will (McMaster University)
Sarkar, Sucharit (UCLA)
Saveliev, Nikolai (University of Maimi)
Sazdanovic, Radmila (North Carolina State University)
Scaduto, Christopher (University of Miami)
Sivek, Steven (Imperial College London)
Starkston, Laura (University of California-Davis)
Stipsicz, Andras (Renyi Institute)
Stoffregen, Matthew (MIT)
Strle, Saso (University of Ljubljana)
Szabo, Zoltan (Princeton University)
Tosun, Bulent (University of Alabama)
Tovstopyat-Nelip, Lev (Michigan State University)
Traynor, Lisa (Bryn Mawr College)
Tripp, Samuel (Dartmouth College)
Vela-Vick, Shea (Louisiana State University)
Vertesi, Vera (University of Vienna)
Wang, Joshua (Harvard University)
Watson, Liam (University of British Columbia)
Willis, Mike (UCLA)
Wilson, Robin (Cal Poly Pomona)
Winkeler, Zachary (Dartmouth College)
Wong, Biji (CIRGET/MPIM)
Wong, Mike (Louisiana State University)
Yildiz, Eylem (Harvard University)
Zemke, Ian (Princeton University)
Zhang, Boyu (Princeton University)
Zibrowius, Claudius (University of British Columbia)

Mathematical Frameworks for Integrative Analysis of Emerging Biological Data Types
June 14 - 19, 2020 (Online)

Organizers:

Aedin Culhane (Harvard TH Chan School of Public Health)
Elana Fertig (John Hopkins)
Kim-Anh Le Cao (University of Melbourne)



Accurate mathematical models of biological cells during health and disease are essential in understanding biology, advancing precision medicine and treating disease. Emerging technologies, such as RNA and DNA sequencing give clinical and basic research laboratories great power to quantify tens of thousands of biological molecules and generate highly detailed biological maps at different molecular, spatial and temporal resolutions. Integrating these diverse data may provide a comprehensive multi-layer view of a biological system that cannot be obtained by considering each dataset individually. However, currently biological insight is hindered by the inherent complexity of the data and paucity of methods to integrate these data. By gathering mathematical, statistical and computational experts in the field of genomic data integration, pioneer solutions for data integration problems will be discussed. This workshop will promote the development of cutting edge mathematical, statistical and computational methods to extract reliable information from big biological data. The anticipated deliverables are a set of open source resources for international scientists to use and reuse on their own data, to accelerate the pace and impact of discoveries in this exciting field of research.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5197

Participants:

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Curtis, Christina (Stanford University)
Davide, Risso (University of Padova)
Davis, Sean (NIH Intramural)
Deng, Yidi (University of Melbourne)
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Fertig, Elana (John Hopkins)
Forster, Duncan (University of Toronto)
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S**odicoff, Joshua** (University of Michigan Medical School)
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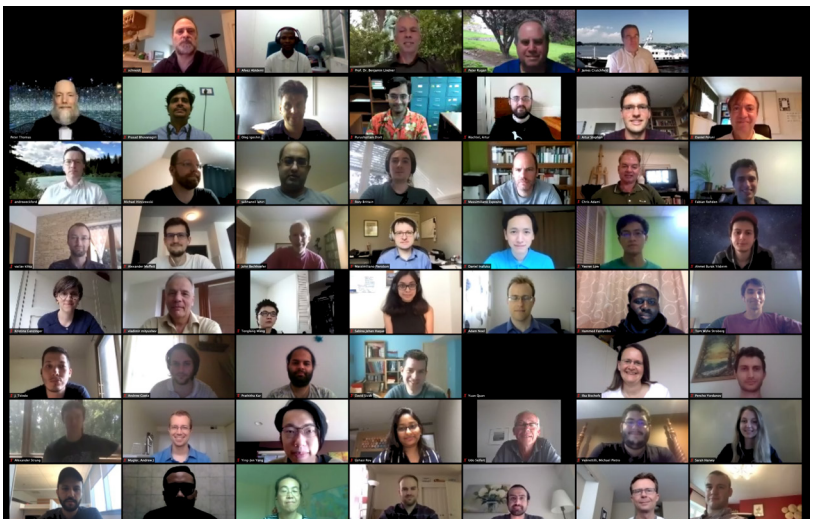
Mathematical Models in Biology: from Information Theory to Thermodynamics
July 26 - 31, 2020 (Online)

Organizers:

Peter Thomas (Case Western Reserve University)
Andrew Eckford (York University)
Michael Hinczewski (Case Western Reserve University)



All living things, from the simplest bacteria to human beings, are made of cells. Fundamental understanding of living systems, both in health and in disease, depends on understanding the complex interactions among and within living cells. Multiple scientific disciplines have separately shed light on the problems of communication and organization in living systems. Biochemistry, bioinformatics and systems biology describe the basic ingredients of cells: DNA, RNA, proteins, lipids, and their interactions. Information theory, founded by Claude Shannon, provides a framework for quantifying the flow of information through any communications system, whether living or engineered (or both, as in the rapidly growing field of synthetic biology). Statistical thermodynamics, the branch of physics concerned with transformations among different forms of energy as well as with the physics of information, sets fundamental limits on the energetic price cells must pay for the information they sense (from each other, from the environment, and from their own DNA).

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5074

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Abidemi, Afeez (Universiti Teknologi Malaysia)
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Bechhoefer, John (Simon Fraser University)
Bhuvanagiri, Sri Rama Vara Prasad (Vellore Institute of Technology)
Bischofs, Ilka (Max Planck Institute Marburg)
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Bovyn, Matt (UC Irvine)
Brittain, Rory (University of Luxembourg)
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Crutchfield, James (University of California Davis)
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Demir, Mahmut (Yale)
Dixit, Purushottam (University of Florida (Physics))
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Eckford, Andrew (York University)
Elayan, Hadeel (University of Toronto)
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Yordanov, Pencho (Harvard Medical School)
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Interfacial Phenomena in Reaction-Diffusion Systems
August 02 - 07, 2020 (Online)

Organizers:

Hiroshi Matano (Meiji University)
Hirokazu Ninomiya (Meiji University)
Peter Polacik (University of Minnesota)
Luca Rossi (CNRS - EHESS)

Interfacial phenomena are observed in many fields of sciences, such as chemistry, physics, biology and medicine. Examples include formation and motion of phase boundaries in multi-phase materials, propagation of population waves in ecology, and so on. This workshop focuses, among other things, on interfacial phenomena in complex environments, such as those in spatially and/or temporally heterogeneous media, those in random environments, and those in the presence of obstacles. We also focus on interfacial phenomena in biology and those related to geometry. We aim at developing new mathematical framework to deepen our understanding of those complex interfacial phenomena.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5205

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Bates, Peter (Michigan State University)
Berestycki, Henri (Ecole des Hautes Etudes en Sciences Sociales Paris)
Campos Cordero, Judith (Facultad de Ciencias - UNAM)
Chang-Lara, Héctor (CIMAT-Guanajuato)
Ding, Weiwei (South China Normal University)
Duboc, Guillaume (École Polytechnique)
Fang, Jian (Harbin Institute of Technology)
Fernández, Juan Carlos (UNAM - Mexico)
Fujiwara, Ryu (Meiji University)
Garnier, Jimmy (CNRS - University Savoie Mont-Blanc)
Giletti, Thomas (University of Lorraine)
Girardin, Léo (Université Claude Bernard Lyon-1)
Graham, Cole (Stanford University)
Griette, Quentin (University of Bordeaux)
Grossi, Massimo (Sapienza Università di Roma)
Gui, Changfeng (University of Texas at San Antonio)
Guo, Jong-Shenq (Tamkang University)
Hamamuki, Nao (Hokkaido University)
Hamel, Francois (Universite d'Aix-Marseille)
Hilhorst, Danielle (CNRS and Universite Paris-Saclay)
Ikeda, Kota (Meiji University)
Ioku, Norisuke (Tohoku University)
Ito, Ryo (Meiji University)
Leoni, Fabiana (Sapienza Università di Roma)
Liang, Xing (University of Science and Technology of China)
Lou, Yuan (Ohio State University)
Lou, Bendong (Shanghai Normal University)
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Martinazzi, Luca (University of Padova)
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Ninomiya, Hirokazu (Meiji University)
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Pistoia, Angela (Sapienza Università di Roma)
Polacik, Peter (University of Minnesota)
Robert, Frédéric (Universite de Lorraine)
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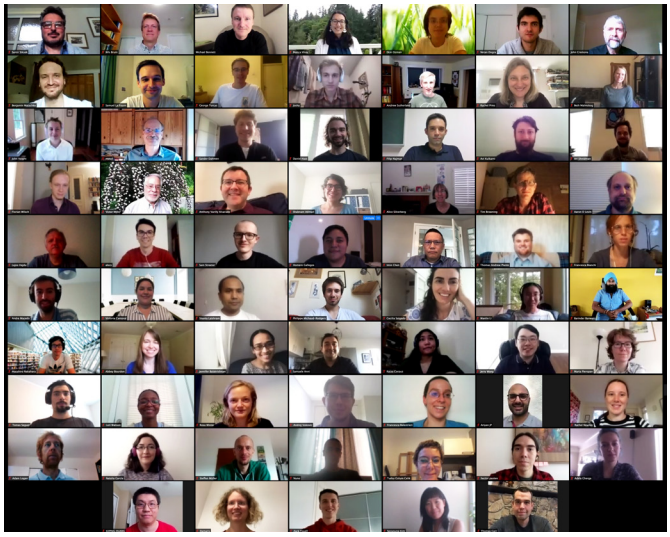
Modern Breakthroughs in Diophantine Problems
August 31 - September 04, 2020 (Online)

Organizers:

Samir Siksek (University of Warwick)
Michael Bennett (University of British Columbia)
Nils Bruin (Simon Fraser University)
Bianca Viray (University of Washington)



An equation is called Diophantine if whole number or fractional solutions are sought. Diophantine equations are named after Diophantus of Alexandria, a 3rd century mathematician and were popularized by Pierre de Fermat, a 17th century lawyer and amateur mathematician. Unlike most branches of mathematics, many Diophantine questions and theorems can be understood and appreciated by the general public, and the subject is a favourite with popularizers of mathematics. The methods for tackling Diophantine equations are however deep and varied, and the subject has recently experienced an explosion of new directions and results. This workshop will bring together experts and young scholars to explore these new directions and stimulate further research into Diophantine problems.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5005

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Arithmetic Aspects of Algebraic Groups
September 08 - 09, 2020 (Online)

Organizers:

Mikhail Ershov (University of Virginia)
Alex Lubotzky (Hebrew University of Jerusalem)
Dave Morris (University of Lethbridge)
Gopal Prasad (University of Michigan)

The investigation of arithmetic groups has been an active and important area of mathematical research ever since it arose in the work of Gauss, Klein, Poincare, and other famous mathematicians of the 18th and 19th centuries. New points of view have recently led to progress on classical problems, opened new directions of inquiry, and revealed unexpected connections with other areas of mathematics. The workshop will bring together experts in the area, researchers in related fields, and young mathematicians who wish to learn about the most recent advances and the most promising directions for the future of the field.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5133

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Ayyer, Arvind (Indian Institute of Science)
Banerjee, Naya (University of Delaware)
Billey, Sara (University of Washington)
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Björnberg, Jakob (Chalmers)
Borga, Jacopo (University of Zurich)
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Bukh, Boris (Carnegie Mellon University)
Cator, Eric (Radboud University, Nijmegen)
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Corwin, Ivan (Columbia University)
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Gorin, Vadim (UW Madison / MIT)
Hamaker, Zachary (University of Florida)
Hoffman, Christopher (University of Washington)
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Noel, Jonathan (University of Victoria)
Okado, Masato (City University of Osaka)
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Permutations and Probability
September 15 - 17, 2020 (Online)

Organizers:

Omer Angel (University of British Columbia)
James Martin (Oxford University)
Balint Virag (University of Toronto)

A permutation is an ordering or arrangement of a set of objects. One might think of shuffling a pack of cards, or sorting a list of options into order of preference, or arranging the seating of passengers on an aeroplane or guests at a dinner. Permutations are central objects in many areas of mathematics. This workshop will explore aspects of permutations which arise in probability theory and related fields. This is a highly active area of study, with a variety of striking results in the last few years and many challenging problems outstanding. Random permutations have applications ranging from genetics to comupter science to economics, and arise in many challenging questions throughout mathematics. Many interesting random processes can be thought of as permutations evolving over time. The workshop will bring together researchers from many backgrounds including probability, combinatorics, physics and theoretical computer science, with the goal of advancing our understanding of random permutations and permutation processes, and of sharing ideas from across the many disparate fields where they are studied.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5203

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Biskup, Marek (University of California at Los Angeles)
Björnberg, Jakob (Chalmers)
Borga, Jacopo (University of Zurich)
Bouttier, Jérémie (CEA Saclay & ENS de Lyon)
Bufetov, Alexey (University of Bonn)
Bukh, Boris (Carnegie Mellon University)
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Loomis, Alex (University of Arizona)
Maazoun, Mickaël (Oxford University)
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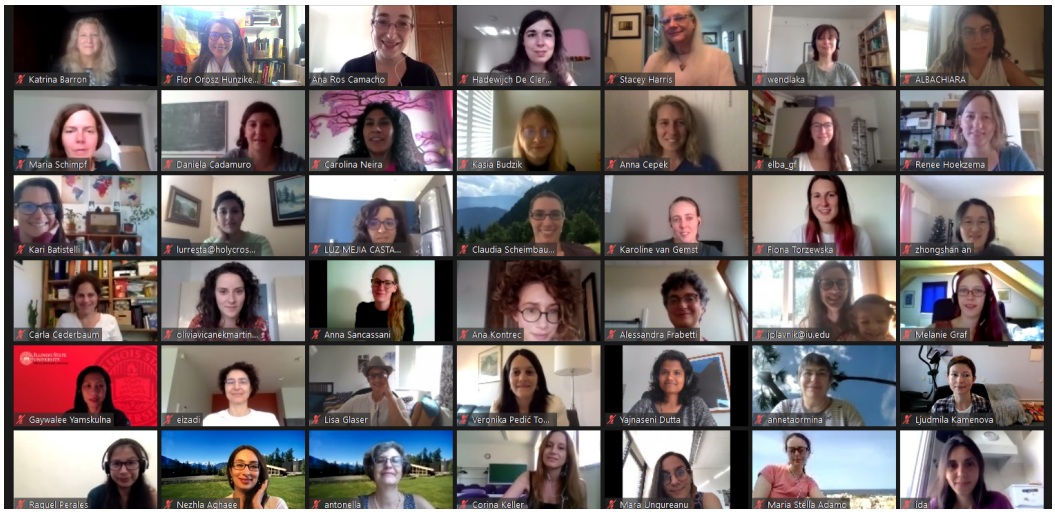
Martin, James (Oxford University)
Müller, Tobias (Groningen University)
Nestoridi, Evita (Princeton University)
Noel, Jonathan (University of Victoria)
Okado, Masato (City University of Osaka)
Pak, Igor (University of California Los Angeles)
Panagiotis, Christoforos (University of Geneva)
Panario, Daniel (Carleton University)
Pandey, Aaradhya (Indian Institute of Science)
Peled, Ron (Tel Aviv University)
Pierrot, Adeline (Université Paris Saclay - LRI)
Puder, Doron (Institute for Advanced Study, Princeton)
Rastegar, Reza (University of Tulsa)
Romik, Dan (University of California Davis)
Shapir, Yonathan (Univ Rochester)
Slade, Gordon (University of British Columbia)
Slivken, Erik (Dartmouth University)
Ueltschi, Daniel (Warwick)
Valko, Benedek (University of Wisconsin - Madison)
Virag, Balint (University of Toronto)
Williams, Lauren (Harvard University)
Winkler, Peter (Dartmouth College)
Young, Benjamin (University of Oregon)
Zhang, Lingfu (Princeton University)

Women in Mathematical Physics
September 21 - 22, 2020 (Online)

Organizers:

Ana Ros Camacho (Cardiff University)

Nezhla Aghaei (Max Planck Institute for mathematics Bonn)



Mathematical Physics is an interdisciplinary topic at the crossroads of pure mathematics and theoretical physics. On the one hand, theoretical physics (in particular string and gauge theories in various dimensions and their duality relations) has been a constant source of inspiration for mathematics over the last decades. They have made the mathematical community realize underlying connections between mathematical entities which otherwise would have taken much longer, and have guided many astounding recent developments in very diverse topics. As an exchange, the study of properties and the application of new mathematical structures is essential to understand the nature of string theory and quantum gravity. In this workshop we plan to create an environment with talks and disscussions in the direction where mathematical rigor and physical intuition merge in a natural way.

Women are underrepresented on the most of the STEM areas, and this one is no dierent. It is often the lack of nominations of women that leads to all-male lists of presenters at international mathematical conferences and prize winners. It is most crucial to improve the networks of female mathematical physicists, with an emphasis on the younger generations. Our workshop will create and strengthen such networks - all this in a supportive environment. To achieve this, we will follow the established, successful format of previous female-only events like “Women in Topology” or “Women in Noncommutative Algebra and Representation Theory”. We will have few introductory talks and ample time for research in teams and discusssions.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5170

Participants:

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Addabbo, Darlayne (University of Notre Dame)
Aghaei, Nezhla (Max Planck Institute for mathematics Bonn)
An, Zhongshan (University of Connecticut)
Barron, Katrina (University of Notre Dame)
Batistelli, Karina (Facultad de Ciencias - Universidad de Chile)
Budzik, Kasia (Perimeter Institute)
Cadamuro, Daniela (Universität Leipzig)
Cederbaum, Carla (Universitat Tubingen)
Cepek, Anna (IBS-CGP)
Cogo, Albachiara (Universität Tübingen)
De Clercq, Hadewijch (Ghent University)
Delaney, Colleen (Indiana University)
Dutta, Yajnaseni (Universität Bonn)
Frabetti, Alessandra (University Lyon 1)
Garcia-Failde, Elba (Institut de Physique Theorique (Paris-Saclay))
Glaser, Lisa (University of Vienna)
Graf, Melanie (University of Washington)
Grassi, Antonella (Università di Bologna)
Harris, Stacey (Saint Louis University)

Hoekzema, Renee (University of Oxford)
Iseppi, Roberta (QGM, Aarhus University)
Izadi, Elham (University of California San Diego)
Jabiri, Fatima Ezzahra (Sorbonne Universités)
Kamenova, Ljudmilla (Stony Brook University)
Keller, Corina (University of Montpellier)
Kontrec, Ana (University of Zagreb)
Mejía Castaño, Adriana (Universidad del Norte)
Neira, Carolina (Universidad Nacional de Colombia)
Ninad, Urmi (University of Bonn)
Orosz Hunziker, Flor (Harvard University)
Paycha, Sylvie (Potsdam University)
Pedic Tomic, Veronika (University of Zagreb)
Perales, Raquel (UNAM, Oaxaca)
Plavnik, Julia (Indiana University)
Rejzner, Kasia (York University)
Ros Camacho, Ana (Cardiff University)
Sancassani, Anna (University of Tübingen)
Scheimbauer, Claudia (TU Munich)
Schimpf, Maria (TU Wien)
Taormina, Anne (Durham University)
Tillmann, Ulrike (Oxford University)
Torzewska, Fiona (University of Leeds)
Ungureanu, Mara (University of Freiburg)
Urresta, Lyda (University of Notre Dame)
Valcu, Maria Caterina (École Polytechnique)
van Gemst, Karoline (University of Sheffield)
Vičánek Martínez, Olivia (Universität Tübingen)
Wendland, Katrin (Albert-Ludwigs-Universität Freiburg)
Yamskulna, Gaywalee (Illinois State University)
Zadeh, Ida (ICTP)
Zhang, Qing (Purdue University)

Combinatorial and Geometric Discrepancy
September 30 - October 02, 2020 (Online)

Organizers:

Aleksandar Nikolov (University of Toronto)
Christoph Aistleitner (Graz University of Technology)
Nicole Tomczak-Jaegermann (University of Alberta)
Christian Weiss (Hochschule Ruhr West)

Discrepancy theory is concerned with the existence and the construction of configurations which exhibit a high degree of regularity or uniformity. A classical example is the case of finite point sets in Euclidean space, where the degree of regularity is measured by comparing the number of points contained in an axis-parallel test box to the volume of the box, and then taking the maximal deviation among all test boxes. The notion of discrepancy has been generalized to many different settings and the concept has been fruitfully used in convex and computational geometry, numerical analysis, combinatorics and theoretical computer science, to name just a few areas. For example the notion of discrepancy with respect to boxes above is closely related to combinatorial discrepancy, which is itself closely related to vector balancing problems amenable to tools from geometric convex analysis. These connections also raise algorithmic questions, which have seen much recent progress again using tools from geometry and high-dimensional probability.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5141

Participants:

Adamo, Maria Stella (Oberwolfach Leibniz Fellow)
Ahn, Hee-Kap (Pohang University of Science and Technology (POSTECH))
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Athreya, Jayadev (University of Washington)
Bansal, Nikhil (CWI)
Barrera Vargas, Gerado (University of Alberta)
Beltran, Carlos (Universidad de Cantabria)
Bilyk, Dmitriy (University of Minnesota)
Blagojevic, Pavle (Freie Universität)
Blumenthal, Alex (University of Maryland)
Borda, Bence (Graz University of Technology)
Briceño, Raimundo (Pontificia Universidad Católica de Chile)
Brown, Louis (Yale University Math Department)
Brunner, Jim (Mayo Clinic)
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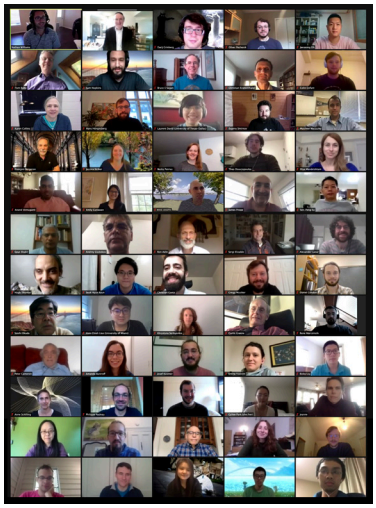
De Courcy-Ireland, Matthew (EPFL)
Defant, Colin (Princeton University)
Doerr, Benjamin (École Polytechnique)
Drmota, Michael (Technische Universitaet Wien)
Drutu, Cornelia (Oxford University)
Dueñez, Eduardo (University of Texas at San Antonio)
El-Baz, Daniel (TU Graz)
Eren Gokmen, Buket (TU Graz)
Etayo, Ujue (TU Graz)
Fairchild, Samantha (University of Washington)
Feldheim, Ohad Noy (Hebrew University of Jerusalem)
Ferenczi, Sebastien (Institut de Mathematiques de Marseille)
Franks, Cole (MIT)
Garcia-Lirola, Luis C. (Universidad de Zaragoza)
Garcia-Ramos, Felipe (Universidad Autonoma de San Luis Potosi)

Ge, Yan (University of Alberta)
Gnewuch, Michael (Universität Osnabrück)
Goering, Max (University of Washington)
Grepstad, Sigrid (Norwegian University of Science and Technology)
Gurel-Gurevich, Ori (Hebrew University of Jerusalem)
Hauke, Manuel (TU Graz)
Hinrichs, Aicke (Johannes Kepler Universität Linz)
Hofer, Roswitha (Johannes Kepler Universität)
Huicochea, Mario (CONACyT/UAZ)
Jaquette, Jonathan (Boston University)
Jiménez de Santiago, Valentín (Instituto de Matemáticas UNAM)
Kolountzakis, Mihalis (University of Crete)
Kovac, Vjekoslav (University of Zagreb)
Kritzer, Peter (Austrian Academy of Sciences)
Kwietniak, Dominik (Jagiellonian University)
Lapkova, Kostadinka (TU Graz)
Larcher, Gerhard (Johannes Kepler Universitat)
Latala, Rafal (University of Warsaw)
Leobacher, Gunther (KFU Graz)
Li, Lily (University of Toronto)
Lipnik, Gabriel (TU Graz)
Litvak, Alexander (University of Alberta)
Liu, Yang (Stanford University)
Lovett, Shachar (University of California San Diego)
Maldonado, Cesar (Instituto Potosino de Investigación Científica y Tecnológica)
Mastrianni, Michelle (University of Minnesota - Twin Cities)
Matzke, Ryan (University of Minnesota)
Meka, Raghu (University of California, Los Angeles)
Munsch, Marc (TU Graz)
Myroshnychenko, Sergii (University of Alberta)
Neumayer, Sebastian (TU Berlin)
Newman, Alantha (CNRS and Université Grenoble-Alpes)
Nikolov, Aleksandar (University of Toronto)
Niu, Yeli (University of Alberta)
Oleszkiewicz, Krzysztof (University of Warsaw)
Ortega Moreno, Oscar Adrian (Technische Universität Wien)
Park, Josiah (Texas A&M University)
Pasing, Hendrik (Ruhr West University of Applied Sciences)
Pausinger, Florian (Queen's University Belfast)
Petersen, Karl (University of North Carolina)
Petrache, Mircea (Pontificia Universidad Católica de Chile)
Pillichshammer, Friedrich (Johannes Kepler Universität)
Pohl, Anke (Universität Bremen)
Putterman, Eli (Tel Aviv University)
Ramachandran, Akshay (University of Waterloo)
Reis, Victor (University of Washington)
Roysdon, Michael (Tel Aviv University)
Rubin, Natan (Ben-Gurion University)
Sadhu, Susmita (Georgia College and State University)
Sawhney, Mehtaab (MIT)
Singh, Mohit (Georgia Institute of Technology)
Skill, Thomas (Hochschule Bochum)
Sonnleitner, Mathias (JKU Linz)
Sourmelidis, Athanasios (TU Graz)
Steinerberger, Stefan (University of Washington)
Stepaniuk, Tetiana (Universität zu Lübeck)
Szarek, Stanislaw (Case Western Reserve University)
Taha, Diaaeldin (American University in Cairo)
Technau, Marc (TU Graz)
Tomczak-Jaegermann, Nicole (University of Alberta)
Travaglini, Giancarlo (Università di Milano-Bicocca)
Treviño, Rodrigo (University of Maryland)
Ullrich, Mario (JKU Linz)
Verjovsky, Alberto (UNAM Mexico)
Vlasiuk, Oleksandr (Florida State University)
Weiss, Christian (Hochschule Ruhr West)
Xing, Sudan (University of Alberta)
Yang, Daodao (TU Graz)
Yoo, Jisang (Sungkyunkwan University)

Dynamical Algebraic Combinatorics
October 19 - 30, 2020 (Online)

Organizers:

Tom Roby (University of Connecticut)
James Propp (University of Massachusetts-Lowell)
Jessica Striker (North Dakota State University)
Nathan Williams (University of Texas at Dallas)



Dynamics is the study of systems that evolve over time. Combinatorics is the study of discrete structures such as binary strings, well-formed expressions in simple languages, data trees, colorings of graphs, etc. In Dynamical Algebraic Combinatorics, we study key parameters associated with these systems as they evolve, which helps us make sense of the underlying dynamics.

The past four years have seen a surge of interest in applying dynamical ideas to combinatorial objects with the use of algebraic techniques. The BIRS workshop on dynamical algebraic combinatorics will capitalize on this momentum by bringing together specialists with an interest in this topic.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5164

Participants:

Adin, Ron (Bar-Ilan University)
Alexandersson, Per (Stockholm University)
Alfaro Montufar, Carlos Alejandro (Banxico)
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Arreche, Carlos (The University of Texas at Dallas)
Banaian, Esther (University of Minnesota)
Barkley, Grant (Harvard University)
Barnard, Emily (DePaul University)
Berenstein, Arkady (University of Oregon)
Bergeron, François (Université du Québec à Montréal)
Bernstein, Joe (North Dakota State University)
Billey, Sara (University of Washington)
Biswal, Rekha (MPIM, Bonn)
Brauner, Sarah (University of Minnesota)
Burcroff, Amanda (Durham University)
Buskirk, Adam (North Dakota State University)
Byun, Seok Hyun (Indiana University Bloomington)
Cameron, Peter (University of St Andrews)
Chen, Angela (University of Minnesota)
Collins, Karen (Wesleyan University)
Colmenarejo, Laura (University of Massachusetts Amherst)
Commins, Patty (University of Minnesota)
Condon, Daniel (Indiana University)
David, Laurent-Marc (University of Texas-Dallas)
Defant, Colin (Princeton University)
Desai, Deep (University of Texas at Dallas)
Drucker, Ben (Swarthmore College)
Elizalde, Sergi (Dartmouth)
Eu, Sen-Peng (National Taiwan Normal University)
Farrell, Libby (University of Minnesota)
Feinberg, Robert (self)
Forsman, Joey (NDSU Math Graduate Student)
Franckowiak, Spencer (University of Texas at Dallas)
Fraser, Chris (University of Minnesota)
Gaetz, Christian (MIT)
Galashin, Pavel (UCLA)
Gao, Yibo (MIT)
Garver, Alexander (University of Michigan)
Gaudin, Solal (Universitat Wien)
Gessel, Ira (Brandeis University)

Glubokov, Andrey (Ave Maria University)
Greene, Curtis (Haverford College)
Greenwood, Torin (North Dakota State University)
Grinberg, Darij (Drexel University)
Gunawan, Emily (University of Oklahoma)
Haglund, Jim (University of Pennsylvania)
Hamaker, Zachary (University of Florida)
Heuer, Dylan (North Dakota State University)
Höngesberg, Hans (University of Vienna)
Hopkins, Sam (University of Minnesota)
Hopkins, Brian (Saint Peter's University)
Hossain, Chetak (Texas State University)
Hwang, Byung-Hak (Sungkyunkwan University)
Johnson, Joe (North Carolina State University)
Joseph, Michael (Dalton State - Georgia)
Jung, Woo-Seok (Sogang University)
Karn, Trevor (University of Minnesota)
Kelley, Elizabeth (University of Minnesota)
Kim, Jang Soo (Sungkyunkwan University)
Krattenthaler, Christian (University of Vienna)
Küstner, Josef (University of Vienna)
Lai, Tri (University of Nebraska)
Lakshmanadoss, Karthikeyan (University of Texas at Dallas)
Lazar, Alexander (KTH Royal Institute of Technology)
Lazzeroni, Anthony (Hong Kong Baptist University)
Lee, Yi-Lin (Indiana University)
Lee, Kang-Ju (Seoul National University)
Li, Jingke (University of Minnesota - Twin Cities)
Liao, Hsin-Chieh (University of Miami)
Linusson, Svante (KTH - Royal Institute of Technology)
Liu, Ricky (North Carolina State University)
Lo, Yuan-Hsun (National Pingtung University)
Macauley, Matthew (Clemson University)
Majumder, Pritam (Tata Institute of Fundamental Research)
Mandelshtam, Olya (Brown University)
Marczinzik, Rene (University of Stuttgart)
Mazin, Mikhail (Kansas State University)
McConville, Thomas (Kennesaw State University)
McDonough, Alex (Brown University)
Meunier, Paul (École normale supérieure de Lyon)
Mishra, Pratyush (North Dakota State University)
Moore, Katherine (Wake Forest University)
Musiker, Gregg (University of Minnesota)
Nadeau, Philippe (CNRS and University Lyon 1)
Nenashev, Gleb (Brandeis University)
nguyen, khanh (Institute Camille Jordan)
Oh, Jaeseong (Seoul National University)
Okada, Soichi (Nagoya University)
Panova, Greta (University of Southern California)
Park, GaYee (UMass Amherst)
Patrias, Rebecca (University of Michigan)
Pechenik, Oliver (University of Waterloo)
Perkinson, David (Reed College)
Pevzner, Sasha (University of Minnesota)
Plante, Matthew (University of Connecticut)
Potka, Samu (KTH Royal Institute of Technology)
Poznanovic, Svetlana (Clemson University)
Propp, James (University of Massachusetts-Lowell)
Pylyavskyy, Pavlo (University of Minnesota - Twin Cities)
Rashid, Mushfiq (University of Texas at Dallas)
Reiner, Victor (University of Minnesota)
Rhoades, Brendon (UC San Diego)
Roby, Tom (University of Connecticut)
Sadhukhan, Arghya (University of Maryland)
Sagan, Bruce (Michigan State University)
Saikia, Manjil (Cardiff University)
Schiffler, Ralf (University of Connecticut)
Schilling, Anne (University of California - Davis)
Scott, Jeanne (Universidad de los Andes)
Scrimshaw, Travis (University of Queensland)
Serhiyenko, Khrystyna (University of Kentucky
Sferrazza, Michelle (The University of Texas at Dallas)
Shakir, Qays (Middle Technical University)
Sherman-Bennett, Melissa (UC Berkeley/Harvard University)
Silver, Rose (Northeastern University)
Smirnov, Evgeny (National Research University Higher School of Economics)
Solhjem, Sara (Minnesota State University Moorhead)
Stanley, Richard (University of Miami)
Stephens, Riley (The University of Texas at Dallas)
Striker, Jessica (North Dakota State University)
Sundaram, Sheila (Pierrepont School)
Swanson, Joshua (UC San Diego)
Terada, Itaru (University of Tokyo)
Tewari, Vasu (University of Pennsylvania)
Thomas, Hugh (Université du Québec à Montréal)
van Willigenburg, Steph (University of British Columbia)
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von Bell, Matias (University of Kentucky)
Vorland, Corey (Marian University)
Williams, Lauren (Harvard University)
Williams, Nathan (University of Texas at Dallas)
Williams, Austin (University of Texas at Dallas)
Wilson, Andy (Kennesaw State University)
Winkler, Peter (Dartmouth College)
Winter, Matthew (The University of Texas at Dallas)
Yip, Martha (University of Kentucky)
Yıldırım, Emine (Queen's University)
Yoo, Meesue (Chungbuk National University)
Young, Benjamin (University of Oregon)
Zhang, Sylvester (University of Minnesota, Twin Cities)

Derived, Birational, and Categorical Algebraic Geometry
November 01 - 06, 2020 (Online)

Organizers:

David Favero (University of Alberta)
Matthew Ballard (University of South Carolina)
Nitin Kumar Chidambaram (Max Planck Institute for Mathematics)

Birational geometry is a classical mathematic subject dating back to the late 1800s. It aims to classify geometric shapes by looking at the majority of their points and asks “if I remove some points from shape A and some other points from shape B, do they become the same shape?”. This turns out to be a surprisingly difficult and fundamental mathematical question. Perhaps more surprising is that the classification of geometric shapes from birational geometry is related to the classification of abstract mathematical gadgets called derived categories, a formal language developed by prominent mathematicians in France in the 1960s. However, the relationship between derived categories and birational geometry remains unproven.

One avenue to pursue this connection is through a modern mathematical subject known as “derived algebraic geometry”. This workshop brings together experts in birational geometry, derived categories, and derived algebraic geometry in an effort to connect the disciplines and more thoroughly understand this deep mathematical phenomenon.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5176

Participants:

Addington, Nicolas (University of Oregon)
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Bayer, Arend (University of Edinburgh)
Belmans, Pieter (University of Bonn)
Bergner, Julie (University of Virginia)
Bernardara, Marcello (Institut de Mathématiques de Toulouse)
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Bhatt, Bhargav (University of Michigan)
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Caldararu, Andrei (University of Wisconsin, Madison)
Cannizzo, Catherine (Simons Center)
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Cheltsov, Ivan (University of Edinburgh)
Chidambaram, Nitin Kumar (Max Planck Institute for Mathematics)
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Coskun, Izzet (UIC)
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Donovan, Will (Yay MSC, Tsinghua U)
Doran, Charles (University of Alberta)
Duncan, Alexander (University of South Carolina)
Fan, Yu-Wei (University of California, Berkeley)
Farman, Blake (University of Louisiana Monroe)
Favero, David (University of Alberta)
Flapan, Laure (Michigan State University)

Frei, Sarah (Rice University)
Glubokov, Andrey (Ave Maria University)
Grieve, Nathan (Tutte Institute)
Griffiths, Phillip (IAS (Princeton)/University of Miami)
Guere, Jeremy (Fourier Institute, University of Grenoble)
Hacking, Paul (University of Massachusetts, Amherst)
Hacon, Christopher (University of Utah)
Hassett, Brendan (Brown University)
Heath, Bailey (UofSC)
Hirano, Yuki (Kyoto University)
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Hua, Zheng (The University of Hong Kong)
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Kaplan, Daniel (University of Birmingham)
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Kawamata, Yujiro (The University of Tokyo)
Keller, Bernhard (University of Paris)
Kelly, Tyler (University of Birmingham)
Kim, Bumsig (Korea Institute for Advanced Study)
Klang, Inbar (Columbia University)
Kollar, Janos (Princeton University)
Kopper, John (Penn State)
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Kuznetsov, Alexander (Steklov Mathematical Institute, NRU HSE)
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Logvinenko, Timothy (Cardiff University)
Lunts, Valery (Indiana University)
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Nuer, Howard (Technion)
Olsson, Martin (University of California Berkeley)
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Ottem, John Christian (University of Oslo)
Pedchenko, Dmitrii (Penn State)
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Pirutka, Alena (Courant Institute)
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Rajchgot, Jenna (University of Saskatchewan)
Rennemo, Jørgen (University of Oslo)
Rizzardo, Alice (University of Liverpool)
Ruddat, Helge (Mainz & Hamburg)
Saccà, Giulia (Columbia University)
Scherotzke, Sarah (University of Luxembourg)
Segal, Ed (University College London)
Sharpe, Eric (Virginia Tech)
Shoemaker, Mark (Colorado State)
Shramov, Constantin (Steklov Mathematical Institute of Russian Academy of Sciences and HSE)
Soibelman, Yan (Kansas State University)
Spenko, Spela (Université libre de Bruxelles)
Stojanoska, Vesna (University of Illinois - Urbana Champaign)
Taggart, Niall (MPIM)
Takahashi, Ryan (Oregon)
Tevelev, Jenia (University of Massachusetts)
Tirabassi, Sofia (Stockholm University)
Toda, Yukinobu (University of Tokyo)
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Torres, Sebastian (UMass Amherst)
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Uehara, Hokuto (Tokyo Metropolitan University)
Vandermolen, Robert (Saint Mary-of-the-Woods College)
Vaquié, Michel (Université de Toulouse)
Wemyss, Michael (University of Glasgow)
Whitcher, Ursula (Mathematical Reviews (American Mathematical Society))
Xu, Chenyang (Princeton)
You, Fenglong (University of Alberta)
Zakharevich, Inna (Cornell University)

Algebraic Dynamics and its Connections to Difference and Differential Equations
November 08 - 13, 2020 (Online)

Organizers:

Dang Khoa Nguyen (University of Calgary)
Jason Bell (University of Waterloo)
Thomas Scanlon (University of California, Berkeley)

The field of algebraic dynamics has emerged over the past two decades at the confluence of algebraic geometry, discrete dynamical systems, and diophantine geometry. In recent work, striking connections have been observed between algebraic dynamics and much older theories of difference and differential equations. This meeting brings together mathematicians with expertise in such diverse fields as ring theory, complex dynamics, differential and difference algebra, combinatorics and algebraic geometry. New work towards the dynamical Mordell-Lang and dense orbit conjectures as well as theorems on hypertranscendence and functional independence proven by connecting difference Galois theory, algebraic dynamics and other algebraic approaches to the study offunctional equations will be presented at this meeting.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5206

Participants:

Adamczewski, Boris (CNRS, Lyon)
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Barroero, Fabrizio (Università degli studi Roma 3)
Bell, Jason (University of Waterloo)
Benedetto, Rob (Amherst College)
Bugeaud, Yann (Université de Strasbourg)
Cantat, Serge (CNRS -- Université de Rennes)
Capuano, Laura (Politecnico di Torino)
Chatzidakis, Zoe (CNRS - ENS Paris)
Chen, Shaoshi (Chinese Academy of Sciences)
Dang, Nguyen-Bac (Stony Brook University)
Delaygue, Eric (Universite de Lyon 1)
DeMarco, Laura (Harvard University)
Deshalit, Ehud (Hebrew University of Jerusalem)
Di Vizio, Lucia (Universite de Versailles-St Quentin)
Diller, Jeffrey (University of Notre Dame)
Dimitrov, Vesselin (University of Toronto)
Dreyfus, Thomas (Universite de Strasbourg)
Dujardin, Romain (Sorbonne Université)
Eterović, Sebastian (UC Berkeley)
Favre, Charles (CNRS - Ecole Polytechnique)
Feng, Ruyong (Chinese Academy of Sciences)
Fili, Paul (Oklahoma State University)
Filip, Simion (University of Chicago)
Firsova, Tanya (Kansas State University)
Freitag, James (University of Illinois at Chicago)
Gauthier, Thomas (Ecole Polytechnique)
Ghioca, Dragos (University of British Columbia)
Glubokov, Andrey (Ave Maria University)
Gunn, Keira (University of Calgary)
Hardouin, Charlotte (Institut de mathematiques de Toulouse)
Henson, Ward (University of Illinois)
Hindes, Wade (Texas State University)
Hrushovski, Ehud (University of Oxford)
Hu, Fei (University of Waterloo)
Ih, Su-ion (University of Colorado at Boulder)
Ingram, Patrick (York University)
Jones, Rafe (Carleton College)
Jones, Gareth (University of Manchester)
Juul, Jamie (Colorado State University)
Kamensky, Moshe (Ben Gurion University)
Kawaguchi, Shu (Doshisha University)
Kowalski, Piotr (Uniwersytet Wrocławski)

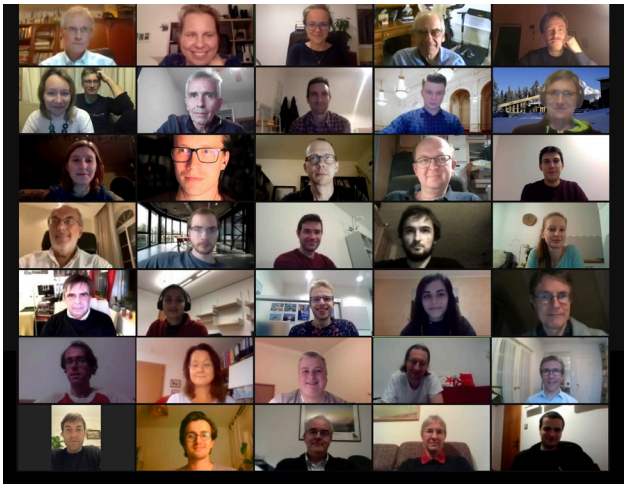
Krieger, Holly (University of Cambridge)
Leon Sanchez, Omar (University of Manchester)
Lesieutre, John (The Pennsylvania State University)
Lind, Douglas (University of Washington)
Looper, Nicole (Brown University)
Mavraki, Myrto (University of Basel)
McMullen, Curtis (Harvard University)
Medvedev, Alice (City College of New York)
Mello, Jorge (UNSW Sydney)
Meretzky, David (The University of Notre Dame)
Mishna, Marni (Simon Fraser University)
Moosa, Rahim (University of Waterloo)
Mutchnik, Scott (UC Berkeley)
Nagloo, Joel (City University of New York)
Nguyen, Dang Khoa (University of Calgary)
Okuyama, Yusuke (Kyoto institute of technology)
Olechnowicz, Mateusz (University of Toronto)
Ovchinnikov, Alexey (CUNY Queens College)
Padgett, Adele (UC Berkeley)
Pakovich, Fedor (Ben Gurion University)
Pillay, Anand (University of Notre Dame)
Poonen, Bjorn (Massachusetts Institute of Technology)
Ramadas, Rohini (Brown University)
Reichstein, Zinovy (University of British Columbia)
Satriano, Matthew (University of Waterloo)
Scanlon, Thomas (University of California, Berkeley)
Schmidt, Harry (University of Basel)
Silverman, Joseph (Brown University)
Singer, Michael (North Carolina State University)
Vicaria, Mariana (University of California at Berkeley)
Walker, Roland (University of Illinois at Chicago)
Wibmer, Michael (Graz University of Technology)
Wood, Carol (Wesleyan University)
Xie, Junyi (Universite de Rennes I)
Yasufuku, Yu (Nihon University)
Ye, Hexi (Zhejiang University)
Zannier, Umberto (Scuola Normale Superiore di Pisa)
Zhang, De-Qi (National University of Singapore)

Multiscale Models for Complex Fluids: Modeling and Analysis
November 22 - 27, 2020 (Online)

Organizers:

Miroslav Bulicek (Charles University)

Agnieszka Świerczewska-Gwiazda (University of Warsaw)



Complex fluids are ubiquitous in nature and in various fields of human activity. Blood circulates in the human body, all kinds of foams, suspensions and emulsions are encountered in pharmaceutical and food industry, paints are met everywhere in mechanical and civil engineering. It is a challenging task to describe the behaviour of such fluids, as it depends heavily on the small-scale structures inside the fluid. Given the complexity and diversity of problems in this field, there is hardly any opportunity for researchers to meet and exchange ideas.

The current workshop is designed to bring together experts in mathematical and numerical analysis as well as mathematical modeling and to create a well-focused environment in which they can discuss recent problems, models and methods developed in their respective fields.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5188

Participants:

Abbatiello, Anna (Institut für **Mathematik, Technische** Universität Berlin)
Barta, Tomas (Charles University)
Bathory, Michal (University of Vienna)
Benesova, Barbora (Charles University)
Boyaval, Sébastien (Ecole des Ponts ParisTech & Inria Paris)
Budnarowski, Bartosz (University of Warsaw)
Bulicek, Miroslav (Charles University
Carrillo, José (University of Oxford)
Choi, Young-Pil (Yonsei University)
Davis, Paige (Charles University)
Dębiec, Tomasz (University of Warsaw)
Degond, Pierre (Imperial College London)
Dostalik, Mark (Charles University)
Doumic, Marie (INRIA)
Duczmal, Kamil (University of Warsaw)
Fabisiak, Michał (University of Warsaw)
Feireisl, Eduard (Academy of Sciences of the Czech Republic)
Fusco, Nicola (Universita di Napoli)
Gerard-Varet, David (University Paris Diderot)
Gmiterek, Kamil (University of Warsaw)
Gryszówka, Marcin (University of Warsaw)
Gwiazda, Piotr (Polish Academy of Sciences)
Jabin, Pierre-Emmanuel (University of Maryland)
Juengel, Ansgar (TU Wien)
Kaplicky, Petr (Charles University)
Kreml, Ondřej (Czech Academy of Sciences)
Lelievre, Tony (Ecole des Ponts)
Los, Tomas (Charles University)
Lukácová-Medvidová, Mária (Johannes Gutenberg-Universität Mainz)
Lyu, Yong (Nanjing University)
Macha, Vaclav (Academy of Sciences, Czech Republic)
Málek, Josef (Charles University, Faculty of Mathematics and Physics)
Maringová, Erika (TU Wien)
Mucha, Piotr (University of Warsaw)
Niu, Dongjuan (Capital Normal University)
Patel, Victoria (University of Oxford)
Petraszczuk, Bogdan (University of Warsaw)
Pokorný, Milan (Charles University)

Pražák, Dalibor (Charles University)
Průša, Vít (Charles University)
Renardy, Michael (Virginia Tech)
Şengül, Yasemin (Sabancı University)
Skrzeczkowski, Jakub (University of Warsaw)
Suli, Endre (University of Oxford)
Świerczewska-Gwiazda, Agnieszka (University of Warsaw)
Szlenk, Maja (University of Warsaw)
Szlufik, Patryk (University of Warsaw)
Titi, Edriss (Texas A&M University)
Trivisa, Konstantina (University of Maryland)
Tzavaras, Athanasios (KAUST)
Vasseur, Alexis (University of Texas at Austin)
Wiedemann, Emil (Universität Ulm)
Woznicki, Jakub (University of Warsaw)
Wroblewska-Kaminska, Aneta (Polish Academy of Sciences)
Zatorska, Ewelina (University College London)

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2020

2-Day Workshops

Data Science on Blockchains
March 13 - 15, 2020

Organizers:

Cuneyt Akcora (University of Manitoba)
Kantarcioglu Murat (UT Dallas)
Matthew Dixon (Illinios Institute of Technology)

This decade has been marked with the rise of Blockchain based technologies. On a blockchain, two unacquainted parties can create an unmodifiable transaction that is permanently recorded on the ledger to be seen by the public. The first application of Blockchain has been the Bitcoin cryptocurrency. Bitcoin's success has ushered an age known as the Blockchain 1.0; currently there are more than 1000 Blockchain based cryptocurrencies, known as alt-coins.

With the arrival of Ethereum and Nem in 2015, the age of Blockchain 2.0 has been underway. Adoption of Ethereum and other Blockchain platforms for societal use is termed as the upcoming age of Blockchain 3.0. Researchers imagine the diffusion of Blockchain's decentralized and authority-less mechanisms to create consensus in diverse aspects of the modern life. As legendary venture capitalist Marc Andreessen states "the consequences of this breakthrough are hard to overstate". Some observers compare the inception of Blockchains to the invention of double entry accounting that revolutionized the business world.

With this workshop, we aim to bring together researchers who work on data from this diverse ecology. From price prediction to ransomware detection, our topics are deeply intertwined in the daily lives of our modern society.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/2-day-workshops/20w2246

Participants:

Akcora, Cuneyt (University of Manitoba)
Deters, Ralph (University of Saskatchewan)
Jacobsen, Hans (Middleware Systems Research Group)
Laskowski, Marek (York University)
Lehar, Alfred (University of Calgary)
Noda, Shunya (University of British Columbia)
Zhang, Kaiwen (École de technologie supérieure)

Alberta Number Theory Days XII
May 01 - 03, 2020 (Online)

Organizers:

Zafer Selcuk Aygin (University of Lethbridge)
Andrew Fiori (University of Lethbridge)
Jack Klys (University of Calgary)
Eric Primozic (University of Alberta)

Number theory is a broad and central area of research with many connections and applications to other areas of mathematics and science. It is also an extremely active and diverse area of research. In recent years there have been significant advances in both analytic and algebraic number theory. The subject may be divided into several subdisciplines that range from pure mathematics, to more applied areas such as computational number theory and mathematical physics. Some of the pure mathematics subdisciplines are algebraic number theory, arithmetic geometry, analytic number theory, automorphic forms and representation theory. All of these fields are represented among the Albertan number theorists from Calgary, Edmonton and Lethbridge.

The annual Alberta Number Theory Days provide a unique venue for these researchers, their students, and their visitors for face to face discussion of ideas and for facilitating collaborations. New connections are made and old associations are renewed. The workshop also allows for the exchange of knowledge, which will improve the progress of current projects.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/2-day-workshops/20w2254

Participants:

Akbary, Amir (University of Lethbridge**)**
Ali, Abid (University of Alberta)
Aygin, Zafer Selcuk (University of Lethbridge)
Bennett, Michael (University of British Columbia)
Berger, Arno (University of Alberta)
Broadbent, Sam (University of Lethbridge)
Cameron, Alex (University of Calgary)
Cunningham, Clifton (University of Calgary)
Das, Sourabh (University of Lethbridge)
de Waal, André (University of Calgary)
Fakhari, Milad (University of Lethbridge)
Fever, Amy (The King's University)
Fiori, Andrew (University of Lethbridge)
Greenberg, Matthew (University of Calgary)
Gunn, Keira (University of Calgary)
Hamieh, Alia (University of Northern British Columbia)
Hasanalizade, Elchin (University of Lethbridge)
Jacobson, Jr., Michael (University of Calgary)
Joshi, Aniket (University of Alberta)
Kadiri, Habiba (University of Lethbridge)
Klys, Jack (University of Calgary)
Leem, Sumin (University of Calgary)
Lumley, Allysa (York University)
MacDonald, Colter (University of Alberta)
Morrill, Ryan (University of Calgary)
Ng, Nathan (University of Lethbridge)
Nguyen, Dang Khoa (University of Calgary)
Pacheco Castan, Edgar (University of Calgary)
Patnaik, Manish (University of Alberta)

Primozic, Eric (University of Alberta)
Roettger, Eric (Mount Royal University)
Scheidler, Renate (University of Calgary)
Shen, Quanli (University of Lethbridge)
Smolcic, Josip (University of Lethbridge)
Sobrevilla Moreno, Pedro (University of Calgary)
Steele, James (University of Calgary)
Swidinsky, Joshua (University of Lethbridge)
Topaz, Adam (University of Alberta)
Totani, Yash (University of Lethbridge)
Tran, Ha (Concordia University of Edmonton)
Vooys, Geoff (University of Calgary)
Wong, Peng-Jie (University of Lethbridge)
Yee, Randy (University of Waterloo)
Zhang, Qin (University of Calgary)

Canadian Queueing Theorists and Practitioners Conference
August 21- 22, 2020 (Online)

Organizers:

Javad Tavakoli (University of British Columbia, Okanagan)

Yiqiang Zhao (Carleton University)

Queueing theory is concerned with developing and investigating mathematical models of systems where "customers" wait for "service." The terms "customers" and "servers" are generic. Customers could, for example, be humans waiting in a physical line or waiting on hold on the telephone, jobs waiting to be processed in a factory, or tasks waiting for processing in a computer or communication system.

Queueing theory started with the work of Danish mathematician A. K. Erlang in 1905, which was motivated by the problem of designing telephone exchanges. The field has grown to include the application of a variety of mathematical methods to the study of waiting lines in many different contexts. The mathematical methods include Markov processes, linear algebra, transform theory, and asymptotic methods, to name a few. The areas of application include computer and communication systems, manufacturing systems, and health care systems. Many recent developments in queueing theory have been driven in large part by a greater interest in applications that involve human customers, for example in the rapidly growing call centre sector. Humans behave in less predictable ways than, say, jobs in a factory or tasks in a computer system. For example, they may renege (abandon the queue), and retry later. The needs of human customers are likely to be heterogeneous (motivating the use of skills-based routing to connect different customers to different servers) and to vary with time (sometimes requiring transient rather than steady-state solutions).

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/2-day-workshops/20w2253

Participants:

Alfa, Attahiru (University of Manitoba)
Ammar, Sherif (Menofia University)
Asgari, Arash (University of Alberta)
Bijvank, Marco (University of Calgary)
Brendan, Patch (CWI)
Brill, Percy (University of Windsor)
De Souza Dutra, Michael David (Polytechnique Montréal)
Ding, Likang (University of Alberta)
Down, Douglas (McMaster University)
Geranmayeh, Shirin (University of Alberta)
Ghashim, Ehssan (Carleton University)
Grassmann, Winfried (University of Saskatchewan)
He, Qi-Ming (University of Waterloo)
Hlynka, Myron (University of Windsor)
HUI, David (Hong Kong Univresity)
Ingolfsson, Armann (University of Alberta)
Ji, Yonghua (University of Alberta)
Jiang, Ruichao (UBC Okanagan)
Jiesen, Wang (University of Melbourne)
Joe Burgess, Kiefer (University of Waterloo)
Kalantari, Elham (Carleton University)
Karunarathne, Wathsala (University of Melbourne)
Li, Na (Mcmaster University)
Li, Wendi (Carleton University)
Luo, Meiqing (Carleton University)
Madduma Wellalage, Achini Erandi (University of Melbourne)

Margolius, Barbara (Cleveland State University)
Rajangom, Krishna Sabareesh (University of Waterloo)
Ranveer, Kaur (University of Windsor)
Rastpour, Amirv (Ontario Tech University)
Samiedaluie, Saied (University of Alberta)
Sasanuma, Katsunobu (Stony Brook University)
Shaikhet, Gennady (Carleton University)
Shlakhter, Oleksandr (Alberta Health Services)
Sid Ali, Ahmed (Carleton University)
Tavakoli, Javad (University of British Columbia, Okanagan)
Taylor, Peter (University of Melbourne)
Thapa, Suman (Carleton University)
Tilson, Vera (University of Rochester)
Wu, Haoran (University of Waterloo)
Wu, Zhenggao (University of Waterloo)
Wu, Fan (Carleton University)
Xing, Chenchen (University of Melbourne)
Yaghoubi, Marjan (UBC Okanagan)
Zakeri, Maryam (University of Alberta)
Zhang, George (Simon Fraser University)
Zhao, Yiqiang (Carleton University)

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2020

Summer School

Online Open Probability School
May 18 - August 13, 2020

Organizers:

Edwin Perkins (University of British Columbia)
Louigi Addario-Berry (McGill University)
Omer Angel (University of British Columbia)
Sarai Hernandez-Torres (University of British Columbia)
Thomas Hughes (University of British Columbia)

Due to the impossibility of running the 2020 PIMS-CRM summer school in probability and the Seminaire de Mathematiques Superieures scheduled for this summer as originally planned, the organizers of those events have united to run a series of mini-courses on diverse topics in probability. All courses will take place online. Most courses will consist of three 1-hour lectures, and will be open to all interested participants. Some courses will be accompanied by short research presentations on related topics.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/summer-schools/20ss230

Participants:

Name (Affiliation)
Addario-Berry, Louigi (McGill University)
Angel, Omer (University of British Columbia)
Bates, Erik (UC Berkeley)
Calvert, Jacob (UC Berkeley)
Coja-Oghlan, Amin (University of Frankfurt)
Corteel, Sylvie (Berkeley)
Corwin, Ivan (Columbia University)
Croydon, David (Kyoto University)
Dauvergne, Duncan (Princeton University)
den Hollander, Frank (University of Leiden)
Dyszewski, Piotr (Instytut Matematyczny Uniwersytetu Wrocławskiego)
Ganguly, Shirshendu (UC Berkeley)
Gantert, Nina (Technical University of Munich)
Hegde, Milind (UC Berkeley)
Hernandez-Torres, Sarai (University of British Columbia)
Holden, Nina (Zurich)
Hughes, Thomas (University of British Columbia)
Hutchcroft, Tom (University of Cambridge)
Jagannath, Aukosh (University of Waterloo)
Johnson, Samuel (University of Bath)
Johnston, Samuel (University of Graz)
Kozma, Gady (Weizmann Institute)
Miolane, Léo (New York University)
Montanari, Andrea (Stanford University)
Mossel, Elchanan (MIT)
Mourrat, Jean Christophe (New York University)
Perkins, Edwin (University of British Columbia)
Pulvirenti, Elena (University of Bonn)
Sarkar, Sourav (University of Toronto)
Sousi, Perla (University of Cambridge)
Subag, Eliran (Courant Institute)
Wu, Xuan (Columbia University)
Zhang, Lingfu (Princeton University)

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2020

Cancelled 5-Day Workshops

The Interface Between Selective Inference and Machine Learning
March 08 - 13, 2020 (Cancelled)

Organizers:
William Fithian (University of California, Berkeley)
Rina Foygel Barber (Chicago)
Daniel Yekutieli (Tel Aviv University)

Modern scientific data sets are large and complex, and often collected without a specific research question in mind. Rather, the express goal is to explore the data in search of novel insights, often using sophisticated algorithms to discover complex relationships and structure, and draw conclusions about what we find. Although data-driven exploration plays a vital and growing role in scientific discovery, standard statistical methods are invalidated when we use the data to decide what questions to ask. As advances in machine-learning algorithms for discovering patterns in data outpace our ability to provide reliable inferences about the patterns they find, the need for new selective inference methods -- statistically valid methods for answering questions suggested by the data -- has never been more urgent.

Recent years have seen a remarkable burst of exciting new methodologies and application areas at the interface of selective inference and machine learning. Our proposed workshop will bring together core researchers in each community, to share recent advances, generate new ideas, and to identify the most pressing problems in the field.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5214*

Stochastic Mass Transports
March 22 - 27, 2020 (Cancelled)

Organizers:
Jan Obloj (University of Oxford)
Mathias Beiglböck (University of Vienna)
Martin Huesmann (Universität Münster)

Need to decide on optimal way to transport iron ore from mines to factories? Need to decide if two images are similar or not? Trying to reconstruct how the universe looked a moment after the Bing Bang?

Optimal transport is a theory offering a unified mathematical language for these and many other problems and a powerful methodology to understand and characterise their solutions, and to compute them numerically. Originally posed by G.\ Monge in 1781, the theory has earned Fields medals and thick monographs to testify to its importance. What happens however if we want to design optimal actions looking into the future? We can only trade on the current stock prices, we do not know where gravitational waves will reach us next year. As we now understand, a host of problems in economics, finance and stochastic modelling can be re-interpreted as optimal transport questions but with an additional directional, often temporal, aspect. The workshop focuses on the mathematics which arise at these crossroads and which can help us to understand and solve such problems.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5229*

New Directions in Geometric Flows
March 29 - April 03, 2020 (Cancelled)

Organizers:
Jeff Streets (University of California, Irvine)
Richard Bamler (University of California, Berkeley)
Robert Haslhofer (University of Toronto)
Gang Tian (Beijing University)

Geometric evolution equations describe physical phenomena ranging from a child's soap bubble to the evolution of the cosmos. The famous, Fields Medal winning work of Grigory Perelman used the "Ricci flow'' equation to give a complete understanding of geometry in three dimensions. This was a huge leap forward in our understanding of these equations, and set off a firestorm of activity in the ensuing years. This conference will bring together researchers working in this exciting area to discuss recent developments and push towards new horizons.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5077*

Analysis and Geometry of Metric Spaces - a Bridge between Smooth and Fractal Views
April 05 - 10, 2020 (Cancelled)

Organizers:
Jun Kigami (Kyoto University)
Mario Bonk (University of California, Los Angeles)

The notion of fractals was introduced by Mandelbrot as new models of the shapes of objects in nature like the coastline, trees and the surface of rocks, which can not be represented by combinations of smooth objects such as lines, rectangles, circles and spheres. Since there happens natural phenomena such as waves and heat diffusions on those objects modeled by fractals, we need to develop the theory to treat such natural phenomena on fractals, which are included in the category of metric spaces. This direction of study is called analysis and geometry on metric spaces. In this area of research, there have been two groups, one has tried to extend the existing theory for smooth spaces and the other has tried to use the complicated structure of the object itself. These two groups have been working separately for more than 20 years and both have obtained fruitful results. However, recently, evidences of strong connection between those two approaches. So the main purpose of this workshop is to gather people from both sides, to promote interaction and to create a common ground for deeper study in this area.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5105*

Almost-Periodic Spectral Problems
April 12 - 17, 2020 (Cancelled)

Organizers:
David Damanik (Rice University)
Svetlana Jitomirskaya (University of California, Irvine)
Leonid Parnovski (University College London)

Almost periodic problems have arisen in physics long ago in the study of electrons on a two-dimensional lattice exposed to a constant magnetic field with irrational flux (the Harper model), and more recently (in the 1980's) in the study of electrons in quasi-crystals (the Fibonacci model). It has turned out that, unlike periodic problems where one has a powerful tool for their study (Floquet-Bloch decomposition), almost periodic operators are very difficult to study, and the earliest mathematical results on these operators were obtained in the late 1970's. Since then many people have devoted their efforts to the study of spectral properties of almost periodic problems, including Avila, Bourgain, Sarnak, Simon, and Sinai. The spectral theory of almost periodic operators is much richer than that of periodic operators, with new phenomena such as Cantor spectra, purely singular continuous spectral measures or Anderson-type localization occurring in a natural, and in some settings generic, way.

Given the progress that has been made recently and the multitude of tools that have been employed, the meeting aims at bringing together people with various backgrounds to present recent results, exchange ideas, learn new methods, and potentially start new collaborations.

Junior participants (including current PhD students who may have been exposed to only one perspective and set of tools so far) will have the opportunity to experience the breadth of the area and the whole arsenal of technical tools that have been used successfully in recent advances.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5026*

Statistical Methods for Computational Advertising
April 19 - 24, 2020 (Cancelled)

Organizers:
David Banks (Duke University)
Nancy Heckman (University of British Columbia)
Nancy Reid (University of Toronto)

Computational advertising is a multi-billion dollar business, but it has received little attention from academic statisticians. Nonetheless, this collection of pricing models, keyword auctions, A/B tests, and recommender systems depends heavily upon statistical methodology in nearly every aspect of its performance. This program

will bring together scientists from the information technology companies and university] researcher to collaborate on new methods to enable consumers to only see ads for things they actually want to buy, and to enable manufacturers to save advertising budget by accurately targeting interested customers.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5102*

Restriction, Kakeya, and Carleson-Type Problems
April 26 - May 01, 2020 (Cancelled)

Organizers:
Joshua Zahl (University of British Columbia)
Nets Katz (California Institute of Technology)
Victor Lie (Purdue University)

Harmonic analysis is a branch of mathematics that studies the properties of operators such as the Fourier transform. Over the past few years, a number of powerful new techniques have been developed that have led to progress on old and difficult problems. The goal is to gather experts and young researchers to share their expertise in these techniques and disseminate them more broadly within the harmonic analysis community.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5178*

Optimal Transport and Analysis for Machine Learning
May 10- 15, 2020 (Cancelled)

Organizers:
Young-Heon Kim (University of British Columbia)
Marco Cuturi (Université Paris-Saclay)
Hyung Ju Hwang (Pohang University of Science and Technology)
Dejan Slepčev (Carnegie Mellon University)

Dealing with large sets of often high-dimensional data, and extracting the information they contain, is an important practical problem that is central to modern machine learning. The theory of optimal transportation (OT) provides a robust way of approaching important aspects of such problems by giving a natural way of measuring differences between datasets. It has had seen remarkable theoretical advances over the recent years, especially finding many surprising connections to analysis and geometry, as well as in understanding the behavior of the optimal transport solutions. These have led a large range of applications, e.g. to economics, image processing, and statistics, although lack of fast and stable numerical algorithms for computing OT correspondences has been a bottleneck for a long time. However, over the last five years there have been breakthroughs, producing new algorithms which have enabled OT to be effectively applicable in data-intensive fields such as machine learning.

Optimal transport has now become an integral part of models for important tasks in machine learning, including deep learning and domain transfer. Recently, analytical approaches have shown to provide important information about the behavior of the functions that model key tasks in machine learning, including their asymptotics and stability, as well as their numerical optimization. The aim of the workshop is to bring together experts, as well as young researchers, in optimal transportation, applied analysis, scientific computing, and machine learning, to consider some of the interesting and deep research questions that would benefit from joint expertise.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5126*

A Convergence of Computable Structure Theory, Computable Analysis, and Randomness
May 17 - 22, 2020 (Cancelled)

Organizers:
Timothy McNicholl (Iowa State University)
Johanna Franklin (Hofstra University)

This workshop focuses on the newly developing connection between computable structure theory, computable analysis, and algorithmic randomness. Historically, computable structure theory has been centered around countable algebraic structures such as algebraically closed fields and linear orders. However, with some care, it is possible to study uncountable structures such as Banach spaces and metric spaces in this context and to define the notion of an algorithmically random structure. This workshop will bring together researchers in these three areas to build on recent advances in the intersection of these topics and develop new questions in and new approaches to this emerging field of study.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5191*

Stochastic Analysis, Mathematical Finance and Economics
May 24 - 29, 2020 (Cancelled)

Organizers:
Gordan Zitkovic (The University of Texas at Austin)
Constantinos Kardaras (London School of Economics)
Walter Schachermayer (University of Vienna)

Probabilistic tools, together with a variety of methods from stochastic, functional and convex analysis and partial differential equations are routinely used in mathematical finance and economics; in fact, the field draws from a host of other mathematical disciplines to accomplish its goals. Prior advances in this field have not only made a huge impact on the practice of finance and regulation, but have also inspired a number of breakthroughs in related areas of mathematics traditionally regarded as theoretical. In this workshop, we bring together a group of experts and young researchers in various sub-areas of mathematical finance and economics, with a special focus on those whose work draws heavily on stochastic analysis. Our goal is to foster a free interchange of ideas and facilitate sharing of some of the recent results in this challenging field.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5062*

Algorithms for Linear Groups
June 21 - 26, 2020 (Cancelled)

Organizers:
Jon Carlson (University of Georgia)
O'Brien Eamonn (University of Auckland)
Bettina Eick (University of Braunschweig)
Alexander Hulpke (Colorado State University)

Since its inception, Computational Group Theory has proved to be a fertile area for the development of effective computational techniques, which have been applied in diverse areas of mathematics, science and engineering; these include coding theory, design theory, integer programming, crystallography, algebraic number theory, and topology. The aim of this meeting is to bring together a combination of leading and young researchers on computations with linear groups, for the purpose of exploring new directions for research in the light of significant recent advances.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5040*

Modeling, Learning and Understanding: Modern Challenges between Financial Mathematics, Financial Technology and Financial Economics
June 28 - July 03, 2020 (Cancelled)

Organizers:
Antonis Papapantoleo (National Technical University of Athens)
Agostino Capponi (Columbia University)
Christoph Frei (University of Alberta)
Ronnie Sircar (Princeton University)

This 5-day research workshop at the Banff International Research Station is motivated by the need to better understand, quantify and regulate the risk of financial markets in the face of massive technological and economic changes. In order to discuss and assess these new developments, the workshop brings together experts from the fields of financial mathematics, financial technology (FinTech), and mathematical economics. The focus lies on the following three topics which are at different levels of modeling development and technical complexity: (i) interbank markets, valuation adjustments and clearinghouses, (ii) energy and commodity markets, (iii) FinTech and high-frequency trading.

With active participation from women and other underrepresented groups in mathematics and its applications, the workshop's success is based on diversity and inclusion. By inviting young researchers to participate, the workshop aims at encouraging PhD students and postdoctoral fellows to direct their research efforts towards these important mathematical applications of finance and economics, with a clear impact on society.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5101*

Moving Frames and their Modern Applications
July 5 - 10, 2020 (Cancelled)

Organizers:
Francis Valiquette (Monmouth University)
Alexander Bihlo (Memorial University of Newfoundland)
Irina Kogan (North Carolina State University)
Peter Olver (University of Minnesota -- Twin Cities)

Originally introduced by Martin Bartels in the early nineteenth century, and then extensively developed by Élie Cartan in the first half of the twentieth century, the method of moving frames is a powerful tool for studying the geometry of curves, surfaces, and, more generally, submanifolds under the action of a group of transformations. In 1999, a new and more general formulation of moving frame was introduced by Fels and Olver which led to a dramatic resurgence of interest in the method accompanied by a striking extension of the range of applications. The workshop will bring together a diverse group of experts with the goal of exploring existing and emerging applications of the moving frame method to differential equations and integrable systems in physics, to computer vision and object recognition, medical imaging, broken object reconstruction, discrete and differential-difference equations, geometric numerical integration, and much more.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5086*

Markov Chains with Kinetic Constraints and Applications
July 12 - 17, 2020 (Cancelled)

Organizers:
Cristina Toninelli (CNRS and University Paris Dauphine)
Shirshendu Ganguly (University of California - Berkeley)
Fabio Martinelli (Universita' Roma Tre)

Glass is widely present in our daily life: it is a very versatile material, easily produced and manipulated on an industrial scale. And yet a microscopic understanding of this state of matter and of how the glass forms still remains a challenge for scientists. At the heart of this puzzle lies the intriguing fact that glasses display properties of both solids and liquids. Even though glasses are rigid, their disordered arrangement of atoms and molecules is essentially indistinguishable from that of a liquid. Thus, when physicists or chemists look at a drinking glass filled with water and ice cubes, it's not clear to them whether the glass is more like the water or the ice! Even though scientists cannot yet explain how glass is formed, we have we been manufacturing glasses for the last 2000 years. The secret is to cool a liquid mixture of silica, sodium carbonate and calcium oxyde very fast in order to prevent the formation of the ordered crystal structure. Then molecules move slower and slower forming a thick syrup and eventually they get stuck in the structureless glass state. A very rich and fascinating phenomenology occurs before the formation of the glass including aging, hysteresis, rejuvenation, anomalous transport phenomena, cooperative and heterogeneous motion. Furthermore, a dynamical arrest displaying similar features occurs in a variety of different materials: grains in powders, emulsions, foams, colloidal suspensions, plastics, However, despite a great deal of experimental and theoretical investigation, understanding these phenomena is far out of reach and the subject is still hotly debated. To use a joke of David Weitz, a physics professor at Harvard, "There are more theories of the glass transition than there are theorists who propose them."

So, how do mathematicians come into play? in the 1980's, a class of models called "Kinetically Constrained Models" (KCM), have been proposed by physicists to shed some light on the glassy behavior. KCM live on a discrete grid, each site of the grid being either empty or occupied by one particle, and dynamics evolves via a stochastic process in which moves at a certain location occur only if there are enough empty sites around. Despite being an oversimplified model, KCM display a rich phenomenology including the key dynamical features of real glassy systems. However, understanding the behavior of KCM turned out to be a hard task. On the one hand the interesting regimes are often beyond reach of numerical simulations, since KCM display an extremely slow dynamics (as do the real glassy systems). On the other hand most of the tools that have been developed by physicists and mathematicians to study particle systems with stochastic dynamics cannot be applied to KCM. This is a direct consequence of the presence of the constraints requiring enough empty neighbouring sites, which are in turn essential to model glassy dynamics. In the last decade, an increasing number of mathematical works have been devoted to the study of KCM. These rigorous results have already had an important impact in the glassy community, confirming or disproving some conjectures that had been put forward on the basis of numerical simulations. However, several key issues remain widely open. The aim of this workshop is to gather highly qualified experts covering complementary areas that are related to the different facets of the KCM dynamics, to foster interactions among different communities and to develop novel mathematical tools to solve the open problems.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5154*

New Developments in Quantum Machine Learning
July 12 - 17, 2020 (Cancelled)

Organizers:
Barry Sanders (University of Calgary)
Peter Wittek (University of Toronto)
Valerii Fedorov (Icon)
Sergei Leonov (CSL Behring)

Quantum machine learning lies at the intersection of artificial intelligence, quantum computing, quantum information theory, quantum many-body physics, statistics, operations research, optimization, and control theory. The seminal works in this area showed exponentially faster learning protocols, limits on the learnable class functions as bound by quantum physics, and advantages in robustness in quantum control.

The workshop will gather specialists from the various disciplines involved. The goal of the workshop is to quickly review the latest progress in the field in a few invited talks, and to facilitate interactions between scientists normally working in their own silos.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5211*

Singularity Formation in Nonlinear PDEs
July 19 - 24, 2020 (Cancelled)

Organizers:
Monica Musso (University of Bath)
Bob Jerrard (University of Toronto)
Juncheng Wei (University of British Columbia)

This five-day workshop gathers world-wide expert in formation of singularities in several different mathematical models that involve partial differential equations (PDEs). These equations arise in situations as diverse as the long-term evolution of temperature and winds on earth surface due to climate change, the spreading of a tumor, changes of light's behavior near a black hole, the evolution of stock markets or the shape an ice mountain takes as it melts. Solutions to PDE can be interpreted as attainable situations. They may exhibit "singularities", namely places or instants where they "blow-up" or exhibit irregular behavior. Examples abound in nature: one may think of the breaking of a wave, the formation of black holes, meteorological phenomena such as tornados; similar phenomena are found in physical phenomena such as liquid crystal and superconductivity. It is of enormous interest to predict "how" and "when" singularities occur, since they indicate situations where the original model collapses. Similar PDEs can model natural phenomena that appear to be completely different, which makes them an intriguing and complex object of study.

The main purpose of this workshop is to share high quality information related to the contemporary research in the fields of partial differential equations, dispersive equations and geometric flows, with the objective of working on common research problems and favoring the formation of students and young researchers.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5070*

Applied and Computational Differential Geometry and Geometric PDEs
August 9 - 14, 2020 (Cancelled)

Organizers:
Yanyan Li (Rutgers University)
David Glickenstein (University of Arizona)
Joel Hass (University of California, Davis)
Haomin Zhou (Georgia Institute of Technology)

This workshop will bring together mathematicians with expertise spanning the theoretical, numerical, discrete and computational geometry and partial differential equations (PDEs) and computer scientists with related interests to identify and discuss some of the most promising areas for advances in the understanding and application in geometric data analysis.

The explosion of digital data being produced today urgently calls for the creation of new mathematical and computational processing tools. The classical theory of differential geometry and PDEs have produced mathematical results of exceptional depth and beauty which have potential applications to geometric data analysis. However, the process of translating these deep results from geometry and PDEs into algorithms and applying them to real world problems is still in its infancy. This important task asks for collaborations of pure and applied mathematicians and computer scientists to identify the key issues. The workshop will serve as a forum to facilitate the interactions among mathematicians and scientists working in applied areas, bearing fruit at the interface of mathematics, engineering, and computer science.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5089*

Causal Inference with Big Data
August 16 - 21, 2020 (Cancelled)

Organizers:
Peng Ding (University of California, Berkeley)
Lihua Lei (Stanford University)
Marloes Maathuis (Eidgenössische Technische Hochschule Zürich)
Fabrizia Mealli (University of Florence)

Causal inference is a central pillar of many scientific disciplines. Motivated by applications in different scientific fields, there has been tremendous progress in causal inference in the last twenty years. At the same time, the era of big data has presented the field with massive, heterogeneous and complex data sets, posing further challenges. It is therefore crucial and timely to bring together the researchers from both ends, in order to share recent advances, to identify pressing problems, to spark productive collaborations, and to ultimately advance the state of the art by developing new theory and methods for causal inference with big data.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5210*

The Mathematics of Microbial Evolution: Beyond the Limits of Classical Theory
August 23 - 28, 2020 (Cancelled)

Organizers:
Lindi Wahl (University of Western Ontario)
Helen Alexander (University of Edinburgh)
Sylvain Gandon (Centre national de la recherche scientifique)
Sarah Otto (University of British Columbia)

Bacteria, viruses and other microbial populations evolve rapidly, developing resistance to antibiotics, infecting new host species, or emerging as highly pathogenic strains. Mathematical models play a central role in our un-

derstanding of evolution, but have largely been developed to describe evolution in humans and animal species. Since microbial evolution differs, often quite profoundly, from evolution in higher organisms, new mathematical approaches must be developed.

The goal of this workshop is to bring microbiologists, evolutionary biologists and applied mathematicians together to discuss recent experimental discoveries in microbial genetics and evolution. Our aim is to develop new mathematical approaches and predictive models that account for the complexity and diversity of microbial evolution. Overall, a deeper understanding of the ever-changing microbial populations within and around us will be critical in responding to novel pathogens and changing environments.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5107*

Biological Active Porous Materials: Modeling, Simulation and Experimentation
October 04 - 09, 2020 (Cancelled)

Organizers:
Scott MacLachlan (Memorial University of Newfoundland)
Filiz Ates (Mayo Clinic)
Luis Dorfmann (Tufts University)
Oliver Röhrle (University of Stuttgart)

One of the key technologies emerging in the 21st century is that of advanced materials, which offer the opportunity to change our lives in many ways, from improving energy efficiency through enabling new biomedical treatments and devices. In order to harness these materials, though, significant progress is needed in developing our understanding of how they work and interact, across scales ranging from those of atoms and molecules through the full size of devices constructed from them. Across the fields of experimentalists, materials scientists, and computational scientists focusing on active biological tissue, significant research is now underway in understanding the properties of both natural and engineered materials across these scales. This workshop brings together experts with distinct views on these materials and devices, aiming to seed the cross-disciplinary research needed to realize their potential to gain new knowledge on active biological materials and to best exploit it. We will bring together a diverse group of world-leading researchers focusing on discussions on the advances currently being made and the collaborations needed to fully unlock the transformative power of advanced materials by using biological active materials as role models.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5110*

Statistical Modeling for Large Complex Time Dependent Systems
October 11 - 16, 2020 (Cancelled)

Organizers:
Robert Lund (University of California - Santa Cruz)
Scott Holan (University of Missouri)
Tucker McElroy (United States Census Bureau)
Vladas Pipiras (University of North Carolina)

The Banff International Research Station will host the “Statistical Modeling for Large Complex Time Dependent Systems” workshop in the year 2020. This workshop will focus on recent developments and open problems involving the techniques of dimension reduction, dynamic networks, multi-scale modeling for nonlinear processes and count processes, and machine learning, with applications to fields such as climatology, disease mapping, social media behavior, ecology, measurement of small populations, and neuroscience.

This congress of diverse intellects, which includes both world-renowned scholars and junior researchers, and the stimulating forum of the Banff environment are expected to foster new collaborations and the spread of knowledge. Participants will be chosen from many countries, different demographic profiles, and diverse backgrounds in academia and government. The exposure to colleagues with similar but challenging scientific problems will broaden the research horizon of each visitor, and the effort to find consensus on promising techniques - as well as those vital challenges that merit future study - should prove valuable to the broader public.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5155*

Mathematical Approaches for Data Assimilation of Atmospheric Constituents and Inverse Modeling
October 18 - 23, 2020 (Cancelled)

Organizers:
Richard Menard (Environment and Climate Change Canada)
Marc Bocquet (Ecole des Ponts ParisTech)
Kayo Ide (University of Maryland)
Dylan Jones (University of Toronto)

As the world population lives more and more in large urban areas, and as we are about to reach critical levels of greenhouse gases concentrations, the changing atmospheric composition has increasingly important economic, environmental and health impacts. It is thus becoming important to better quantify air pollution and its sources, using all the available information from observations to computer models, and use it in a synergistic way to maximize the information content – this is what data assimilation and inverse modeling aim for.

This interdisciplinary workshop brings together engineers and researchers from numerical mathematics, statistics, and environmental sciences, to develop and innovate on the assimilation and inverse methods to address the specific issues related to atmospheric composition and chemistry. It will also be a forum to train new scientists in this emerging field, and to promote the research towards new operational monitoring products.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5166*

WIN5: Women in Numbers 5
November 15 - 20, 2020 (Cancelled)

Organizers:
Renate Scheidler (University of Calgary)
Alina Bucur (University of California San Diego)
Wei Ho (University of Michigan)

Despite recent progress in gender equality in STEM fields, women continue to be underrepresented in the research landscape of many areas of mathematics, including number theory. The Women in Numbers (WIN) network was created in 2008 for the purpose of increasing the number of active female researchers in number theory. For this purpose, WIN sponsors regular conferences, taking place approximately every three years, where female scholars gather to collaborate on cutting-edge research in the field and produce publishable scientific results. The WIN workshops provide an ongoing forum for involving each new generation of junior faculty and graduate students in state-of-the-art research in number theory. They have to come be highly regarded among the broader number theory community due to the quality of research produced by these collaborations.

WIN5 is the fifth in this series of events, bringing together female number theorists at various career stages for research collaboration and mentorship. As always, the scientific program will centre on onsite collaboration on open research problems in number theory, conducted in small groups comprised of senior and junior scholars as well as graduate students. Groups will publish their initial finding in a peer-reviewed conference proceedings volume, and research partnerships formed at the WIN5 workshop are expected to last well beyond the duration of the event. WIN projects have the potential to grow into fruitful long-term research alliances that have a transforming influence on participants' careers and a significant positive impact on the research landscape in number theory. Past WIN workshop project groups have matured into highly effective research teams producing ongoing scholarly work of exceptional scientific quality.

WIN5 is organized in partnership with the Clay Mathematics Institute. We gratefully acknowledge financial support from the Number Theory Foundation and Elsevier Publishers.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5175*

Interactions Between Topological Combinatorics and Combinatorial Commutative Algebra
November 29 - December 04, 2020 (Cancelled)

Organizers:
Sara Faridi (Dalhousie University)
Satoshi Murai (Waseda University, Japan)

Isabella Novik (University of Washington)
Adam Van Tuyl (McMaster Univeristy)

Two groups of mathematicians, who specialize either in topological combinatorics or in combinatorial commutative algebra, are organizing a workshop in order to identify and to work on problems in the intersection of both fields. Topological combinatorics uses tools from topology to study discrete structures, while combinatorial commutative algebra also studies discrete structures but uses algebraic tools. As a result, the two groups of mathematicians may be studying the exact same problem about discrete structures, but using completely different tools and mathematical language. As an example, questions about the enumeration of the faces of a topological object called a Cohen--Macaulay flag complex can be translated into questions about Hilbert functions of ideals. The goal of this workshop is to bring together 21 mathematicians in both fields to facilitate discussions and encourage new collaborations between these two groups. The organizers have identified five possible themes that will bring an additional focus to the direction of the workshop.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5009*

Topology and Entanglement in Many-Body Systems
November 29 - December 04, 2020 (Cancelled)

Organizers:
Sven Bachmann (The University of British Columbia)
Fernando Brandao (Caltech)
Martin Fraas (Virginia Tech)

The possibility of using quantum mechanics to build computers that are both faster and more secure is an exciting technological leap. One of the most promising pathways to a robust architecture, referred to as topological quantum computing, has lead to fascinating research at the frontier of mathematics and physics. Properties of new, exotic states of matter can be understood - and hence implemented in practice - using tools that were developed by pure mathematicians in connection to surfaces and their curvature. This workshop is bringing together international experts to explore the intimate connections between such topological properties of quantum matter and the key resource of quantum computing: entanglement.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5016*

Foundations for a Distributed Ledger
December 06 - 11, 2020 (Cancelled)

Organizers:
Valerie King (University of Victoria)
Maurice Herlihy (Brown University)
Jared Saia (University of New Mexico)
Elaine Shi (Cornell University)

Significant money and human effort is now being poured into the development of Blockchain technology. Blockchains are currently used, most notably, for the creation and maintenance of digital currencies (e.g., bitcoin). There are also efforts to apply them to many other domains, ranging from “smart” contracts to documenting art provenance. A key goal of these systems is to maintain a distributed ledger, a record of events and transactions between users, and to do so in a way that avoids reliance on a central authority. Instead, these systems depend on the interactions among their many users to come to agreement on what events to enter in the ledger.

The distributed ledger problem is still far from understood. There is no consensus on basic definitions and assumptions of the models, which impedes progress in providing reliability guarantees. There are scaling problems, including the need to spend large amounts of energy, and the small transaction processing rate for current blockchain systems. Interestingly, solving these problems seems to require expertise from several diverse research areas including: cryptography, distributed computing, game theory and public policy. This workshop will bring together experts from these areas to establish and explore the theoretical foundations of Blockchain.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5087*

Banff International Research Station

2020

Cancelled 2-Day Workshops

Creating Authentic Experiences in Mathematics Courses
March 27 - 29, 2020 (Cancelled)

Organizers:
Kseniya Garaschuk (University of the Fraser Valley)
Miroslav Lovric (McMaster University)

The subject area of this workshop is best described as improvement and enrichment of 'service' courses in first-year mathematics, in particular mathematics and statistics for the life sciences. It is a timely topic - over the last two years, we have witnessed several highly attended CMS sessions and a number of stand-alone conferences and workshops, which brought together instructors across Canada who are teaching first-year mathematics courses. One of the biggest challenges that is continuously brought up is the lack of authentic applications. The novelty of this workshop is in addressing this challenge head on by not only socializing existing resources and making them widely accessible through a common database, but also by actually spending the time to create new, fresh materials and class activities.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2237*

Scientific Workshop for Graduate Students in Mathematical Biology
April 03 - 05, 2020 (Cancelled)

Organizers:
Rebecca Tyson (University of British Columbia - Okanagan)
Daniel Coombs (University of British Columbia)
Mark Lewis (University of Alberta)

The interaction between evolution and population dynamics is a key concern under the pressures of climate change. There is already evidence that some species are evolving adaptations such as earlier emergence, and dispersal into new habitats following range shifts. Other species, however, seem much less able to adapt. For conservation purposes, it is critically imprtant that we understand how the evolutionary pressures exerted by climate change and the mathematical dynamics of interacting populations lead to survival or extinction of species. The mathematical study of these processes, eco-evolutionary dynamics, is an area of active research, and a talented researcher from the Centre National de Recherche Scientifique in France will be coming to present his work in this area, as well as an extended lecture on the mathematical techniques used in the study of eco-evolutionary models. The workshop is aimed chiefly at graduate students in mathematical biology, who will gain skills in eco-evolutionary dynamics, and a wider network of peers and mentors through the research discussions at the workshop. In addition, a policy expert will hold give an interactive presentation showing the process whereby mathematical work can be included into policy, thus empowering students to make even greater contributions to society through their research.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2265*

Ted Lewis SNAP Math Fair Workshop 202
April 17 - 19, 2020 (Cancelled)

Organizers:
Sean Graves (University of Alberta)
Trevor Pasanen (University of Alberta)

Over the past few years it has become apparent the importance in finding the correct balance between inquiry-based problem solving and practicing basic facts in the mathematics classroom. The purpose of a SNAP math fair is to provide a meaningful problem-solving experience for all students.

This would be the eighteenth annual Ted Lewis Math Fair Workshop at BIRS. The workshop is extremely popular with teachers in elementary and secondary schools, provides them with resources for lesson plans, and it is helping to reshape the way mathematics is being approached in the schools. Problem solving and puzzles in the classroom is now a specific area of the K-9 curriculum and in-service teachers have had very little training in using these tools effectively. This is not limited to Alberta schools, and the SNAP math fair idea is now spreading around the world. This type of 2-day workshop is considered front line approach in the collaborative effort between mathematicians, more experienced teachers, and all teachers interested in professional development to improve the mathematics teaching in the elementary level and beyond. To have teachers share their valuable experiences with math fair in their own schools is the best and most useful

information to others. Teachers in Alberta and participants from outside view the Ted Lewis Workshop as one of PIMS and BIRS most valuable education initiatives.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2257*

Mathematical Constitutive Models and Numerical Methods to Simulate Soft Tissue Under Impact Loading
April 24 - 26, 2020 (Cancelled)
Organizers:
Duane Cronin (University of Waterloo)
Matthew Panzer (University of Virginia)

Over the last decade, computational human body models have become prolific in both academic studies and industrial design with the aim to improve human safety in impact events, ultimately to address 'the experiment that cannot be undertaken'. That is, injurious tests on a live human cannot be undertaken, although this knowledge is critical to reduce injury risk in everyday exposures including automotive crash scenarios and sports impacts. More recently human models are critical to simulate response to automated braking and crash avoidance systems, as well as for the development of safety systems in autonomous vehicles, which cannot be addressed using traditional methods such as crash test dummies owing to the unconventional seating positions proposed.

The primary inputs to a detailed human model include geometry, boundary conditions and material properties. Material properties and constitutive models to implement these properties are widely regarded as one of the greatest challenges for the adoption and use of human models. This workshop will bring together world experts in tissue characterization, constitutive modeling and human body modeling to address an urgent need to improve mathematical constitutive models representing tissues in human models. This need is driven by the original intent for these models to predict Crash Induced Injuries in automotive crash scenarios, and the current urgent need to address new seating positions in autonomous vehicles, and human pre-crash response for automated driver assist systems such as automatic braking.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2263*

Canadian Abstract Harmonic Analysis Symposium
May 08 - 10, 2020 (Cancelled)
Organizers:
Volker Runde (University of Alberta)
Brian Forrest (University of Waterloo)
Keith Taylor (Dalhousie University)

Abstract harmonic analysis has evolved out of classical Fourier analysis; it deals with locally compact groups, their representations, and the Banach algebras associated with them.

Abstract harmonic analysis has had a strong presence in Canada's mathematical community for several decades. Since 1997, the Canadian Abstract Harmonic Analysis Symposium has been successful in bringing together researchers, from Canada and abroad, in abstract harmonic analysis and related areas, such as Banach algebras, operator algebras, and operator spaces. This meeting will continue this tradition and provide a forum for researchers in the area for fruitful interaction. This particular meeting will also pay tribute to Anthony To-Ming Lau, a major contributor to the area over decades, who will retire effective June 30, 2020.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2235*

Alberta-Montana Combinatorics and Algorithms Day
May 22 - 24, 2020 (Cancelled)
Organizers:
Hadi Kharaghani (University of Lethbridge)
Ryan Hayward (University of Alberta)
Mark Kayll (University of Montana)
Robert Woodrow (University of Calgary)

May 21-22, 2020 will see the first Alberta-Montana Combinatorics and Algorithms Day hosted at the Banff International Research Station (BIRS). The event brings together faculty and students from three Alberta universities (in Calgary, Lethbridge, and Edmonton) and the University of Montana (Missoula). Combinatorics is the branch of mathematics concerned with finite sets: their properties, structures, and number. Studying the classic Rubik's Cube reveals the number of possible positions (it's 43,252,003,274,489,856,000). Understanding the cube's structure leads to efficient algorithms for solving it (an Algorithm is a sequence of well-defined instructions for solving a problem, answering a question, or even playing a game). In 2010, a group of researchers working with Google proved that every one of that staggering number of positions could be solved in no more than 20 moves.

The fields of Combinatorics and Algorithms became inextricably linked at the dawn of the computer age due to computers themselves being finite structures. This meeting offers researchers in these fields an opportunity to share their recent successes, tackle open problems together, and expose their students to the latest methods and developments.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2245*

Multiplex Brain Networks
May 29 - 31, 2020 (Cancelled)
Organizers:
Joern Davidsen (University of Calgary)
Peter Grassberger (Forschungszentrum Juelich)
Javier Orlandi (RIKEN Center for Brain Science)
Seung-Woo Son (Hanyang University)

Understanding the relationship between structure, dynamics, and function in the brain is a crucial step toward innovative solutions for brain-related diseases such as epilepsy, Parkinson's disease and Autism Spectrum Disorders, and hence, it is of immense importance for society. Complex network approaches have successfully provided new insights about the structure and function of the brain for two decades. With recent advances in data science for neuroscience, the increased complexity of the data such as neurosignals from multiple frequency bands, large-scale optical imaging of neuronal activity, and high-resolution Functional Magnetic Resonance Imaging, has led to the proposition that multilayer-network models are essential to model and understand brain dynamics. This workshop builds on early successes using this framework and brings together a diverse group of world-leading experts of various backgrounds to take the application of multiplex networks in neuroscience to the next level. Bridging the gap between complex network theory and neuroscience. We expect that this workshop and the transdisciplinary collaborations between the different fields and participants will stimulate significant advances in our understanding of the brain and indeed lead to new diagnostic methods and treatments of brain related diseases in the future.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2249*

Recent progress in detection and prediction of epilepsy
June 12 -14, 2020 (Cancelled)
Organizers:
Elena Braverman (University of Calgary)

Human epilepsy is a common neurological disorder 0.6% of Canadian suffer from. The focus of this 2-days meeting is mathematical processing of epilepsy-associated EEG data, its role in seizure analysis and diagnostics. The purpose is to bring together three groups of researchers: physicians specializing in drug-resistant epilepsy, behavioral neuroscientists, and applied mathematicians.Thanks to the first group, extensive clinical data is available with detailed description. The second group experiments with animals, and some data analysis methods can be applied to clinical data as well. This is a conference, a brainstorming activity and a training opportunity for research associates, postdoctoral fellows and graduate students involved in all three groups. The proposed participants are members of the mathematics and statistics departments, neurology, clinical neurosciences, cell biology, physiology, psychology and practicing medical doctors.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2244*

Almost Periodicity in Aperiodic Order
June 24 - 26, 2020 (Cancelled)

Organizers:
Nicolae Strungaru (MacEwan University)
Michael Baake (Bielefeld University)
Natalie Frank (Vassar College)

The theory of Aperiodic Order was stimulated by the discovery of quasicrystals in 1980s by Dan Shechtman, a discovery for which he was awarded the 2011 Nobel Prize in Chemistry. It built upon groundbreaking work of Yves Meyer and Roger Penrose from the 1970s, and major contributions were made by Jeffrey Lagarias and Robert Moody in the 1990s.

This area of mathematics studies systems with long-range order, typically manifested by a large Bragg diffraction spectrum, but without translation symmetries. It connects seemingly different areas of mathematics, such as harmonic analysis, dynamical systems and ergodic theory, spectral theory, discrete geometry and Fourier analysis, to name just a few. This meeting will focus on the recent developments regarding the connection between almost periodicity, dynamical systems and aperiodic order.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2232*

Canadian Math Kangaroo Contest Meeting
August 07 - 09, 2020 (Cancelled)

Organizers:
Rossitza Marinova (Concordia University of Edmonton)
Tzvetalin Vassilev (Nipissing University)

The Canadian Math Kangaroo Contest (CMKC) aims to dispel the myth that mathematics is inaccessible and difficult by using an all-inclusive and open mathematics competition to create a positive environment that emphasizes the practical and fun nature of mathematics. Since joining the International Association “Kangaroo without Borders” in 2006, the CMKC has formed hosting partnerships with multiple universities and prestigious organizations across the country. Since its inception, the CMKC has found many ways to expand the reach and scope of its unique program, and to build new, complementary programs based upon the competition. Over the past 14 years, the CMKC has grown significantly from its humble beginnings with approximately 300 participants at 3 locations to just over 6900 students nationwide in the 2019 competition in more than 50 locations in 9 provinces across Canada. The purpose of the workshop is to chart the future course for Math Kangaroo in Canada.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2255*

Mathematical Challenges in Computational Chemistry: Multiscale, Multiconfigurational Approaches, Machine Learning
August 14 - 16, 2020 (Cancelled)

Organizers:
Sergey Gusarov (National Research Council Canada)
Alexander Kobryn (Nanotechnology Research Centre)
Stanislav Stoyanov (Natural Resources Canada)
Valera Veryazov (Lund University, Sweden)

Our workshop is dedicated to the current mathematical and computational problems of QC. The main purpose of the meeting is to bring together experts actively involved into development of mathematical tools and ideas for QC immediately after the world largest computational chemistry congress to be held in Vancouver in August 2020. The idea of such event is long overdue because the majority of the computational codes in quantum chemistry have been developed by
i) chemists/physicists,
ii) long time ago,
iii) grew to very large packages.

There is a need of a revision of these huge, dusty and amateur codes and approaches. We expect that this can be done by considering, planning and implementing the following:
1. Efficient use of Linear Algebra, Fast Fourier, etc.
2. Revising parallel algorithms and implementations

3. Pointing problems in QC which can benefit from Machine Learning: tuning parameters, selection of active space etc.
4. Reconsidering resources: many algorithmic solutions were made at the time of limited memory, single core architecture, etc.
5. Adaptation of new computer technologies, new hardware and their use in QC. Interaction with hardware and software developers and explaining them our immediate needs.
6. Scaling of QC algorithms with respect to the future development of hardware.
7. Deep mathematical revision of current methodologies used in QC
8. What we expect to compute in 10 years?

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2262*

Multitaper Spectral Analysis
September 04 - 06, 2020 (Cancelled)

Organizers:
Charlotte Haley (Argonne National Laboratory)
Wesley Burr (Trent University)
David Thomson (Queen's University)

Fourier transforms bridge the gap between time and frequency thus making it possible to analyze data organized in time in terms of either lags or cycles. Schuster analyzed the first time series in terms of its Fourier cyclical components in 1898, whilst mathematicians have studied functions that are both finite in time and contained in a short bands in frequency since the 1960's. The Thomson multitaper method combines these two notions to estimate contributions to signal variance in terms of discrete frequency bins using bandlimited sequences. Since its publication in 1982, the multitaper method has been shown to have numerous performance advantages over other estimators, and has been applied to the analysis of time series previously thought to be "too pathological" for conventional spectrum estimators to produce any scientific conclusion, either because of small sample sizes, or because the spectrum being estimated has large range.
The purpose of this workshop is to bring together researchers in mathematics and statistics to discuss the next generation of problems evolving from the analysis of time series and spatiotemporal data using multitaper methods.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/2-day-workshops/20w2230*

Banff International Research Station

2020

Cancelled Focussed Research Groups

Noncommutative Boundaries for Tensor Algebras
March 1 - 8, 2020 (Cancelled)

Organizers:
Marcelo Laca (University of Victoria)
Adam Dor-On (University of Illinois UC)
Evgenios Kakariadis (University of Newcastle)

Algebras of operators on Hilbert space are the mathematical models of quantum mechanical systems. The algebra associated to a quantum system is naturally selfadjoint, in the sense that if it contains an operator it also contain its adjoint. The observables are encoded by operators that are equal to their adjoints and the probability of observing a certain range of values is determined by a state, which is a positive linear functional. The motivation to consider a nonselfadjoint tensor algebra is that certain distinguished operators, such as the so-called creation operators that signal the creation of a new particle in a system, are essentially different from their adjoints, the annihilation operators that eliminate the particle. The present project aims to elucidate the relation between a large class of tensor algebras generated by creation operators and the associated selfadjoint algebras that contains both the creation operators and the associated annihilation operators in a canonical minimal way.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/focussed-research-groups/20frg248*

Mathematical Modelling and Machine Learning for Phonetics
April 19 - 26, 2020 (Cancelled)

Organizers:
Paul Tupper (Simon Fraser University)

Phonetics is the study of the sounds of the worlds languages and how they are used to communicate. A wealth of information is known by linguists about which sounds are used, how they are produced, how children learn these sounds, and how the use of sounds differs between different groups of speakers. Still, many fundamental questions remain unanswered relating to this important part of human language.

The purpose of this Focussed Research Group is to bring together mathematicians and computer scientists who are interested in phonetics with linguists who are seeking ways to i) handle the massive amounts of data that are available in the human speech stream, and ii) develop mathematical models to clarify research questions and guide empirical study.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/focussed-research-groups/20frg241*

Predicting and Preventing Wellbore Leakage
May 10 - 17, 2020 (Cancelled)

Organizers:
Ian Frigaard (University of British Columbia)
Ida Karimfazli (Concordia University)
Seyed Mohammad Taghavi (Laval University)

Canada is entering an era of P&A (Plug and Abandonment) in which 1000's of oil & gas wells will be abandoned annually for the foreseeable future, highlighting the critical question of safe long-term abandonment of these wells. Leaking wells (i.e. when natural gas seeps from wellbores) are threats to the environment and public safety of Canada and they can result in the destruction of near well ecosystems, environment pollution (e.g. groundwater contamination), GHG emissions and safety hazards (explosion risks). This workshop brings together mathematically oriented scientists and engineers to develop complementary and interlinked studies addressing knowledge gaps underlying these societally important issues.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/focussed-research-groups/20frg258*

Novel fluid/structure/field (FFSI) modeling framework in the context of ion channels
May 31 - June 07, 2020 (Cancelled)

Organizers:
Nir Gavish (Technion)
Huaxiong Huang (York University)

Tremendous progress has been made in the past century in biological sciences thanks to technological advances in experimental and measuring techniques. As was the case for physics and chemistry in the previous century, biological sciences are at a critical juncture where further advancements depend and rely crucially on the development of now quantitative tools. Mathematics will inevitably play a crucial role during the processes while biology comes increasingly more quantitative as a scientific discipline.

Bio-ions and biomolecules are essential in performing biological functions in living organisms. The understanding of their roles in nerve and physiological functions has fundamental importance, as demonstrated by several Noble prize winning researchers since the prize was established. For example, Cajal shared the 1906 prize for his discovery of synaptic transmission in neural communication. Hodgkin and Huxley won the 1963 prize for their discoveries concerning the ionic mechanism involved in the excitation and inhibition in the nerve cells. The detailed discovery of the functions of single ion channels came much later, which was recognized by the 1991 prize awarded to Neher and Sakmann.

Real biological problems of ion transport are characterized by interaction on all scales and no living biological systems can function without flows. Working on problems from living biological systems requires mathematics that describes interactions of ions at the atomic scale as well as the organ scale. These problems are inherently multi disciplinary and they present formidable challenges as well as fantastic opportunities for modelers, analysts, and computational scientists. Concurrently, renewable energy devices rely on ionic transport at increasingly large densities. Thus, similar mathematical challenges arise in modeling permeability in biological ionic channels and ionic transport in nano-pores of capacitive desalination devices.

In this research group, we focus on the modeling of ionic flows through ion channels, while taking into account possible deformations in the structure of the ionic channel. Such deformations can completely change the behavior of the channel, and have not yet been systematically studied, probably due to the challenges that such a study poses. Using new approaches, we are now able to consider these problems.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/focussed-research-groups/20frg240*

Dynamics of Biopolymers across Multiple Scales (Cancelled)
July 19 - 26, 2020 (Cancelled)

Organizers:
Adriana Dawes (The Ohio State University)

Cells rely on an internal network of biopolymers to provide structural support and scaffolding for a diverse set of biological processes. Actin is one such biopolymer, capable of orchestrating higher order processes that ultimately drive macroscale behaviour including cell motility. Actin polymer filaments, in addition to the proteins that act upon these structures, form an interconnected biological meshwork displaying complex and heterogeneous spatiotemporal dynamics. The actin polymers continuously remodel both themselves and the meshwork they form, resulting in a dense network with various micro-structures. Mathematical models provide a powerful method to gain insight into and create predictions of fundamental mechanisms underlying observable phenomena. However, a unique challenge is presented in modelling semi-flexible polymers in an active-matter system existing across a broad length scale, spanning from the level of protein molecular interactions to the moving, whole-cell level.

The purpose of this Focused Research Group is to bring together a team of women in mathematical biology to develop connected stochastic and continuum models to represent actin dynamics at the micro- and macroscales, respectively. These mathematical formulations incorporate biologically relevant parameters and link large-scale behaviour, inferred from experimental observations, to small-scale, local interactions. We implement concrete measures to bridge these micro-macro scale representations and subsequently investigate the sensitivity of these measures to changes in the parameter space. Taken together, these models predict time-resolved evolution of the actin network by connecting actin dynamics across scales. The jointed models will enable exploration of the relationship between local actin dynamics and global whole-cell behaviour.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/focussed-research-groups/20frg264*

Studying PDE Dynamics via Optimization with Integral Inequality Constraints
July 26 - August 02, 2020 (Cancelled)

Organizers:
David Goluskin (University of Victoria)
Charlie Doering (University of Michigan)
David Papp (North Carolina State University)
Ian Tobasco (University of Illinois at Chicago)

Partial differential equations arise ubiquitously as laws of physics and other mathematical models across the scientific and engineering disciplines. The solutions to these equations describe the behavior of the systems modeled by the equations, but very often the solutions are too complicated to be found exactly. As an example from one of many disciplines, equations governing the flow of liquids or gases can be simple to write down, but solutions corresponding to extremely intricate turbulent motions of the fluids are impossible to find. One approach in such cases is to use powerful computers to approximate single solutions. A second complementary approach is to seek mathematical statements that give only partial information about solutions but that apply broadly to all possible solutions. This Focused Research Group aims to improve and apply methods that take the latter approach. This will be done by using recently developed tools from the field of optimization to solve research questions in the field of partial differential equations. This requires bringing together researchers in both of these largely separate mathematical disciplines, which is made possible by the BIRS Focused Research Group program.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/focussed-research-groups/20frg243*

CMO 2020 Program

5-Day Workshops 2020

Apr 26	May 01	Using Quantum Invariants to do Interesting Topology (Cancelled)
May 03	May 08	Kinetic Equations: Recent Developments and Novel Applications (Cancelled)
May 10	May 15	Geometric and Analytical Aspects of Nonlinear Elliptic Equations and Related Evolution Problems (Cancelled)
May 17	May 22	Modeling and Engineering of the Mammalian Embryo (Cancelled)
May 31	Jun 05	Outstanding Challenges in Computational Methods for Integral Equations (Cancelled)
Jun 07	Jun 12	Advances in Mixed Characteristic Commutative Algebra and Geometric Connections (Cancelled)
Jun 14	Jun 19	Higher Segal Spaces and their Applications to Algebraic K-Theory, Hall Algebras, and Combinatorics (Cancelled)
Jun 21	Jun 26	Mathematical and Conceptual Aspects of Quantum Theory (Cancelled)
Jun 28	Jul 03	Moduli, Motives and Bundles – New Trends in Algebraic Geometry (Cancelled)
Aug 02	Aug 07	Applied Functional Analysis (Cancelled)
Aug 09	Aug 14	Statistical and Computational Challenges Arising from Ubiquitous Molecular Measurements (Cancelled)
Aug 16	Aug 21	M^5 - Mathematics of Multiphase, Multiscale, Multiphysics Models (Cancelled)
Aug 23	Aug 28	Statistical Challenges in the Identification, Validation, and Use of Surrogate Markers (Cancelled)
Aug 30	Sep 04	Convex Integration and Paradoxical Shapes (Cancelled)
Sep 06	Sep 11	Theory and Computational Methods for SPDEs (Cancelled)
Sep 13	Sep 18	Multiscale Modeling of Plant Growth, Pattern Formation and Actuation (Cancelled)
Sep 17	Sep 20	Topological Complexity and Motion Planning (Online)
Sep 20	Sep 25	Approximation Algorithms and the Hardness of Approximation (Cancelled)
Sep 27	Oct 02	Bases for Cluster Algebras (Cancelled)
Oct 04	Oct 09	Geometric and Variational Methods in Celestial Mechanics (Cancelled)
Oct 18	Oct 23	Locality and Functoriality in Symplectic Geometry (Cancelled)
Oct 25	Oct 30	Algebraic Methods in Coding Theory and Communication (Cancelled)
Nov 01	Nov 06	Integral and Metric Geometry (Cancelled)
Nov 08	Nov 13	Mathematics and Statistics of Genomic Epidemiology (Online)
Nov 15	Nov 20	Learning in Networks: Performance Limits and Algorithms (Cancelled)
Nov 29	Dec 04	Langlands Program: Number Theory and Representation Theory (Cancelled)

Casa Matemática Oaxaca

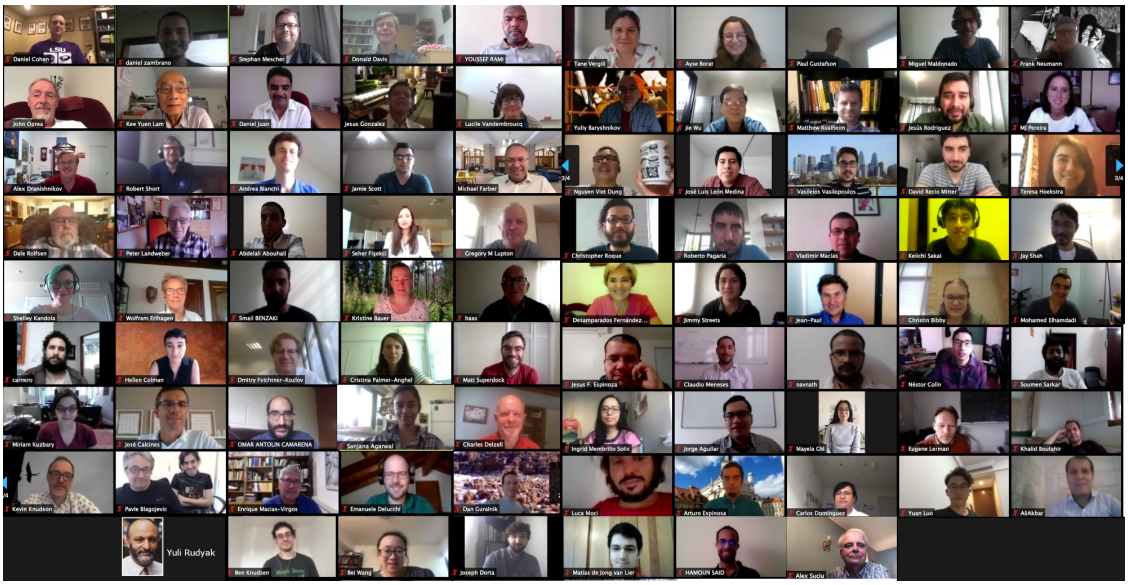
2020

5-Day Workshops

Topological Complexity and Motion Planning
September 17 - 20, 2020 (Online)

Organizers:

Daniel Cohen (Louisiana State University)
Jesus Gonzalez (Cinvestav)
Lucile Vandembroucq (Universidade do Minho)



Teaching a robot to move about on an empty football field is easy. There is exactly one line joining the robot's starting and finishing points, and the robot can be instructed to move from start to finish along this line. This instruction scheme is robust in the sense that nearby starting and finishing points give rise to similar instructions. If the robot is attached to a circular track, teaching it to move is harder. The instructions ``move along the shortest arc'' lead to confusion if the starting and finishing points are precisely opposite one another, as the robot doesn't know whether to move in the clockwise or counterclockwise direction. Choosing one of these two, say, the instructions ``move clockwise'', yields confusion when the starting and finishing points are the same. From these instructions, the robot does not know if it should simply stay at the start/finish point, or move in a less efficient manner, looping around the circle once or twice or\ldots

The problem can be solved by giving different instructions for different pairs of starting and finishing points. The objectives of this workshop are to bring together scientists from all around the world working on diverse aspects of motion planning and topological complexity so as to provide exposure to potentially new perspectives and foster collaboration, to prepare young scientists for work in these rich and fascinating areas of research, and to establish directions for future work and interaction in these areas.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5194

Participants:

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Mischaikow, Konstantin (Rutgers University)
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Mosquera-Lois, David (Universidade de Santiago de Compostela)
Mramor, Neza (University of Ljubljana)
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Roldan Roa, Erika (Technical University Munich and EPFL)
Rolfsen, Dale (University of British Columbia)
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Rudyak, Yuli B. (University of Florida)
Sadykov, Rustam (Kansas State University)
Sakai, Keiichi (Shinshu University)
Sarkar, Soumen (Indian Institute of Technology Madras)
Scheirer, Steven (Ashland University)
Schneider, Friedrich Martin (Technische Universitat Dresden)
Scott, Jamie (University of Florida)
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Shah, Jay (WWU Münster)
Short, Robert (John Carroll University)
Singh, Mahender (IISER Mohali)
Skraba, Primoz (Queen Mary University of London)
Song, Ruzhi (Hebei Normal University)
Sorea, Miruna-Stefana (MPI MiS, Leipzig)
Superdock, Matt (Carnegie Mellon University)
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Torres-Giese, Enrique (Trinity Western University)
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Vandembroucq, Lucile (Universidade do Minho)
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Vela-Vick, Shea (Louisiana State University)
Vergili, Tane (Karadeniz Technical University)
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Zhang, Zhiguo (Hebei Normal University)
Zhang, Conglei (Hebei Normal University)
Zúñiga Rojas, Ronald Alberto (Universidad de Costa Rica)

Mathematics and Statistics of Genomic Epidemiology
November 08 - 13, 2020 (Online)

Organizers:

Leonid Chindelevitch (Imperial College, London)
Alexandre Bouchard (University of British Columbia)
Jesse Shapiro (University of Montreal/McGill University)

This workshop will focus on some mathematical and statistical challenges faced by the discipline of genomic epidemiology, which tries to study the spread, transmission, and other characteristics of infectious disease-causing microbes by leveraging the information contained in their genome. These challenges are exacerbated by the large amounts of data, the relative difficulty of ascertaining transmission patterns in real-life observations, and the inherent heterogeneity of microbes.

For details, please refer to the workshop webpage
http://www.birs.ca/events/2020/5-day-workshops/20w5222

Participants:

Abrudan, Monica (Wellcome Sanger Institute)
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Becker, Devan (University of Western Ontario)
Bedford, Trevor (Fred Hutchinson Cancer Research Center)
Beiko, Robert (Dalhousie University)
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Bouchard, Alexandre (University of British Co-lumbia)
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Burstein, David (Tel Aviv University)
Castillo-Ramirez, Santiago (UNAM)
Cazares, Adrian (EMBL-EBI & Sanger Institute)
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Feil, Edward (University of Bath)
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Fink, Ryan (Dalhousie)
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Luhmann, Nina (Warwick University)
Ma, Kevin (Harvard University)
Mahé, Pierre (bioMérieux)
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Minin, Vladimir (University of California - Irvine)
Monod, Melodie (Imperial College London)
Montiel Molina, Hector (UNAM)
Moreira, Sandrine (INSPQ)
Morel, Marie (Pasteur Institute)
Mortimer, Tatum (Harvard T.H. Chan School of Public Health)
Mugnier, Nathalie (BioMerieux)
Munoz-Zanzi, Claudia (University of Minnesota)
Murall, Carmen (UdeM)
Myall, Ashleigh (Imperial College London)
Navanekere Rudrappa, Chandana (Dalhousie)
Olabode, Abayomi (Western University)
Ostrovnaya, Irina (Memorial Sloan-Kettering Cancer Center)
Platt, Robert (McGill University)
Poon, Art (Western University)
Qiu, Xueting (Harvard School of Public Health)
Quirion, Pierre-Olivier (McGill University)
Rasmussen, David (NC State)
Ratmann, Oliver (Imperial College London)
Roberts, Leah (EMBL-EBI/University of Cambridge)
Sczyrba, Alexander (Bielefeld University)
Senghore, Madikay (Harvard School of Public Health)
Shapiro, Jesse (University of Montreal/McGill University)
Song, Dongyuang (UCLA)
Spencer, Simon (University of Warwick)
Stern, Kiri (University of Montreal)
Taylor, Bradford (Harvard School of Public Health)
Tordoff, Diana (University of Washington)
Vaninsberghe, David (Emory)
Voznica, Jakub (Institut Pasteur)
Wahl, Lindi (University of Western Ontario)
Wang, Liangliang (Simon Fraser University)
Wheeler, Nicole (University of Birmingham)
Wu, Jianhong (Laboratory for Industrial and Applied Mathematics, York University)
Xi, Xiaoyue (Imperial College)
Xi, Miles (UCLA)
Zhang, Erin (SFU)
Zhou, Zhemin (University of Warwick)

Casa Matemática Oaxaca

2020

Cancelled 5-Day Workshops

Using Quantum Invariants to do Interesting Topology

April 26 - May 01, 2020 (Cancelled)

Organizers:
Liam Watson (University of British Columbia)
Elisenda Grigsby (Boston College)
Andrew Lobb (Durham University)

This workshop centres on new advances in topology resulting from quantum invariants, a novel collection of algebraic objects that in currently experiencing a period of intense development. These invariants have their origins in knot theory, that is, the study of knotted loops in three-dimensional space. Beginning with Jones' discovery of a new invariant of knots in the 80s, quantum invariants have grown into a wide-reaching algebraic discipline with ramifications that extend beyond the study of knots and links. Indeed, the most recent developments - pioneered by Khovanov - move these polynomial invariants to homological invariants which have, in recent years, provided new insight in 4-dimensional topology. The workshop will bring together a broad range of experts from around the world working in quantum-homological invariants of knots and links with the aim of tackling new problems in topology with these tools.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5083*

Kinetic Equations: Recent Developments and Novel Applications

May 03 - 08, 2020 (Cancelled)

Organizers:
Marie-Therese Wolfram (University of Warwick)
José Carrillo (University of Oxford)
Alina Chertock (North Carolina State University)
Min Tang (Shanghai Jiao Tong University)

Starting with Boltzmann's seminal idea of describing the dynamics of a large system of interacting particles by its statistical distribution, kinetic theory has become a powerful tool to model for example the transport of charged carriers in plasma and semiconductor crystals or the herding behavior of large animal flocks. More recently kinetic theory made its way into socio-economic applications, for instance to describe the dynamics of trading agents in economic markets. Various mathematical and computational techniques have been developed in the respective fields to analyze the complex behavior of large interacting particles systems. However many questions in classical as well as novel applications are still open. The workshop will bring together experts working on different aspects of kinetic theory to facilitate exchange, advance further in the field and promote novel research directions.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5049*

Geometric and Analytical Aspects of Nonlinear Elliptic Equations and Related Evolution Problems

May 10 - 15, 2020 (Cancelled)

Organizers:
Filomena Pacella (University of Roma "Sapienza")
Mónica Clapp (Universidad Nacional Autónoma de México)
Bernhard Ruf (Università degli Studi di Milano)

The workshop will focus on the interplay between some stationary and evolution differential equations which appear in a large number of problems in sciences. They represent mathematical models for the study of important phenomena in physics, engineering, biology, medicine etc. The workshop is aimed at gathering leading international experts and younger talented researchers from many countries, to promote exchange of ideas .It is an excellent opportunity for an update overview of the state of the art in the study of these important equations as well as an occasion of implementing collaborations among participants.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5038*

Modeling and Engineering of the Mammalian Embryo

May 17 - 22, 2020 (Cancelled)

Organizers:
University Of Michigan, Ann Arbor (University Of Michigan, Ann Arbor)
Janet Rossant (Hospital for Sick Children, University of Toronto)
Eric Siggia (Rockefeller University)

The mammalian embryo is a paradigm of regulative development and self-organization, making it a fascinating system for quantitative experimentation and analysis and mathematical modeling. Most of our current knowledge of mammalian embryology is derived from studies of the mouse embryo, leading to astonishing discoveries of self-organizing and emergent properties ("the laws of development") manifest during embryonic development. Importantly, recent advances in generating human embryo-like structures from human pluripotent stem cells and in vitro cultured human embryos have led to exciting new human-related embryological models that are promising for advancing human embryology. Thus, the aspiration for this BIRS workshop is to bring together world-leading embryologists, theoretical physicists, mathematicians and bioengineers, who share common interests in studying the laws of development, to tackle emerging open questions in the field of embryology. This BIRS workshop will help initiate new collaborations between the attendants, and such collaborative efforts will lead to novel integrative approaches that incorporates quantitative experimentation and analysis and mathematical models developed from formal mathematical or physical principles.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5134*

Outstanding Challenges in Computational Methods for Integral Equations

May 31 - June 05, 2020 (Cancelled)

Organizers:
Michael O'Neil (New York University)
Stephanie Chaillat-Loseille (CNRS)
Adrianna Gillman (University of Colorado Boulder)
Per-Gunnar Martinsson (University of Texas Austin)

As technology advances, so does the cost (both time and energy) of experimental design. For certain classes of problems (e.g. radar propagation, fluid flow, heat dispersion, structural modeling), in which the observed phenomena is well-understood and accurately modelled via the equations of classical mathematical physics, design by simulation can mitigate some of the costs associated with purely experimental design. However, in order to do this, advances in both the mathematical formulation of the problem and the computational algorithms used in their solution are needed. This workshop brings together experts in various fields of mathematics and computation to develop next-generation computational tools and algorithms that will bridge the gap between design by experiment and design by simulation.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5060*

Advances in Mixed Characteristic Commutative Algebra and Geometric Connections

June 07 - 12, 2020 (Cancelled)

Organizers:
Karl Schwede (University of Utah)
Linquan Ma (Purdue University)
Luis Núñez-Betancourt (Centro de Investigación en Matemáticas)

One of the big ideas in modern mathematics is that integers (like 1, 2, 3, 4, 5, ...) in many formal ways behave similarly to polynomial equations (like y = x^2, which defines the parabola). Frequently, and perhaps surprisingly, many questions in mathematics are easier to study for polynomials than for integers. Hence intuition and results for polynomials can tell us about the integers. Commutative algebra lives at the intersection of both perspectives, and one fundamental object of study is polynomials with integer coefficients, this is called the mixed characteristic case. Recently, Yves Andre proved a long standing open conjecture in commutative algebra in this mixed characteristic setting, relying on constructions of Scholze (and then Bhatt gave a simplified proof of the same conjecture).

This workshop aims to foster and discuss these and other recent tools, to study some remaining open problems

in mixed characteristic. The workshop will bring together a diverse group of researchers from different fields, such as commutative algebra, algebraic geometry, and number theory.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5119*

Higher Segal Spaces and their Applications to Algebraic K-Theory, Hall Algebras, and Combinatorics

June 14 - 19, 2020 (Cancelled)

Organizers:
Julie Bergner (University of Virginia)
Mark Penney (Perimeter Institute for Theoretical Physics / University of Waterloo)

Homotopy theory and combinatorics are two typically quite disparate areas of mathematics. Whereas combinatorics is concerned with discrete, enumerative problems, homotopy theory has its origins in a more geometric context and has in many ways become quite abstract. The emerging theory of higher Segal spaces provides a bridge between these two areas, allowing for the more theoretical tools of homotopy theory to be applied to combinatorial problems, as well as new homotopy-theoretic frameworks motivated by combinatorial constructions. Furthermore, higher Segal spaces provide a critical link between algebraic K-theory (a field which incorporates researchers in homotopy theory, algebra, and number theory) and Hall algebras (typically studied in representation theory and algebraic geometry).

The aim of our workshop is to bring together researchers in each of these areas: homotopy theory, combinatorics, algebraic K-theory, and Hall algebras, to help facilitate not only the study of higher Segal spaces themselves, but also the interplay between these different fields with the goal of opening new research directions and forming collaborations. The participants of this workshop will also be at a range of career stages, from graduate students to established researchers, from several different countries, and gender diverse.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5173*

Mathematical and Conceptual Aspects of Quantum Theory

June 21 - 26, 2020 (Cancelled)

Organizers:
Robert Oeckl (Universidad Nacional Autónoma de México)
Chryssomalis Chryssomalakos (ICN UNAM Mexico)

In recent years the foundations of quantum theory have seen a boost of interest and development. This is on the one hand due to their crucial role in new developments such as quantum information theory, quantum computing, and nano-scale physics. On the other hand, it is due to the increasing recognition of their relevance in big unsolved questions such as quantum gravity and black hole physics. At the same time, successful theories of physics have always relied on and driven mathematical development. The fruitful interaction with physics extends to almost all areas of mathematics, but is arguably most broad and intense at the foundations of physics.

Thus, researchers working on conceptual and mathematical aspects of quantum theory, and especially foundations, could contribute substantially to advance these new developments and address these big questions. However, there is considerable fragmentation in this broad area with many small groups or even individual researchers working in isolation on specialized problems, particularly in Mexico. The present workshop aims to bring together leading researchers working on a number of different directions in this area. This is with the aim to initiate or foster their mutual communication, initiate collaboration and contribute to community formation, both internationally, and in Mexico in particular.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5137*

Moduli, Motives and Bundles – New Trends in Algebraic Geometry

June 28 - July 03, 2020 (Cancelled)

Organizers:
Alexander Schmitt (Freie Universität Berlin)
Pedro Luis del Angel Rodriguez (Centro de Investigacion en Matematicas)
Frank Neumann (University of Leicester)

Classification problems are doubtless some of the most important problems in mathematics. Normally objects are classified with respect to a notion of symmetry, equivalence or isomorphism. As geometers, we are really happy when the classifying set of symmetries turns out to be a geometric object as well. When this is the case, the geometry of this classifying object tells us something about the classification problem itself, basically points of this geometric object correspond to the isomorphism classes of the structures one wants to classify. These classifying or moduli spaces can then be studied themselves with methods from algebraic geometry. Nowadays, apart from the classical techniques such as invariant theory developed during the 19th and 20th century to study these moduli spaces, other new techniques are used such as derived categories or motivic homotopy theory. A problem arises when the classification problem gives rise to too many symmetries and no moduli space can be directly constructed. A modern way to deal with this problem is to use the language of algebraic stacks, which intrinsically allows to keep track of all the isomorphisms and gives rise to the notion of a moduli stack, a more abstract categorified version of a moduli space, but nevertheless tractable with methods from algebraic geometry. Fundamentally important in geometry, topology, arithmetic and physics is the classification of vector bundles and principal bundles over a fixed algebraic variety and the associated moduli spaces and moduli stacks have very rich geometric structures. This school and workshop intends to give fresh insights into new methods and techniques for the study of these moduli spaces and moduli stacks including GIT methods, derived categories and motivic homotopy theory.
Organised in partnership with the Clay Mathematics Institute and the Foundation Compositio.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5226*

Applied Functional Analysis

August 02 - 07, 2020 (Cancelled)

Organizers:
Feng Dai (University of Alberta)
Ronald DeVore (Texas A & M University)
Vladimir Temlyakov (University of South Carolina)
Sergey Tikhonov (ICREA and Centre de Recerca Matemàtica - Barcelona)

The workshop will focus on important recent developments and progress in applied functional and harmonic analysis. It will provide not only a platform for strengthening the mathematical research in this area, but also an opportunity for the participants in knowing the emerging areas of research.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5011*

Statistical and Computational Challenges Arising from Ubiquitous Molecular Measurements

August 9 - 14, 2020 (Cancelled)

Organizers:
Jeffrey Leek (Johns Hopkins Bloomberg School of Public Health)
Anna Goldenberg (Hospital for Sick Children/UofT)
Sara Mostavafi (University of British Columbia)
Elizabeth Purdom (University of California, Berkeley)

The cost of collecting molecular measurements about our DNA, RNA, and their abundances has dropped dramatically over the last five years. Genomic data is now ubiquitous across biology and medicine. But while the data have become ever cheaper to collect and store, efficiently extracting useful information from these measurement still remains a significant challenge. Solving this challenge could better allow us to use new knowledge about our genomes to understand our ancestry, how our bodies develop, and how we can predict and treat diseases.

This workshop brings together experts in biology, computational biology, machine learning, and statistics to

answer some of the large, unsolved problems presented by the explosion of molecular information we are experiencing. They will help to create ideas for extracting, understanding, and testing the information we get from these experiments to benefit the biological and medical sciences.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5199*

M^5 - Mathematics of Multiphase, Multiscale, Multiphysics Models
August 16 - 21, 2020 (Cancelled)

Organizers:
Krishnaswamy Nandakumar (Louisiana State University & Agri)
Francois Bertrand (Ecole Polytechnique)
Wei Ge (Chinese Academy of Sciences)
Samir Khanna (BP - USA)

Understanding the dynamics of dispersed multiphase flow and developing models at the appropriate scales (continuum, meso and interpenetrating continua scales) remains a challenge. It is of importance not only as a scientific problem in its own merit for understanding dynamics of volcanos, avalanches, sediment transport etc, in nature, but also for its engineered applications in such areas as chemical, material, mineral and food processing applications where such processes are commonly encountered. Advanced computational algorithms and High Performance Computing tools are enabling scientists and engineers to design and operate new manufacturing facilities that can be highly efficient and modular in design with a low energy and environmental foot print. Thus while the impact of such studies is quite broad, the workshop will focus on the three aspects of multiscale, multiphase and multiphysics models. We bring a group of leading international researchers to address current progress and challenges ahead on this topic. Although many industries (auto, aerospace ..) have already incorporated computational models as a reliable tool in their design practices to develop optimal designs, the process industry is trailing behind. This is due to a higher level of complexity in these flows. However, the next generational breakthrough in the process industry will not happen without multiphase CFD. The process industry is a key component of modern society. With increasing environmental concerns about high intensity use of fossil fuels, it is imperative that reliability of multiphase models and their computational solutions be improved to assist in the development a new generation of process equipment designs.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5227*

Statistical Challenges in the Identification, Validation, and Use of Surrogate Markers
August 23 - August 28, 2020 (Cancelled)

Organizers:
Layla Parast (RAND)
Peter Gilbert (Fred Hutchinson Cancer Center)
Lang Wu (The University of British Columbia)

In studies examining the effectiveness of an intervention, the availability of a surrogate marker that could be used to estimate the intervention effect and could be observed earlier than the primary outcome would allow researchers to make conclusions regarding effectiveness with less required follow-up time. Statistical methodological research on identifying such surrogate markers, assessing the value of such markers, determining when these markers should be collected, and developing tools to use these markers for future studies has led to numerous available methods and has highlighted a number of limitations. There is little agreement on the appropriate approach to identify, validate, and use surrogate markers. This workshop will bring together statisticians, biostatisticians, and epidemiologists to build on recent methodological advances in the evaluation of surrogate markers to identify robust methods that could appropriately be used in practice while also quantifying potential risks if certain necessary assumptions are violated

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5208*

Convex Integration and Paradoxical Shapes

August 30 - September 04, 2020 (Cancelled)

Organizers:
Boris Thibert (Université Grenoble Alpes)
Vincent Borrelli (Université Lyon 1)
Francis Lazarus (CNRS Grenoble)

The Banff International Research Station will host the Convex Integration and paradoxical shapes workshop. Convex Integration, an abstract and powerful theory in mathematics, recently allowed to establish deep connections between different fields such as fluid mechanics, geometry or even origami. This workshop will gather experts from across the world with background in those fields with the aim of developing and exploring the connections through the lens of Convex Integration, both from the theoretical and applied point of views.

New avenues of research resulting from this meeting could potentially lead to the discovery of new paradoxical shapes as well as the development of practical tools allowing for effective computations.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5100*

Theory and Computational Methods for SPDEs

September 6 - 11, 2020 (Cancelled)

Organizers:
David Cohen (Umeå University)
Annika Lang (Chalmers University of Technology and University of Gothenburg)
Marta Sanz-Solé (University of Barcelona)
Samy Tindel (Purdue University)

The BIRS workshop on theory and computational methods for SPDEs brings together a number of world experts in the theoretical analysis of these equations, which model dynamical systems disturbed by noise together with specialists in scientific computing, in a first meeting of its kind.

Mathematical models based on SPDEs play an increasingly important role in modern science, society, and industry. They have an impact on a wide variety of applications from biology and neurology to finance and engineering. Effective and efficient simulations of such models can only be done with a deep theoretical understanding of dynamical properties of SPDEs as well as of numerical algorithms. The aim of this workshop is to gather two sub-communities (theory and numerical analysis for SPDEs) to address challenges in our relatively young research field. Young talents as well as influential mathematicians will come to Banff from numerous international institutes (Austria, China, France, Germany, Netherlands, Spain, Sweden, Switzerland, UK, USA) as well as Canadian researchers (Edmonton, Ottawa, Vancouver). The participants of this workshop will present and discuss the current state of their respective disciplines. We also wish to stimulate a fluid communication between theory and practice of SPDEs, in order to initialize new collaborations on promising research directions in our area.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5106*

Multiscale Modeling of Plant Growth, Pattern Formation and Actuation

September 13 - 18, 2020 (Cancelled)

Organizers:
Anja Geitmann (McGill University)
Plant growth and development involve the flux of molecules from one cell to another, the mechanical deformation of structures, and the exchange of signals between cells and tissues. Mathematical modeling of these complex biological processes has allowed life scientists to better understand the regulatory principles that govern plant functioning and development. However, translating ‘biology’ into mathematical algorithms is challenging. The power of a modeling approach is determined by the conceptual understanding of biological processes and their causal relationships, as well as the ability of the researcher to quantify essential input parameters.

The workshop is focused at the intersection of three areas: molecular signaling (hormonal control and exchange of signaling molecules), network modeling (mathematical representation of biological feedback mechanisms), and biomechanical concepts (physical and mechanical analysis of force driven deformation or cells and tissues).

The workshop will provide a forum for mathematicians, physicists and engineers to develop, exchange and challenge novel approaches to simulate these complex biological processes in integrated manner. The long term goal is to improve our understanding of plant growth, pattern formation and motion.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5180*

Approximation Algorithms and the Hardness of Approximation

September 20 - 25, 2020 (Cancelled)

Organizers:
Jochen Koenemann (University of Waterloo)
Julia Chuzhoy (Toyota Technical Institute at Chicago)
Zachary Friggstad (University of Alberta)
Rico Zenklusen (Swiss Federal Institute of Technology in Zurich)

Most of the many discrete optimization problems arising in the sciences, engineering, and mathematics are NP-hard, that is, there exist no efficient algorithms to solve them to optimality, assuming the P.not.=NP conjecture. The area of approximation algorithms focuses on the design and analysis of efficient algorithms that find solutions that are within a guaranteed factor of the optimal one. Loosely speaking, in the context of studying algorithmic problems, an approximation guarantee captures the quality of an algorithm -- for every possible set of input data for the problem, the algorithm finds a solution whose cost is within this factor of the optimal cost. A hardness threshold indicates the difficulty of the algorithmic problem -- no efficient algorithm can achieve an approximation guarantee better than the hardness threshold assuming that P.not.=NP. Over the last two decades, there have been major advances on the design and analysis of approximation algorithms, and on the complementary topic of the hardness of approximation.

The goal of the workshop is to focus on a few key topics that could lead to deep new results in the areas of approximation algorithms, combinatorial optimization, hardness of approximation, and proof complexity. Some of the focus topics are:
- the Traveling Salesman Problem (TSP),
- the Unique Games Conjecture,
- and Clustering and Facility Location Problems.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5184*

Bases for Cluster Algebras

September 27 - October 02, 2020 (Cancelled)

Organizers:
Alfredo Nájera Chávez (Universidad Nacional Autónoma de México)
Laurent Demonet (Google France)
David Hernandez (Université Paris Diderot - Paris VII)
Jan Schroer (University of Bonn)

The theory of cluster algebras emerged in the year 2000 as a combinatorial approach to study bases for quantum groups. Since then, commutative cluster algebras and their quantum deformations have been present in very diverse areas of mathematics and theoretical physics.

Constructing bases for both commutative and quantum cluster algebras and understanding their multiplicative structure is a meeting point of techniques and ideas from combinatorics, mirror symmetry, representation theory and quantum groups.

This topic has attracted the attention of distinguished mathematicians such as the Fields medalist Maxim Kontsevich and the 2018 Chern medalist Masaki Kashiwara. In the last 4 years there has been remarkable progress in the problem of constructing bases for cluster algebras and relating them to the canonical bases for quantum groups. Understanding the relation among these approaches is a difficult and important task that has been undertaken by various groups of researchers in recent years. This is a great moment to bring these groups together for a focused workshop on bases for cluster algebras.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5114*

Geometric and Variational Methods in Celestial Mechanics

October 04 - 09, 2020 (Cancelled)

Organizers:
Renato Calleja (Universidad Nacional Autónoma de México)
Jacques Fejoz (Université Paris Dauphine)
Marcel Guardia (Universitat Politècnica de Catalunya)
Susanna Terracini (Università di Torino)

Determining qualitative properties of the long term behavior of the planets of the Solar system, and now also of extra Solar systems, is the oldest question in Dynamical Systems. The simplest model of the Solar system is the N-body problem: N bodies moving under the influence of the Newtonian gravitational force. Even if it has been studied from more than two centuries and despite the outstanding recent progress, the N-body problem is far from being well understood.

The goal of this conference is to bring together different mathematicians who study Celestial Mechanics models from different perspectives and with different techniques to achieve a deeper understanding of the dynamics of the N-body problem.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5132*

Locality and Functoriality in Symplectic Geometry

October 18 - 23, 2020 (Cancelled)

Organizers:
Vivek Shende
Mohammed Abouzaid (Columbia University)

Symplectic geometry concerns symplectic manifolds. A key modern tool is an algebraic structure called the 'Fukaya category', which is associated to a single such object. Geometric relations between the manifolds are reflected in algebraic interactions between the categories. There has been a great deal of recent progress in understanding such relations. This workshop will bring together many of the key workers in this rapidly developing field to share ideas and set further directions of exploration.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5221*

Algebraic Methods in Coding Theory and Communication

October 25 - 30, 2020 (Cancelled)

Organizers:
Felice Manganiello (Clemson University)
Elisa Gorla (University of Neuchatel)
Marcus Greferath (University College Dublin)
Hiram H. López Valdez (Cleveland State University)

Since the seminal works of Claude Shannon in the 1940's, coding theory has been a flourishing subject for research collaborations between mathematicians, computer scientists and electrical engineers. Research problems in coding theory have evolved in the years to answer important practical questions from real world applications. This workshop aims at bringing together researchers from different backgrounds in order to foster interdisciplinary collaborations that will push forward the research in coding theory and communication.

The workshop will concentrate on three contemporary, central themes in coding theory and its applications. Algebraic coding theory tackles classical communication problems, such as error-free communication between a source and a receiver over a noisy channel, using a wide range of tools from computational algebra, algebraic geometry, and probability theory. More recently coding theory has found applications to emerging challenges in communication. The kind of problems that arise has been shifting, as our digital lives got more and more interconnected. Network Coding seeks answers to problems of maximization of information flow over networks. These answers often require establishing new communication schemes, relying on mathematical structures which were not used in this context before. In the last few years a new set of problems with local features arose from practical applications such as distributed storage of large amounts of data. Locally recoverable codes

allow the recovery of a codeword symbol's erasure by mean of a small set of other codeword symbols. These codes are a central topic of research of the last few years, due also to their applicability to these problems.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5187*

Integral and Metric Geometry
November 01 - 06, 2020 (Cancelled)

Organizers:
Dmitry Faifman (Tel Aviv University)
Andreas Bernig (Goethe University Frankfurt)

Alexander Lytchak (University of Cologne)
Alina Stancu (Concordia University)

Modern geometry consists of numerous, virtually independent fields. A unifying theme of mathematics is the uncovering of deep ties between different, seemingly unrelated facts. Our workshop strives to improve our understanding of one such deep link, the Weyl principle, which we hope could form a bridge between the disciplines of integral geometry and valuation theory on one side, and metric geometry and spaces with curvature bounds on the other.

Valuation theory grew out of integral geometry, and studies such geometric quantities as volume, surface area, and their generalizations. Spaces with curvature bounds are geometric objects which are not necessarily smooth, but that retain nevertheless some of the features of smooth spaces. For example convexity/concavity properties of the distance function can be seen as a non-smooth generalization of the smooth notion of curvature of constant sign.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5190*

Learning in Networks: Performance Limits and Algorithms
November 15 - 20, 2020 (Cancelled)

Organizers:
Bruce Hajek (University of Illinois)
Yihong Wu (Yale University)
Jiaming Xu (Duke University)

The focus of the workshop is on statistical learning, algorithms, information and computational limits, in large-scale networks. The overall objective of the workshop is to develop a better understanding of the information theoretic and computational barriers to making significant inferences from large-scale network data. The topics are organized into three interrelated areas, ranging from inference problems for single graphs, to inference involving two graphs, to classification of graphs from general families.

Inference problems to be addressed for single graphs include the detection of densely connected communities within dynamic graphs, and detection of other structures including Hamiltonian paths and bipartite matchings, with applications to seriation of DNA and particle tracking in physics experiments. A prototypical inference problem involving two graphs is the graph matching problem, in which two noisy versions of a parent graph are presented and the problem is to line up the vertices of the two graphs. The algorithms and analysis involve an interesting interplay of combinatorial algorithms and stochastic analysis. Another prototypical problem for graph classification to be addressed at the workshop is to estimate the density of network motifs or to estimate the number of connected components of a graph based on sampled neighborhoods.

Research on learning in networks: performance limits and algorithms combines techniques from probability theory, graph theory and combinatorics, statistical physics, optimization, and information theory.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5212*

Langlands Program: Number Theory and Representation Theory
November 29 - December 04, 2020 (Cancelled)

Organizers:
Luis Lomeli (Pontificia Universidad Catolica de Valparaiso)
Anne-Marie Aubert (CNRS, Sorbonne Université, Université de Paris)
Luis Dieulefait (Universitat de Barcelona)
Manish Mishra (IISER Pune)

Langlands functoriality conjectures predict a vast generalization of the classical reciprocity laws of Class Field Theory, providing crossroads between Number Theory and Representation Theory. The conjectures are both local and global and pertain a connected reductive group and its Langlands dual group.

We aim to introduce young mathematicians in México and Latin-America to topics of current research in the Langlands Program. We will also promote the participation women and of graduate students from a diverse background in a workshop where experts in the field from across the world will gather to expand upon the frontiers of current research. In addition to research talks, there will be three courses that will also be accessible to mathematicians working in closely related fields.

For details, please refer to the workshop webpage: *http://www.birs.ca/events/2020/5-day-workshops/20w5142*

Casa Matemática Oaxaca (CMO) is an International research facility affiliated with the Banff International Research Station (BIRS) of Canada. CMO will host scientific activities and gather mathematicians from around the world in an environment that will promote innovative ideas in the mathematics field. CMO will also support activities to promote local development through research and teaching of mathematics.

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