Banff International Research Station
for Mathematical Innovation and Discovery

2009 Scientific Report

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Alberta Innovation and Science

5-Day Workshops 2009

Jan 11	Jan 16	Affine Convex Geometric Analysis
Jan 18	Jan 23	Dynamics and Statistics of Spatially Extended Systems (dedicated to 60th birthday of Leonid Bunimovich)
Jan 25	Jan 30	Lower Bounds for Distributed Computing
Jan 25	Jan 30	Mathematics of String Spaces and Algorithmic Applications
Feb 1	Feb 6	Gauge Fields, Cosmology and Mathematical String Theory
Feb 8	Feb 13	Stability Theoretic Methods in Unstable Theories
Feb 15	Feb 20	Computational Mathematics of Discrete Surfaces
Feb 22	Feb 27	Random Fields and Stochastic Geometry
Mar 1	Mar 6	Multivariable Complex Dynamics
Mar 8	Mar 13	Data Analysis using Computational Topology and Geometric Statistics
Mar 15	Mar 20	Frames from first principles: Error correction, symmetry goals, and numerical efficiency
Mar 22	Mar 27	Interactions of Geometry and Topology in dimensions 3 and 4
Mar 29	Apr 3	Invariants of Incidence Matrices
Apr 5	Apr 10	Semiparametric and Nonparametric Methods in Econometrics
Apr 12	Apr 17	Advances and Perspectives on Numerical Methods for Saddle Point Problems
Apr 19	Apr 24	Random Schrödinger Operators: Universal Localization, Correlations, and Interactions
Apr 26	May 1	Multiscale Processes in the Tropics
May 3	May 8	Causal Inference in Statistics and the Quantitative Sciences
May 17	May 22	Mathematical Immunology of Infectious Diseases
May 24	May 29	Probabilistic Models of Cognitive Development
May 31	Jun 5	Complex Analysis and Complex Geometry
Jun 7	Jun 12	Advances in Stochastic Inequalities and their Applications
Jun 14	Jun 19	The Keith Worsley Workshop on Computational Modeling of Brain Dynamics: From Stochastic Models to Neuroimages
Jun 21	Jun 26	Theory and Applications of Classical and Quantum Kinetic Theory
Jun 28	Jul 3	Extremal Kaehler metrics
Jul 5	Jul 10	Multimedia, Mathematics & Machine Learning II
Jul 12	Jul 17	Multiscale Analysis of Self-Organization in Biology
Jul 19	Jul 24	Permutation Groups
Jul 25	Jul 30	Renaissance Banff II: Mathematics, Music, Art, Culture
Aug 2	Aug 7	Applications of Matroid Theory and Combinatorial Optimization to Information and Coding Theory
Aug 9	Aug 14	Analysis of Nonlinear Wave Equations and Applications in Engineering
Aug 16	Aug 21	Emerging Issues in the Analysis of Longitudinal Data
Aug 23	Aug 28	Probabilistic and Extremal Combinatorics
Aug 30	Sep 4	Computer Vision and the Internet
Sep 6	Sep 11	New Mathematical Challenges from Molecular Biology and Genetics
Sep 13	Sep 18	Linear Algebraic Groups and Related Structures
Sep 20	Sep 25	Transversal and Helly-type Theorems in Geometry, Combinatorics and Topology
Sep 27	Oct 2	t-motives: Hodge structures, Transcendence and Other Motivic Aspects
Oct 4	Oct 9	Nonlinear Conservation Laws and Related Problems
Oct 11	Oct 16	Dedekind Sums in Geometry, Topology, and Arithmetic
Oct 18	Oct 23	Complex Monge-Ampère Equation
Oct 25	Oct 30	Mathematical Methods in Emerging Modalities of Medical Imaging
Nov 1	Nov 6	Interdisciplinary Workshop on Fixed-Point Algorithms for Inverse Problems in Science and Engineering
Nov 8	Nov 13	Noise, Time Delay and Balance Control
Nov 15	Nov 20	Statistical Mechanics on Random Structures
Nov 22	Nov 27	First Nations Math Education
Nov 29	Dec 4	Combinatorial Optimization under Uncertainty
Nov 29	Dec 4	Search in Constraint Programming
Dec 6	Dec 11	Numerical Analysis of Multiscale Computations

2-Day Workshops 2009

Mar 6	Mar 8	Modeling Risk Prediction
Apr 24	Apr 26	Ted Lewis Workshop on SNAP Math Fairs 2009
Jun 5	Jun 7	SNAP math fairs in MATH 160
Sep 4	Sep 6	Subtle transversality - a celebration of Allen Hatcher's 65th birthday
Sep 25	Sep 27	Workshop on Stochasticity in Biochemical Reaction Networks
Oct 16	Oct 18	Northwest Functional Analysis Seminar
Oct 16	Oct 18	Second Canadian Mathematical Leadership Retreat

Summer Schools

May 10	May 17	The Mathematics of Invasions in Ecology and Epidemiology
Jun 28	Jul 12	2009 Summer IMO Training Camp

Research In Teams

Feb 8	Feb 15	Multiscale statistical analysis for inverse problems in correlated noise
Mar 22	Mar 29	Galois cohomology and infinite dimensional Lie theory
Apr 5	Apr 12	Singular perturbation approach to rattleback reversals
Apr 26	May 3	Modular invariants and twisted equivariant K-theory
May 3	May 10	Prime number races and zeros of Dirichlet L-functions
May 17	May 24	Measure algebras and their second duals
Jun 21	Jun 28	Global Dynamics of Stochastic Differential Delay Equations
Sep 20	Sep 27	Connections between Minimum Rank and Minimum Semidefinite Rank
Oct 25	Nov 1	Exceptional Dehn filling
Nov 22	Nov 29	Hochschild homology and global dimension

Focused Research Groups

Apr 12	Apr 19	Residually finite groups, graph limits and dynamics
Jun 14	Jun 21	Indecomposable binary structures

Banff International Research Station

2009

5-Day Workshops

Affine Convex Geometric Analysis
January 11 - 16, 2009

Organizers:

Monika Ludwig (Polytechnic Institute of NYU)
Alina Stancu (Concordia University)
Elisabeth Werner (Case Western Reserve University)

Our meeting brought together researchers from various areas where affine convex geometric analysis plays an important role. Participants from the different fields were able to gain insight to the current research trends of the connected areas. A total of nine graduate students and new PhDs participated in the workshop. For those researchers in the early stages of their career, the workshop provided an excellent opportunity to learn about the most recent results in the field, to present their own research and to make new connections. Also, the timing of the workshop was symbolic: It was the 100-year anniversary of the first publications of the germs of affine differential geometry.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5048

Participants:

Barthe, Frank (University of Toulouse)
Berck, Gautier (University of Fribourg)
Bianchi, Gabriele (Università di Firenze)
Bisztriczky, Ted (University of Calgary)
Colesanti, Andrea (University of Florence)
Fradelizi, Matthieu (Université Paris-Est Marne-la-Vallée)
Gordon, Yehoram (Technion)
Guedon, Olivier (University Paris 6)
Haberl, Christoph (Vienna University of Technology)
Hug, Daniel (Universität Duisburg-Essen)
Jenkinson, Justin (Case Western Reserve University)
Koldobsky, Alexander (University of Missouri)
Lehec, Joseph (Université Paris-Est)
Litvak, Alexander (University of Alberta)
Ludwig, Monika (Polytechnic Institute of NYU)
Meckes, Mark (Case Western Reserve University)
Meyer, Mathieu (Université Paris-Est Marne-la-Vallée)
Morales, Efren (Universidad Autónoma de Guerrero)
Nitsch, Carlo (Università di Napoli Federico II)
Olver, Peter (University of Minnesota)
Peri, Carla (Università Cattolica, Milan)
Petrov, Fedor (Steklov Institute, St. Petersburg)
Pivovarov, Peter (University of Alberta)
Reitzner, Matthias (TU Wien)
Rivasplata, Omar (University of Alberta)
Rudelson, Mark (University of Missouri, Columbia)
Ryabogin, Dmitry (Kent State University)
Saorin-Gomez, Eugenia (University of Murcia)
Schneider, Rolf (University of Freiburg)
Schuster, Franz (Vienna University of Technology)
Schütt, Carsten (University of Kiel)
Stancu, Alina (Concordia University)
Steineder, Christian (University of Vienna)
Tomczak-Jaegermann, Nicole (University of Alberta)
Werner, Elisabeth (Case Western Reserve University)
Yaskin, Vladyslav (University of Oklahoma)
Yaskina, Marina (University of Oklahoma, Norman)
Zvavitch, Artem (Kent State University)
Zymonopoulou, Marisa (Case Western Reserve University)

Dynamics and Statistics of Spatially Extended Systems
January 18 - 23, 2009

Organizers:

Konstantin Khanin (University of Toronto)

Howie Weiss (Georgia Tech)

The workshop brought together leading experts in the theory of dynamical systems, probability theory and statistical mechanics to discuss mathematical problems related to dynamics of spatially extended systems.

Statistical methods have proven to be extremely powerful and useful in modern theory of dynamical systems. However, most of the results until now were obtained for systems with few degrees of freedom. At the same time, many extremely important physical problems correspond to spatially extended systems which depend on many (sometimes infinitely many) variables. Although some properties of spatially extended systems are essentially different from the classical ones, probabilistic methods can be applied to analyze them. One of the main goals of the workshop was to discuss problems related to such an analysis in infinite-dimensional setting.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5085

Participants:

Bakhtin, Yuri (Georgia Tech)
Belykh, Igor (Georgia State University)
Bergelson, Vitaly (Ohio State University)
Berger, Arno (University of Alberta)
Boldrighini, Carlo (Università di Roma La Sapienza)
Bunimovich, Leonid A. (Georgia Tech)
Chernov, Nikolai (University of Alabama, Birmingham)
Demers, Mark (Fairfield University)
Denker, Manfred (Georg-August-Universität; Göttingen)
Hill, Ted (Georgia Tech)
Kaloshin, Vadim (University of Maryland)
Khanin, Konstantin (University of Toronto)
Khesin, Boris (University of Toronto)
Kochergin, Andrey (Lomonosov Moscow State University)
Liverani, Carlangelo (University of Rome Tor Vergata)
Lyubich, Mikhail (SUNY Stony Brook)
Pellegrinotti, Alessandro (Roma Tre Università)
Pikovsky, Arkady (Universität Potsdam)
Shilnilov, Andrey (Georgia State University)
Simanyi, Nandor (University of Alabama, Bimingham)
Sinai, Yakov (Princeton University)
Stoop, Ruedi (ETH Zürich)
Szasz, Domokos (University of Technology, Budapest)
Turaev, Dmitry (Imperial College)
Weiss, Howie (Georgia Tech)
Zagrebnov, Valentin (Centre de Physique Théorique-Luminy, Marseille)

Lower Bounds for Distributed Computing
January 25 - 30 Half Workshop

Organizers:

Faith Ellen (University of Toronto)

Valerie King (University of Victoria)

Distributed computing is an important area of computer science that studies processors which can run concurrently and can communicate with one another. Work needs to be done, despite component failures. Examples include telephone networks, banking systems, airline reservation systems, and the internet. It is well known that many distributed problems cannot be solved, because each processor has limited information. Among those problems that can be solved, there are many for which no efficient solutions are known.

This workshop focuses on mathematically proving that certain distributed computing problems cannot be solved efficiently. Such results are important because they tell us when to stop looking for better ways of solving those problems. They also help us understand the problems much better. Sometimes this can lead to a new, unexpected solution for a problem. It can also help us to carry on, despite bad news, for example, by identifying new features that could be added to the hardware, or finding ways to change the problem slightly, so that it becomes much easier to solve.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5114

Participants:

Aspnes, James (Yale University)
Ben-Or, Michael (Hebrew University)
Castañeda, Armando (UNAM)
Censor, Keren (Technion)
Ellen, Faith (University of Toronto)
Fan, Rui (University of Toronto)
Fraigniaud, Pierre (CNRS and University of Paris Diderot)
Gilbert, Seth (École Polytechnique Fédérale de Lausanne)
Higham, Lisa (University of Calgary)
King, Valerie (University of Victoria)
Kuznetsov, Petr (Technische Universität Berlin / Deutsche Telekom Laboratories)
Rajsbaum, Sergio (UNAM)
Ruppert, Eric (York University)
Woelfel, Philipp (University of Calgary)

Mathematics of String Spaces and Algorithmic Applications
January 25 - 30, 2009 Half Workshop

Organizers:

Alberto Apostolico (Georgia Tech)
Gad Landau (University of Haifa)
Ian Munro (University of Waterloo)
Shan Muthukrishnan (Rutgers University)
Cenk Sahinalp (Simon Fraser University)

Strings from a given alphabet can be treated as objects. There is a number of distance measures that can be used to determine the similarity between such objects: perhaps the most common one is the edit distance which is defined as the minimum number of single symbol insertions, deletions and replacements that can transform one string to another. Variants of this measure involve edits that are performed on substrings (or blocks) such as deleting a whole substring, or copying a substring somewhere else in the string.

String spaces are not as well understood as normed vector spaces. In vector spaces, the specific ordering of dimensions does not typically have an effect on the distance measure used; in string spaces, the specific ordering of symbols is of high significance. Thus, recent work on improving our understanding of string spaces has aimed to provide distance preserving embeddings of string spaces to well understood normed vector spaces. Such embeddings also have applications to many domains such as indexing, compressing, sketching and streaming of strings.

The workshop thus aimed to discuss recent results that have helped us improve our understanding of the mathematical properties of string spaces by investigating their relationship to normed vector spaces. In addition to the embeddings of string spaces to L_1, L_2 and other vector spaces, we also discussed applications of such results to more traditional problems in combinatorial pattern matching.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5124

Participants:

Amir, Ami (Bar Ilan University)
Andoni, Alexandr (MIT)
Apostolico, Alberto (Georgia Tech)
Chakrabarti, Amit (Dartmouth College)
Jowhari, Hossein (Simon Fraser University)
Landau, Gad (University of Haifa)
Lewenshtein, Moshe (Bar Ilan University)
Magen, Avner (University of Toronto)
Munro, Ian (University of Waterloo)
Paterson, Mike (University of Warwick)
Patrascu, Mihai (IBM)
Porat, Ely (Bar Ilan University)
Saglam, Mert (Simon Fraser University)
Sahinalp, Cenk (Simon Fraser University)
Skala, Matthew (University of Waterloo)
Woodruff, David (IBM)

Gauge Fields, Cosmology and Mathematical String Theory
February 1 - 6, 2009

Organizers:

Brian Greene (Columbia University)
Nikita Nekrasov (IHES)
Gordon Semenoff (University of British Columbia)
Stephen Shenker (Stanford University)

Our goal was to bring the most active scientists in these three communities together at a 5-day workshop. The objective is the transfer of ideas, the sharing of techniques and the cross-fertilization between research fields which, in the normal course of events, are becoming more and more disparate. Any event involving string cosmology is timely. This is the “age of precision cosmology,” where experiments are much more quantitative than in previous generations. For this reason, knowledge of the cosmos has been changing rapidly in recent years. Mathematics has made significant progress in unravelling the nature of string theory. It is clear that its understanding at the most fundamental level will require sophisticated, most likely new mathematics. Some of this new mathemtics is already there and bringing it into contact with physics is particularly timely.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5130

Participants:

Basu, Pallab (University of British Columbia)
Becker, Katrin (Texas A&M University)
Becker, Melanie (Texas A&M University)
Brandenberger, Robert (McGill University)
Buchel, Alex (Perimeter Institute)
Chemissany, Wissam (University of Lethbridge)
Chen, Si (University of British Columbia)
Dasgupta, Keshav (McGill University)
Doran, Charles (University of Alberta)
Gomis, Jaume (Perimeter Institute)
Grignani, Gianluca (University of Perugia)
Harmark, Troels (Niels Bohr Institute Copenhagen)
Hellerman, Simeon (IPMU, Tokyo)
Kaloper, Nemanja (UC Davis)
Karczmarek, Joanna (University of British Columbia)
Kleban, Matt (New York University)
Kruczenski, Martin (Purdue University)
Kutasov, David (University of Chicago)
Liu, Hong (MIT)
Minahan, Joseph (Uppsala University)
Mukherjee, Anindya (University of British Columbia)
Mukhi, Sunil (Tata Institute)
Okuda, Takuya (Perimeter Institute)
Orselli, Marta (Niels Bohr Institute, Copenhagen)
Peet, Amanda (University of Toronto)
Semenoff, Gordon (University of British Columbia)
Sethi, Savdeep (University of Chicago)
Sigurdson, Kris (University of British Columbia)
Taylor, Washington (MIT)
Trancanelli, Diego (UC Santa Barbara)
Vainshtein, Arkady (University of Minnesota)
Van Raamsdonk, Mark (University of British Columbia)
Verlinde, Herman (Princeton University)
Westphal, Alexander (Stanford University)
Yin, Xi (Harvard University)
Zarembo, Konstantin (École Normale Supérieure)

Stability Theoretic Methods in Unstable Theories
February 8 - 13, 2009

Organizers:

Bradd Hart (McMaster University)
Alf Onshuus (Universidad de los Andes)
Anand Pillay (University of Leeds)
Thomas Scanlon (UC Berkeley)
Frank Wagner (Université Lyon I)

Stability theory, in the sense of mathematical logic, consists of a collection of technical methods first developed to address the logical problem of classifying abstract models of mathematical theories. Stability theory has proven to be applicable to other mathematical problems ranging from understanding rational solutions of algebraic equations to setting definite bounds in learning processes in artificial intelligence. It has recently been shown that the techniques and methods used for the classification described above can be used in much more general settings. Researchers at this meeting studied these developments to extend the scope of stability theory to a wider range of mathematical theories.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5113

Participants:

Adler, Hans (University of Leeds)
Baldwin, John (University of Illinois at Chicago)
Baudisch, Andreas (Humboldt-Universität zu Berlin)
Ben Yaacov, Itaï (Université Lyon I)
Berenstein, Alexander (Universidad de Los Andes)
Bouscaren, Elisabeth (CNRS, Université Paris XI)
Boxall, Gareth (University of Leeds)
Casanovas, Enrique (Universitat de Barcelona)
Chatzidakis, Zoé (CNRS - Université Paris VII)
Chernikov, Artem (Humboldt Universität zu Berlin)
Dolich, Alfred (Chicago State University)
Dzamonja, Mirna (University of East Anglia)
Ealy, Clifton (Western Illinois University)
Gismatullin, Jakub (University of Wroclaw)
Goodrick, John (University of Maryland)
Hart, Bradd (McMaster University)
Haskell, Deirdre (McMaster University)
Hasson, Assaf (Oxford University)
Hils, Martin (Université Paris VII)
Hrushovski, Ehud (Yale University)
Kamensky, Moshe (University of Waterloo)
Kaplan, Itay (Hebrew University of Jerusalem)
Kikyo, Hirotaka (Kobe University)
Kim, Byunghan (Yonsei University)
Krupinski, Krzysztof (University of Wroclaw)
Laskowski, Chris (University of Maryland)
Lippel, David (Haverford College)
Macpherson, Dugald (Leeds)
Malliaris, Maryanthe (UC Berkeley)
Moosa, Rahim (University of Waterloo)
Newelski, Ludomir (University of Wroclaw)
Onshuus, Alf (Universidad de los Andes)
Patel, Rehana (Harvard University)
Ramakrishnan, Janak (Université Lyon I)
Scanlon, Thomas (UC Berkeley)
Simon, Pierre (ENS Paris)
Steinhorn, Charles (Vassar College)
Tent, Katrin (Universität Münster)
Usvyatsov, Alex (Universidad de Lisboa)
VanDieren, Monica (Robert Morris University)
Vasilyev, Yevgeniy (Memorial University)
Wagner, Frank (Université Lyon I)
Wood, Carol (Wesleyan University)
Ziegler, Martin (Albert-Ludwigs-Universität Freiburg)

Computational Mathematics of Discrete Surfaces
February 15 - 20, 2009

Organizers:

Konrad Polthier (Freie Universität Berlin)
Helmut Pottmann (Vienna University of Technology)
Alla Sheffer (University of British Columbia)

Discrete surfaces consisting of triangles and polygonal faces are fundamental for the computational modeling and simulation of real world shapes. In the mathematics and computer science communities, discrete surfaces are investigated from several vastly different perspectives including differential and computational geometry, computer graphics, and scientific computing. This workshop aims to combine the knowledge accumulated in these different research communities to advance the mathematical insight and to develop effective computational methods for principled processing of discrete surfaces.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5119

Participants:

Alexa, Marc (Technische Universität Berlin)
Alliez, Pierre (INRIA Sophia Antipolis)
Botsch, Mario (Bielefeld University)
Bradley, Derek (University of British Columbia)
Chen, Xi (University of British Columbia)
Dey, Tamal (Ohio State University)
Dyer, Ramsay (Simon Fraser University)
Floery, Simon (Technische Universität Wien)
Gotsman, Craig (Technion)
Grimm, Cindy (Washington University)
Grinspun, Eitan (Columbia University)
Gu, David (SUNY Stony Brook)
Hildebrandt, Klaus (Freie Universität Berlin)
Hormann, Kai (Clausthal University of Technology)
Kazhdan, Misha (Johns Hopkins University)
Kilian, Martin (Technische Universität Wien)
Kobbelt, Leif (RWTH Aachen)
Nealen, Andrew (Rutgers University)
Nieser, Matthias (Freie Universität Berlin)
Pauly, Mark (ETH Zurich)
Polthier, Konrad (Freie Universität Berlin)
Popa, Tiberiu (University of British Columbia)
Rumpf, Martin (University of Bonn)
Schaefer, Scott (Texas A&M University)
Sechelmann, Stefan (Technische Universität Berlin)
Sheffer, Alla (University of British Columba)
Silva, Claudio T. (University of Utah)
Sorkine, Olga (New York University)
Tamstorf, Rasmus (Walt Disney Animation Studios)
Vouga, Etienne (Columbia University)
Wallner, Johannes (Graz University of Technology)
Wardetzky, Max (Georg-August-University Goettingen)
Wicke, Martin (Stanford University)
Xu, Kevin (Kai) (Simon Fraser University)
Zhang, Richard (Simon Fraser University)
Zhang, Eugene (Oregon State University)
Zorin, Denis (New York University)

Random Fields and Stochastic Geometry
February 22 - 27, 2009

Organizers:

Robert Adler (Technion-Israel Institute of Technology) **Jonathan Taylor** (Stanford University)

Of the various terms in the title of this workshop, Geometry, as perhaps the oldest of all mathematical disciplines, needs no introduction. Stochastic Geometry, which dates back to the 18th century, is young by comparison, and studies the geometry of structures produced in a random fashion. The study of random surfaces and functions (or "random fields," as they are known technically) is but an infant compared to these, with a history of less than a century. It draws from classic Geometry, from Stochastic Geometry, and from Random Process theory. Over the past three decades, major advances have been made in developing this theory, with significant applications of the results to areas as widespread as Medical Imaging and Cosmology. In particular, over the last 5 years, some quite major breakthroughs in the theory have occurred. The aim of this workshop is to both investigate their potential for yet further advances in the theory and, just as importantly, in applications to non-mathematical problems.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5040

Participants:

Adler, Robert (Technion)
Anderes, Ethan (UC Berkeley)
Azais, Jean-Marc (Université de Toulouse)
Bartz, Kevin (Harvard University)
Burgisser, Peter (University of Paderborn)
Chamandy, Nicholas (Google)
Dennis, Mark (University of Bristol)
Farzan, Rohani (McGill University)
Feldman, Raya (UC Santa Barbara)
Hug, Daniel (Universität Duisburg-Essen)
Jakobson, Dmitry (McGill University)
Joshi, Sarang (University of Utah)
Khoshnevisan, Davar (University of Utah)
Kou, Samuel (Harvard University)
Kuriki, Satoshi (Institute of Statistical Mathematics)
Marinucci, Domenico (University of Rome)
Mazza, Christian (Université de Fribourg)
Nardi, Yuval (Carnegie Mellon University)
Ninomiya, Yoshiyuki (Kyushu University)
Renaud, Olivier (Université de Genève)
Rootzen, Holger (Chalmers Institute of Technology)
Samorodnitsky, Gennady (Cornell University)
Schneider, Rolf (University of Freiburg)
Schwartzman, Armin (Harvard School of Public Health)
Siegmund, David (Stanford University)
Spodarev, Evgeny (Ulm University)
Sun, Jiayang (Case Western Reserve University)
Takemura, Akimichi (University of Tokyo)
Taylor, Jonathan (Stanford University)
Tecuapetla Gomez, Inder Rafael (Cornell University)
Teguia, Alberto M (Duke University)
Vadlamani, Sreekar (Stanford University)
Vitale, Rick (University of Connecticut)
Weil, Wolfgang (Universitaet Karlsruhe)
Wigman, Igor (CRM, Université de Montréal)
Wilson, Richard (The University of Queensland)
Wschebor, Mario (Universidad de la Republica Uruguay)
Xiao, Yimin (Michigan State University)
Younes, Laurent (Johns Hopkins University)
Zelditch, Steve (Johns Hopkins University)

Multivariable Complex Dynamics
March 1 - March 6, 2009

Organizers:

Eric Bedford (Indiana University)

Jeffrey Diller (University of Notre Dame)

Dynamical systems concerns itself with making predictions about the distant future in situations governed by definite but often quite complicated mathematical rules. The solar system, the weather, and the stock market are all things modeled mathematically as dynamical systems. In all these examples, one finds that small gaps in knowledge make precise predictions about the future practically impossible. Nevertheless, dynamical systems provides tools for describing the future in probabilistic terms, forecasting broad trends rather than specific occurrences.

Our workshop in multivariable complex dynamics takes up this theme for a class of systems known as “meromorphic mappings.” These are mathematically much easier to analyze than things like the weather, but they arise naturally in computer algorithms and in various physical models. Furthermore, recent progress in understanding meromorphic dynamics has revealed beautiful connections with algebra, geometry, and number theory, enriching our perspective on a large range of mathematics beyond dynamical systems.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5060

Participants:

Abate, Marco (Università di Pisa)
Bayraktar, Turgay (Indiana University)
Bedford, Eric (Indiana University)
Benini, Anna (SUNY Stony Brook)
Bonifant, Araceli (University of Rhode Island)
Cantat, Serge (Université de Rennes)
DeMarco, Laura (University of Chicago)
Deserti, Julie (Université Paris Diderot)
Diller, Jeffrey (University of Notre Dame)
Dujardin, Romain (Université Paris Diderot)
Firsova, Tatiana (University of Toronto)
Fornaess, John Erik (University of Michigan)
Jonsson, Mattias (University of Michigan)
Kim, Kyounghee (Florida State University)
Koch, Sarah (Cornell University)
Lin, Jan-Li (Indiana Unviersity)
Lipa, Chris (Cornell University)
Lyubich, Mikhail (SUNY Stony Brook)
Milnor, John (SUNY Stony Brook)
Moncet, Arnaud (Université de Rennes 1)
Parra, Manuel Rodrigo (University of Michigan, Ann Arbor)
Peters, Han (SUNY Stony Brook)
Petersen, Carsten Lunde (Roskilde University)
Raissy, Jasmin (Università di Pisa)
Roeder, Roland (University of Toronto)
Rong, Feng (Syracuse University)
Ruggiero, Matteo (Scuola Normale Superiore)
Truong, Tuyen (Indiana University)
Vivas, Liz (University of Michigan, Ann Arbor)
Wulcan, Elizabeth (University of Michigan)
Zinsmeister, Michel (Université d’Orléans)

Data Analysis Using Computational Topology and Geometric Statistics
March 8 - 13, 2009

Organizers:

Peter Bubenik (Cleveland State University)
Gunnar Carlsson (Stanford University)
Peter Kim (University of Guelph)

Mathematical scientists are being asked to apply their techniques to large, complex data sets, for which traditional methods are inadequate. Examples include data from natural images, gene-chips, neuroscience, protein interactions, sensor networks, astronomy, biomechanics, medical imaging and music. These present challenges in representation, visualization, interpretation and analysis. Two approaches to this problem are given by the fields of Computational Topology and Geometric Statistics. Although these fields have used different techniques, they share an understanding that there is some underlying geometry from which the data is generated by statistical sampling. This workshop will bring together these two approaches for the purpose of statistical data analysis.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5112

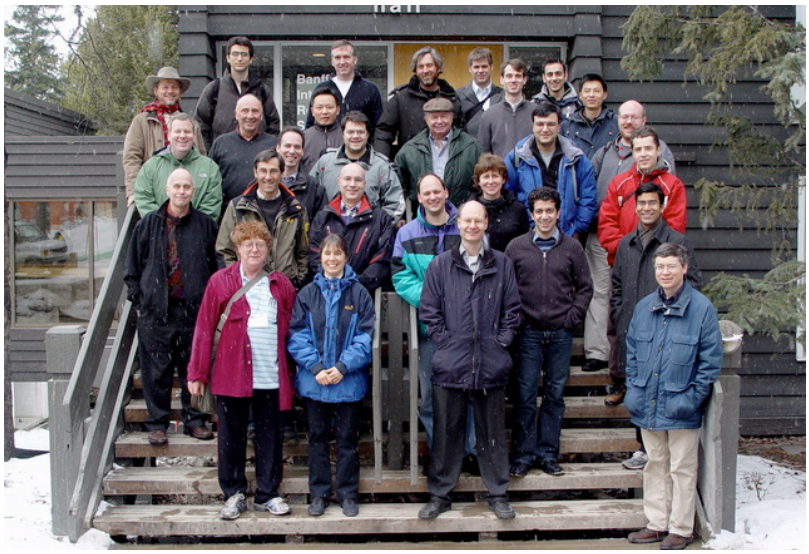
Participants:

Asimov, Daniel (UC Berkeley)
Attali, Dominique (CNRS Grenoble)
Bubenik, Peter (Cleveland State University)
Carlsson, Gunnar (Stanford University)
Chang, Ted (University of Virginia)
Chazal, Frederic (INRIA Saclay Ile-de-France)
Chung, Moo (University of Wisconsin, Madison)
Cohen-Steiner, David (INRIA Sophia Antipolis)
de Silva, Vin (Pomona College)
Denham, Graham (University of Western Ontario)
Dey, Tamal (Ohio State University)
Feichtner-Kozlov, Dmitry (University of Bremen)
Gamble, Jennifer (University of Alberta)
Guibas, Leonidas (Stanford University)
Heo, Giseon (University of Alberta)
Holmes, Susan (Stanford University)
Huckemann, Stephan (University of Goettingen)
Jardine, Rick (University of Western Ontario)
Jupp, Peter (St Andrews University)
Kahle, Matthew (Stanford University)
Kim, Peter (University of Guelph)
Klemela, Jussi (University of Oulu)
Lieutier, Andre (Dassault Systemes)
Luo, Zhiming (University of Guelph)
McNicholas, Paul (University of Guelph)
Memoli, Facundo (Stanford University)
Mileyko, Yuriy (Georgia Tech)
Mischaikow, Konstantin (Rutgers University)
Morozov, Dmitriy (Stanford University)
Morton, Jason (Stanford University)
Mukherjee, Sayan (Duke University)
Munk, Axel (Institute of Mathematical Stochastics, Goettingen)
Patrangenaru, Victor (Florida State University)
Pelletier, Bruno (University of Montpellier II)
Pierrynowski, Michael (McMaster University)
Rivest, Louis-Paul (Laval University)
Schick, Thomas (Georg-August-Universitaet Goettingen)
Scott, Jonathan (Cleveland State University)
Smale, Steve (Toyota Technology Institute, Chicago)
Vejdemo Johansson, Mikael (Stanford University)
Wang, Yusu (Ohio State University)
Wang, Bei (Duke University)

Frames From First Principles: Error Correction, Symmetry Goals and Numerical Efficiency
March 15 - 20, 2009

Organizers:

Bernhard Bodmann (University of Houston)
Peter Casazza (University of Missouri)
Gitta Kutyniok (University of Osnabrueck)
Ozgur Yilmaz (University of British Columbia)



Digital signal transmissions have revolutionized our daily lives, from cellular phones and Voice-over-Internet-Protocol telephony to High-Definition Television and other streaming media. The use of digitization guarantees seemingly faultless communication by repeating information in the stream of transmitted bits and bytes. However, at times the digital nature of error suppression leads to behaviors that do not resemble the graceful degradation we recall from analog technology. Such problems could range from blocky images, choppy satellite radio, or dropped cell-phone calls to possible instabilities in digital fly-by-wire control systems. This undesirable behavior can be caused by imperfections in the digitization process or by transmissions using digital error-correction schemes which are not tailored to the type of the transmitted signal, say audio or video. Understanding the best way to use repeated information in the digitization as well as in the transmission processes seems the key to significant progress in this field. Engineers have already contributed many approaches to address this challenge, which lead to interesting mathematical questions. Answering these questions as well as developing a systematic treatment for digital transmissions is a primary motivation for this workshop.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5082

Participants:

Balan, Radu (University of Maryland)
Benedetto, John (University of Maryland)
Bodmann, Bernhard (University of Houston)
Boufounos, Petros (Rice University)
Bownik, Marcin (University of Oregon)
Calderbank, Robert (Princeton University)
Casazza, Peter (University of Missouri)
Christensen, Ole (Technical University of Denmark)
Cohn, Henry (Microsoft Research New England)
Daubechies, Ingrid (Princeton University)
Feichtinger, Hans (University of Vienna)
Fickus, Matthew (Air Force Institute of Technology)
Groechenig, Karl-Heinz (University of Vienna)
Gunturk, Sinan (Courant Institute)
Han, Bin (University of Alberta)
Heil, Christopher (Georgia Tech)
Jain, Saurabh (University of Houston)
Khatirinejad, Mahdad (Helsinki University of Technology)
Kutyniok, Gitta (University of Osnabrueck)
Lammers, Mark (University of North Carolina, Wilmington)
Lamoureux, Michael (University of Calgary)
Larson, David (Texas A&M University)
Li, Shidong (San Francisco State University)
Pfander, Goetz (Jacobs University)
Powell, Alex (Vanderbilt University)
Rauhut, Holger (University of Bonn)
Saab, Rayan (University of British Columbia)
Speegle, Darrin (Saint Louis University)
Steidl, Gabriele (University of Mannheim)
Strohmer, Thomas (UC Davis)
Tropp, Joel (Caltech)
Weber, Eric (Iowa State University)
Yilmaz, Ozgur (University of British Columbia)

Interactions of Geometry and Topology in Dimensions 3 and 4
March 22 - 27, 2009

Organizers:

Denis Auroux (MIT)
Hans Boden (McMaster University)
Olivier Collin (Université du Québec à Montréal)
John Etnyre (Georgia Tech)

This workshop focussed on interactions between symplectic geometry, gauge theory, contact topology, and applications to low-dimensional manifolds. While each of these areas has been very active for many years in an independent fashion, the theory of low-dimensional manifolds has greatly benefited from interactions with the other subjects represented at the event. Our workshop was a follow-up to the BIRS event Interactions of geometry and topology in low dimensions from March of 2007. Because the fields are progressing at a rapid pace, there were many new and interesting results presented at the workshop. Participants were selected from among the world experts in these areas. Organizers made an effort to balance interest between the different research areas and to ensure that the most important current trends were well represented. There was a good mixture of well-established researchers and younger talented mathematicians. This stimulated many lively discussions and enabled a rich exchange of ideas in all directions.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5095

Participants:

Auckly, Dave (Kansas State University)
Auroux, Denis (MIT)
Boden, Hans (McMaster University)
Bourgeois, Frédéric (Université Libre de Bruxelles)
Boyer, Steve (Université du Québec a Montréal)
Cebanu, Radu (Université du Québec à Montréal)
Colin, Vincent (Université de Nantes)
Collin, Olivier (Université du Quebéc à Montréal)
Dunfield, Nathan (UIUC)
Eftekhary, Eaman (IPM Tehran)
Ekholm, Tobias (Uppsala University)
Fintushel, Ronald (Michigan State University)
Fuller, Terry (California State University, Northridge)
Gay, David (University of Cape Town)
Ghiggini, Paolo (CNRS - Laboratoire Jean Leray)
Gordon, Cameron (University of Texas, Austin)
Grigsby, Julia (Columbia University)
Hedden, Matthew (MIT)
Honda, Ko (University Southern California)
Hutchings, Michael (University of California)
Jabuka, Stanislav (University of Nevada, Reno)
Kirby, Robion (UC Berkeley)
Kronheimer, Peter (Harvard University)
Kutluhan, Cagatay (University of Michigan)
Lekili, Yanki (MIT)
Livingston, Charles (Indiana University)
Naik, Swatee (University of Nevada, Reno)
Ng, Lenny (Duke University)
Ni, Yi (MIT)
Plamenevskaya, Olga (SUNY Stony Brook)
Stipsicz, Andras (Hungarian Academy of Sciences)
Strle, Saso (University of Ljubljana)
Thurston, Dylan (Barnard College, Columbia University)
Vertesi, Vera (Renyi Institute)
Vidussi, Stefano (UC Riverside)
Watson, Liam (Université du Québec à Montréal)
Wehrheim, Katrin (MIT)
Yazinski, Jonathan (Indiana University, Bloomington)

Invariants of Incidence Matrices
March 29 - April 3, 2009

Organizers:

Chris Godsil (University of Waterloo)
Peter Sin (University of Florida)
Qing Xiang (University of Delaware)

Incidence matrices are rectangular arrays of zeros and ones in which the columns and rows represent two sets of objects and the occurrence of a one in a certain row and column indicates a relation between the corresponding row object and column object. The study of incidence matrices is fundamental to several areas of algebra and combinatorics and also has applications in statistics to the design of experiments and in electrical engineering to the reliable transmission and storage of data. In organizing this workshop our goals were to provide a general context for a broad range of analogous problems which previously may have appeared isolated, and to publicize certain methods, approaches and problems from the component subdisciplines which were either unknown or had never been tried by researchers with other backgrounds. Our scientific aims will have been achieved if the workshop has accelerated the adoption of new methods, provoked interest in open problems and provided a framework for future collaborative work between different subdisciplines in which invariants of incidence matrices are important.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5071

Participants:

Akbari Feyzaabaadi, Saieed (IPM Tehran)
Anstee, Richard (University of British Columbia)
Arslan, Ogul (University of Florida)
Balachandran, Niranjan (Caltech)
Blokhuis, Aart (Technical University Eindhoven)
Brouwer, Andries (Technical University Eindhoven)
Bruen, Aiden (University of Calgary)
Chandler, David (University of Delaware)
Cioaba, Sebi (University of Toronto)
Dempwolff, Ulrich (Universität Kaiserslautern)
Ebert, Gary (University of Delaware)
Godsil, Chris (University of Waterloo)
Haemers, Willem H (Tilburg University)
Kantor, William (University of Oregon)
Kharaghani, Hadi (University of Lethbridge)
Khosrovshahi, Gholamreza B. (IPM Tehran)
Kim, Jon-Lark (University of Louisville)
Leung, Kahin (National University of Singapore)
Liebler, Robert (Colorado State University)
Moorhouse, Eric (University of Wyoming)
Mullin, Natalie (University of Waterloo)
Muzychuk, Mikhail (Netanya Academic College)
Newman, Michael (University of Ottawa)
Roy, Aidan (University of Calgary)
Sastry, Narasimha (Indian Statistical Institute)
Saunders, David B. (University of Delaware)
Schmidt, Bernhard (Nanyang Technological University)
Shirazi, Hamed (University of Waterloo)
Sin, Peter (University of Florida)
Singhi, Navin (Tata Institute)
Storme, Leo (Ghent University)
Tayfeh-Rezaie, Behruz (IPM Tehran)
Tonchev, Vladimir (Michigan Technological University)
Wilson, Richard (Caltech)
Wu, Yaokun (Shanghai Jiao Tong University)

Semiparametric and Nonparametric Methods in Econometrics
April 5 - 10, 2009

Organizers:

Yacine Ait-Sahalia (Princeton University)
Joel L. Horowitz (Northwestern University)
Oliver Linton (London School of Economics)
Enno Mammen (University of Mannheim)

The main objective of this workshop is to bring together mathematical statisticians and econometricians who work in the field of nonparametric and semiparametric statistical methods. Nonparametric and semiparametric methods are active fields of research in econometric theory and are becoming increasingly important in applied econometrics. This is because the flexibility of non- and semi-parametric modelling provides important new ways to investigate problems in substantive economics. Moreover, the development of non- and semiparametric methods that are suitable to the needs of economics presents a variety of mathematical challenges.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5032

Participants:

Andrews, Donald (Yale University)
Bickel, Peter (UC Berkeley)
Chen, Xiaohong (Yale University)
Dümbgen, Lutz (Universität Bern)
Florens, Jean-Pierre (Toulouse School of Economics)
Gijbels, Irene (Katholieke Universiteit Leuven)
Horowitz, Joel L. (Northwestern University)
Ichimura, Hidehiko (University of Tokyo)
Jacho-Chavez, David Tomas (Indiana University)
Kitamura, Yuichi (Yale University)
Komarova, Tatiana (London School of Economics)
Kristensen, Dennis (Columbia University)
Lee, Sokbae (University College London)
Lewbel, Arthur (Boston College)
Linton, Oliver (London School of Economics)
Mammen, Enno (University of Mannheim)
Matzkin, Rosa (UCLA)
Melly, Blaise (Brown University)
Newey, Whitney (MIT)
Robinson, Peter (London School of Economics)
Rothe, Christoph (University of Mannheim)
Schienle, Melanie (University of Mannheim)
Simoni, Anna (Toulouse School of Economics)
Spokoiny, Vladimir (WIAS and Humboldt University Berlin)
Srisuma, Sorawoot (London School of Economics)
Van Bellegem, Sebastien (Université de Toulouse I)
van der Vaart, Aad (Vrije Universiteit)
Van Keilegom, Ingrid (Université catholique de Louvain)
VanHems, Anne (Toulouse Business School)
Whang, Yoon-Jae (Seoul National University)
Yu, Kyusang (University of Mannheim)

Advances and Perspectives on Numerical Methods for Saddle Point Problems
April 12 - April 17, 2009

Organizers:

Howard Elman (University of Maryland)
Chen Greif (University of British Columbia)
Dominik Schoetzau (University of British Columbia)
Andrew Wathen (Oxford University)

The primary objective of this workshop was to address and discuss the most recent advances in saddle point research and identify emerging new directions and applications. For example, saddle point problems in optimal flow control present new issues and have received much attention over the last few years: the contraints (forward problems) are partial differential equations whose numerical solution is a challenge by itself. Another example are multiphysics problems (e.g. multiphase flow or magnetohydrodynamics applications) in which several physical models of a different scale and different properties are coupled. Important numerical challenges are how to efficiently solve these problems, to what level of accuracy, and how to exploit the properties of the underlying continuous problems. More specifically, longstanding issues are: design and numerical analysis of new and robust discretization techniques, singularity detection and resolution, treatment of ill-posed inverse problems, development of preconditioners and fast iterative solvers, and implementation on parallel computing platforms for simulating large scale engineering applications.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5101

Participants:

Bacuta, Constantin (University of Delaware)
Bai, Zhong-Zhi (Chinese Academy of Sciences)
Benzi, Michele (Emory University)
Bochev, Pavel (Sandia National Laboratories)
Bridson, Robert (University of British Columbia)
Dollar, Sue (Rutherford Appleton Laboratory)
El Maliki, Abderrahman (Université Laval)
Elman, Howard (University of Maryland)
Gondzio, Jacek (University of Edinburgh)
Greif, Chen (University of British Columbia)
Haber, Eldad (Emory University)
Kanschat, Guido (Texas A&M University)
Le Borne, Sabine (Tennessee Technological University)
Lehoucq, Richard (Sandia National Laboratories)
Li, Dan (University of British Columbia)
Liesen, Joerg (Technical University of Berlin)
Loghin, Daniel (University of Birmingham)
Maes, Chris (Stanford University)
Olshanskii, Maxim (Moscow Lomonosov State University)
Overton, Michael (New York University)
Powell, Catherine (University of Manchester)
Ramage, Alison (University of Strathclyde)
Rees, Tyrone (Oxford University)
Reusken, Arnold (RWTH Aachen)
Rozloznik, Miro (Academy of Sciences of the Czech Republic)
Saunders, Michael (Stanford University)
Schenk, Olaf (University of Basel)
Schoeberl, Joachim (RWTH Aachen)
Schoetzau, Dominik (University of British Columbia)
Silvester, David (University of Manchester)
Simoncini, Valeria (Università di Bologna)
Spence, Alastair (University of Bath)
Stoll, Martin (Oxford University)
Szyld, Daniel (Temple University)
Wei, Xiaoxi (University of British Columbia)
Wong, Elizabeth (UC San Diego)
Xue, Fei (University of Maryland)
Zhu, Liang (University of British Columbia)
Zulehner, Walter (Johannes Kepler University, Linz)

Random Schrödinger Operators: Universal Localization, Correlations, and Interactions April 19 - 24, 2009

Organizers:

Jean Bellissard (Georgia Tech)
Peter Hislop (University of Kentucky)
Abel Klein (UC Irvine)
Gunter Stolz (University of Alabama, Birmingham)

The basic theory of electrical conductivity is a simple model of an electron moving in a perfect crystal of identical atoms. However, perfect crystals do not exist in nature, so it is natural to consider impurities and defects in crystals. The properties of these real crystals are very different. One of the most striking effects is that electrons do not propagate freely and may actually be localized in space. The mathematical theory of random Schrodinger operators provides models which allow a rigorous study of the propagation properties of electrons in disordered systems and thus an understanding of the finite conductivity observed in nature. The goal of the workshop was to bring leading international experts together to discuss these new developments and to focus the research community on outstanding open problems.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5116

Participants:

Bellissard, Jean (Georgia Tech)
Boumaza, Hakim (Keio University)
Breuer, Jonathan (Caltech)
Combes, Jean Michel (Université de Sud Toulon-Var)
Damanik, David (Rice University)
Disertori, Margherita (Université de Rouen)
Dombrowski, Nicolas (Université de Cergy-Pontoise)
Elgart, Alexander (Virginia Tech)
Erdos, Laszlo (LMU Munich)
Figotin, Alexander (UC Irvine)
Froese, Richard (University of British Columbia)
Germinet, François (Université de Cergy-Pontoise)
Goldstein, Michael (University of Toronto)
Halasan, Florina (University of British Columbia)
Hamza, Eman (Michigan State University)
Hasler, David (College of William & Mary)
Hislop, Peter (University of Kentucky)
Hoecker-Escuti, Francisco (Université Paris XIII)
Hundertmark, Dirk (University of Illinois)
Kang, Yang (Michigan State University)
Karpeshina, Yulia (University of Alabama, Birmingham)
Klein, Abel (UC Irvine)
Klopp, Frédéric (Université Paris XIII)
Kritchevski, Evgenij (University of British Columbia)
Krueger, Helge (Rice University)
Lenz, Daniel (Technische Universität Chemnitz)
Metzger, Bernd (Université Paris XIII)
Mueller, Peter (Ludwig-Maximilians-Universitaet Muenchen)
Nakamura, Shu (University of Tokyo)
Nakano, Fumihiko (Kochi University)
Post, Olaf (Humboldt Universitaet Berlin)
Sadel, Christian (Georgia Tech)
Schenker, Jeffrey (Michigan State University)
Schulz-Baldes, Hermann (Universität Erlangen)
Shterenberg, Roman (University of Alabama, Birmingham)
Stoiciu, Mihai (Williams College)
Stolz, Gunter (University of Alabama, Birmingham)
Tchoulaevski, Victor (Université de Reims)
Wang, Wei-Min (Université Paris XI)

Multiscale Processes in the Tropics
April 26 - May 1, 2009

Organizers:

Boualem Khouider (University of Victoria)
Andrew Majda (Courant Institute)
Norman McFarlane (Canadian Centre for Climate Modelling and Analysis)
Adam Monahan (University of Victoria)

The tropical climate is characterized by dramatic variability affecting billions of lives, with sudden storms bringing heavy rainfall and floods or extended droughts resulting in crop failure. Unlike the mid-latitude regions, the large-scale organisation of irregular tropical weather was a mystery, and tropical weather events were believed to be unpredictable. Recent developments have significantly improved our understanding of tropical atmosphere dynamics and the associated rainfall variability. It is now recognized in the scientific community that tropical climate is organized into a hierarchy of almost-periodic oscillations occurring on different time scales (from days through months to years), and embedded one in the other.
University-based mathematicians and physicists together with scientists from operational climate modelling centres gathered in the Banff International Research Station to discuss “Multiscale Processes in the Tropics.” New theoretical and observational results in tropical meteorology, with a particular emphasis on the MJO and other features of organised tropical convection, and bringing to bear on the problem modern techniques of applied mathematics such as asymptotic analysis, stochastic and statistical physics, and numerical modeling.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5073

Participants:

Ajayamohan, R. S. (Environment Canada)
Austin, Phillip (University of British Columbia)
Biello, Joseph (UC Davis)
Davoudi, Jahanshah (University of Toronto)
Deng, Qiang (University of Wisconsin, Madison)
Dolaptchiev, Stamen (Free University of Berlin)
Dunkerton, Timothy (Northwest Research Associates)
Frenkel, Yevgeniy (New York University)
Frierson, Dargan (University of Washington)
Haertel, Patrick (Yale University)
Han, Ying (University of Victoria)
He, Yanping (University of Victoria)
Johnson, Richard (Colorado State University)
Khouider, Boualem (University of Victoria)
Kiladis, George (NOAA)
Klein, Rupert (Freie Universität Berlin)
Lin, Jia-Lin (Ohio State University)
Lin, Hai (Environment Canada)
Majda, Andrew (Courant Institute)
McFarlane, Norman (Canadian Centre for Climate Modelling and Analysis)
Monahan, Adam (University of Victoria)
Montgomery, Michael (Naval Postgraduate School)
Muraki, David (Simon Fraser University)
Namazi, Maryam (University of Victoria)
Owinoh, Antony (Free University of Berlin)
Pauluis, Olivier (Courant Institute)
Qian, Taotao (The Ohio State University)
Ross, Ian (University of Victoria)
Roundy, Paul (SUNY Albany)
Shaw, Tiffany (University of Toronto)
Smith, Leslie (University of Wisconsin)
Smith, Roger (University of Munich)
Stechmann, Samuel (UCLA)
Takayabu, Yukari (University of Tokyo)
Tulich, Stefan (NOAA)
Waite, Micheal (University of Victoria)
Waliser, Duane (Caltech)
Yang, Gui-Ying (University of Reading)
Zhang, Chidong (University of Miami)

Causal Inference in Statistics and the Quantitative Sciences
May 3 - 8, 2009

Organizers:

Jay Kaufman (McGill University)
Erica E. M. Moodie (McGill University)
Robert Platt (McGill University)
David A. Stephens (McGill University)
Tyler VanderWeele (University of Chicago)

In performing inference, statisticians attempt to find associations between variables. Typically, however, it is not only association but causation which is of interest, that is, the statistician would like to say whether some exposure causes a particular outcome. Causal inference is an area of statistics in which methods are developed with the goal of uncovering the underlying structure of the data so as to eliminate all non-causative explanations for an observed association. Causal inference is a highly inter-disciplinary field, with important methodological and theoretical contributions from areas such the computer sciences and economics. Our five-day workshop reviewed recent advances in the causal inferences in statistic and brought together researchers from the quantitative sciences who work on causal inference methodology so that knowledge may be shared. Finally, we hope that this workshop will increase attention on causal inference amongst Canadian statisticians and other researchers.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5043

Participants:

Abadie, Alberto (Harvard University)
Arjas, Elja (University of Helsinki)
Chakraborty, Bibhas (University of Michigan)
Ertefaie, Ashkan (McGill University)
Geneletti, Sara (Imperial College London)
Glynn, Adam (Harvard University)
Goetghebeur, Els (University of Ghent)
Graham, Dan (Imperial College London)
Gustafson, Paul (University of British Columbia)
Henderson, Robin (University of Newcastle)
Hernan, Miguel (Harvard School of Public Health)
Hirano, Keisuke (University of Arizona)
Joffe, Marshall (University of Pennsylvania)
Kaufman, Jay (McGill University)
Lefebvre, Genevieve (Université du Québec à Montréal)
McCandless, Lawrence (Simon Fraser University)
Neufeld, Eric (University of Saskatchewan)
Noorbaloochi, Siamak (Center for Chronic Disease Outcome Research)
Pearl, Judea (UCLA)
Platt, Robert (McGill University)
Redman, Mary (Fred Hutchinson Cancer Research Center)
Rich, Benjamin (McGill University)
Richardson, Thomas (University of Washington)
Richardson, Sylvia (Imperial College)
Robins, James (Harvard University)
Rosenblum, Michael (UC San Francisco)
Schaubel, Doug (University of Michigan)
Schnitzer, Mireille (McGill University)
Sekhon, Jasjeet (UC Berkeley)
Shortreed, Susan (Monash University)
Small, Dylan (University of Pennsylvania)
Strumpf, Erin (McGill University)
Stuart, Elizabeth (Johns Hopkins Bloomberg School of Public Health)
van der Laan, Mark (UC Berkeley)
VanderWeele, Tyler (University of Chicago)
Xiao, Yongling (McGill University)

Mathematical Immunology of Infectious Diseases
May 17 - 22, 2009

Organizers:

Jane Heffernan (York University)
Beni Sahai (Cadham Provincial Laboratory)
Robert Smith? (University of Ottawa)

There is strong motivation for the development of mathematical models that help us minimize the frequency and severity of infectious disease outbreaks (e.g. SARS, Influenza, HIV, HPV). There are two major fields of mathematical modeling of infectious diseases. Mathematical epidemiology focuses on the spread of disease at the population level with the aim of tracing factors that contribute to pathogen propagation. Mathematical immunological models of infectious disease focus on disease progression within an infected host.
This workshop will combine the expertise of international leaders and active researchers working in the fields of mathematical immunology, epidemiology, evolutionary dynamics and public health. Only by this integrated approach can we fully account for the complex interplay between infectious pathogens and the immune system, drug therapy or vaccine interventions and other key contributors to the growth of a pathogen in-host. Models that combine immunological and epidemiological characteristics will also have an important focus in this workshop since such models have great potential to provide new insights into the mechanism of pathogen growth, suggest new lines of research, and produce guidelines for the development of new drug therapies or vaccination protocols.
For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5054

Participants:

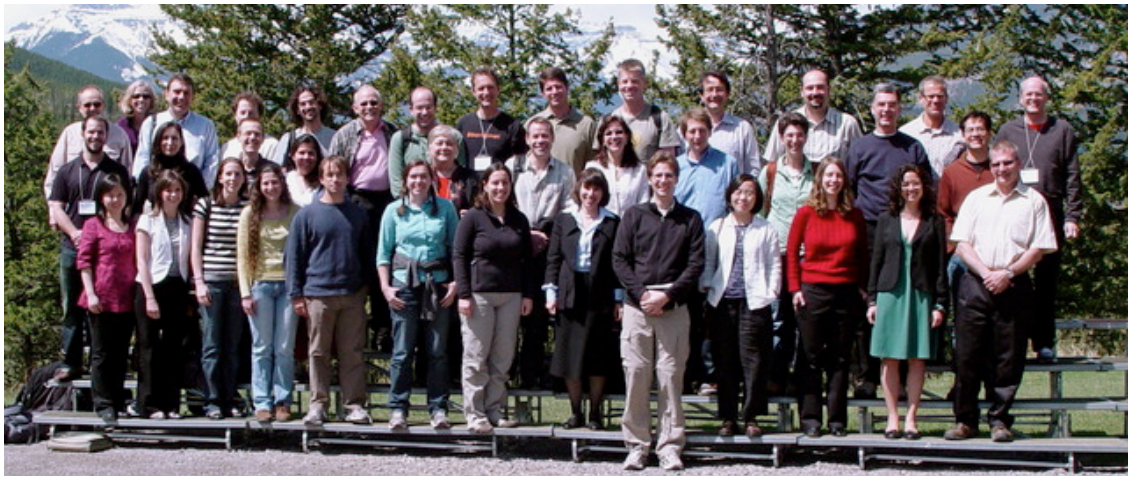
Alexander, Murray (IBD-NRC)
Alexander, Helen (Queen's University)
Anvari, Vahid (York University)
Arino, Julien (University of Manitoba)
Bauch, Chris (University of Guelph)
Beauchemin, Catherine (Ryerson University)
Bhattacharyya, Samit (University of Guelph)
Bretscher, Peter (University of Saskatchewan)
Chhibba, Ruchi (Cadham Provincial Laboratory)
Ciupe, Stanca (Duke University)
Coombs, Daniel (University of British Columbia)
De Boer, Rob (Utrecht University)
Ghosh, Suma (York University)
Gilchrist, Michael (University of Tennessee)
He, Wenhua (Mount Royal)
Heffernan, Jane (York University)
Jaberi-Douraki, Majid (University of New Brunswick)
Li, Jing (University of Ottawa)
Li, Michael (University of Alberta)
Liu, Luju (Memorial University)
Lou, Yijun (Memorial University)
Madras, Neal (York University)
Miron, Rachelle (Ottawa University)
Murall, Carmen (University of Guelph)
Osgood, Nathaniel (University of Saskatchewan)
Perelson, Alan (Los Alamos National Laboratory)
Portet, Stephanie (University of Manitoba)
Reluga, Tim (Pennsylvania State University)
Ribeiro, Ruy (Los Alamos National Laboratory)
Sahai, Beni (Cadham Provincial Laboratory)
Schwartz, Elissa (Washington State University)
Severins, Maite (Utrecht University)
Smith?, Robert (University of Ottawa)
Svishchuk, Mariya (Mount Royal College)
Talbert-Slagle, Kristina (Yale University)
van den Driessche, Pauline (University of Victoria)
Vickers, David (University of Saskatchewan)
Wahl, Lindi (University of Western Ontario)
Wang, Xiaohong (Arizona State University)
Wang, Yan (University of British Columbia)
Wodarz, Dominik (UC Irvine)

Probabilistic Models of Cognitive Development
May 24 - 29, 2009

Organizers:

Tom Griffiths (UC Berkeley)

Fei Xu (University of British Columbia)



This workshop aims to capitalize on a major new direction in research on formal models of human cognition. The question of how people come to know so much about the world on the basis of their limited experience has been at the center of the study of the mind since it was first asked by Plato. This question takes modern form in the nature-nurture debate, which has guided the study of cognitive development from infants to middle childhood over the last few decades. This debate has been hard to resolve without formal tools for evaluating what might plausibly be learned from experience, and what kind of constraints are necessary to support the inferences that children make. In recent years, several researchers in the cognitive sciences have argued that the nature-nurture framework may have set up a false dichotomy. A more fruitful and productive research strategy may be to find principled ways of combining prior constraints with statistical information in the input. By analyzing the conclusions that a rational learner might draw from the data provided by experience, Bayesian models can be used to investigate how nature and nurture contribute to human knowledge.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5100

Participants:

Abelev, Maxim (University of British Columbia)
Aslin, Richard (University of Rochester)
Baldwin, Dare (University of Oregon)
Bonatti, Luca (University of Nantes)
Bonawitz, Liz (MIT)
Buchsbaum, Daphna (UC Berkeley)
Chater, Nick (University College London)
Ciancetta, Matthew (California State University, Chico)
Colunga, Eliana (University of Colorado)
Danks, David (Carnegie Mellon University)
Denison, Stephanie (University of British Columbia)
Dewar, Kathryn (University of British Columbia)
Feldman, Naomi (Brown University)
Frank, Michael (MIT)
Gerken, LouAnn (University of Arizona)
Girotto, Vittorio (University Iuav of Venice)
Goldwater, Sharon (University of Edinburgh)
Gomez, Rebecca (University of Arizona)
Goodman, Noah (MIT)
Gopnik, Alison (UC Berkeley)
Griffiths, Tom (UC Berkeley)
Johnson, Scott (UCLA)
Johnson, Mark (Brown University)
Kemp, Charles (Carnegie Mellon University)
Kushnir, Tamar (Cornell University)
Lee, Michael (UC Irvine)
Lehrer, Rich (Vanderbilt University)
Lidz, Jeff (University of Maryland)
Lucas, Christopher (UC Berkeley)
Ma, Lili (University of British Columbia)
Mareschal, Denis (Birkbeck College)
McClelland, Jay (Stanford University)
Newport, Elissa (University of Rochester)
Perfors, Amy (MIT)
Regier, Terry (University of Chicago)
Saffran, Jenny (University of Wisconsin, Madison)
Shafto, Patrick (University of Louisville)
Shultz, Thomas (McGill University)
Strevens, Michael (New York University)
Tenenbaum, Josh (MIT)
Werker, Janet (University of British Columbia)
Xu, Fei (University of British Columbia)

Complex Analysis and Complex Geometry
May 31 - June 5, 2009

Organizers:

Dan Coman (Syracuse University)
Finnur Larusson (University of Adelaide)
Stefan Nemirovski (Steklov Institute)
Rasul Shafikov (University of Western Ontario)

Complex analysis and complex geometry is an active area of modern mathematics. It interacts with many other areas of mathematics and has applications in physics and engineering. Forty experts from many countries have gathered in Banff to report on recent progress in the area and discuss open problems.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5033

Participants:

Barrett, David (University of Michigan)
Blocki, Zbigniew (Jagiellonian University)
Bloom, Thomas (University of Toronto)
Boucksom, Sebastien (Institut Mathématique de Jussieu)
Chakrabarti, Debraj (University of Notre Dame)
Coman, Dan (Syracuse University)
de Oliveira, Bruno (University of Miami)
Dharmasena, Dayal (Syracuse University)
Gaussier, Herve (University of Provence, Marseille)
Gong, Xianghong (University of Wisconsin)
Guedj, Vincent (Université Aix-Marseille)
Halfpap, Jennifer (University of Montana)
Heier, Gordon (UC Riverside)
Ho, Pak Tung (Purdue University)
Isaev, Alexander (Australian National University)
Ivashkovich, Sergey (University of Lille-1)
Jöricke, Burglind (IHES)
Kruzhilin, Nikolay (Steklov Mathematical Institute)
Kutzschebauch, Frank (Universität Bern)
Larusson, Finnur (University of Adelaide)
Lempert, Laszlo (Purdue University)
Levenberg, Norm (Indiana University)
Masagutov, Vakhid (Purdue University)
Meersseman, Laurent (PIMS/Université de Bourgogne)
Merker, Joel (ENS)
Patyi, Imre (Georgia State University)
Perkins, Tony (Syracuse University)
Pinchuk, Sergey (Indiana University)
Poletsky, Evgeny (Syracuse University)
Porten, Egmont (Mid Sweden University)
Rosay, Jean-Pierre (University of Wisconsin)
Shafikov, Rasul (University of Western Ontario)
Shcherbina, Nikolay (Wuppertal)
Stensones, Berit (University of Michigan, Ann Arbor)
Sukhov, Alexandre (University of Lille-1)
Taylor, Al (University of Michigan)
Vassiliadou, Sophia (Georgetown University)
Vivas, Liz (University of Michigan, Ann Arbor)
Winkelmann, Jörg (Mathematisches Institut, Bayreuth)
Zeager, Crystal (University of Michigan)
Zerhusen, Aaron (Illinois Wesleyan University)

Advances in Stochastic Inequalities and their Applications
June 7 - 12, 2009

Organizers:

Luc Devroye (McGill University)
Gabor Lugosi (ICREA and Pompeu Fabra University)
David M. Mason (University of Delaware)

The need for stochastic inequalities arises whenever one cannot compute a probability exactly. This especially occurs when one models complex phenomenon such as stock market and weather fluctuations as random processes or one makes decisions in the face of uncertainty. Stochastic inequalities provide bounds on the likelihood that certain events of interest will occur, for instance, the odds that a stock will reach a certain price by a particular date or that it will rain on a given day.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5004

Participants:

Adamczak, Radoslaw (University of Warsaw)
Addario-Berry, Louigi (Université de Montréal)
Berthet, Philippe (University of Toulouse)
Boucheron, Stephane (Université Paris VII)
Broutin, Nicolas (McGill University)
Chafai, Djalil (INRA Toulouse and IMT)
de La Pena, Victor (Columbia University)
Deheuvels, Paul (University of Paris VI)
Devroye, Luc (McGill University)
Dony, Julia (Free University Brussels)
Dubhashi, Devdatt (Chalmers University and Göteborg University)
Einmahl, Uwe (Free University Brussels)
Giné, Evarist (University of Connecticut)
Goetze, Friedrich (University of Bielefeld)
Koltchinskii, Vladimir (Georgia Tech)
Kuelbs, Jim (University of Wisconsin, Madison)
Latala, Rafal (University of Warsaw)
Li, Wenbo (University of Delaware)
Li, Deli (Lakehead University)
Litvak, Alexander (University of Alberta)
Luczak, Malwina (London School of Economics)
Lugosi, Gabor (ICREA and Pompeu Fabra University)
Mason, David M. (University of Delaware)
Massart, Pascal (Université de Paris XI)
Maurer, Andreas (Stemmer Imaging)
Meckes, Elizabeth (Case Western Reserve University)
Meckes, Mark (Case Western Reserve University)
Merlevede, Florence (University of Paris XII)
Neininger, Ralph (J.W. Goethe-Universität)
Nickl, Richard (University of Cambridge)
Oleszkiewicz, Krzysztof (University of Warsaw)
Peligrad, Magda (University of Cincinnati)
Pinelis, Iosif (Michigan Technological University)
Radulovic, Dragan (Florida Atlantic University)
Seregin, Arseni (University of Washington)
Steele, J. Michael (University of Pennsylvania)
Tomczak-Jaegermann, Nicole (University of Alberta)
Veraar, Mark (Delft University of Technology)
Wellner, Jon (University of Washington)
Zinn, Joel (Texas A&M University)
Zvavitch, Artem (Kent State University)

The Keith Worsley Workshop on Computational Modeling of Brain Dynamics: from Stochastic Models to Neuroimages June 14 - 19, 2009

Organizers:

Viktor Jirsa (Theoretical Neuroscience Group)
Pedro A. Valdés-Sosa (Cuban Neuroscience Center)
Keith Worsley (McGill University)

Recent developments in brain imaging technology have provided a wealth of information about the detailed structure and function of the human brain, organized by the Human Brain Mapping Project in public domain databases similar to those of the Human Genome. Yet we are still far from understanding how the interactions of neurons organized into complex networks originate mental states and cognitive processes. A major stumbling block is that the sophisticated set of mathematical and physical models that have been developed to model neural activity, while explaining in a qualitative fashion some brain phenomena, have yet to be used to explain in detail the processes occurring in a given individual's brain and that are measurable using current neuroimaging methods. A complicating issue is the need for new types of statistical methods that are adequate to deal with the overwhelming amount of information provided by methods such as functional magnetic imaging and brain electrical tomography. This workshop surveyed the current state of neural modeling and the Human Brain Mapping Project and examined recently available advances in numerical methods, large scale computation and statistical methods that can provide the necessary links to provide a more rapid advance in understanding normal brain function and its alterations in neurological and psychiatric diseases.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5092

Participants:

Amini, Ladan (GIPSA-lab Grenoble-INP)
Bellec, Pierre (McGill University)
Bergiounoux, Maïtine (Université d'Orléans)
Burrage, Kevin (University of Queensland)
Carbonell, Felix (McGill University)
Daffertshofer, Andreas (Vrije Universiteit Amsterdam)
Daunizeau, Jean (University College London)
David, Olivier (Grenoble Institut des Neurosciences)
De La Cruz Cancino, Hugo Alexander (University of Informatic Sciences)
Evans, Alan (Montreal Neurological Institute)
Faugeras, Olivier (INRIA Sophia-Antipolis)
Galka, Andreas (University of Kiel Germany)
Harrison, Lee (York Neuroimaging Centre, University of York)
Hilgetag, Claus C. (Jacobs University Bremen)
Hlinka, Jaroslav (University of Nottingham)
Horwitz, Barry (National Institute of Health)
Jirsa, Viktor (Theoretical Neuroscience Group)
Knock, Stuart (University of New South Wales)
Kötter, Rolf (Nijmegen Medical Centre, Radboud University)
Lemieux, Louis (UCL Institute of Neurology)
McIntosh, Randy (Rotman Institute University of Toronto)
Nunez, Paul (Tulane University)
Pflieger, Mark (Source Signal Imaging)
Ritter, Petra (Bernstein Center for Computational Neuroscience, Berlin)
Robinson, Peter (University of Sydney)
Roebroeck, Alard (Maastricht Brain Imaging Center)
Shmuel, Amir (Montreal Neurological Institute)
Starke, Jens (Technical University of Denmark)
Suffczynski, Piotr (Warsaw University)
Trujillo-Barreto, Nelson (Cuban Neuroscience Center)
Uludag, Kamil (Max Plank Institue for Biological Cybernetics)
Valdés-Sosa, Pedro A. (Cuban Neuroscience Center)
Wendling, Fabrice (INSERM, France)

Theory and Applications of Classical and Quantum Kinetic Theory
June 21 - 26, 2009

Organizers:

Jean Dolbeault (University of Paris, Dauphine)
Irene M. Gamba (University of Texas, Austin)
Reinhard Illner (University of Victoria)
Ansgar Juengel (Vienna University of Technology)

This workshop on kinetic theory will focus on problems of fundamental significance in physics and engineering, typically related to well-posedness or validation of the basic equations. At the same time, kinetic equations are powerful models for numerous phenomena beyond the traditional realms of rarefied gases, plasmas or stellar systems. For example, kinetic models are presently being studied for such diverse applications as electron flows in semiconductors, gene-gene interactions in the cell (involving reaction-diffusion of the transcribed mRNA and the translated proteins), radiative transfer in molten glass, traffic flows on multi-lane freeways, turbulence models, and even kinetic models for trade exchange and distribution of wealth, with applications in finance. The workshop will cover all three aspects of the typical faces of research and education: Creating and solidifying foundations, applications, and educating the next generations.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5050

Participants:

Agueh, Martial (University of Victoria)
Anton, Arnold (Technical University Vienna)
Aoki, Kazuo (Kyoto University)
Carlen, Eric (Rutgers University)
Carvalho, Maria (University of Lisbon and Rutgers University)
Degond, Pierre (Université Paul Sabatier)
Desvillettes, Laurent (ENS Cachan)
Dolbeault, Jean (University of Paris, Dauphine)
Gamba, Irene M. (University of Texas, Austin)
Ghoussoub, Nassif (BIRS)
Gualdani, Maria (University of Texas, Austin)
Guo, Yan (Brown University)
Ibrahim, Slim (University of Victoria)
Illner, Reinhard (University of Victoria)
Juengel, Ansgar (Vienna University of Technology)
Karabash, Illia (University of Calgary)
Klar, Axel (Technische Universität Kaiserslautern)
Kuo, Hung-Wen (Taiwan University)
Liu, Tai-Ping (Stanford University)
Matthes, Daniel (Vienna University of Technology)
Mehats, Florian (Université de Rennes)
Morrison, Philip (University of Texas, Austin)
Nouri, Anne (Université de Marseille)
Panferov, Vladislav (California State University, Northridge)
Pareschi, Lorenzo (Università di Ferrara)
Rein, Gerhard (Universitaet Bayreuth)
Schmeiser, Christian (University of Vienna)
Sospedra Alfonso, Reinel (University of Victoria)
Strain, Robert (Princeton University)
Strauss, Walter (Brown University)
Struchtrup, Henning (University of Victoria)
Tzavaras, Athanasios (University of Maryland)
Vasseur, Alexis (University of Texas)
Violet, Ingrid (Université Lille 1)
Wagner, Wolfgang (Weierstrass Institut, Berlin)
Wennberg, Bernt (Chalmers University of Technology)
Yu, Shih-Hsien (National University of Singapore)

Extremal Kaehler metrics
June 28 - July 3, 2009

Organizers:

Vestislav Apostolov (Université du Québec à Montréal)
Claudio Arezzo (University of Parma)
Xiuxiong Chen (University of Wisconsin)
Richard Thomas (Imperial College)

In mathematics, many striking problems and their solutions lie at the interface of seemingly separate disciplines. This phenomenon is well exemplified by the problem, first proposed by Calabi, of finding a canonical Kaehler metric, called extremal Kaehler metrics, in a given cohomology class. The techniques relevant to this problem come from Geometric Analysis, Differential Geometry and Algebraic Geometry. In rough terms, the extremal Kaehler metrics are natural generalisations of metrics of constant Gauss curvature on 2-dimensional surfaces. From the point of view of global analysis, they are solutions to a fully non-linear 4th order PDE of Monge-Ampere type, for which no general methods are currently available. Particular cases include Kaehler metrics of constant scalar curvature (CSC) and Kaehler--Einstein metrics (KE), the study of which is in the forefront of Kaehler geometry over the last decades. The main objective of the workshop is to brought together researchers in the separate but related fields of geometric analysists, differential geometry and algebraic geometry to focus on a specific, hard problem at the forefront of current research, and make a progress.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5027

Participants:

Apostolov, Vestislav (Université du Québec à Montréal)
Arezzo, Claudio (University of Parma)
Berndtsson, Bo (Chalmers University of Technology)
Boyer, Charles (University of New Mexico)
Calderbank, David (University of Bath)
Chen, Xiuxiong (University of Wisconsin)
Della Vedova, Alberto (University of Parma)
Fine, Joel (Université Libre de Bruxelles)
Futaki, Akito (Tokyo Institute of Technology)
Gauduchon, Paul (CNRS)
Huang, Hongnian (UQAM and McGill University)
Keller, Julien (University of Provence, Aix-Marseille)
La Nave, Gabriele (Yeshiva University)
Legendre, Eveline (Université du Québec à Montréal)
Maschler, Gideon (Clark University)
Pacard, Frank (Université Paris XII)
Pali, Nefton (University of Paris XI)
Paul, Sean (University of Wisonsin, Madison)
Ross, Julius (Cambridge University)
Sano, Yuiji (Kyushu University)
Simanca, Santiago R (University of New Mexico)
Song, Jian (Rutgers University)
Sun, Song (University of Wisconsin, Madison)
Szekelyhidi, Gabor (Columbia University)
Thomas, Richard (Imperial College)
Tonnesen-Friedman, Christina (Union College)
Tosatti, Valentino (Columbia University)
Tsuji, Hajime (Sophia University)
Wang, Bing (Princeton University)
Weinkove, Ben (UC San Diego)
Zhu, Xiaohua (Beijing University)

Multimedia, Mathematics & Machine Learning II
July 5 - 10, 2009

Organizers:

Jeffrey Bloom (Dialogic Research Inc.)
Li Deng (Microsoft Research)
Rabab Ward (University of British Columbia)

Multimedia technologies have evolved and continue to evolve at a very rapid rate. They are now widely deployed in industries in a multitude of applications which affect the way we live, communicate, interact with each other, work, and play. The aim of this workshop is to push the state of the art in multimedia processing so as to create next-generation multimedia technologies that are intelligent, robust, effective, integrative, and unifying across all media types. Academic researchers and industry innovators who have rich working/research experience in one or more media types will share their experiences on the commonalities and differences in processing the different types of media contents. To increase the level of processing intelligence, machine learning which provides a rich set of practical algorithms derived from rigorous mathematical analysis and are applicable across the different media types will form as a principal element in the workshop's theme.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5056

Participants:

Al Regib, Ghassan (Georgia Tech)
Altunbasak, Yucel (Georgia Tech)
Apostolopoulos, John (Hewlett-Packard Laboratories)
Atlas, Les (University of Washington)
Bayoumi, Magdy (University of Louisiana, Lafayette)
Bloom, Jeffrey (Dialogic Research Inc.)
Chen, Tsuhan (Cornell University)
Coria Mendoza, Lino (University of British Columbia)
Delp, Edward (Purdue University)
Deng, Li (Microsoft Research)
Dumitras, Adriana (Apple)
Fatourechi, Mehrdad (University of British Columbia)
Girod, Bernd (Stanford University)
He, Xiaodong (Microsoft Research)
Hu, Bo (University of Alberta)
Kalker, Ton (Hewlett-Packard)
Karam, Lina (Arizona State University)
Kingsbury, Nick (University of Cambridge)
Kirovski, Darko (Microsoft Research)
Kundur, Deepa (Texas A&M University)
Li, Xingyu (University of Alberta)
Liang, Jie (Simon Fraser University)
Liu, Ray (University of Maryland)
Lv, Xudong (University of British Columbia)
Lyon, Richard F (Google, Inc.)
Malekesmaeili, Mani University of British Columbia)
Moura, Jose M. F. (Carnegie Mellon University)
Ney, Herman (RWTH Aachen University)
Nezhadarya, Ehsan (University of British Columbia)
Said, Amir (Hewlett-Packard Labs)
Susstrunk, Sabine (École Polytechnique Fédérale de Lausanne)
Tang, Qiang (University of British Columbia)
Tzanetakis, George (University of Victotia)
Varodayan, David (Stanford University)
Wang, Z. Jane (University of Britishi Columbia)
Ward, Rabab (University of British Columbia)
Wiesler, Simon (RWTH Aachen)
Yu, Dong (Microsoft Research)
Zhao, Hong (Vicky) (University of Alberta)

Multiscale Analysis of Self-Organization in Biology
July 12 - 17, 2009

Organizers:

Thomas Hillen (University of Alberta)

Benoit Perthame (Laboratoire J. L. Lions, Université Pierre et Marie Curie)

Partial Differential Equations are a unique tool to derive proper models in biology and health sciences. Molecular motion within cells, cells' self-organization, and tissue growth are fields where PDEs are established tools. In major health issues such as cancer developments, PDEs are one of the tools allowing for a better understanding and replacing experiments by numerical simulations. The mathematical modelling of biological systems has rapidly grown over the past decades. Positions in mathematical biology are announced in many Universities and relevant contributions are reported in the highest international journals. Most of the research is done on a model-computation-result and prediction basis. There are, however, very interesting mathematical problems related to these biological models. In this workshop we want to focus on the mathematical and analytical side of modelling, where we particularly focus on the use of integro-differential equations and partial differential equations for multi scale analysis of self organization in Biology.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5070

Participants:

Babak, Petro (University of Alberta)
Bates, Peter (Michigan State University)
Bournaveas, Nikolaos (University of Edinburgh)
Cantrell, Stephen (University of Miami)
Carrillo, José Antonio (ICREA)
Cosner, Chris (University of Miami)
Cuadrado, Silvia (Universitat Autónoma de Barcelona)
Dolbeault, Jean (University of Paris, Dauphine)
Eberl, Hermann J (University of Guelph)
Ephsteyn, Yekaterina (Carnegie-Mellon University)
Erban, Radek (University of Oxford)
Fetecau, Razvan (Simon Fraser University)
Friedman, Avner (Ohio State University)
Gong, Jiafen (University of Alberta)
Hillen, Thomas (University of Alberta)
Hinow, Peter (Institute for Mathematics and its Applications, University of Minnesota)
Jin, Yu (University of Alberta)
Kawohl, Bernd (University of Koeln)
Kinderlehrer, David (Carnegie Mellon University)
Laurençot, Philippe (Institut de Mathématiques de Toulouse)
Lepoutre, Thomas (Université Pierre et Marie Curie)
Levy, Doron (University of Maryland, College Park)
Lewis, Mark (University of Alberta)
Lorz, Alexander (University of Cambridge)
Marciniak-Czochra, Anna (University of Heidelberg)
Mirrahimi, Sepideh sadat (Université Pierre et Marie Curie)
Morandotti, Marco (SISSA/ISAS)
Oelz, Dietmar (Wolfgang Pauli Institute)
Perthame, Benoit (Laboratoire J. L. Lions, Université Pierre et Marie Curie)
Raoul, Gael (ENS Cachan)
Riviere, Tristan (ETH Zürich)
Schmeiser, Christian (University of Vienna)
Souganidis, Panagiotis (University of Chicago)
Tosin, Andrea (Politecnico di Torino)
Wakano, Joe Yuichiro (Meiji University)
Ward, Michael (University of British Columbia)
Wrzosek, Dariusz (University of Warsaw)

Permutation Groups
July 19 - 24, 2009

Organizers:

Robert Guralnick (University of Southern California)
Cheryl Praeger (University of Western Australia)
Jan Saxl (University of Cambridge)
Katrin Tent (Universität Münster)

The group of permutations of a finite set is one of the most important examples of a finite group. Indeed, one of the most ancient theorems in the subject tells us that every group is a subgroup of a permutation group. In the last two decades, there has been enormous progress in the theory. More importantly, permutation groups are a fundamental way to apply the group theory machinery to many problems in number theory, algebraic geometry and logic. For example, these ideas were used to answer Mark Kac's question about hearing the shape of a drum. More recently, there has been much progress related to expander graphs (with connections to computer networks) coming out of group theory. The flow goes both ways. Techniques and questions from other areas of mathematics have led to breakthroughs in permutation groups. This workshop will bring together both experts and outstanding young people in the field and related areas.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5030

Participants:

Aschbacher, Michael (Caltech)
Baginski, Paul (UC Berkeley)
Bamberg, John (Ghent University)
Blackburn, Simon (Royal Holloway, University of London)
Burness, Tim (University of Southampton)
Cameron, Peter (Queen Mary University of London)
Damian, Erika (University of East Anglia)
De Medts, Tom (Ghent University)
Diaconis, Persi (Stanford University)
Giudici, Michael (University of Western Australia)
Guest, Simon (Baylor University)
Guralnick, Robert (University of Southern California)
Kantor, William (University of Oregon)
Korchagina Capdeboscq, Inna (Warwick University)
Liebeck, Martin (Imperial College)
Lubotzky, Alex (Hebrew University of Jerusalem)
Lucchini, Andrea (University of Padova)
Lyons, Richard (Rutgers University)
Magaard, Kay (Birmingham)
Malle, Gunter (Universitaet Kaiserslautern)
Muehlherr, Bernhard (Université Libre de Bruxelles)
Neumann, Peter M (The Queen's College)
Parker, Christopher (University of Birmingham)
Praeger, Cheryl (University of Western Australia)
Pyber, Laci (Renyi Institute, Budapest)
Reichstein, Zinovy (University of British Columbia)
Saxl, Jan (University of Cambridge)
Schneider, Csaba (University of Lisbon)
Segev, Yoav (Ben Gurion University)
Seitz, Gary (University of Oregon)
Seress, Akos (The Ohio State University)
Shareshian, John (Washington University)
Steinberg, Benjamin (Carleton University)
Tent, Katrin (Universität Münster)
Testerman, Donna (École Polytechnique Fédérale de Lausanne)
Tiep, Pham Huu (University of Arizona)
Van Bon, John (Università della Calabria)
Weiss, Richard (Tufts University)
Wilson, Rob (Queen Mary London)
Ziegler, Martin (Mathematisches Institut Freiburg)

Renaissance Banff II: Mathematics, Music, Art, Culture
July 25 - 30, 2009

Organizers:

George W. Hart (Stony Brook University)
Craig Kaplan (University of Waterloo)
Reza Sarhangi (Towson University)
Carlo Sequin (UC Berkeley)

In July 2009, more than 150 architects, artists, computer scientists, dancers, educators, hobbyists, mathematicians, musicians, and assorted creative thinkers assembled in Banff for the 12th annual Bridges conference. The conference, which has been travelling across North America and Europe since its genesis in Winfield, Kansas, was hosted this year by BIRS with the cooperation of the Banff Centre. The conference was previously held in Banff in 2005, and we were delighted to have an opportunity to return.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5134

Participants:

Abbott, Stephen (Middlebury College)
Alagic, Mara (Wichita State University)
Bier, Carol (The Textile Museum)
Bosch, Robert (Oberlin College)
Buhler, Amina (Independent Artist)
Bumgardner, Jim (jbum & co)
Cameron, David (Student)
Craig, Robert (The Pembroke Hill School)
Demaine, Erik (MIT)
Erdély, Dániel (Spidron Bt.)
Fathauer, Robert (Tessellations)
Fenyvesi, Kristóf (Pécs Cultural Centre / Pécsi Kulturális Központ)
Gailiunas, Paul (Bridges)
Garfield, Susan (KMZ Consulting Group)
Gerofsky, Susan (University of British Columbia)
Greenfield, Gary (University of Richmond)
Hall, Rachel (Saint Joseph's University)
Harrison, Erika (University of Calgary)
Hart, George W. (Stony Brook University)
Hart, Vi (Stony Brook University)
Hildebrandt, Paul (Zometool Inc.)
Kaplan, Craig (University of Waterloo)
Lakins, Tamara (Allegheny College)
Lang, Robert (Robert J. Lang Origami)
Machado, Penousal (University of Coimbra)
McKenna, Doug (Mathemaesthetics, Inc.)
McKenzie, Diana (Steel Phoenix Rapper Sword Team)
Palmer, Chris (University of Colorado)
Roelofs, Rinus (Rinus Roelofs)
Rollings, Robert (Ontario)
Sarhangi, Reza (Towson University)
Sarhangi, Maryam (University of Maryland)
Schaffer, Karl (De Anza College)
Sequin, Carlo (UC Berkeley)
Shea, Laura (A Dancing Rainbow)
Stansfield, Robert (Independent)
Stranahan, Michael (Zometool Inc.)
Tymoczko, Dmitri (Princeton University)
Verhoeff, Tom (Eindhoven University of Technology)
Wells, Benjamin (University of San Francisco)
Yackel, Carolyn (Mercer University)
Zongker, Doug (Google)

Applications of Matroid Theory and Combinatorial Optimization to Information and Coding Theory
August 2 - 7, 2009

Organizers:

Navin Kashyap (Queens University)
Emina Soljanin (Alcatel-Lucent Bell-Labs)
Pascal Vontobel (Hewlett-Packard Laboratories)

This workshop brought together experts from pure and applied mathematics, computer science, and electrical engineering, to tackle problems of central importance in digital communications and information theory. The workshop focused on problems of enormous practical significance to digital communications and Internet technology, as they are directly motivated by the need to find increasingly efficient and robust coding schemes for reliable transmission and storage of data. The necessity of such coding schemes cannot be over-stressed, given the ever-increasing pressure on network resources with the need for transmitting, storing and processing ever-larger amounts of data. These practical motivations give rise to difficult and deep theoretical problems that require the use of tools from the mathematical theories of matroids and combinatorial optimization. The aim of the workshop was to provide an environment within which mathematicians and computer scientists with expertise in matroid theory and optimization could interact and exchange ideas with experts from digital communications and information theory.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5103

Participants:

Axvig, Nathan (University of Nebraska, Lincoln)
Barg, Alexander (University of Maryland)
Beimel, Amos (Ben-Gurion University)
Britz, Thomas (University of New South Wales)
Byrne, Eimear (University College Dublin)
Cai, Ning (Xidian University)
Chekuri, Chandra (UIUC)
Chertkov, Michael (Los Alamos National Lab)
Chun, Carolyn (Louisiana State University)
Dogan, Mert (Texas A & M University)
Dougherty, Randall (IDA Center for Communications Research)
Duursma, Iwan (UIUC)
Fink, Alex (UC Berkeley)
Geelen, Jim (University of Waterloo)
Gerards, Bert (CWI, Amsterdam)
Grant, Alex (University of South Australia)
Kahle, Thomas (MPI MiS - Leipzig)
Kashyap, Navin (Queens University)
Langberg, Michael (The Open University of Israel)
Madiman, Mokshay (Yale University)
Manada, Akiko (Queen's University)
Matus, Frantisek (Institute of Information Theory and Automation, Prague)
Mayhew, Dillon (Victoria University of Wellington)
Milenkovic, Olgica (UIUC)
Mitchell, Abigail (University of Zurich)
Newman, Mike (University of Ottawa)
Oxley, James (Louisiana State University)
Padro, Carles (Universitat Politecnica de Catalunya)
Rai, Brijesh Kumar (IIT-Bombay)
Ruskai, Mary Beth (Tufts University)
Sarvepalli, Pradeep (University of British Columbia)
Savari, Serap (Texas A&M University)
Smarandache, Roxana (San Diego State University)
Soljanin, Emina (Alcatel-Lucent Bell-Labs)
Sprintson, Alex (Texas A & M University)
Usefi, Hamid (University of British Columbia)
Vardy, Alexander (UC San Diego)
Vontobel, Pascal (Hewlett-Packard Laboratories)
Wainwright, Martin (UC Berkeley)
Whittle, Geoff (Victoria University of Wellington)
Winter, Andreas (University of Bristol)
Yeung, Raymond (The Chinese University of Hong Kong)

Analysis of Nonlinear Wave Equations and Applications in Engineering
August 9 - 14, 2009

Organizers:

James Colliander (University of Toronto)
Michael Weinstein (Columbia University)
Vadim Zharnitsky (UIUC)

Nonlinear dispersive equations are a class of mathematical equations (partial differential equations or PDEs) which are central to the description of such diverse physical models as light propagation in an optical wave guide, waves in a shallow water channel, confinement of Bose-Einstein condensate, etc ... Common themes in these models are a) Dispersion, or the spread of energy due to the dependence of the speed of signal propagation on wavelength (an effect responsible for the color-splitting of a prism) and b) Nonlinear self-focusing. Such equations are not explicitly solvable in any simple sense, yet mathematical methods of analysis and computation are showing how to make these mathematical models into powerful predictive tools. The phenomena are very rich. This workshop brought together researchers working on the analysis of nonlinear dispersive equations and coherent structures in important application areas. The goal of the workshop was to develop an agenda of outstanding problems in applications which can be solved or approached with the tools of modern analysis. Further progress on these problems will contribute to a better mathematical theory of optical communication, photonic crystals and other new technologies.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5121

Participants:

Abou Salem, Walid (University of Toronto)
Anapolitanos, Ioannis (University of Toronto)
Anton, Ramona (Université Pierre et Marie Curie)
Bronski, Jared (UIUC)
Camassa, Roberto (University of North Carolina)
Chen, Thomas (University of Texas, Austin)
Colliander, James (University of Toronto)
Dodson, Benjamin (UC Riverside)
Fibich, Gadi (Tel Aviv University)
Goodman, Roy (New Jersey Institute of Technology)
Grillakis, Manoussos (University of Maryland)
Gustafson, Stephen (University of British Columbia)
Holmer, Justin (Brown University)
Hundertmark, Dirk (University of Illinois)
Ilan, Boaz (UC Merced)
Kath, William L. (Northwestern University)
Kirr, Eduard (UIUC)
Kunze, Markus (Universitaet Duisburg-Essen)
Lee, Young-Ran (Sogang University)
Lewin, Mathieu (CNRS / University of Cergy-Pontoise)
Liu, Baoping (UC Berkeley)
Marzuola, Jeremy (Columbia University and University of Bonn)
Pavlovic, Natasa (University of Texas, Austin)
Pelinovsky, Dmitry (McMaster University)
Promislow, Keith (Michigan State University)
Sandstede, Bjorn (Brown University)
Schlag, Wilhelm (University of Chicago)
Schlein, Benjamin (University of Cambridge)
Shlizerman, Eli (Weizmann Institute)
Simpson, Gideon (University of Toronto)
Stanislavova, Milena (University of Kansas)
Tataru, Daniel (UC Berkeley)
Tsutsumi, Yoshio (Kyoto University)
Weinstein, Michael (Columbia University)
Zharnitsky, Vadim (UIUC)

Emerging Issues in the Analysis of Longitudinal Data
August 16 - 21, 2009

Organizers:

Charmaine Dean (Simon Fraser University)
Xihong Lin (Harvard University)
John Neuhaus (UC San Francisco)
Liqun Wang (University of Manitoba)
Lang Wu (University of British Columbia)
Grace Yi (University of Waterloo)

Studies in medicine, social sciences and other fields commonly follow subjects over time and monitor them for changes. Such changes may relate to the frequency of occurrence of some important events, such as recurrences for some disease, hospital re-admissions, etc. In certain cases, the major focus of the study is a comparison across individuals of such changes, perhaps across individuals in undergoing different treatments for the disease. There are many challenges in the analysis of such complex data. A major challenge is missing data, especially for lengthy studies. In addition, there may be errors in measurement, or different kinds of responses of interest all of which impact the overall understanding of the nature of the responses over time. This workshop brought together international experts in this important field of research to advance our understanding of the methods and tools which can be effectively brought to bear in the analysis of such complex data.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5081

Participants:

Abarin, Taraneh (University of Manitoba)
Carpenter, James (London School of Hygiene and Tropical Medicine)
Carroll, Raymond (Texas A&M University)
Chen, Baojiang (University of Waterloo)
Chen, Zhijian (University of Waterloo)
Cook, Richard (University of Waterloo)
Dean, Charmaine (Simon Fraser University)
He, Wenqing (University of Western Ontario)
Hu, Joan (Simon Fraser University)
Ibrahim, Joseph (University of North Carolina)
Kenward, Mike (London School of Hygiene and Tropical medicine)
Lai, Tze Leung (Stanford University)
Lee, Youngjo (Seoul National University)
Li, Daniel (University of Manitoba)
Li, Song (Sebastian) (University of Toronto)
Liang, Hua (University of Rochester)
Lin, Xihong (Harvard University)
Little, Roderick (University of Michigan)
Liu, Wei (York University)
Liu, Juxin (University of Saskatchewan)
Ma, Renjun (University of New Brunswick)
McCulloch, Charles (University of California)
Nan, Bin (University of Michigan)
Nathoo, Farouk (University of Victoria)
Neuhaus, John (UC San Francisco)
Ory, Marcia (Texas A&M Health Science Center)
Petkau, A. John (University of British Columbia)
Qin, Li (Fred Hutchinson Cancer Research Center)
Qiu, Jin (Zhejiang University of Economics and Finance)
Qu, Annie (UIUC)
Rotnitzky, Andrea (Harvard University and Di Tella University)
Song, Peter (University of Michigan)
Sun, Jiayang (Case Western Reserve University)
Taylor, Jeremy (University of Michigan)
Wang, Liqun (University of Manitoba)
Wang, Naisyin (Texas A&M University)
Wang, Lu (University of Michigan, Ann Arbor)
Wu, Lang (University of British Columbia)
Xu, Ronghui (UC San Diego)
Yi, Grace (University of Waterloo)
Zeng, Leilei (Simon Fraser University)
Zhao, Yang (University of Regina)

Probabilistic and Extremal Combinatorics
August 23 - 28, 2009

Organizers:

Michael Krivelevich (Tel Aviv University)
Bruce Reed (McGill University)
Benny Sudakov (UCLA)

Combinatorics, sometimes also called Discrete Mathematics, is a branch of mathematics focusing on the study of discrete objects and their properties. Although Combinatorics is probably as old as the human ability to count, the field experienced tremendous growth during the last fifty years and is one of the most modern in today's Mathematics, with numerous connections to different disciplines and various practical applications, ranging from designing VLSI chips to modeling complex social networks. Is it true that in any company of six people there are three who know each other, or alternatively are unfamiliar with each other? Can the countries of any planar map be colored with at most four colors so that no two countries that share a common boundary have the same color? In how many ways can one traverse all major cities of some country, visiting each city only once? If each link of a complex telephone network fails with probability p, what is the probability that Alice will not be able to have a phone conversation with her friend Bob? Questions of this type are in the heart of modern Combinatorics, and especially two of its most central branches - Probabilistic and Extremal Combinatorics. The workshop will discuss some of latest developments in these fields, their connections and applications.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5035

Participants:

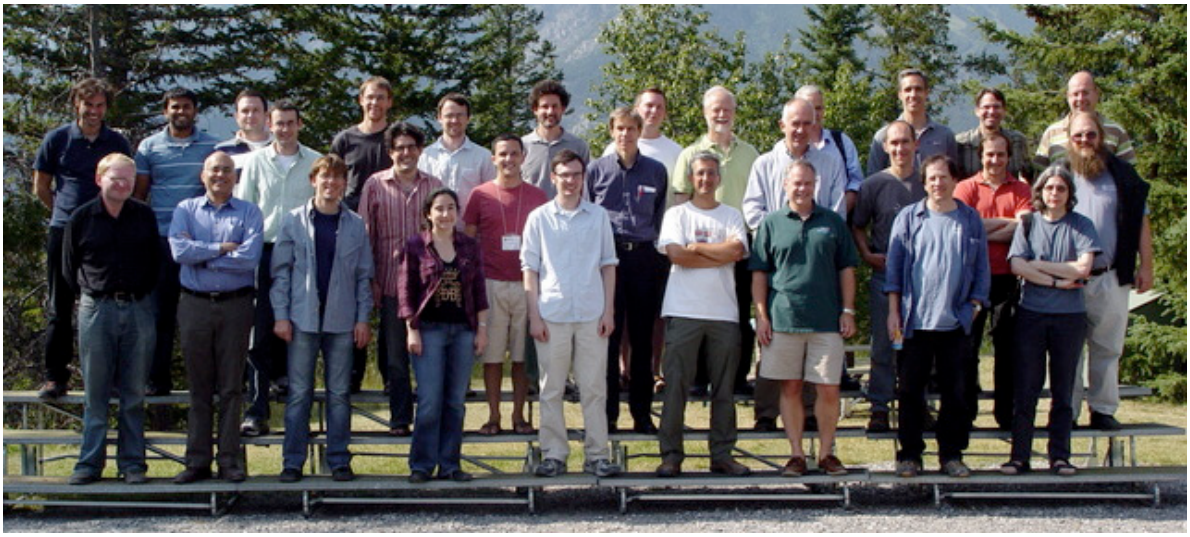
Addario-Berry, Louigi (Université de Montréal)
Amini, Omid (CNRS-ENS)
Balogh, Jozsef (UIUC)
Conlon, David (Cambridge University)
Costello, Kevin P. (Georgia Tech)
Fountoulakis, Nikolaos (Max-Planck Institut)
Fox, Jacob (Princeton University)
Griffiths, Simon (McGill University)
Haxell, Penny (University of Waterloo)
Kahn, Jeff (Rutgers University)
Keevash, Peter (Queen Mary University of London)
Kostochka, Alexandr (UIUC)
Krivelevich, Michael (Tel Aviv University)
Lee, Choongbum (UCLA)
Linial, Nathan (Hebrew University)
Loh, Po-Shen (Princeton University)
Lubetzky, Eyal (Microsoft Research)
Luczak, Tomasz (Adam Mickiewicz University)
Mubayi, Dhruv (University of Illinois at Chicago)
Pikhurko, Oleg (Carnegie Mellon University)
Reed, Bruce (McGill University)
Scott, Alex (University of Oxford)
Shapira, Asaf (Georgia Tech)
Solymosi, Jozsef (University of British Columbia)
Spencer, Joel (Courant Institute)
Steger, Angelika (Eidgenössische Technische Hochschule, Zürich)
Sudakov, Benny (UCLA)
Tetali, Prasad (Georgia Tech)
Verstraete, Jacques (UC San Diego)
Vu, Van (Rutgers University)
Yuster, Raphael (University of Haifa)

Computer Vision and the Internet
August 30 - September 4, 2009

Organizers:

Kyros Kutulakos (University of Toronto)

Steve Seitz (University of Washington)



With billions of photographs online, the Internet comprises the richest photographic record ever assembled. Within this collection are the world's significant sites, people, things and events, photographed from almost every conceivable viewing position and angle, different times of day and night, changes in season, weather, and decade. The availability of such imagery presents profound opportunities for computer vision research in such areas as 3D modeling and recognition, and exciting practical applications. At the same time, the huge diversity and size of such collections poses major challenges for the field, requiring the development of new mathematical, statistical, and algorithmic tools. This workshop will brought together, for the first time, leading thinkers in computer vision and related areas to explore the impact that the Internet will have on the field of computer vision (and vice versa), and identify key developments, challenges, research directions, and opportunities. As such, the workshop will help define and lay the groundwork for this emerging field, and foster collaborations.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5126

Participants:

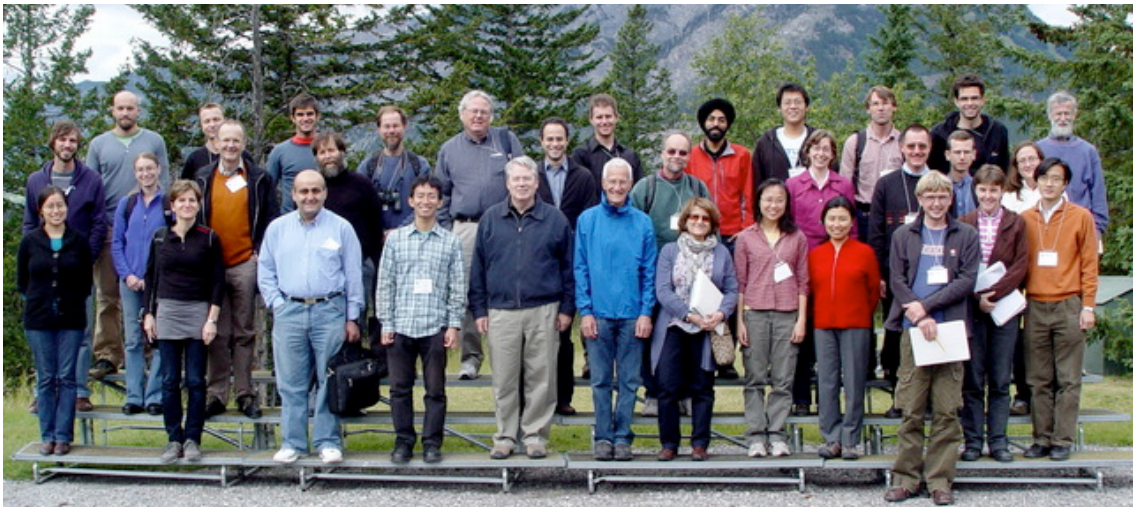
Aguera y Arcas, Blaise (Microsoft)
Avidan, Shai (Adobe)
Belhumeur, Peter (Columbia University)
Belongie, Serge (UC San Diego)
Berg, Alexander (Columbia University)
Curless, Brian (University of Washington)
Durand, Fredo (MIT)
Efros, Alyosha (Carnegie Mellon University)
Fergus, Rob (New York University)
Forsyth, David (UIUC)
Freeman, Bill (MIT)
Goesele, Michael (TU Darmstadt)
Grauman, Kristen (University of Texas, Austin)
Hebert, Martial (Carnegie Mellon University)
Hoiem, Derek (UIUC)
Huttenlocher, Dan (Cornell University)
Kutulakos, Kyros (University of Toronto)
Lazebnik, Svetlana (University of North Carolina Chapel Hill)
Lowe, David (University of British Columbia)
Malik, Jitendra (UC Berkeley)
Perona, Pietro (Caltech)
Pless, Robert (Washington University)
Ramanan, Deva (UC Irvine)
Savarese, Silvio (University of Michigan)
Seitz, Steve (University of Washington)
Sivic, Josef (INRIA / ENS)
Snavely, Noah (Cornell University)
Szeliski, Richard (Microsoft Research)
Torralba, Antonio (MIT)
van Gool, Luc (ETH Zurich)
Vincent, Luc (Google)
Zickler, Todd (Harvard University)
Zisserman, Andrew (University of Oxford)

New Mathematical Challenges from Molecular Biology and Genetics
September 6 - 11, 2009

Organizers:

Richard Durrett (Cornell University)

Ed Perkins (University of British Columbia)



Some of the earliest applications of mathematical probability were in population genetics where Fisher, Wright and Feller used random processes to model the distribution of allele types in a population undergoing change due to random mating, mutation and selection. The explosion of biological data in the last decade presents a number of new opportunities for mathematical models to offer insights in the processes which shaped the observed patterns. It is important for Probabilists to learn about newly discovered genetic phenomena in order to design models and develop statistical methods to make biological inferences. It is equally important for Biologists to understand what recent probabilistic methodologies can be brought to bear on these questions. The greatest challenge is often to get a critical mass of both groups together in the same room for a meaningful exchange.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5062

Participants:

Berestycki, Nathanel (Cambridge University)
Betancourt, Andrea (University of Edinburgh)
Birkner, Matthias (Weierstrass-Institut fuer Angewandte Analysis und Stochastik)
Clark, Andrew (Cornell University)
Durrett, Richard (Cornell University)
Eldon, Bjarki (Harvard University)
Etheridge, Allison (Oxford)
Evans, Steve (UC Berkeley)
Geng, Xin (University of British Columbia)
Gill, Hardeep (University of British Columbia)
Goldschmidt, Christina (University of Warwick)
Griffiths, Robert (University of Oxford)
Gutenkunst, Ryan (Los Alamos National Laboratory)
Huerta-Sanchez, Emilia (Berkeley)
Jensen, Jeff (UC Berkeley)
Joyce, Paul (University of Idaho)
Maruki, Takahiro (Arizona State)
Matsen, Frederick (UC Berkeley)
Mayberry, John (Cornell University)
Moehle, Martin (University of Tuebingen)
Nielsen, Rasmus (UC Berkeley)
Perkins, Ed (University of British Columbia)
Pfaffelhuber, Peter (University of Freiburg)
Popovic, Lea (Concordia University)
Sanz-Solé, Marta (Universitat de Barcelona)
Sargsyan, Ori (Harvard University)
Schmidt, Deena (Ohio State University)
Schweinsberg, Jason (UC San Diego)
Song, Yun (UC Berkeley)
Tang, Hua (Stanford University)
Taylor, Jay (Arizona State University)
Wakolbinger, Anton (Goethe-University, Frankfurt)
Watkins, Joe (University of Arizona)
Zhang, Nancy (Stanford University)

Linear Algebraic Groups and Related Structures
September 13 - 18, 2009

Organizers:

Vladimir Chernousov (University of Alberta)
Alexander Merkurjev (UCLA)
Ján Mináč (University of Western Ontario)
Zinovy Reichstein (University of British Columbia)

At the turn of the 20th century, the great German mathematician Felix Klein championed the idea that geometric figures can be best understood by studying their symmetries. These symmetries form a structure called a group. In the past 100 years Klein's idea has proved to be extremely fruitful in geometry as well as in many other parts of mathematics, theoretical physics and chemistry. This workshop aims to explore the Klein's vision in the algebraic context. The symmetries of various algebraic objects (e.g., quadratic forms, finite-dimensional algebras or algebraic varieties) form important and intrinsically beautiful structures called algebraic groups. The theory of algebraic groups was founded by A. Borel, C. Chevalley, M. Demazure, A. Grothendieck, T. A. Springer and J.-P. Serre in the 1950s and 60s. In recent years there has been rapid progress in this subject. Several important long-standing open problems have been either completely or partially solved. In 2002 a Fields medal for ground-breaking work in this area was awarded to V. Voevodsky; in subsequent years the subject continued to develop at a rapid pace. The workshop is intended to provide a forum for the experts to discuss their latest work and for younger researchers to learn about open problems and state of the art techniques in this exciting and rapidly developing field.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5026

Participants:

Auel, Asher (Emory University)
Baek, Sanghoon (UCLA)
Baeza, Ricardo (University of Talca)
Balmer, Paul (UCLA)
Bayer-Fluckiger, Eva (École Polytechnique Fédérale de Lausanne)
Blunk, Mark (UCLA)
Borovoi, Mikhail (Tel Aviv University)
Brosnan, Patrick (University of British Columbia)
Calmes, Baptiste (University of Cambridge)
Chebolu, Sunil (Illinois State University)
Chernousov, Vladimir (University of Alberta)
Duncan, Alexander (University of British Columbia)
Friedlander, Eric (University of Southern California)
Garibaldi, Skip (Emory University)
Gille, Philippe (ENS)
Gille, Stefan (Ludwig-Maximilians-Universitaet Munich)
Hoffmann, Detlev (University of Nottingham)
Karpenko, Nikita (Université Paris 6)
Knus, Max (ETH Zurich)
Krashen, Daniel (University of Georgia)
Loetscher, Roland (University of Basel)
MacDonald, Mark (University of British Columbia)
Mathews, Bryant (UCLA)
McKinnie, Kelly (University of Montana)
Merkurjev, Alexander (UCLA)
Meyer, Aurel (University of British Columbia)
Mináč, Ján (University of Western Ontario)
Ondrus, Alex (University of Alberta)
Parimala, Raman (Emory University)
Pianzola, Arturo (University of Alberta)
Popov, Vladimir (Steklov Mathematical Institute)
Rehmann, Ulf (University of Bielefeld)
Reichstein, Zinovy (University of British Columbia)
Saltman, David J (Center for Communications Research, Princeton)
Schultz, Andrew (UIUC)
Semenov, Nikita (Ludwig-Maximilians-Universitaet Muenchen)
Starr, Jason (SUNY Stony Brook)
Swallow, John (Davidson College)
Tignol, Jean-Pierre (Université Catholique de Louvain)
Vishik, Alexander (University of Nottingham)

Transversal and Helly-type Theorems in Geometry, Combinatorics and Topology
September 20 - 25, 2009

Organizers:

Imre Barany (Renyi Institute)
Ted Bisztriczky (University of Calgary)
Jacob E. Goodman (City College, City University of New York)
Luis Montejano (UNAM)
Deborah Oliveros (UNAM)

A point, a line, a plane, or its generalization in higher dimensions, a hyperplane, is called a transversal to a family of sets if it intersects every member of a family. Eduard Helly proved in 1913 one of the most celebrated results in geometry that gives conditions for the members of a family of convex objects (with convex boundary and without holes) to have a common point. Helly's theorem gives rise to numerous generalizations and variants, many of which focus on conditions for families of objects to have a common transversal. The proposed workshop will assemble the key people working in this area, in order to explore recent progress and to help focus on future directions of research in geometric transversal theory.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5047

Participants:

Ambrus, Gergely (University College London)
Aronov, Boris (Polytechnic Institute of New York University)
Barany, Imre (Renyi Institute)
Bezdek, András (Auburn University)
Bezdek, Karoly (University of Calgary)
Bracho, Javier (UNAM)
Böröczky, Károly (Eötvös Loránd University)
Cheong, Otfried (KAIST)
Deza, Antoine (McMaster University)
Fodor, Ferenc (University of Szeged)
Goaoc, Xavier (INRIA)
Heppes, Aladar (Renyi Institute)
Holmsen, Andreas (KAIST)
Hua, William (McMaster University)
Karasev, Roman (Moscow Institute of Physics & Technology)
Kuperberg, Wlodzimierz (Auburn University)
Larman, David (University College London)
Montejano, Luis (UNAM)
Oliveros, Deborah (UNAM)
Pocchiola, Michel (ENS)
Pollack, Richard (Courant Institute)
Ramirez Alfonsin, Jorge (Université Montpellier 2)
Ranestad, Kristian (University of Oslo)
Rubin, Natan (Tel Aviv University)
Smorodinsky, Shakhar (Ben-Gurion University)
Soberón, Pablo (UNAM)
Soltan, Valeriu (George Mason University)
Stephen, Tamon (Simon Fraser University)
Strausz, Ricardo (UNAM)
Toth, Csaba D. (University of Calgary)
Tverberg, Helge (University of Bergen)
Zinchenko, Yuriy (University of Calgary)

t-motives: Hodge Structures, Transcendence and Other Motivic Aspects
September 27 - October 2, 2009

Organizers:

Gebhard Boeckle (University of Duisburg-Essen)
David Goss (The Ohio State University)
Urs Hartl (University of Muenster)
Matthew Papanikolas (Texas A&M University)

In the mid 1980s, t-motives were defined by Greg Anderson as an analogue over function fields of abelian varieties over number fields and generalizing the previously introduced notion of elliptic module by Drinfeld. Many of the properties predicted for the conjectured motives over number fields by A. Grotendieck are shared by t-motives. However t-motives are in many ways simpler, and so results beyond those for Grothendieck's motives can be expected. In parts, this expectation does hold true (e.g. transcendence theory); in other parts, one obtains similar results (e.g. Galois representations, adic period spaces) but in some areas the function field setting reveals new and unexpected phenomena which makes the situation more complicated but also more interesting (e.g. Hodge structures, L-functions). Leading experts as well as young researchers and researchers from neighboring fields from many continents meet at the Banff International Research station to discuss the state of the art in the subject in a single conference, to get to know each other, to initiate new research projects and benefit from the inspiring environment. The workshop also includes two lecture series on some of the most recent and important developments in the area.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5094

Participants:

Armana, Cécile (Universität des Saarlandes)
Boeckle, Gebhard (University of Duisburg-Essen)
Bosser, Vincent (Université de Caen)
Breuer, Florian (University of Stellenbosch)
Brownawell, Dale (Pennsylvania State University)
Butenuth, Ralf (Universitaet Duisburg-Essen)
Chang, Chieh-Yu (National Center for Theoretical Sciences, Taiwan)
Chen, Imin (Simon Fraser University)
Cojocaru, Alina Carmen(University of Illinois,Chicago)
Gekeler, Ernst-Ulrich (Universität des Saarlandes)
Goss, David (The Ohio State University)
Hartl, Urs (University of Muenster)
Hiranouchi, Toshiro (RIMS, Kyoto university)
Hsia, Liang-Chung (National Central University, Taiwan)
Hubschmid, Patrik (ETH Zurich)
Jeong, Sangtae (Inha University Korea)
Karumbidza, Archiebold (University of Stellenbosch)
Kim, Wansu (Imperial College London)
Kondo, Satoshi (University of Tokyo)
Laskar, Abhijit (Université de Strasbourg)
Long Hoelscher, Jing (University of Arizona)
Longhi, Ignazio (National Taiwan University)
Lutes, Brad (Texas A&M University)
Newton, James (Imperial College London)
Pal, Ambrus (Imperial College London)
Papanikolas, Matthew (Texas A&M University)
Papikian, Mihran (Pennsylvania State University)
Pellarin, Federico (Université Jean Monnet Saint-Etienne)
Rueck, Hans-Georg (Universitaet Kassel)
Taelman, Lenny (Mathematisch Instituut Leiden NL)
Thakur, Dinesh (University of Arizona)
Top, Jaap (University of Groningen)
Wei, Fu-Tsun (National Tsing Hua University)
Yasuda, Seidai (Kyoto University)
Yu, Jing (National Tsing-Hua University Taiwan)

Nonlinear Conservation Laws and Related Problems
October 4 - 9, 2009

Organizers:

Gui-Qiang Chen (Northwestern University)
Walter Craig (McMaster University)
Constantine Dafermos (Brown University)
Konstantina Trivisa (University of Maryland)

Nonlinear Conservation Laws result from the balance laws of continuum physics and govern a broad spectrum of physical phenomena in compressible fluid dynamics, nonlinear materials science, particle physics, semiconductors, combustion, multi-phase flows, astrophysics, and other applied areas. They have a close connection with various geometric problems including low codimension isometric embeddings and the Nirenberg problem of embedding of Riemannian manifolds with prescribed Gauss curvature. In recent years, major progress has been made in both the theoretical and numerical aspects of the field. The theme of the workshop is on several aspects of the theory of weak solutions for hyperbolic systems, the mathematical theory of transport equations that arise in the kinetic theory of gases, the investigation of the multidimensional Euler, relativistic Euler, Euler-Poisson, and Navier-Stokes equations, and related applications of nonlinear conservation laws to physical and geometric problems. The goal of the workshop is to bring together experts in the theoretical and numerical aspects of hyperbolic conservation laws and related partial differential equations to take part in the examination of emerging problems, exchanging ideas in a structured and focused environment. Furthermore, the workshop offers an opportunity to bring into focus other problems that are able to be addressed by the methods developed by the conservation laws community.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5090

Participants:

Ancona, Fabio (University of Padova)
Bae, Myoungjean (University of Wisconsin, Madison)
Benzoni-Gavage, Sylvie (University of Lyon)
Chen, Gui-Qiang (Northwestern University)
Chen, Xiuxiong (University of Wisconsin)
Craig, Walter (McMaster University)
Dafermos, Constantine (Brown University)
Ding, Qian (Northwestern University)
Donadello, Carlotta (Northwestern University)
Feireisl, Eduard (Czech Academy of Sciences)
Feldman, Mikhail (University of Wisconsin)
Fetecau, Razvan (Simon Fraser University)
Frid, Hermano (Instituto de Matematica Pura e Aplicada-IMPA)
Gao, Shu (Northwestern University)
Ha, Seung Yeal (Seoul National University)
Han, Qing (University of Notre Dame)
Holden, Helge (NTNU Trondheim)
Karlsen, Kenneth (University of Oslo)
Klingenberg, Christian (Wurzburg University)
LeVeque, Randy (University of Washington)
Liu, Tai-Ping (Stanford University)
Marcati, Pierangelo (University of L'Aquila)
McCann, Robert (University of Toronto)
Pan, Ronghua (Georgia Tech)
Ruan, Weihua (Purdue University Calumet)
Serre, Denis (ENS Lyon)
Spinolo, Laura (Centro De Giorgi)
Su, Shaowei (Northwestern University)
Tadmor, Eitan (University of Maryland)
Torres, Monica (Purdue University)
Trivisa, Konstantina (University of Maryland)
Tzavaras, Athanasios (University of Maryland)
Xin, Zhouping (The Chinese University of Hong Kong)
Zhang, Yongqian (Fudan University)
Zhou, Yi (Fudan University)
Zhu, Dianwen (UC Davis)

Dedekind Sums in Geometry, Topology, and Arithmetic
October 11 - 16, 2009

Organizers:

Matthias Beck (San Francisco State University)
Paul Gunnells (University of Massachusetts, Amherst)
Adam Sikora (SUNY Buffalo)

This workshop plans to focus on intriguing relationships between several different fields of mathematics: number theory, convex geometry, and topology. Number theory is one of the oldest fields in mathematics. It studies properties of the whole numbers and fractions as well as more exotic constructions, and today finds many applications in computer science and cryptography. Convex geometry studies the properties of rigid shapes in space built from points, lines, and polygons, such as the pyramid and the cube. Topology is also known as "rubber-sheet" geometry: its practitioners investigate properties of geometric objects that remain unchanged under continuous deformations. Although these branches of mathematics sound wildly different, it turns out there are fascinating relationships between them. One relationship is captured by Dedekind sums. These sums often arise in the different subjects in the course of computing other quantities, and usually reflect some kind of geometric complexity in the quantities under study. The goals of the workshop are to explore connections between these subjects using Dedekind sums as a bridge, to try to understand the significance of Dedekind sums in these fields, and to try to unearth new relationships between these areas.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5102

Participants:

Bayad, Abdelmejid (University Evry-Paris)
Beck, Matthias (San Francisco State University)
Bliem, Thomas (San Francisco State University)
Chan, O-Yeat (Dalhousie University)
Charollois, Pierre (Institut de Mathématiques de Jussieu)
Chinta, Gautam (City College of New York)
Christie, Aaron (University of Calgary)
Dasgupta, Samit (UC Santa Cruz)
Diaz, Ricardo (University of Northern Colorado)
Dilcher, Karl (Dalhousie University)
Greenberg, Matthew (University of Calgary)
Gunnells, Paul (University of Massachusetts, Amherst)
Hamahata, Yoshinori (Tokyo University of Science)
Hill, Richard (University College London)
Kurt, Veli (Akdeniz University)
Lawrence, Ruth (Hebrew University, Jerusalem)
Lisonek, Petr (Simon Fraser University)
Martin, Greg (University of British Columbia)
Meyer, Jeffrey (Syracuse University)
Milev, Todor (Jacobs University Bremen)
Pfeifle, Julian (Universitat Politècnica de Catalunya)
Pommersheim, James (Reed College)
Robins, Sinai (Nanyang Technological University)
Sczech, Robert (Rutgers University)
Sikora, Adam (SUNY Buffalo)
Simsek, Yilmaz (Akdeniz University)
Steele, Ander (Boston University)
Stevens, Glenn (Boston University)
Urzua, Giancarlo (University of Massachusetts, Amherst)
Woods, Kevin (Oberlin College)

Complex Monge-Ampère Equation
October 18 - 23, 2009

Organizers:

Zbigniew Blocki (Jagiellonian University)
Pengfei Guan (McGill University)
Duong Phong (Columbia University)

The complex Monge-Ampère equation appears in many areas of mathematics, e.g. Complex Geometry and Pluripotential Theory. This important, fully nonlinear partial differential equation of second order was for example used in a spectacular way by Yau who proved conjectures of Calabi in 1976. Today it is still a very active area of research, related in particular to the complex version of Hamilton's Ricci flow, existence of Kähler-Einstein metrics, and other problems of Kähler geometry. This workshop provided a wonderful opportunity to bring the most senior experts of the field together with junior mathematicians working in the area. Another advantage of such a meeting at BIRS, with its facilities and atmosphere, is a geographic diversity of the proposed participants. Apart from 25 40-minute talks, we asked the most senior participants to moderate additional problem sessions.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/5049

Participants:

Apostolov, Vestislav (Université du Québec à Montréal)
Berman, Robert (Chalmers University)
Blocki, Zbigniew (Jagiellonian University)
Cegrell, Urban (Umea Universitet)
Czyz, Rafal (Jagiellonian University)
Demailly, Jean-Pierre (Université de Grenoble I)
Dinew, Slawomir (Jagiellonian University)
Edigarian, Armen (Jagiellonian University)
Fu, Jixiang (Fudan University)
Guan, Pengfei (McGill University)
Guan, Bo (Ohio State University)
Guedj, Vincent (Université Aix-Marseille)
Huang, Yong (Chinese Academy of Sciences and McGill University)
Huang, Hongnian (UQAM and McGill University)
Kolodziej, Slawomir (Jagiellonian University)
LaNave, Gabriele (Yeshiva University)
Li, Song-Ying (UC Irvine)
Li, Qun (Wright State University)
Lu, Zhiqin (UC Irvine)
Phong, Duong (Columbia University)
Plis, Szymon (Cracow University of Technology)
Song, Jian (Rutgers University)
Spruck, Joel (Johns Hopkins University)
Sturm, Jacob (Rutgers University)
Szekelyhidi, Gabor (Harvard University)
Taylor, Al (University of Michigan)
Tosatti, Valentino (Columbia University)
Varolin, Dror (Stony Brook University)
Xu, Lu (Chinese Academy of Sciences and McGill University)
Yau, Shing-Tung (Harvard University)
Yuan, Yuan (Rutgers University)
Zhang, Xiangwen (McGill University)

Mathematical Methods in Emerging Modalities of Medical Imaging
October 25 - 30, 2009

Organizers:

David Finch (Oregon State University)
Peter Kuchment (Texas A&M University)
John Schotland (University of Pennsylvania)
Yuan Xu (Ryerson University)

Medical diagnostic imaging, since the invention of the first medical scanner 40 years ago, has relied heavily upon sophisticated mathematical methods. The successes of X-ray CT scan, MRI, and other well developed methods are widely known. However, requirements for the safety of patients and practitioners, low cost, high contrast, high resolution, etc. are hard (almost impossible) to satisfy in a single method, which has triggered recent attempts to develop novel methods. The mathematical toolbox that is needed involves various techniques of contemporary mathematical analysis, as well as of discrete and numerical mathematics. Most of those are not at the stage of clinical implementation yet, but rather under intensive research and development. One can name, for instance, various types of optical tomography, phase contrast CT, thermo/photoacoustic tomography, elastography, electrical impedance tomography, ultrasound modulated optical tomography, and several others. The workshop assembled leading researchers from mathematics, physics, engineering and medicine interested in developing and implementing mathematical methods of novel medical diagnostic imaging, as well as junior scientists entering this exciting field to formulate the mathematical problems that must be resolved to meet outstanding challenges of this young and fast- developing area and to assess and facilitate the current progress in these directions.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/5017

Participants:

Allmaras, Moritz (Texas A&M University)
Ambartsoumian, Gaik (University of Texas, Arlington)
Arridge, Simon (University College London)
Bal, Guillaume (Columbia University)
Bangerth, Wolfgang (Texas A&M University)
Burgholzer, Peter (Upper Austrian Research)
Carney, Scott (UIUC)
Finch, David (Oregon State University)
Hristova, Yulia (Texas A&M University)
Hubenthal, Mark (University of Washington)
Isaacson, David (Rensselaer Polytechnic Institute)
Katsevich, Alexander (University of Central Florida)
Kim, Arnold (UC Merced)
Kuchment, Peter (Texas A&M University)
Kunyansky, Leonid (University of Arizona, Tucson)
Lawrence, Albert (Rick) (UC San Diego)
Lewis, Matthew (UT Southwestern Medical Center at Dallas)
Li, Changhui (Washington University)
Machida, Manabu (University of Pennsylvania)
Manduca, Armando (Mayo Clinic)
Markel, Vadim (University of Pennsylvania)
McLaughlin, Joyce (Rensselaer Polytechnic Institute)
Moskow, Shari (Drexel University)
Nachman, Adrian (University of Toronto)
Natterer, Frank (University of Münster)
Nguyen, Linh (Texas A&M University)
Palamodov, Victor (Tel Aviv University)
Quinto, Eric Todd (Tufts University)
Ritman, Erik (Mayo Clinic College of Medicine)
Rundell, William (Texas A&M University)
Scherzer, Otmar (University of Vienna)
Schotland, John (University of Pennsylvania)
Stefanov, Plamen (Purdue University)
Tamasan, Alexandru (University of Central Florida)
Xu, Yuan (Ryerson University)
Yoon, Jeong-Rock (Clemson University)

Interdisciplinary Workshop on Fixed-Point Algorithms for Inverse Problems in Science and Engineering
November 1 - 6, 2009

Organizers:

Heinz Bauschke (UBC Okanagan)
Regina Burachik (University of South Australia)
Patrick Combettes (Université Pierre et Marie Curie)
Veit Elser (Cornell University)
Russell Luke (University of Delaware)
Henry Wolkowicz (University of Waterloo)

The objective of this workshop was to bring together researchers with a strong interest in projection and first-order fixed-point algorithms, both from mathematics and from the applied sciences, in order to survey the state-of-the-art of theory and practice, to identify emerging problems driven by applications, and to discuss new approaches for solving these problems. Various monographs and conference proceedings on projection methods and their applications have been published recently. The participants have not met before and it is very unlikely they will meet again at ordinary optimization conferences. We expect this workshop to be the base for new innovative research and collaborations by its unique mix of experts whose areas of applications are broad, ranging from variational analysis, numerical linear algebra, machine learning, computational physics and crystallography.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5006

Participants:

Bauschke, Heinz (UBC Okanagan)
Beck, Amir (Technion)
Ben-Israel, Adi (Rutgers University)
Bot, Radu Ioan (Chemnitz University of Technology)
Burachik, Regina (University of South Australia)
Burke, James V. (University of Washington)
Cegielski, Andrzej (University of Zielona Góra)
Cheung, Yuen-Lam (Vris) (University of Waterloo)
Christou, Cameron (University of British Columbia)
Combettes, Patrick (Université Pierre et Marie Curie)
Corvellec, Jean-Noel (Université de Perpignan)
De Pierro, Alvaro (University of Campinas)
Ebrahimi, Mehran (University of Toronto)
Elser, Veit (Cornell University)
Hare, Warren (Simon Fraser University)
Koch, Valentin (UBC Okanagan)
Lo, Victor (University of Canterbury NZ)
Loewen, Philip (University of British Columbia)
Lopez Acedo, Genaro (Universidad de Sevilla)
Lucet, Yves (UBC Okanagan)
Luke, Russell (University of Delaware)
Macklem, Mason (UBC Okanagan)
Marnitz, Philipp (Georg-August Universitaet Goettingen)
Martin-Marquez, Victoria (Universidad de Sevilla)
Modersitzki, Jan (McMaster University)
Moffat, Sarah (UBC Okanagan)
Nasri, Mostafa (Université Laval)
Plemmons, Bob (Wake Forest University)
Revalski, Julian (Université des Antilles et de la Guyane)
Schaad, Jason (UBC Okanagan)
Scherzer, Otmar (University of Vienna)
Simons, Stephen (UC Santa Barbara)
Teboulle, Marc (Tel Aviv University)
Wang, Shawn X. (UBC Okanagan)
Wolkowicz, Henry (University of Waterloo)
Yamada, Isao (Tokyo Institute of Technology)
Yao, Liangjin (UBC Okanagan)
Yedidia, Jonathan (Mitsubishi Electric Research Labs)
Zarate Saiz, Ramon (University of British Columbia)
Zinchenko, Yuriy (University of Calgary)

Noise, Time Delay and Balance Control
November 8 - 13, 2009

Organizers:

Sue Ann Campbell (University of Waterloo)
John Milton (The Claremont Colleges)
Toru Ohira (Sony Computer Science Laboratories, Inc.)
Minoru Shinohara (Georgia Tech)
Gabor Stepan (Budapest University of Technology and Economics)

What can stick balancing at the fingertip, buckling springs, and walking two-legged robots tell us about balance and falling in adults? World-famous mathematicians and motion scientists investigated this and more during a workshop held at The Banff Centre. The workshop is designed to bring together applied mathematicians and motion scientists in at atmosphere that promotes interactive and thought provoking discussion. This is an ideal forum for mathematicians to introduce results concerning the use of delay and stochastic delay differential equations for the study of balance to the motion science community. In turn, motion scientists will have a chance to introduce observations at the cutting edge of human and two-legged balance control to the mathematics community. The hope is to use mathematical insight to identify a set of workable strategies that can help improve balance control in humans and in two-legged robots. Falls are the most common cause of trauma, and the single largest cause of accidental death among the elderly. This workshop will go a long way towards uniting the efforts of mathematicians and motion scientists towards solving this problem.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5052

Participants:

Balasubramaniam, Ramesh (McMaster University)
Belair, Jacques (Université de Montréal)
Bingham, Jeffrey (Georgia Tech)
Boulet, Jason (University of Ottawa)
Campbell, Sue Ann (University of Waterloo)
Choi, Julia (Emory University and Georgia Tech)
Cluff, Tyler (McMaster University)
Finley, James (Northwestern University)
Gruben, Kreg (University of Wisconsin)
Insperger, Tamas (Budapest University of Technology and Economics)
Jeka, John (University of Maryland)
Kiemel, Tim (University of Maryland)
Kuo, Arthur (University of Michigan)
Kuske, Rachel (University of British Columbia)
Kutch, Jason (University of Southern California)
Loram, Ian (Manchester Metropolitan University)
Milton, John (The Claremont Colleges)
Ohira, Toru (Sony Computer Science Laboratories, Inc.)
Perreault, Eric (Northwestern University)
Peterka, Robert J (Oregon Health and Science University)
Rácz, Kornelius (University of Southern California)
Radunskaya, Ami (Pomona College)
Ruina, Andy (Cornell University)
Shinohara, Minoru (Georgia Tech)
Sieber, Jan (University of Portsmouth)
Srinivasan, Manoj (Ohio State University)
Stepan, Gabor (Budapest University of Technology and Economics)
Ting, Lena (Emory University and GeorgiaTech)
Valero-Cuevas, Francisco (University of Southern California)
van Antwerp, Keith (Georgia Tech)
Venkadesan, Madhusudhan (Harvard University)
Vette, Albert (University of Toronto)

Statistical Mechanics on Random Structures
November 15 - 20, 2009

Organizers:

Anton Bovier (Rheinische Friedrich-Wilhelms-Universität Bonn)
Pierluigi Contucci (University of Bologna)
Frank den Hollander (University of Leiden and EURANDOM)
Cristian Giardina (TU Eindhoven and EURANDOM)

The theme of the workshop has been equilibrium and non-equilibrium statistical mechanics in a random spatial setting. Put differently, the question was what happens when the world of interacting particle systems is put together with the world of disordered media. This area of research is lively and thriving, with a constant flow of new ideas and exciting developments, in the best of the tradition of mathematical physics. Spin glasses were at the core of the program, but in a broad sense. Spin glass theory has found applications in a wide range of areas, including information theory, coding theory, algorithmics, complexity, random networks, population genetics, epidemiology and finance. This opens up many new challenges to mathematics.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5055

Participants:

Agliari, Elena (University of Parma)
Aizenman, Michael (Princeton University)
Aldous, David (UC Berkeley)
Arguin, Louis-Pierre (New York University)
Barra, Adriano (Sapienza Università di Roma)
Ben Arous, Gerard (New York University)
Bianchi, Alessandra (Weierstrass Institute Berlin)
Bovier, Anton (Rheinische Friedrich-Wilhelms-Universität Bonn)
Burioni, Raffaella (Università di Parma)
Damron, Michael (Princeton University)
Dembo, Amir (Stanford University)
den Hollander, Frank (University of Leiden and EURANDOM)
Dommers, Sander (TU Eindhoven)
Fedele, Micaela (Bologna University)
Franz, Silvio (Université Paris Sud)
Giardina, Cristian (TU Eindhoven and EURANDOM)
Giberti, Claudio (Università di Modena e Reggio Emilia)
Kistler, Nicolas (Bonn University)
Klimovsky, Anton (Universität Erlangen-Nürnberg)
Kuelske, Christof (Rijksuniversity Groningen)
Luczak, Malwina (London School of Economics)
Macris, Nicolas (École Polytechnique Fédérale de Lausanne)
Marsili, Matteo (Abdus Salam ICTP Trieste)
Montanari, Andrea (Stanford University)
Newman, Charles (New York University)
Nishimori, Hidetoshi (Tokyo Institute of Technology)
Percus, Allon (Claremont Graduate University)
Semerjian, Guilhem (ENS Paris)
Sherrington, David (University of Oxford)
Starr, Shannon (University of Rochester)
Stein, Daniel (New York University)
Virag, Balint (University of Toronto)
Zdeborova, Lenka (Los Alamos National Laboratory)

First Nations Math Education
November 22 - 27, 2009

Organizers:

Melania Alvarez-Adem (PIMS)
Genevieve Fox (First Nations Adult and Higher Education Consortium)
Sharon Friesen (University of Calgary)

At this meeting, Elders from different First Nations were invited to attend, as well as mathematicians and teachers. Through various sessions, mathematicians worked with the elders to extract explicitly the mathematical knowledge of their traditional ways. We were able to demonstrate how mathematics is implicitly and explicitly a part of Aboriginal traditional knowledge. Our main goal was to create lessons for use in the current mathematics curriculum, that reflect Aboriginal knowledge.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5078

Participants:

Alvarez-Adem, Melania (PIMS)
Bastien, Muriel (Aahsaopi Elementary School)
Blood, Narcisse (Elder Kainai Nation)
Doolittle, Edward (First Nations University of Canada)
Fox, Genevieve (First Nations Adult and Higher Education Consortium)
Fox, Marvin (Iniskim Centre)
Friesen, Sharon (University of Calgary)
Good Striker, Evelyn (Teacher)
Guy, Richard (University of Calgary)
Hanoski, Kaleena (Ta-Otha Community School)
Healy, Trina (Red Crow College)
James, Nkixwstn (Stein Valley Nlha'ka'pamux School)
Jungic, Veselin (Simon Fraser University)
Lagu, Indy (Mount Royal University)
Leeming, David (University of Victoria)
Low Horn, Denise (Siksika Nation High School)
Mackenzie, Sheila (Sk'elep School of Excellence)
MacLean, Mark (University of British Columbia)
Martinez, Maria Jose Athie (University of British Columbia)
McDougall, Wilf (First Nation Elder)
McDougall, Mary Ruth (First Nation Elder)
Megginson, Robert (University of Michigan)
Mitzner, Diana (Nak'albun Elementary School)
Nicol, Cynthia (University of British Columbia)
Petrie, Linda (Blue Quills)
Redbear, Gerry (Yellowhead Tribal College Elder)
Russell, Caroline (Tatsikiisaapo'p Middle School)
Scout-Bastien, Kathy (Piikani Blackfoot reserve)
Seymour, Colleen (Sk'elep School of Excellence)
Sinclair, Rena (Siksika Board of Education)
Smith, Marvin (Piikani secondary school)
Spring Chief, Maryanne (Siksika Board of Education)
Stent, Norma Phyllis (Nak'al Bun Elementary School)
Sterenberg, Gladys (University of Alberta)
Tailfeathers, Ruby (Kainai High School)
Verreault, Jocelyn (Yellowhead Tribal College)
Water Chief, Natasha (Siksika Board of Education)
Weston, Harley (University of Regina)
Wojtowicz, Adam (PIMS)

Combinatorial Optimization under Uncertainty
November 29 - December 4, 2009 Half Workshop

Organizers:

Michel Gendreau (Université de Montréal)

Sen Suvrajeet (The Ohio State University)

Optimizing decision-making in a variety of key application contexts, ranging from the design of telecommunications or logistics networks to the staffing of call centers, involves solving complex optimization models that include discrete decisions (e.g., should a bridge be constructed in this location or not?). More often than not, all the information relevant to the decision-making process is not known with complete certainty and the impact of this uncertainty on the best decisions in the context may be critical. This realization has prompted researchers from many disciplines (applied probabilities, computer science, engineering, operations research, etc.) to start developing specialized solution approaches to tackle these difficult combinatorial optimization problems under uncertainty.

Unfortunately, these research streams have largely evolved independently and there is a pressing need for the researchers involved to share results, ideas, and concerns. The main objective of this workshop is to address this need by getting together some of the top researchers of the various communities involved in combinatorial optimization under uncertainty. Researchers from key application areas, such as stochastic vehicle routing, revenue management and call centers optimization will also participate in the workshop.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5097

Participants:

Ahmed, Shabbir (Georgia Tech)
Ball, Michael (University of Maryland)
Bayraksan, Guzin (University of Arizona)
Crainic, Teodor Gabriel (Université du Québec à Montréal)
Fu, Michael (University of Maryland)
Gendreau, Michel (Université de Montréal)
Jaillet, Patrick (MIT)
Kleywegt, Anton (Georgia Tech)
Kucukyavuz, Simge (The Ohio State University)
Linderoth, Jeff (Wisconsin University)
Lokketangen, Arne (Molde University College)
Miller, Andrew (Université Bordeaux 1)
Rei, Walter (Université du Québec à Montréal)
Schultz, Ruediger (Universität Duisburg-Essen)
Shmoys, David B. (Cornell University)
Smith, J. Cole (University of Florida)
Suvrajeet, Sen (The Ohio State University)
van der Vlerk, Maarten (University of Groningen)
Voss, Stefan (University Hamburg)

Search in Constraint Programming
November 29 - December 4, 2009 Half Workshop

Organizers:

Gilles Pesant (École Polytechnique de Montréal) **Meinolf Sellmann** (Brown University)

As the modern economic era of growth based on over-consumption draws near to its end, we need to find new ways to maintain the standard of living while operating within the limited capacities of renewable resources, under the pressure of global competition, and in an aging society. Computers can help increase efficiency by providing intelligent decision support on a broad scale. Producers and service providers are especially in need of advice on how to streamline their operations by saving scarce natural or human resources. Computers can intelligently support decisions on how to optimize objectives while observing problem-specific constraints. In this way, computational decision support can help save precious raw materials or reduce pollution. While decision support is employed very successfully in some core application areas, the technology does not live up to its vast potential today. Ease of use is a vital requirement for a broader exploitation of computational optimization power. To the present day, human experts are still necessary to model and solve real-world problems efficiently.

This workshop aims to make decision support more easily accessible by automating solvers so that expert intervention is not required anymore to allow for an efficient solution process.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5125

Participants:

Beck, Chris (University of Toronto)
Chapados, Nicolas (Université de Montréal)
Dilkina, Bistra (Cornell University)
Hooker, John (Carnegie Mellon University)
Hoos, Holger (University of British Columbia)
Hsu, Eric (University of Toronto)
Hutter, Frank (University of British Columbia)
Kadioglu, Serdar (Brown University)
Leyton-Brown, Kevin (University of British Columbia)
Malitsky, Yuri (Brown University)
Pesant, Gilles (École Polytechnique de Montréal)
Rousseau, Louis-Martin (École Polytechnique de Montréal)
Sabharwal, Ashish (Cornell University)
Sellmann, Meinolf (Brown University)
Smith, Stephen (Carnegie-Mellon University)
van Hoeve, Willem-Jan (Carnegie Mellon University)

Numerical Analysis of Multiscale Computations
December 6 - 11, 2009

Organizers:

Bjorn Engquist (University of Texas, Austin)
Olof Runborg (Royal Institute of Technology, Sweden)
Steve Ruuth (Simon Fraser University)
Richard Tsai (University of Texas, Austin)

In this workshop we considered the mathematics of multiscale problems and in particular a new class of numerical methods which aim to make the coupling between the coarse and fine scale models more efficient. This new kind of multiscale approach makes it feasible to treat problems that were previously out of reach, and to obtain higher accuracy when simulating important physical phenomena in the applied sciences including, materials science, chemistry, fluid dynamics, and biology.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w5109

Participants:

Abdulle, Assyr (École Polytechnique Fédérale de Lausanne)
Ascher, Uri (University of British Columbia)
Berlyand, Leonid (Pennsylvania State University)
Bou-Rabee, Nawaf (New York University)
Cances, Eric (ENPC and INRIA)
Darve, Eric (Stanford University)
Delgado-Buscalioni, Rafael (Autonomous University of Madrid)
Delle Site, Luigi (Max-Planck Institut für Polymerforschung)
Donev, Aleksandar (Lawrence Berkeley National Laboratory)
Engquist, Bjorn (University of Texas, Austin)
Gloria, Antoine (INRIA Lille - Nord Europe)
Hoel, Håkon (KTH)
Holst, Henrik (KTH / CSC Computer Science and Communication)
Hu, Jingwei (University of Wisconsin, Madison)
Häggblad, Jon (KTH)
Jin, Shi (University of Wisconsin, Madison)
Kalligiannaki, Evangelia (University of Tennessee)
Le Bris, Claude (CERMICS ENPC France)
Lelievre, Tony (École Nationale des Ponts et Chaussées)
Luskin, Mitchell (University of Minnesota)
Martinsson, Gunnar (University of Colorado, Boulder)
Owhadi, Houman (Caltech)
Popovic, Jelena (KTH)
Prudhomme, Serge (University of Texas, Austin)
Runborg, Olof (Royal Institute of Technology, Sweden)
Ruuth, Steve (Simon Fraser University)
Sanz-Serna, J M (Universidad de Valladolid Spain)
Smyshlyaev, Valery (University of Bath)
Stockie, John (Simon Fraser University)
Tanushev, Nicolay (University of Texas, Austin)
Tornberg, Anna-Karin (Royal Institute of Technology)
Tsai, Richard (University of Texas, Austin)
Ying, Lexing (University of Texas, Austin)

Banff International Research Station

2009

2-Day Workshops

Modeling Risk Prediction
March 6 - 8, 2009

Organizers:

Elizabeth Claus (Yale University)
Joel Dubin (University of Waterloo)
Annette Molinaro (Yale University)

Thus far, the group of researchers who have constructed the majority of cancer risk models remains relatively small, with relatively similar educational and training backgrounds. One of the goals of this meeting is to introduce individuals from outside this small group, with the potential to address the current problems from a different perspective.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w2581

Participants:

Amos, Chris (The University of Texas, M.D. Anderson Cancer Center)
Antoniou, Antonis (University of Cambridge)
Barlow, William (Cancer Research and Biostatistics)
Begg, Colin (Memorial Sloan Kettering)
Briollais, Laurent (Samuel Lunenfeld Research Institute)
Chatterjee, Nilanjan (National Cancer Institute)
Claus, Elizabeth (Yale University)
Crooke, Philip (Vanderbilt University)
Dubin, Joel (University of Waterloo)
Euhus, David (UT Southwestern Medical Center at Dallas)
Freedman, Andrew (National Cancer Institute)
Gard, Charlotte (University of Washington)
Hauptmann, Michael (Netherlands Cancer Institute)
Holford, Theodore (Yale University)
Kopciuk, Karen (University of Calgary/Alberta Cancer Board)
Lostritto, Karen (Yale University)
Miglioretti, Diana (Group Health Center for Health Studies)
Molinaro, Annette (Yale University)
Parl, Fritz F (Vanderbilt University Medical Center)
Parmigiani, Giovanni (Johns Hopkins University)
Pfeiffer, Ruth (National Cancer Institute)
Powers, Natalie (Yale University)
Rosner, Bernard (Harvard Medical School)
Taylor, Jeremy (University of Michigan)
Yuan, Yan (Alberta Cancer Board)

Ted Lewis Workshop on SNAP Math Fairs 2009
April 24 - 26, 2009

Organizers:

Tiina Hohn (Grant MacEwan College)
Ted Lewis (University of Alberta)
Andy Liu (University of Alberta)

This was the seventh year that math fair workshops have been held at BIRS. This year two workshops were held with seventeen participants in the first workshop and sixteen in the second. The first workshop was directed mainly towards math fairs for elementary, junior, and senior high schools, the other was concerned with math fairs for pre-service teachers attending colleges and universities. The participants came from elementary schools, junior-high and high schools, from independent organizations, and from universities and colleges. The purpose of the workshop was to bring together educators who are interested in using our particular type of math fair, called a SNAP math fair, to enhance the mathematics curriculum.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w2150

Participants:

Ditlof, Gail (Edmonton Public Schools)
Francis-Poscente, Krista (St. Mary's University College)
Graves, Sean (University of Alberta)
Hamilton, Gordon (Masters Academy and College)
Hoffman, Janice (Edmonton Schools)
Hohn, Tiina (Grant MacEwan University)
Kirsch, Julie (Calgary Board of Education)
Lewis, Ted (University of Alberta)
Martin, Judy (University of Calgary)
Motoska, Kimberly (Edmonton Catholic Schools)
Nichols, Ryan (Edmonton Schools)
Pasanen, Trevor (University of Alberta)
Shaw, Dolph (Edmonton Public Schools)
Thomas, Teena (Edmonton Public Schools)
Tonoyan, Garnik (Yerevan State University)
Tonoyan, Lusine (University of Alberta)
Wheeler, Dallas (Calgary Board of Education)

SNAP Math Fairs in MATH 160
June 5 - 7, 2009

Organizers:

Tiina Hohn (Grant MacEwan College)
Ted Lewis (University of Alberta)
Andy Liu (University of Alberta)

The workshop offers practical, hands-on information on how to incorporate SNAP math fair in the basic mathematics course for pre-service teachers and education students. This math fair approach helps to include puzzles and problemsolving as part of classroom and school activities to improve the teaching of mathematics in our schools and introduce mathematics culture to school environment.

SNAP math fair has increased in popularity among schools and teachers and has gained a reputation all across Canada and outside our continent as one of the best initiatives to popularize mathematics in our school culture. Many teachers have witnessed an increased interest in studying mathematics in the classrooms and then consequently improved results in student assesments.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w2151

Participants:

Cannon, Jane (University of the Fraser Valley)
Desaulniers, Shawn (Okanagan College)
Dumanski, Micheal (SNAP Foundation)
Francis-Poscente, Krista (St. Mary's University College)
Friesen, Sharon (University of Calgary)
Godwaldt, Terry (Edmonton Public Schools)
Hamilton, Gordon (Masters Academy and College)
Hohn, Tiina (Grant MacEwan University)
Lewis, Ted (University of Alberta)
Marion, Samantha (University of Alberta)
Mckenzie, Hannah (University of Alberta)
Pasanen, Trevor (University of Alberta)
Rioux-Wilson, Judith (St.Catherine School)
Thompson, Tanya (ThinkFun, Inc)
Tomoda, Satoshi (Okanagan College)

Subtle Transversality
September 4 - 6, 2009

Organizers:

Ryan Budney (University of Victoria)
Charles Delman (Eastern Illinois University)
Kiyoshi Igusa (Brandeis University)
Ulrich Oertel (Rutgers University)
Nathalie Wahl (University of Copenhagen)

The workshop's aim is to expose the work of Allen Hatcher and its modern descendants, such as my own work on knot spaces, and Nathalie Wahl's work on homological stability of 3-manifold mapping class groups. The idea is to invite Hatcher's former students and people who have either developed mathematics in a similar style or collaborated with Hatcher, to talk about their work. In effect this means inviting people who study spaces or complexes of low-dimensional topological objects. An aspect of the conference would be a tribute to Hatcher near his 65th birthday. Another aspect would be that it would allow people with an interest in Hatcher's methods and/or interests to gain access to many people who have similar pursuits.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w2138

Participants:

Brendle, Tara (University of Glasgow)
Brittenham, Mark (University of Nebraska)
Budney, Ryan (University of Victoria)
Clay, Adam (University of British Columbia)
Delman, Charles (Eastern Illinois University)
Edwards, Robert (UCLA)
Godin, Veronique (University of Calgary)
Hatcher, Allen (Cornell University)
Hsiang, Wu-Chung (Stanford University)
Igusa, Kiyoshi (Brandeis University)
Laudenbach, Francois (University of Nantes)
Lawson, Terry (Tulane University)
Oertel, Ulrich (Rutgers University)
Peschke, George (University of Alberta)
Rahmati, Saeed (University of Alberta)
Roberts, Rachel (Washington University)
Rolfsen, Dale (University of British Columbia)
Rubinstein, J. Hyam (University of Melbourne)
Smith, Jeffrey (University of British Columbia)
Stanley, Don (University of Regina)

Workshop on Stochasticity in Biochemical Reaction Networks September 25 - 27, 2009

Organizers:

Brian Munsky (Los Alamos National Laboratory)

David Thorsley (University of Washington)

The workshop emphasized recent improvements in the theoretical, computational, and experimental investigation of stochasticity at the cellular and nanoscale levels. The workshop promoted cross-disciplinary communication and collaboration between researchers in mathematical fields such as stochastic processes, Markov models, stochastic simulation and information theory, engineering fields such as control theory, computer science, and circuit design, and scientific fields such as computational biology, nucleic acid research, biophysics, biochemistry, and nanotechnology. The event was highly successful in encouraging the development of a research community uniquely qualified to investigate the phenomenon of stochasticity in biochemical reaction networks.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w2142

Participants:

Chevalier, Michael (UC San Francisco)
Dunlop, Mary (Lawrence Berkeley National Laboratory)
Faeder, James (University of Pittsburgh)
Hess, Henry (University of Florida / Columbia University)
Jang, S. Shelly (University of Washington)
Kim, Kyung Hyuk (University of Washington)
Klavins, Eric (University of Washington)
Lampoudi, Sotiria (UC San Diego)
Maheshri, Narendra (MIT)
Munsky, Brian (Los Alamos National Laboratory)
Murray, Richard (Caltech)
Nemenman, Ilya (Emory University)
Neuert, Gregor (MIT)
Popovic, Lea (Concordia University)
Raj, Arjun (MIT)
Rao, Christopher (UIUC)
Riedel, Marc (University of Minnesota)
Samoilov, Michael (QB3/UC Berkeley)
Scott, Matthew (University of Waterloo)
Sheppard, Patrick (University of California)
Shih, William (Harvard Medical School)
Soloveichik, David (Caltech)
Thorsley, David (University of Washington)
Walczak, Aleksandra (Princeton University)

Northwest Functional Analysis Seminar
October 16 - 18, 2009

Organizers:

Berndt Brenken (University of Calgary)
Heath Emerson (University of Victoria)
Douglas Farenick (University of Regina)
Vladimir Troitsky (University of Alberta)

The field of functional analysis is a central and thriving branch of modern mathematics. Western Canada is particularly strong in the field, as there are researchers in the region who are internationally recognised for their contributions to Banach space geometry, noncommutative harmonic analysis, operator algebras, noncommutative geometry, and operator theory.

This meeting of the Northwest Functional Analysis Seminar was the fourth, the first three having taken place at BIRS in 2003, 2005, and 2007. Like the first three meetings, the 2009 meeting was very successful in its aim to play a formative role in developing the profiles of young researchers and graduate students. In addition to a strong scientific program, the seminar provided the only venue in 2008 and 2009 at which the region's researchers in functional analysis came into contact collectively at one meeting.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09w2156

Participants:

Belinschi, Serban (University of Saskatchewan)
Binding, Paul (University of Calgary)
Brenken, Berndt (University of Calgary)
Brudnyi, Alex (University of Calgary)
Cheng, Michael Yin Hei (University of Alberta)
Deeley, Robin (University of Victoria)
Emerson, Heath (University of Victoria)
Erlijman, Juliana (University of Regina)
Farenick, Douglas (University of Regina)
Floricel, Remus (University of Regina)
Haagerup, Uffe (University of Southern Denmark)
Ivanescu, Cristian (Grant MacEwan University)
Karabash, Illia (University of Calgary)
Killough, Brady (Mount Royal University)
Kinzebulatov, Damir (University of Toronto)
Lamoureux, Michael (University of Calgary)
McCann, Shawn (University of Calgary)
McLean, Doug (University of Calgary)
Nica, Bogdan (University of Victoria)
Phillips, John (University of Victoria)
Popov, Alexey (University of Alberta)
Rivasplata, Omar (University of Alberta)
Runde, Volker (University of Alberta)
Samei, Ebrahim (University of Saskatchewan)
Sourour, Ahmed Ramzi (University of Victoria)
Spektor, Susanna (University of Alberta)
Troitsky, Vladimir (University of Alberta)
Yaskin, Vladyslav (University of Alberta)
Yuncken, Robert (University of Victoria)
Zhang, Dali (University of Calgary)

Banff International Research Station

2009

Summer Schools
Research in Teams
Focused Research Groups

Summer Schools

The Mathematics of Invasions in Ecology and Epidemiology
May 10 - 17, 2009

Organizers:

Rachel Bennett (Queen's University)
Fred Brauer (University of British Columbia)
Troy Day (Queens University)
James Watmough (University of New Brunswick),
Jianhong Wu (York University)

The school brought together students and researchers in evolution, ecology and epidemiology using a variety of modelling and analytical techniques, including game theoretic, statistical, pde, ode and dynamical systems. The lectures and case studies presented techniques, ideas and problems at the leading edge of mathematics and its applications to ecology and evolution. Most of the case studies covered applications of mathematics from an ecological perspective, encouraging all participants to think about new mathematical approaches to problems. Some of the project reports covered new ground, and we encourage the students to continue their collaboration wih the goal of publishing their results in a peer reviewed journal. We hope that many students will continue to work in this emerging research area of theoretical epidemiology at the interface of mathematics, ecology and evolution.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09ss128

Participants:

Alexander, Helen (Queen's University)
Allen, Linda (Texas Tech University)
Anvari, Vahid (York University)
Arino, Julien (University of Manitoba)
Ashander, Jaime (University of Alberta)
Biernaskie, Jay (University of Toronto)
Brauer, Fred (University of British Columbia)
Crespo Perez, Veronica (University Paris VI / Pontifical Catholic University of Ecuador)
Day, Troy (Queens University)
Du, Yimin (York University)
Ghosh, Atiyo (University of Leiden)
Gilchrist, Michael (University of Tennessee)
Gomulkiewicz, Richard (Washington State University)
Gourley, Stephen (University of Surrey)
Hammond, Rebecca (Acadia University)
Hansen, Johanna (Queen's University)
Jaberi Douraki, Majid (Laval University)
Johnson, Angella (University of Southern California)
Kapitanov, Georgi (Vanderbilt University)
Lang, John (University of Alberta)
Langhammer, Penny (Arizona State University)
Lim, Aaron (University of Alberta)
Liu, Luju (Memorial University)
Lou, Yijun (Memorial University)
Maidens, John (University of Alberta)
Musgrave, Jeff (University of New Brunswick)
Nelson, Bill (Queen's University)
Nonaka, Etsuko (University of New Mexico)
Nowack, Shane (Montana State University)
O'Regan, Suzanne Marie (University College Cork)
Qesmi, Redouane (York University)
Rahman, S.M. Ashrafur (University of Western Ontario)
Read, Andrew (Pennsylvania State University)
Reiseberg, Loren (University of British Columbia)
Rozins, Carly (Queen's University)
Sakrejda-Leavitt, Krzysztof (University of Massachusetts)
Starrfelt, Jostein (University of Helsinki)
Teller, Brittany (Pennsylvania State University)
Wang, Qian (York University)
Wang, Yan (University of British Columbia)
Watmough, James (University of New Brunswick)
Xiao, Yanyu (University of Western Ontario)
Yu, Fang (University of New Brunswick)
Zandstra, Robert (Mississippi State University)
Zou, Xingfu (University of Western Ontario)

2009 Summer IMO Training Camp
June 28 - July 12, 2009

Organizers:

Radmila Bulajich (IMO 2009)
Bill Sands (University of Calgary)
Christopher Small (University of Waterloo)

The International Mathematical Olympiad (IMO), a mathematics contest for high school students, is held each year somewhere in the world, and Canada enters a team of six students each year, organized and sponsored by the Canadian Mathematical Society (CMS). In 2009, the IMO will take place in Bremen, Germany. A Training Camp for the Canadian Team is taking place at BIRS just before the IMO. Here the students will receive lectures and problem sets to work on, plus several "Mock Olympiads", practice contests to prepare them for the IMO ahead. The students will also be given ample time off for excursions and other opportunities to enjoy the many facilities of BIRS and the wonders of the Banff area. Similar Training Camps were held at BIRS just before the 2003, 2005 and 2007 IMOs.

For more information about the IMO, see the official IMO site at http://www.imo-official.org/.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09ss007

Participants:

Arthur, David (Stanford University)
Bibiano Velasco, César (Morelos)
Bulajich, Radmila (IMO 2009)
Cheng, Robin (Pinetree S.S. Coquitlam)
Gallegos Baños, Erik Alejandro (Oaxaca)
Hernández González, Flavio (Aguascalientes)
Isaías Castellanos, Luis Ángel (Colima)
López Buenfil, Manuel Guillermo (Chihuahua)
Pronk, Dorette (Dalhousie University)
Rodríguez Angón, César Ernesto (IMO 2009)
Schneider, Jonathan (IMO 2009)
Shi, Danny (Sir Winston Churchill H.S. Calgary)
Small, Christopher (University of Waterloo)
Soberón, Pablo (IMO 2009)
Spink, Hunter (Western Canada H.S. Calgary)
Sun, Chen (A.B. Lucas S.S. London Ont.)
Sun, Jarno (Chengyue) (IMO 2009)
Tang, Adrian (University of Calgary)
Tsimerman, Jacob (Princeton)

Multiscale Statistical Analysis for Inverse Problems in Correlated Noise
February 8 - 15, 2009

Organizers:

Rafal Kulik (University of Ottawa)
Justin Wishart (University of Sydney)
Marc Raimondo (University of Sydney)

Statistical inverse problems has been a very active field of research in recent years. Existing methods of estimation (among others) include Efromovich's orthogonal series approach and wavelet thresholding algorithm (Donoho, Johnstone, Kerkyacharian, Picard, Raimondo). While adaptive estimation has been derived in certain inverse problems or in direct regression models with correlated noise, the combined effect of dependence and degree of ill posedness on adaptive estimation remains largely unstudied. Due to the level of technicalities involved as well as the number of possible applications, this project will most likely span other 2 or 3 years, potentially leading to several publications in major statistical journals. The distance and time difference between Canada and Australia make it very difficult for the participants to meet or even discuss the project over the phone. We see the research group meeting at Banff in February 2009 as a fantastic opportunity to meet face to face and discuss many of the challenging questions arising in this exciting project. During the meeting at Banff, we had a week of uninterrupted research activities specifically dedicated to this project including revision of manuscripts, finalizing ongoing submission as well as initiate future research directions.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit136

Participants:

Kulik, Rafal (University of Ottawa)
Wishart, Justin (University of Sydney)

Galois Cohomology and Infinite Dimensional Lie Theory
March 22 - 29, 2009

Organizers/participants:

Philippe Gille (ENS) **Arturo Pianzola** (University of Alberta)

The methods developed by Gille and Pianzola allow for the classification of Extended Affine Lie Algebras by cohomological methods (which is a rather elegant point of view). A much finer classification that has a remarkable resemblance to the methods of Jacques Tits over complete local fields is possible. However to have a full dictionary with Tits' picture we are facing a technical obstacle, namely a proof of the existence of maximal tori for certain reductive group schemes over Laurent polynomial rings.

The existence of maximal tori in this case is very interesting problem on its own right. We do know the answer to be positive for twisted groups of inner type.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit145

Singular Perturbation Approach to Rattleback Reversals
April 5 - 12, 2009

Organizers/Participants:

George Patrick (University of Saskatchewan) **Cristina Stoica** (Wilfrid Laurier University)

Nonholonomic systems are ubiquitous and important in mechanics and their structures are of current interest. For example, devices with rolling components, often admit nonholonomic models.

There has been a cascade of work on nonholonomic mechanics starting in the late 1990s. The geometric theory resulting from that work should be assessed in the light of some difficult specific systems. The implications of the geometric theory for dynamics need to be investigated.

The purpose of our project is to explain the spin reversal of the rattleback. We are approaching the problem as a perturbation from a nonsmooth system. Thus we have constructed the nonsmooth system corresponding to the limiting case where the rattleback is replaced by a cylinder. The rattleback switching and the dynamics of the nonsmooth system are similar.

These methods, while developed in the context of the rattleback, have general applications to perturbation of degenerate Lagrangian systems.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit137

Modular Invariants and Twisted Equivariant K-theory
April 26 - May 3, 2009

Organizers/participants:

David Evans (Cardiff University) **Terry Gannon** (University of Alberta)

Witten, in 1998, predicted that a theme of twenty-first century mathematics would be to come to terms with quantum field theory. The most accessible classes of these are the 2-dimensional conformal field theories (CFTs), or equivalently the 3-dimensional topological field theories, associated to compact Lie groups G.

This proposal is to formulate a general theory - which encompasses not only conformal embeddings and orbifold models but also coset models and permutation orbifolds (e.g. related to the monster group) - and understand these structures at the level of specific twisted bundles, rather than the K-groups themselves (which as equivalence classes of the bundles lose much of the information).

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit146

Prime Number Races and Zeros of Dirichlet L-functions
May 3 - 10, 2009

Organizers/Participants:

Greg Martin (University of British Columbia) **Nathan Ng** (University of Lethbridge)

This Research in Teams meeting focused on the finer behaviour of the function π(x; q, a), which denotes the number of prime numbers of the form qn + a that are less than or equal to x. Dirichlet's famous theorem on primes in arithmetic progressions asserts that that there are infinitely many primes of the form qn + a when a is a reduced residue modulo q (that is, when a and q are relatively prime), and so π(x; q, a) is unbounded.
Our Research in Teams meeting was extremely productive and successful—although none of our successes, as it turns out, involved progress towards the main goal of the week! As it happened, we did prove one result directly related to the main goal, although it actually demonstrates that the goal is harder to achieve than we first imagined. We also established several other results related more fundamentally to the LI hypothesis.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit148

Measure Algebras and Their Second Duals
May 17 - 24, 2009

Organizers:

Harold Garth Dales (University of Leeds)

Anthony To-Ming Lau (University of Alberta)

The three colleagues, Dales, Lau, and Strauss, continue their collaboration. This collaboration works well because Dales is an expert on Banach algebras , Lau is an expert on harmonic analysis, and Strauss is an expert on compactications, and these three areas are all relevant to our project.

Our first priority was to complete the manuscript. We also attacked some significant problems that arise naturally; if we resolve these successfully, the solution will be incorporated in. However it is more likely that they will be the seed of further collaborative work (partially supported by an NSERC grant to Lau, and possible LMS grants to Dales and Strauss).

The three participants have submitted for publication the memoir that they produced.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit139

Participants:

Dales, Harold Garth (University of Leeds)
Lau, Anthony To-Ming (University of Alberta)
Strauss, Dona (University of Leeds)

Global Dynamics of Stochastic Differential Delay Equations
June 21 - 28, 2009

Organizer:

Anatoli Ivanov (unsylvania State University)
Stochastic functional differential equations represent a relatively new field of the qualitative theory of differential equations. Their significance has become more evident in recent years due to a great variety of their applications in modeling real life phenomena. Delays are intrinsic features in a multitude of processes in applied sciences and engineering. Uncertainty of the available data and/or the randomness of aspects of the processes themselves lead to the presence of random elements in the models, thus resulting in stochastic differential delay equations. Though the theory of both deterministic functional differential equations and the stochastic ordinary differential equations are rather well developed areas of research, the qualitative theory of stochastic differential delay equations is largely in its infancy stage. Partial explanation of such state of things is the sometimes enormous difficulties facing the researchers, in their approaches and attempts to
solve even simply formulated problems.

The purpose of the one-week meeting at the BIRS has been two-fold. The first one was to develop a program of joint research in particular directions of stochastic differential delay equations that are in the intersection of mutual interests of the participants. We have achieved this goal by identifying a number of applied models with the related equations that we will approach to study various aspects of their dynamical behavior.
The second part of the main objective was to further advance and to complete several aspects of joint ongoing research that have been in the working lately between the participants. We have succeeded in this
part too. In particular, Ivanov and Swishchuk have completed a typescript dealing with the problem of global stability in a stochastic differential delay equation which is a singular and random perturbation of a continuous time difference equation. Ivanov and Khusainov have completed their work on certain representations of solutions for partial differential equations with delay. Both works have been submitted for publication. Two more manuscripts are near completion.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit141

Participants:

Ivanov, Anatoli (Pennsylvania State University)
Khusainov, Denys Y. (Kyiv National University)
Swishchuk, Anatoliy (University of Calgary)
Teran, Edson (University of Calgary)

Connections between Minimum Rank and Minimum Semidefinite Rank
September 20 - 27, 2009

Organizers/Participants:

Francesco Barioli (University of Tennessee at Chattanooga)
Shaun Fallat (University of Regina)
Lon Mitchell (Virginia Commonwealth University)
Sivaram Narayan (Central Michigan University)

Recently, significant progress has been made in a number of difficult minimum rank questions. In some of these, progress in the real symmetric case has been matched by corresponding results for msr. For example, two of our team have found the mr of the join of two graphs from the mr of the component graphs in the case of balanced inertia, while the other half of our team has achieved the complete solution in the minimum semidefinite rank case.

During the week at BIRS our team considered a number of important open problems regarding minimum rank and minimum semidefinite rank. One such issue, which is of current interest, was to consider the class of graphs known as outerplanar. A graph is outerplanar if it has a crossing-free embedding in the plane such that all vertices lie on the same face. It is worth noting that all trees and all unicyclic graphs are outerplanar.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit155

Exceptional Dehn Filling
October 25 - November 1, 2009

Organizers/Participants:

Steve Boyer (Université du Quebéc à Montréal)
Cameron Gordon (University of Texas, Austin)

This Research in Team workshop focused on several problems in the theory of exceptional Dehn fillings in 3-dimensional topology. The precise focus of this Research in Team workshop was the case where M (α) is toroidal and M (β) is a SSFS. During our week at BIRS, we essentially completed the proof that $\Delta(\alpha, \beta) \leq 5$ if F does not split M into I -bundles and $m \geq 3$. This was achieved by enhancing the method used in [2, 3] based on the JSJ decomposition. A paper Characteristic Submanifold Theory and Toroidal Dehn Filling I by S. Boyer, C. McA. Gordon, and X. Zhang is currently being prepared which details this advance. We also made significant advances on the case $m \leq 2$ where a combination of the JSJ technique and tangle-theoretic technique introduced in [5] is used. This work will appear in a second paper Characteristic Submanifold Theory and Toroidal Dehn Filling II that we are currently working on.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit158

Hochschild Homology and Global Dimension
November 22 - 29, 2009

Organizers/Participants:

Petter Andreas Bergh (Norwegian University of Science and Technology)

Dag Madsen (Syracuse University)

The objective of this proposal is to establish Han's conjecture for a wider class of algebras. As mentioned under "Overview", we, Bergh and Madsen, have recently showed that the conjecture holds for graded local algebras, Koszul algebras and graded cellular algebras, provided the characteristic of the ground field is zero. This cooperation began during the workshop ´´Hochschild Cohomology of Algebras: Structure and Applications", held at BIRS in September 2007. We are currently studying how Hochschild homology behaves with respect to products in the category of finite dimensional algebras, and intend to expand to short exact sequences. Partial results obtained so far suggest that establishing the conjecture for augmented algebras is now within reach. This is our objective.

We are confident that a Research in Teams meeting at BIRS will be productive and result in substantial progress towards our above objective. Han's conjecture is ranked among the famous and important problems in homological algebra. Establishing this conjecture for augmented algebras would vastly broaden the knowledge on the homological behavior of finite dimensional algebras.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09rit160

Residually Finite Groups, Graph Limits and Dynamics
April 12 - 19, 2009

Organizers:

Miklos Abert (University of Chicago)
Balazs Szegedy (University of Toronto)

The main aim of the meeting was not to solve particular problems, rather to get to know and discuss each other's work in depth. The ultimate aim was to find strong common directions for further research and pave the way towards building a general theory.

The participants are all mainstream researchers in their fields. For instance, Lyons invented the notion of a unimodular random network, together with Aldous. Szegedy investigates graph limits with Lovasz and others. Jaikin-Zapirain has results on mod p homology growth, using ring theory. Nekrasevich connected classical dynamics to self-similar groups (fractal-like groups naturally acting on rooted trees) in a novel way; this allowed him to settle a longstanding problem in dynamics. Bowen proved some break-through results by introducing entropy of actions in the non-amenable setting. Abert and Nikolov have found an unexpected connection between topological dynamics and 3-manifold theory, using actions on rooted trees.

All these results are quite new (most of them less than three years old) and although they are related in many (mathematical and meta-mathematical) levels, the fields involved simply did not have enough time to assimilate and react to each other's work.

The workshop was intended to provide such an opportunity in order to allow these people to have long discussions in a relaxed environment and go into details where needed.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09frg147

Participants:

Abert, Miklos (University of Chicago)
Bowen, Lewis (University of Hawaii)
Jaikin-Zapirain, Andrei (Universidad Autónoma de Madrid)
Lyons, Russell (Indiana University)
Nikolov, Nikolay (Imperial College)
Szegedy, Balazs (University of Toronto)
Virag, Balint (University of Toronto)

Indecomposable Binary Structures
June 14 - 21, 2009

Organizers:

Gena Hahn (University of Montreal) **Pierre Ille** (Pacific Institute for the Mathematical Sciences)

To begin, we will try to decompose general combinational structures, called binary structures, which are comparable to 2-structures introduced by Ehrenfeucht and Rozenberg in 1990 but whose handling should be easier, for instance, to define a new type of connectivities. These connectivities will allow for a simple proof of a generic decomposition theorem. The Ph.D. Thesis of Sayar is supervised by Boudabbous and Ille. He has been working on indecomposability since his Master's in 2006. This focussed research group will allow him to meet other specialists of the area. Lastly, Ille is writing a book on indecomposable binary structures and he will present some of its chapters during the workshop.

For details, please refer to the workshop webpage
http://www.birs.ca/workshops/2009/09frg149

Participants:

Boussairi, Abderrahim (University of Casablanca)
Hahn, Gena (University of Montreal)
Ille, Pierre (Pacific Institute for the Mathematical Sciences)
Jouve, Bertrand (Université Toulouse II)
Leblet, Jimmy (Institut Telecom)
Rao, Michael (LaBRI - CNRS - Université Bordeaux 1)
Villemaire, Roger (University of Quebec in Montreal)
Woodrow, Robert (University of Calgary)

Front: Photo kindly provided by Brent Kearney
Back: Banff mountains by Gordon Weber
Deer by Brent Kearney

The **Banff International Research Station** for Mathematical Innovation and Discovery (BIRS) is a collaborative Canada-USA-Mexico venture that provides an environment for creative interaction as well as the exchange of ideas, knowledge, and methods within the Mathematical Sciences, with related disciplines and with industry. The research station is located at The Banff Centre in Alberta and is supported by Canada's Natural Science and Engineering Research Council (NSERC), the US National Science Foundation (NSF), Alberta's Advanced Education and Technology, and Mexico's Consejo Nacional de Ciencia y Tecnología (CONACYT).

Contact Us:

Scientific Director: Dr. Nassif Ghoussoub
Phone: 604-822-1649 Fax: 604-822-0883
Email: birs-director@birs.ca

Administrator: Danny Fan
Phone: 604-822-1844 Fax: 604-822-0883
Email: birs-administrator@birs.ca

Program Coordinator: Wynne Fong
Phone: 604-822-1694 Fax: 604-822-0883
Email: birs@birs.ca

Program Assistant: Christina Girardi
Phone: 604-822-5213 Fax: 604-822-0883
Email: birs-secretary@birs.ca

Station Manager: Brenda Williams
Phone: 403-763-6999 Fax: 403-763-6990
Email: birsmgr@birs.ca

Systems Analyst: Brent Kearney
Phone: 403-763-6997 Fax: 403-763-6990
Email: brentk@birs.ca

BIRS Website: http://www.birs.ca

BIRS Mailing Address in Vancouver:
Banff International Research Station
University of British Columbia
#200-1933 West Mall
Vancouver BC V6T 1Z2 CANADA

BIRS Mailing Address in Banff:
Banff International Research Station
c/o The Banff Centre
Corbett Hall, Suite 5110
107 Tunnel Mountain Drive
Box 1020, Stn 4
Banff AB T1L 1H5 CANADA

BIRS is also supported by:

The Pacific Institute for the Mathematical Sciences (PIMS)
The Mathematics of Information Technology and Complex Systems Network (MITACS)
The Mathematical Science Research Institute, Berkeley (MSRI)
The Instituto de Matemáticas - Universidad Nacional Autónoma de México (IM-UNAM)