2012 - 2013
Calendrier des conférences / Conference Calendar

Date Heure/Time : 04/12/2013 - 16:00

Lieu/Venue : UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420

Conférencier/Speaker : Narutaka Ozawa, RIMS, Kyoto University

Titre/Title : Quantum correlations and Tsirelson's problem

Resume/Abstract :
The EPR paradox tells us quantum theory is incompatible with classic realistic theory. Indeed, Bell has shown that quantum correlations of independent bipartite systems have more possibility than the classical correlations. To study what the possibilities are, Tsirelson has introduced the set of quantum correlation matrices, but depending on the interpretation of independence, there are two plausible definitions of it. Tsirelson's problem asks whether these definitions are equivalent. It turned out that this problem in quantum information theory is in fact equivalent to Connes's embedding conjecture, one of the most important open problems in theory of operator algebras. I will talk some recent progress on Tsirelson's problem.

Date Heure/Time : 04/05/2013 - 16:00

Lieu/Venue : UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420

Conférencier/Speaker : Ehud DeShalit, Hebrew University

Titre/Title : Integral structures in p-adic representations

Resume/Abstract :
Representation theory of p-adic Lie groups such as GL_2(F), where F is a p-adic field, is central to many problems in number theory. The coefficients of these representations have been classically taken to be the complex numbers. Although it has been known for many years that p-adic representations of the same groups offer new exciting possibilities, their study has begun, in earnest, only recently. After a brief review of the p-adic numbers we shall explain why it is important to shift from complex representations to p-adic ones, and their relation to the “p-adic Langlands program”. We shall then concentrate on the Breuil-Schneider conjecture.

Date Heure/Time : 03/28/2013 - 16:00

Lieu/Venue : Université de Montréal, Pav. André-Aisenstadt, 2920, chemin de la Tour, SALLE 6214

Conférencier/Speaker : Victor Guillemin, MIT

Titre/Title : Moser averaging

Resume/Abstract :
Moser averaging is a method for detecting periodic trajectories in classical mechanical systems which are small perturbations of periodic systems. (The Kepler system: the earth rotating about the sun, is probably the most familiar example of a system of this type.) In this talk I'll describe how, in the late nineteen seventies, Weinstein and Colin de Verdiere adapted Moser's techniques to the quantum mechanical setting and describe some recent applications of their results to inverse problems. *** La
conférence aura lieu un jeudi / The conference will take place on a Thursday.

**Date Heure/Time : 03/01/2013 - 16:00**

**Lieu/Venue :** UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420

**Conférencier/Speaker :** Frithjof Lutscher, University of Ottawa

**Titre/Title :** Mathematical Models for River Ecosystems

**Resume/Abstract :**
River ecosystems are characterized by unidirectional flow; individuals are at risk of being transported downstream. This movement bias gives rise to the 'drift paradox': How can a population persist if individuals are washed out of the system? More generally, advection introduces an asymmetry into riverine ecosystems that affects not only persistence of a single population but also spatial spread and interactions between two or more species. In this talk, I will present a number of reaction-advection-diffusion models for populations in rivers and other advective environments. I will start with fairly simple equations and move to increasingly complex models of individual behavior and species interactions. I will explain how advection affects population-level patterns, such as persistence, spread or competitive dominance. This talk is aimed at a general audience.

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**Date Heure/Time : 02/15/2013 - 16:00**

**Lieu/Venue :** Université de Montréal, Pav. André-Aisenstadt, 2920, chemin de la Tour, **SALLE 5340**

**Conférencier/Speaker :** Nilima Nigam, Simon Fraser University

**Titre/Title :** Eigenproblems, numerical approximation and proof

**Resume/Abstract :**
In this talk, we investigate the role of numerical analysis and scientific computing in the construction of rigorous proofs of conjectures. We focus on eigenproblems, and present recent progress on three unusual, conceptually simple, eigenvalue problems. We explore how validated numerics and provable convergence and error estimates are helpful in proving theorems about the eigenvalue problems. The first of these problems concerns sharp bounds on the eigenvalue of the Laplace-Beltrami operator of closed Riemannian surfaces of genus higher than one. One may ask: for a fixed genus, and a given fixed surface area, which surface maximizes the first Laplace eigenvalue? The second of these concerns eigenvalue problems for the Laplacian, with mixed Dirichlet-Neumann data. If the Neumann and Dirichlet curves meet at an angle which is $\pi$ or larger, reflection strategies will not work. The third problem is about the famous Hot Spot conjecture: the extrema of the 2nd Neumann eigenfunction of the Laplacian in an acute triangle will be at the vertices.

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**Date Heure/Time : 02/08/2013 - 16:00**

**Lieu/Venue :** UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420

**Conférencier/Speaker :** Sergei Tabachnikov, Pennsylvania State University

**Titre/Title :** Pentagram Map, Twenty Years After

**Resume/Abstract :**
Introduced by R. Schwartz about 20 years ago, the pentagram map acts on plane n-gons, considered up to projective equivalence, by drawing the diagonals that connect second-nearest vertices and taking the
new n-gon formed by their intersections. The pentagram map is a discrete completely integrable system whose continuous limit is the Boussinesq equation, a completely integrable PDE of soliton type. In this talk I shall survey recent work on the pentagram map and its generalizations, emphasizing its close ties with the theory of cluster algebras, a new and rapidly developing field with numerous connections to diverse areas of mathematics.

Date Heure/Time : 02/01/2013 - 16:00

Lieu/Venue : UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420

Conférencier/Speaker : Elliott Lieb, Princeton University

Titre/Title : Proof of a 35 Year Old Conjecture for the Entropy of SU(2) Coherent States, and its Generalization

Resume/Abstract :
35 years ago Wehrl defined a classical entropy of a quantum density matrix using Gaussian (Schrödinger, Bargmann, ...) coherent states. This entropy, unlike other classical approximations, has the virtue of being positive. He conjectured that the minimum entropy occurs for a density matrix that is itself a projector onto a coherent state and this was proved soon after. It was then conjectured that the same thing would occur for SU(2) coherent states (maximal weight vectors in a representation of SU(2)). This conjecture, and a generalization of it, have now been proved with J.P. Solovej. (arxiv: 1208.3632). After a review of coherent states in general, a summary of the proof will be given. Obviously, one would like to prove similar conjectures for SU(n) and other Lie groups. This is open and the audience is invited to join the fun. Another question the audience is invited to think about is the meaning of all this for group representation theory. If this conjecture is correct, it must have some general significance.

Date Heure/Time : 01/25/2013 - 16:00

Lieu/Venue : Université de Montréal, Pav. André-Aisenstadt, 2920, chemin de la Tour, SALLE 6214

Conférencier/Speaker : Sheila Margherita Sandon, CNRS, Nantes and CRM

Titre/Title : Global rigidity in contact topology

Resume/Abstract :
Contact topology studies odd-dimensional manifolds endowed with a maximally non-integrable field of hyperplanes. It is commonly considered the odd-dimensional sister of symplectic topology, with which it shares the local flexibility property. Following the work of Eliashberg-Kim-Polterovich and of myself (partly jointly with Vincent Colin) I will discuss some global rigidity phenomena for contact manifolds, that can be seen as contact analogues (but with some specific and still quite mysterious features) of the symplectic non-squeezing theorem by Gromov, of the Arnold conjecture on fixed points of Hamiltonian symplectomorphisms and of the Hofer metric on the Hamiltonian group.

Date Heure/Time : 12/07/2012 - 16:00

Lieu/Venue : UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420

Conférencier/Speaker : Yuri Tschinkel, New York University and Simons Foundation

Titre/Title : Igusa integrals
Resume/Abstract:
Geometric Igusa integrals appear as important technical tools in the study of rational and integral points on algebraic varieties. I will describe some of these applications (joint work with A. Chambert-Loir).

Date Heure/Time: 11/23/2012 - 16:00
Lieu/Venue: Université de Montréal, Pav. André-Aisenstadt, 2920, chemin de la Tour, SALLE 6214
Conférencier/Speaker: Alexander Gamburd, CUNY Graduate Center
Titre/Title: Expander Graphs, Thin Groups, and Superstrong Approximation
Resume/Abstract:
À venir / Coming soon

Date Heure/Time: 11/16/2012 - 16:00
Lieu/Venue: UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420
Conférencier/Speaker: Konstantina Trivisa, University of Maryland
Titre/Title: On the Doi Model for the suspension of rod-like molecules & related equations
Resume/Abstract:
The Doi model for the suspensions of rod-like molecules in a dilute regime describes the interaction between the orientation of rod-like polymer molecules on the microscopic scale and the macroscopic properties of the fluid in which these molecules are contained (cf. Doi and Edwards (1986)). The orientation distribution of the rods on the microscopic level is described by a Fokker-Planck-type equation on the sphere, while the fluid flow is given by the Navier-Stokes equations, which are now enhanced by an additional macroscopic stress reflecting the orientation of the rods on the molecular level. Prescribing arbitrarily the initial velocity and the initial orientation distribution in suitable spaces we establish the global-in-time existence of a weak solution to our model defined on a bounded domain in the three dimensional space. The proof relies on a quasi-compressible approximation of the pressure, the construction of a sequence of approximate solutions and the establishment of compactness.

Date Heure/Time: 11/02/2012 - 16:00
Lieu/Venue: Université de Montréal, Pav. André-Aisenstadt, 2920, chemin de la Tour, SALLE 6214
Conférencier/Speaker: Jürg Fröhlich, ETH Zurich
Titre/Title: Dissipative motion from a Hamiltonian point of view
Resume/Abstract:
I will study the motion of a classical particle interacting with a dispersive wave medium. (Concretely, one may think of a heavy particle interacting with an ideal Bose gas at zero temperature, in the large-density or mean-field limit.) This is an example of a Hamiltonian system with infinitely many degrees of freedom that describes dissipative phenomena. I will show that the particle experiences a friction force with memory, which is caused by the particle’s emission of Cherenkov radiation of sound waves into the medium. This friction force decelerates the particle until its speed has dropped to the minimal speed of sound in the medium (=0, for an ideal Bose gas). Various open problems that I suspect might be of interest to analysts will be described. (The results presented in this lecture have been found in joint work with Daniel
Resume/Abstract:
There are many examples in mathematics, both pure and applied, in which problems with symmetric formulations have non-symmetric solutions. Sometimes this symmetry breaking is total, but often the symmetry breaking is only partial. One technique that can sometimes be used to constrain the symmetry breaking is reflection positivity. It is a simple and useful concept that will be explained in the talk, together with some examples. One of these concerns the minimum eigenvalues of the Laplace operator on a distorted hexagonal lattice. Another example that we will discuss is a functional inequality due to Onofri. The talk is based on joint work with E. Lieb.

Date Heure/Time : 09/21/2012 - 16:00
Lieu/Venue : Université de Montréal, Pav. André-Aisenstadt, 2920, chemin de la Tour, SALLE 6214
Conférencier/Speaker : Walter Neumann, Barnard College, Columbia University
Titre/Title : Geometry of complex surface singularities
Resume/Abstract :
A complex variety has two intrinsic metric space structures in the neighborhood of any point ("inner" and "outer" metric) which are uniquely determined from the complex structure up to bilipschitz change of the metric (changing distances by at most a constant factor). In dimension 1 the inner metric (given by minimal arc-length within the variety) carries no interesting information, and it is only very recently, starting with a 2008 paper of Birbrair and Fernandes, that it has become clear how rich metric information is in higher dimensions. Dimension 2 is now very well understood through work of Birbrair, Pichon and the speaker. The talk will give an overview of this work and some applications.

Date Heure/Time : 09/14/2012 - 16:00
Lieu/Venue : UQAM, Pav. Sherbrooke, 200, rue Sherbrooke O., salle SH-3420
Conférencier/Speaker : Robert McCann, University of Toronto
Titre/Title : A glimpse at the differential topology and geometry of optimal transportation
Resume/Abstract :
The Monge-Kantorovich optimal transportation problem is to pair producers with consumers so as to minimize a given transportation cost. When the producers and consumers are modeled by probability densities on two given manifolds or subdomains, it is interesting to try to understand the structure of the optimal pairing as a subset of the product manifold. This subset may or may not be the graph of a map. The talk will expose the differential topology and geometry underlying many basic phenomena in optimal transportation. It surveys questions concerning Monge maps and Kantorovich measures: existence and regularity of the former, uniqueness of the latter, and estimates for the dimension of its support, as well as the associated linear programming duality. It shows the answers to these questions concern the
differential geometry and topology of the chosen transportation cost. It establishes new connections --- some heuristic and others rigorous --- based on the properties of the cross-difference of this cost, and its Taylor expansion at the diagonal.