De: **CRM** crm@crm.umontreal.ca
Objet: ***AUJOURD'HUI*** : CONFÉRENCES NIRENBERG DU CRM EN ANALYSE GÉOMÉTRIQUE - 18-22 mars 2016 / Gunther Uhlmann
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CONFÉRENCES NIRENBERG DU CRM EN ANALYSE GÉOMÉTRIQUE
CRM NIRENBERG LECTURES IN GEOMETRIC ANALYSIS
www.crm.math.ca/Nirenberg2016

18-22 mars 2016 / March 18-22, 2016

Gunther Uhlmann (University of Washington)

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Centre de recherches mathématiques
Pavillon André-Aisenstadt, Universite de Montreal
Salle / Room 6254

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Vendredi 18 mars 2016, 16h00 / Friday, March 18, 2016, 4:00 pm

"Harry Potter's Cloak via Transformation Optics"

Can we make objects invisible? This has been a subject of human fascination for millennia in Greek mythology, movies, science fiction, etc., including the legend of Perseus versus Medusa and the more recent Star Trek and Harry Potter. In the last decade or so, there have been several scientific proposals to achieve invisibility. We will introduce some of these in a non-technical fashion, concentrating on the so-called "transformation optics" that has received the most attention in the scientific literature.

(Cette conférence s'adresse à un large auditoire. / This lecture is aimed at a general mathematical audience.)

Le café sera servi à 15h30 et une réception suivra la conférence au salon Maurice L'Abbé, Pavillon André-Aisenstadt (salle 6245).

Coffee will be served at 3:30 pm and a reception will follow the lecture at the Salon Maurice-L'Abbé, Pavillon André-Aisenstadt (room 6245).

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Lundi 21 mars 2016, 16h00 / Monday, March 21, 2016, 4:00 pm

"Journey to the Center of the Earth"

We will consider the inverse problem of determining the sound speed or index of refraction of a medium by measuring the travel times of waves going through the medium. This problem arises in global seismology in an attempt to determine the inner structure of the Earth by measuring travel times of earthquakes. It has also several applications in optics and medical imaging among others.

The problem can be recast as a geometric problem: Can one determine a Riemannian metric of a Riemannian manifold with boundary by measuring the distance function between boundary points? This is the boundary rigidity problem.

We will also consider the problem of determining the metric from the scattering relation, the so-called lens rigidity problem. The linearization of these problems involves the integration of a tensor along geodesics, similar to the X-ray transform.

We will also describe some recent results, joint with Plamen Stefanov and András Vasy, on the partial data case, where you are making measurements on a subset of the boundary. No previous knowledge of Riemannian geometry will be assumed.

Le café sera servi à 15h30 au salon Maurice L'Abbé, Pavillon André-Aisenstadt (salle 6245).

Coffee will be served at 3:30 pm at the Salon Maurice-L'Abbé, Pavillon André-Aisenstadt (room 6245).

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Mardi 22 mars 2016, 16h00 / Tuesday, March 22, 2016, 4:00 pm

"Seeing Through Space Time"

We consider inverse problems for the Einstein equation with a time-depending metric on a 4-dimensional globally hyperbolic Lorentzian manifold. We formulate the concept of active measurements for relativistic models. We do this by coupling Einstein equations with equations for scalar fields.

The inverse problem we study is the question of whether the observations of the solutions of the coupled system in an open subset of the space-time, with the sources supported in this set, determines the properties of the metric in a larger domain. To study this problem, we define the concept of light observation sets and show that knowledge of these sets determines the conformal class of the metric. This corresponds to passive observations from a distant area of space which is filled by light sources.

We will start by considering inverse problems for scalar non-linear hyperbolic equations to explain our method. No previous knowledge of Lorentzian geometry or general relativity will be assumed.

This is joint work with Y. Kurylev and M. Lassas.

Le café sera servi à 15h00 au salon Maurice L'Abbé, Pavillon André-Aisenstadt (salle 6245).

Coffee will be served at 3:00 pm at the Salon Maurice-L'Abbé, Pavillon André-Aisenstadt (room 6245).

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La série de conférences Nirenberg a été nommée ainsi en l'honneur de Louis Nirenberg, un des plus éminents spécialistes en analyse géométrique de notre temps. Professeur Nirenberg est né en 1925 à Hamilton, Ontario. Après le déménagement de sa famille à Montréal, il a étudié à l'école secondaire Baron Byng, souvent évoquée dans les romans de Mordecai Richler. Louis Nirenberg a obtenu son B.Sc. de l'Université McGill en 1945; en 1949, il reçoit son doctorat de New York University et il deviendra professeur au Courant institute. Ses contributions fondamentales incluent des travaux précurseurs sur les techniques nonlinéaires PDE en géométrie globale différentielle, les inégalités Gagliardo-Nirenberg en théorie des espaces Sobolev, la théorie Agmon-Douglis-Nirenberg sur les problèmes aux limites elliptiques, l'espace John-Nirenberg de fonctions de la valeur moyenne de l'oscillation et le théorème Newlander-Nirenberg en géométrie complexe. Les réalisations en recherche de Louis Niremberg ont été soulignées par de nombreux prix et honneurs tels que la National Medal of Science, la Chern Medal, le Crafoord Prize, le Steele Prize et le Jeffery-Williams Prize.

The lecture series is named in honour of Louis Nirenberg who is one of the most prominent geometric analysts of our time. Professor Nirenberg was born in 1925 in Hamilton, Ontario. After his family moved to Montréal, he attended the Baron Byng High School, known to many through the novels of Mordecai Richler. Louis Nirenberg obtained a B.Sc. from McGill University in 1945, and in 1949 received a Ph.D. from New York University, where he later became a professor at the Courant Institute. His fundamental contributions include the pioneer works on nonlinear PDE techniques in global differential geometry, the Gagliardo-Nirenberg inequalities in the theory of Sobolev spaces, the Agmon-Douglis-Nirenberg theory of elliptic boundary value problems, the John-Nirenberg space of functions of bounded mean oscillation and the Newlander-Nirenberg theorem in complex geometry. Research achievements of Louis Nirenberg were recognized by numerous prizes and awards, such as the National Medal of Science, the Chern Medal, the Crafoord Prize, the Steele Prize and the Jeffery-Williams Prize.

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Gunther Uhlmann est professeur de mathématiques Walker Family Endowed à l'Université de Washington. M. Uhlmann a reçu son doctorat du Massachusetts Institute of Technology en 1976. Il est reconnu pour ses contributions fondamentales à l'étude de problèmes inverses, notamment au développement des méthodes microlocales et géométriques. En outre, le professeur Uhlmann et ses collaborateurs ont obtenu des résultats majeurs sur le problème inverse de Calderon, le problème de la frontière rigide, ainsi que le cloaking invisible. Les réalisations en recherche de Gunther Uhlmann ont été récompensées par plusieurs prix et honneurs tel que les prix Bôcher memorial de l'AMS et le prix Kleinman du SIAM en 2011. Il a aussi donné une conférence au Congrès international des mathématiciens en 1998, à la Einstein Lecture de l'AMS en 2012 et à l'International Congress of Mathematical Physics en 2015. Il est membre de l'American Academy of Arts and Sciences et du Finnish Academy of Science and Letters.

Gunther Uhlmann is the Walker Family Endowed Professor of Mathematics at the University of Washington. Professor Uhlmann received his PhD from Massachusetts Institute of Technology in 1976. He is widely known for his fundamental contributions to the study of inverse problems, notably to the development of microlocal and geometric methods. In particular, Professor Uhlmann and his collaborators obtained major results on the Calderon's inverse problem, the boundary rigidity problem, as well as the mathematics of invisibility cloaking. Gunther Uhlmann's research achievements were recognized by many awards and honors, such as the 2011 Bôcher Memorial Prize of the AMS and the 2011 Kleinman Prize of the SIAM, as well as invitations to speak at the 1998 ICM, to deliver the 2012 AMS Einstein Lecture and to give a plenary talk at the 2015 International Congress of Mathematical Physics. He is a member of the American Academy of Arts and Sciences and the Finnish Academy of Science and Letters.