

Seminar & Events Bulletin: What is... ?

07-01-2012 to 06-30-2013

Tuesday, September 11, 2012

2:10pm-3:00pm **What is... ?** -- Barry Simon (Caltech) *What is the Spectral Theory of Orthogonal Polynomials* -- 3096 East Hall

Tuesday, September 25, 2012

2:10pm-3:00pm **What is... ?** -- Jeff Rauch (UM) *What is ... geometric optics?* -- 3096 East Hall

Tuesday, October 02, 2012

2:10pm-3:00pm **What is... ?** -- Anna Gilbert (Univ of Michigan) *What is...Compressed Sensing?* -- 3096 East Hall

Tuesday, October 09, 2012

2:10pm-3:00pm **What is... ?** -- Jinho Baik (UM) *What are ... Tracy-Widom distributions?* -- 3096 East Hall

Tuesday, October 23, 2012

2:10pm-3:00pm **What is... ?** -- Dmitriy Boyarchenko (Univ of Michigan) *What is ... Deligne-Lusztig theory* -- 3096 East Hall

Tuesday, October 30, 2012

2:10pm-3:00pm **What is... ?** -- Yuval Peres (Microsoft Research Redmond) *What is ... the mixing time and the cover time for random walk on a graph?* -- 3096 East Hall

Tuesday, November 06, 2012

2:10pm-3:00pm **What is... ?** -- David Speyer () *What is ... a Grobner basis* -- 3096 East Hall

Tuesday, November 13, 2012

2:10pm-3:00pm **What is... ?** -- Peter Miller (University of Michigan) *What is ... the inverse-scattering transform?* -- 3096 East Hall

Tuesday, November 20, 2012

2:10pm-3:00pm **What is... ?** -- Martin Strauss (University of Michigan) *What is ... a computer?* -- 3096 East Hall

Tuesday, November 27, 2012

2:10pm-3:00pm **What is... ?** -- Zuoqin Wang (Univ of Michigan) *An invitation to spectral geometry* -- 3096 East Hall

Tuesday, January 15, 2013

2:10pm-3:00pm **What is... ?** -- Peter Miller (Univ of Michigan) *What is the inverse-scattering transform?* -- 3866 East Hall

Tuesday, January 29, 2013

2:10pm-3:00pm **What is... ?** -- Jean-francois Lafont (Ohio State University) *What is... a homology manifold?* -- 3866 East Hall

Tuesday, February 19, 2013

2:10pm-3:00pm **What is... ?** -- Joseph Silverman (Brown University) *A whirlwind survey of the arithmetic of elliptic curves* -- 3866 East Hall

Seminar & Events Bulletin: What is... ?
07-01-2012 to 06-30-2013

Tuesday, March 12, 2013

2:10pm-3:00pm **What is... ?** -- Andreas Blass (University of Michigan) *What Is ... Ingleton's Inequality?*
-- 3866 East Hall

Tuesday, March 19, 2013

2:10pm-3:00pm **What is... ?** -- John Schotland (University of Michigan) *What is ... the inverse problem?* -- 3866 East Hall

Tuesday, March 26, 2013

2:10pm-3:00pm **What is... ?** -- Mattias Jonsson (Univ of Michigan) *What is a Berkovich space* -- 3866 East Hall

Tuesday, April 02, 2013

2:10pm-3:00pm **What is... ?** -- Bob Griess (Univ of Michigan) *What is moonshine?* -- 3866 East Hall

Tuesday, April 23, 2013

2:10pm-3:00pm **What is... ?** -- Bill Fulton (Univ of Michigan) *What is ... a bad math talk?* -- 3866 East Hall

Seminar & Events Bulletin: What is... ?
07-01-2012 to 06-30-2013

Abstracts

What is... ?

Tuesday, September 11, 2012, 2:10pm-3:00pm

3096 East Hall

Barry Simon (Caltech)

What is the Spectral Theory of Orthogonal Polynomials

What is... ?

Tuesday, September 25, 2012, 2:10pm-3:00pm

3096 East Hall

Jeff Rauch (UM)

What is ... geometric optics?

What is... ?

Tuesday, October 02, 2012, 2:10pm-3:00pm

3096 East Hall

Anna Gilbert (Univ of Michigan)

What is...Compressed Sensing?

I will discuss what compressed sensing is but I will focus on what are the algorithmic challenges in solving compressed sensing problems and I will include several applications to biological group testing and analog-to-digital converter design.

What is... ?

Tuesday, October 09, 2012, 2:10pm-3:00pm

3096 East Hall

Jinho Baik (UM)

What are ... Tracy-Widom distributions?

The Tracy-Widom distributions are universal random variables which arise in the large limit in random matrices, random tilings, one-dimensional randomly growing surfaces, directed polymers, and many other probabilistic settings and statistical physics models. We discuss two definitions of TW distributions and discuss the meaning of the universality.

Seminar & Events Bulletin: What is... ?

07-01-2012 to 06-30-2013

What is... ?**Tuesday, October 23, 2012, 2:10pm-3:00pm****3096 East Hall****Dmitriy Boyarchenko (Univ of Michigan)***What is ... Deligne-Lusztig theory*

representations of the group $GL_n(K)$, where K is either a finite field or a local field, have been studied for many decades. (The local case is closely related to the structure of Galois groups of local fields via the local Langlands program, and therefore has important applications in number theory.) For finite K , irreducible representations of $GL_n(K)$ were classified by J.A. Green in 1955, but a natural geometric construction of all such representations (which can be generalized to other reductive groups) was only discovered 20 years later by Deligne and Lusztig, who were motivated by the example of the "Drinfeld curve." Remarkably, even though the Drinfeld curve is used to construct representations of GL_2 of a finite field, it was discovered because of its connection with the Lubin-Tate tower, which yields a geometric realization of representations of GL_n of a local field. In my talk I will introduce all the aforementioned terms, give a brief history of the discoveries made by Drinfeld and Deligne-Lusztig, and outline some of the more recent applications of these ideas to p -adic representation theory.

What is... ?**Tuesday, October 30, 2012, 2:10pm-3:00pm****3096 East Hall****Yuval Peres (Microsoft Research Redmond)***What is ... the mixing time and the cover time for random walk on a graph?*

Consider a simple random walk on a finite graph. The mixing time is the time it takes the walk to reach a position that is approximately independent of the starting point; the cover time is the expected time it takes the walk to visit all vertices. These two quantities have been studied intensively by combinatorialists, computer scientists and probabilists; the mixing time arises in statistical physics as well. Applications of mixing times range from random sampling and card shuffling, to understanding convergence to equilibrium in the Ising model. It is closely related to expansion and eigenvalues. Cover times arise in algorithms to determine connectivity in networks.

Besides giving an introduction to these topics, I will describe the open problem of understanding which random walks exhibit a sharp transition to stationarity.

Seminar & Events Bulletin: What is... ?
07-01-2012 to 06-30-2013

What is... ?

Tuesday, November 06, 2012, 2:10pm-3:00pm

3096 East Hall

David Speyer ()

What is ... a Grobner basis

If you have a lot of linear equations, you should put them into row reduced form, using the Gauss-Jordan algorithm. If you have several polynomial equations in one variable, you should compute their GCD by the polynomial Euclidean algorithm. What should you do if you have many polynomial equations in many variables?

Often, the answer is "compute a Groebner basis". I'll tell you what a Groebner basis is, how your computer finds one and, if I have time, give some connections to commutative algebra.

What is... ?

Tuesday, November 13, 2012, 2:10pm-3:00pm

3096 East Hall

Peter Miller (University of Michigan)

What is ... the inverse-scattering transform?

The inverse-scattering transform was first discovered in the 1960's by Gardner, Greene, Kruskal, and Miura as a method of solving the initial-value problem for the Korteweg-de Vries equation, a well-known nonlinear partial differential equation modeling (among many other things) the propagation of surface water waves in a channel. It soon became apparent that the method applies more broadly to a wider class of problems of great interest in nonlinear wave theory. I will describe some of the history and then explain how the method can be used to solve the defocusing cubic nonlinear Schrödinger equation, as was first discovered by Zakharov and Shabat. As suggested by the name of the method, the key ideas come from the mathematical treatment of the direct and inverse-scattering problems for various linear equations, problems that are of independent interest in applications (see John Schotland's talk in this seminar early next semester).

What is... ?

Tuesday, November 20, 2012, 2:10pm-3:00pm

3096 East Hall

Martin Strauss (University of Michigan)

What is ... a computer?

This year we celebrate the centennial of Alan Turing's birth. In the 1930's Turing (working in the same era as Kurt Goedel and Alonzo Church, with various dependencies) carefully formulated a simple notion of abstract computer, that is accepted to this day. With this theory, we can pose simple and natural mathematical problems that are "undecidable," i.e., have no solution by physically-realizable computers.

Seminar & Events Bulletin: What is... ?
07-01-2012 to 06-30-2013

What is... ?

Tuesday, November 27, 2012, 2:10pm-3:00pm

3096 East Hall

Zuoqin Wang (Univ of Michigan)

An invitation to spectral geometry

What is... ?

Tuesday, January 15, 2013, 2:10pm-3:00pm

3866 East Hall

Peter Miller (Univ of Michigan)

What is the inverse-scattering transform?

The inverse-scattering transform was first discovered in the 1960's by Gardner, Greene, Kruskal, and Miura as a method of solving the initial-value problem for the Korteweg-de Vries equation, a well-known nonlinear partial differential equation modeling (among many other things) the propagation of surface water waves in a channel. It soon became apparent that the method applies more broadly to a wider class of problems of great interest in nonlinear wave theory. I will describe some of the history and then explain how the method can be used to solve the defocusing cubic nonlinear Schrödinger equation, as was first discovered by Zakharov and Shabat. As suggested by the name of the method, the key ideas come from the mathematical treatment of the direct and inverse-scattering problems for various linear equations, problems that are of independent interest in applications (see John Schotland's upcoming talk in this seminar).

Although this will be Part II, with particular emphasis on the representation of the inverse scattering problem as a Riemann-Hilbert problem of complex function theory, I will try to make the talk self-contained for those interested people who may have missed Part I last November.

What is... ?

Tuesday, January 29, 2013, 2:10pm-3:00pm

3866 East Hall

Jean-francois Lafont (Ohio State University)

What is... a homology manifold?

I'll provide an introduction to homology manifolds and related notions. This talk should be accessible to graduate students; I will only assume familiarity with the first year topology sequence.

Seminar & Events Bulletin: What is... ?
07-01-2012 to 06-30-2013

What is... ?

Tuesday, February 19, 2013, 2:10pm-3:00pm

3866 East Hall

Joseph Silverman (Brown University)

A whirlwind survey of the arithmetic of elliptic curves

In this talk I will discuss elliptic curves, starting with their topology, geometry (both analytic and algebraic), and etymology, and proceeding to their number theoretic properties, including their group of rational points, set of integral points, points over finite fields, and L-series, with a brief mention of applications ranging from cryptography to Fermat's Last Theorem. There will be no proofs, but at the conclusion I hope to have provided you with a panorama of this beautiful subject.

What is... ?

Tuesday, March 12, 2013, 2:10pm-3:00pm

3866 East Hall

Andreas Blass (University of Michigan)

What Is ... Ingleton's Inequality?

Consider a finite-dimensional vector space and a finite sequence of linear subspaces. Consider also the subspaces obtainable as sums of subsequences of the given sequence. What can one say about the dimensions of such sums? Perhaps surprisingly, there are nontrivial things to be said; Ingleton's inequality is the simplest of these. Perhaps more surprisingly, although some further inequalities beyond Ingleton's are known, there might be more that are still unknown. I'll describe this situation and, if time permits, a couple of related situations outside linear algebra.

What is... ?

Tuesday, March 19, 2013, 2:10pm-3:00pm

3866 East Hall

John Schotland (University of Michigan)

What is ... the inverse problem?

This is an introductory talk on inverse problems for PDEs and their relation to imaging. We will focus on the Calderon problem, which consists of determining the electrical conductivity of a medium from boundary measurements. We will survey what is known about this problem and its cousin, the inverse scattering problem for waves in random media.

Seminar & Events Bulletin: What is... ?
07-01-2012 to 06-30-2013

What is... ?

Tuesday, March 26, 2013, 2:10pm-3:00pm

3866 East Hall

Mattias Jonsson (Univ of Michigan)

What is a Berkovich space

When naively trying to do analytic geometry over fields other than the complex numbers, one often encounters various unpleasant facts, such as the spaces in question being totally disconnected or not locally compact. In the late 1980's, Vladimir Berkovich found a way to define analytic spaces with good topological properties over any field equipped with a norm. I will give a gentle introduction to these spaces, now commonly called Berkovich spaces.

What is... ?

Tuesday, April 02, 2013, 2:10pm-3:00pm

3866 East Hall

Bob Griess (Univ of Michigan)

What is moonshine?

In mathematics, the term "moonshine" indicates a surprising connection between distinct areas of mathematics. The term originated in the late 70s concerning connections between the Monster sporadic simple group and the set of genus 0 function fields on the upper half plane. In this lecture, we briefly list about half a dozen moonshine phenomena, involving finite simple groups, number theory and Lie theory. I will describe a few points in detail. An "explanation" of a moonshine phenomena would probably be some kind of mathematical context where all aspects of the phenomenon are visible and understandable. After three decades, there is hardly anything which qualifies as a real explanation.

What is... ?

Tuesday, April 23, 2013, 2:10pm-3:00pm

3866 East Hall

Bill Fulton (Univ of Michigan)

What is ... a bad math talk?

This talk -- aimed at young mathematicians, and hoping for audience participation -- will attempt to describe what it takes to make a mathematics talk bad. We will sketch the history of bad mathematics talks, including the great progress that has been made possible in recent decades. We will also discuss some of the similarities and differences between giving bad talks and writing bad papers.