

## **RU Math Colloquium (2011-2016)**

- Friday October 28, 2016.

Speaker: **Steve J. Jordan, Loyola University Chicago**

Title: **A Taste of Mathematical Research ~The Road from the Columbian Exposition to Us**

Abstract:

We will meander along a historical path from Chicago's Columbian Exposition to the Centennial Problems of David Hilbert to today. This will lead us into some substantial mathematical research and participants will be able to work on a version of one of Hilbert's problems. This talk is accessible to all.

- Friday September 23, 2016.

Speaker: **Sungwon Ahn, Roosevelt University**

Title: **Transience and Recurrence of Frog Model**

Abstract:

Frog model is a model of interacting random walk. The model is constructed as follows: Initially, there are one frog active at the origin and sleeping frogs at the rest of the graph. Once the frog performs a simple random walk on the graph, sleeping frogs wake up and start their own independent simple random walk. A frog model is said to be recurrent if the origin is visited infinitely often and transient if the origin is visited finite times. We will discuss the transience and recurrence of frog model in various types of graph. Then, we will discuss some partial results of recurrence in special types of graph.

- Friday, March 25, 2016.

Speaker: **Evans Afenya (Elmhurst College, Elmhurst)**

Title: **Mathematical Rendering of Physical Reality – Prospects and Challenges**

Abstract: Various approaches have been adopted over the years in understanding diverse natural phenomena such as the diseases that confront the human race. A number of advances have been made, for example, in the prevention, detection, treatment, and management of various forms of cancer. However, the level of recorded progress in attempts being made to finding lasting cure for such diseases still indicates that great challenges lie ahead on all fronts and demand broad multidisciplinary approaches,

including mathematical ones, to confront them. Within this framework, the prospects presented by the utility of various mathematical techniques and methods in capturing physical reality are highlighted. Consequently, prototypical mathematical rendering of biomedical phenomena is discussed against the backdrop of the increasingly quantitative nature of biomedicine. The inherent challenges of such an endeavor is spotlighted and arguments supporting the increasing relevance of mathematics to diverse scientific disciplines are brought into focus.

- Friday February 26, 2016.

Speaker: **Wilfredo Urbina-Romero, RU**

Title: **New real variable methods in  $H$  summability of Fourier series**

Abstract: In this talk we shall be concerned with  $H_{\alpha}$  summability, for  $0 < \alpha < 2$ , of the Fourier series of arbitrary  $L_1([-\pi, \pi])$  functions. The methods to be employed here are a refinement of the real variable methods introduced by Marcinkiewicz. In addition, we introduce maximal theorems with respect to the Lebesgue measure and  $A_1$  weights.

- Friday January 29, 2016.

Speaker: **Roberto A. Scotto (Universidad Nacional del Litoral, Santa Fé Argentina)**

Title:  **$L_p$  boundedness of Riesz transform associated with orthogonal systems**

Abstract: A. Nowak and K. Stempack proposed a unified approach to the theory of Riesz transforms and conjugacy in the setting of multidimensional orthogonal expansions, and proved their boundedness on  $L_2$ . Following them, we give easy to check sufficient conditions for their boundedness on  $L_p$ ,  $1 < p < \infty$ .

- Friday November 6, 2015

Speaker: **Vali Siadat (Richard Daley Community College)**

Title: **A New Approach to Teaching and Learning of Mathematics The Keystone Model.**

Abstract: In this presentation, I'll talk about the award-winning Keystone method, which has earned national and regional recognitions. The Keystone model was developed as a close collaborative effort by V. Siadat and Y. Sagher, in order to improve teaching and learning in mathematics. The model encompasses an innovative combination of frequent testing and cooperative group work, coupled with a dynamic assessment of student

learning. Administering cumulative, timed-restricted quizzes helps improve students' concentration skills which contributes to their improved reading comprehension scores. The past results have also shown higher student learning outcomes in mathematics as compared to other teaching techniques as well as higher persistence in subsequent mathematics courses and at the college.

- Friday October 30, 2016

Speaker: **Jennifer Pajda-Delao (University of Illinois at Chicago)**

Title: **Another Look at the Law of Iterated Logarithms for Brownian Motion on Compact Manifolds.**

Abstract: Using functional analysis, Brosamler (1983) has shown that the law of iterated logarithms for Brownian Motion on a compact Riemannian manifold will work for all smooth functions simultaneously. We will take another look at his result and explore another avenue of analysis on it.

- Friday October 23, 2016

Speaker: **Alex Austin (University of Illinois at Chicago)**

Title: **Bi-Lipschitz Equivalence, the Quasiconformal Jacobian Problem, and the Heisenberg Group.**

Abstract: It is important we are able to recognize when two metric spaces are bi-Lipschitz equivalent. I will review some examples of bi-Lipschitz parametrizations by low dimensional Euclidean spaces. One approach to detecting such a parametrization is via the Quasiconformal Jacobian Problem. I will introduce the objects necessary to understand that problem, then explain how I have applied this method in the setting of the Heisenberg group.

- Friday September 25, 2015

Speaker: **Paul Musial (Chicago State University)**

Title: **Integrating the Lr-Derivative**

Abstract: We explore properties of Lr-derivates with respect to a monotone increasing Lipschitz function. We define Lr-ex-major and Lr-ex-minor functions with respect to a monotone increasing Lipschitz function and use these to define a Perron-Stieltjes type integral which extends the integral of L. Gordon. We then formulate a product rule for the Lr-derivative and an integration by parts formula for the Lr Henstock-Kurzweil integral. Finally, we discuss functions of Lr-bounded variation. Joint work with E. Massarwi and F. Tulone.

- Friday April 3, 2015

Speaker: **Stefan Catoiu, DePaul University**

Title: **Generalized Trigonometric Hopf Algebras and Fermat's Equation**

Abstract: It is well-known that the Pythagorean equation  $x^2+y^2=z^2$  has infinitely many integer solutions. Fermat's Last Theorem says that the equation  $x^n+y^n=z^n$  has no non-trivial solutions when  $n>2$ . Therefore, despite its similar look, this is not an appropriate generalization of the Pythagorean equation. Using Hopf algebras and generalized trigonometry we produce the appropriate degree  $n$  generalization that has infinitely many solutions. These are parametrized in the same way as the ones for the Pythagorean equation.

- Friday February 27, 2015

Speaker: **Wilfredo Urbina-Romero, RU**

Title: **A transference result of the  $L^p$  continuity from Jacobi Riesz transform to the Gaussian and Laguerre Riesz transforms.**

Abstract: We consider a transference method to obtain the Gaussian-Riesz transform's  $L^p$ -continuity and the Laguerre-Riesz transform's  $L^p$ -continuity from the  $L^p$ -continuity of the Jacobi-Riesz transform, in dimension one, using the well known asymptotic relations between Jacobi polynomials and Hermite and Laguerre polynomials. Also the case of the Littlewood-Paley  $g$ -function is considered. (joint work with Eduard Navas)

- Friday January 23, 2015

Speaker: **Alex Stokolos (Georgia State University, Statesboro)**

Title; **Harmonic Analysis and Nonlinear Dynamics.**

Abstract: An interesting application of harmonic analysis to the problem of chaos stabilization in nonlinear autonomous discrete dynamical systems will be presented. The results are obtained in collaboration with D.Dmitrishyn, P. Hagelstein, A.Khamitova, A.Korenovsky and A.Solyanik.

- Friday November 21, 2014

Speaker: **Steven Cohen, RU**

Title: **Almost everything you want to know about Representation Theory (but were afraid to ask).**

Abstract: Representation Theory is about viewing elements of any group as invertible

linear transformations of a vector space. This provides a universal setting for all groups and possibly a way to organize the classification of finite simple groups. This talk will give an introduction to the subject, look at some examples where the theory works well, and consider some challenging aspects of the exceptional cases.

- Friday October 24 at 1:00 pm.

Speaker: **Wanwan Huang RU**

Title: **Introduction to Ruin Probability Estimation Under Mathematical Models**

Abstract: Ruin probability is an important concept in actuarial science. I will introduce how to use mathematical models to describe an insurer's vulnerability to insolvency/ruin. And portfolio optimization will also be mentioned.

- Friday September 26, 2014.

Speaker: **Calixto P. Calderón (UIC)**

Title: New real variable methods in strong summability of Fourier series.  
Abstract: Using  $A_p$  weights theory we prove and extend a famous result of J. Marcinkiewicz on strong summability of Fourier series.

- Wednesday March , 2014

Speaker: **Barbara González RU**

Title: **A Note on Parameter Estimation Under a t-Model (joint work with N. Pal)**

Abstract: We consider estimating the parameters of a t distribution. The maximum likelihood estimators (MLEs) do not have closed expressions. We propose several estimators of the parameters, including some approximations of the exact MLEs, and compare them in terms of standardized bias and mean squared error. Among other things, we have presented a simple approach to estimate the degrees of freedom efficiently.

- February 26, 2014

Speaker: **Melanie Pivarski, RU**

Title: **Weiner Sausage Asymptotics in Local Dirichlet Spaces**

Abstract: In the context of a heat kernel diffusion which admits Gaussian

type bounds with parameter  $b$  on a local Dirichlet space, we consider the log asymptotic behavior of the negative exponential moments of the Wiener sausage. We will give enough background for an intuitive understanding of the context and statement of the theorem along with a description of the method of enlargement of obstacles and how one can use it to construct a Proof.

- Wednesday January 29, 2014

Speaker: **Calixto Calderón, UIC.**

Title: **A remarkable representation formula for analytic functions of several variables**

- Wednesday November 20, 2013

Speaker: **Marshal Ash DePaul University**

Title: **Victor Shapiro and the theory of uniqueness for multiple trigonometric series**

Abstract: In 1870, Georg Cantor proved that if a trigonometric series converges to 0 everywhere, then all its coefficients must be 0. In the twentieth century this result was extended to higher dimensional trigonometric series when the mode of convergence is taken to be spherical convergence and also when it is taken to be unrestricted rectangular convergence. We will describe the path to each result. An important part of the first path was Victor Shapiro's 1957 paper, Uniqueness of multiple trigonometric series. This paper also was an unexpected part of the second path.

- Wednesday October 2, 2013

Speaker: **Robert DiMartino, RU**

Title: **On Cantor-like sets and Cantor-Lebesgue singular functions**

Abstract: The Cantor ternary set is the best example of a perfect nowhere-dense set in the real line. It was constructed by George Cantor in 1883, nevertheless it was not the first perfect nowhere-dense set in the real line to be constructed. The first construction was done by the a British mathematician Henry J. S. Smith in 1875, and Vito Volterra, still a graduate student in Italy, also showed how to construct such a set in 1881. Due to Cantor's prestige, the Cantor ternary set was (and still is) the typical example of a perfect nowhere-dense set. Following D. Bresoud we will refer as the Smith-Volterra-Cantor sets

or SVC sets to the family of examples of perfect, nowhere-dense sets exemplified by the work of Smith, Voterra and Cantor. In the talk we will discuss construction of several perfect nowhere-dense set in the real line. Most of them variations in one way or the other of the construction of the Cantor ternary set. Thus, it is important to review in detail the construction of the Cantor ternary set C. Joint work with Wilfredo Urbina-Romero.

- Wednesday April 24, 2013

Speaker: **Constantine Georgakis (DePaul University)**

Title: **On The Volatility of the Binomial Option Pricing Model.**

Abstract: After a brief review of the Binomial option pricing model and a derivation of the discrete Black-Scholes formula for the price of a European option, I will discuss a pair of sharp upper and lower upper bounds for the ratio of the variance of the Binomial option pricing model to the variance of the underlying Binomial distribution.

- Wednesday October 24, 2012

Speaker: **A. Eduardo Gatto, DePaul University**

Title: **On fractional calculus associated to Hermite expansions and Gaussian Lipschitz spaces.**

Abstract: In this work we introduce formulas for fractional integrals and derivatives associated to Hermite expansions, in terms of the Poisson-Hermite kernel, and study the boundedness of these operators on Gaussian Lipschitz spaces. To do these results we follow and extend a classical method originally considered for the Poisson integral. This is a joint work with Wilfredo Urbina-Romero.

- Wednesday September 26, 2012

Speaker: **Sarah Wingfield Wolfram Research, Inc**

Title: **An overview of Mathematica for education and research.**

- Wednesday April 25, 2012

Speaker: **Calixto P. Calderón, UIC**

Title: **Reproducing kernels and sums of independent random variables**

- Wednesday, March 28, 2012

Speaker: **Cathy Evins & Mary Williams, RU**

Title: **Roosevelt's New Developmental Math Program.**

Abstract: We will discuss the changes to our Developmental math program and the impetus for these changes. This is not a mere change of the syllabus, but a Redesign of the program. I will include information about similar redesigns at other school and their results. The outcome of these changes will be seen and felt not just in other math classes, but across the university.

- Wednesday February 22, 2012

Speaker: **Yao Wang, RU**

Title: **Useful Properties Of The Three-Parameter Burr XII Distribution.**

Abstract: Several useful distributions related to the Burr distribution are presented. It is shown that the log-odds function for the Burr distribution, in terms of  $\ln(t)$ , is convex upward for  $k > 1$  and convex downward for  $k < 1$ . The log-odds rate in  $\ln(t)$  of Burr distribution is increasing for  $k > 1$  and decreasing for  $0 < k < 1$ . The log-odds function in  $\ln(t)$  is a straight line if and only if the distribution is log-logistic. For model formulation, it is shown that the Burr distribution is the family of distributions that has the accelerated life property, Lehmann proportional odds property, and asymptotic proportional hazards property. The log-linear form of the regression equation of the Burr distribution is also presented.

- Wednesday November 30, 2011

Speaker: **Steven Cohen, RU**

Title: **On Representation Theory**

- Wednesday October 26, 2011

Speaker: **Weihua Li, Columbia College**

Title: **Operator Algebras and Free Entropy Dimensions**

Abstract: The subject popularly known as “operator algebras” made its first appearance in von Neumann’s paper published in the 1929-1930 Math. Ann. Most mathematicians who work in operator algebras focus on two kinds of operator algebras: von Neumann algebras and  $C^*$ -algebras, which are self-adjoint algebras of bounded operators on a Hilbert space. The theory of operator algebras has many fruitful interrelations with other areas of mathematics and physics, such as quantum mechanics, systems theory, ergodic theory and many other areas of science. The theory of free entropy dimension in von Neumann algebras and the theory of topological free entropy dimension in  $C^*$ -algebras, introduced and developed by D. Voiculescu ( a Plenary Speaker at The International Congress of Mathematicians, 1998), play a crucial role in operator algebras. In this talk, I will give you a tour of operator algebras and free entropy dimensions including her recent work. Most of the talk will be accessible to graduate students.

- Wednesday: September 28, 2011

Speaker: **Wilfredo Urbina-Romero, RU**

Title: **Hypercontractivity Property and Functional Inequalities**

- Thursday March 31, 2011

Speaker: **Richard Gundy, Rutgers University**

Title: **Wavelets and Probability.**

Abstract: I will discuss some connections between probability theory and the construction of scaling functions, tilings, and various aspects of wavelet theory. In fact, what I will discuss is contained in an article that appeared in the October, 2010 issue of the Notices of the AMS.