



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of April 1<sup>st</sup> – 5<sup>th</sup>, 2013

#### MONDAY, 1<sup>st</sup>

\*No Seminars/Events

#### TUESDAY, 2<sup>nd</sup>

9:40-11:00AM, SURGE 268

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Julie Bergner)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

#### WEDNESDAY, 3<sup>rd</sup>

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

12:10-1:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Scott McCalla, UCLA)  
"Traveling waves and sacred values in an evolutionary, adversarial game"

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Dr. Feng Xu)

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez, UCR)

"Network Theory"

3:40-5:00PM, SURGE 284

**COLLOQUIUM** - No Colloquium This Week

#### THURSDAY, 4<sup>th</sup>

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP**

\*\*\*Organizational Meeting\*\*\*

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS**

\*\*\*Organizational Meeting\*\*\*

4:10-5:00PM, SURGE 284

**MATH CLUB** (John Simanyi, UCR)

"Complex Series at the Radius of Convergence"

#### FRIDAY, 5<sup>th</sup>

11:10-12:00PM, SURGE 277

**DIFFERENTIAL GEOMETRY** (Dr. Bun Wong)

\*\*\*Organizational Meeting\*\*\*

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Dr. Kuei-Nuan Lin, UCR)

"Bounding the Projective Dimension of a Square-Free Monomial Ideal"



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Partial Differential Equations & Applied Math

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**Dr. Scott McCalla**  
UCLA

“Traveling waves and sacred values in an evolutionary, adversarial game”

**Abstract:** In this talk, two variants of an evolutionary, adversarial game will be discussed. The original game was derived to model the transition of a war-torn or crime-dominated society towards a peaceful and cooperative society. Invasive waves are found in a variant of a reaction-diffusion system used to extend the game into space wherein the influence of various strategies is allowed to diffuse. The waves are driven by a nonlinear instability that enables an unstable state to travel through an initially uncooperative state and mediate the transition to a cooperative state. The wave speed's dependence on the various diffusion parameters is also examined. In the second half, the effects of personal relationships and shared ideologies on levels of crime and the formation of criminal coalitions are studied within the context of the game. Here, “sacred value networks” are interpreted as connections on a graph of  $N$  players. We explore the effects on the dynamics of the system that these networks introduce, through various forms of protection from both victimization and punishment. Under local protection, these networks introduce a new fixed point within the game dynamics, which we find through a continuum approximation of the discrete game. Under more complicated, extended protection, we numerically observe the emergence of criminal coalitions, or “gangs”. We also find that a high-crime steady state is much more frequent in the context of extended protection networks.

**Wednesday, April 3<sup>rd</sup>, 2013**

**Surge 268**

**12:10 noon - 1:00 p.m.**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Commutative Algebra

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**Dr. Kuei-Nuan Lin**  
UC Riverside

“Bounding the Projective Dimension of a Square-Free  
Monomial Ideal”

**Abstract:**

This is a report of the joint work of HAILONG DAO AND JAY SCHWEIG on the preprint, BOUNDING THE PROJECTIVE DIMENSION OF A SQUARE-FREE MONOMIAL IDEAL VIA DOMINATION IN CLUTTERS.

They introduce the concept of edgewise domination in clutters, and use it to provide an upper bound for the projective dimension of any squarefree monomial ideal.

**Friday, April 5<sup>th</sup>, 2013**

**Surge 284**

**3:10 p.m. - 4:00 p.m.**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Topology

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**Dr. Jesse Burke**  
UCLA

“Matrix factorizations and complete intersection rings”

**Abstract:**

Matrix factorizations were introduced by Eisenbud in 1980 to study hypersurface singularities. Since their introduction they have been used in a wide range of fields including representation theory, knot theory and string theory. In my talk I will give an overview of this construction, talk briefly about how they are used, and then discuss recent work using matrix factorizations to study complete intersection singularities.

**Tuesday, April 9<sup>th</sup>, 2013**

**Surge 268**

**11:10 a.m. - 12:00 noon**



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of April 8<sup>th</sup> – 12<sup>th</sup>, 2013

#### MONDAY, 8<sup>th</sup>

2:10-3:00PM, SURGE 284

**GRADUATE STUDENT SEMINAR** (John Dusel)  
\*\*\*Organizational Meeting\*\*\*

#### TUESDAY, 9<sup>th</sup>

8:10-9:30AM, SURGE 268

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Jesse Burke, UCLA)

“Matrix factorizations and complete intersection rings”

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vjayanathi Chari)

#### WEDNESDAY, 10<sup>th</sup>

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

12:10-1:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Gung-Min Gie, UCR)

“Parabolic boundary layers with ill-prepared data”

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Dr. Feng Xu)

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:10-4:00PM, SURGE 268

**GRADUATE REPRESENTATION THEORY SEMINAR** (John Dusel, UCR)

“Highest-weight configurations 1”

#### THURSDAY, 11<sup>th</sup>

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP** (Dr. Michel Lapidus)

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vjayanathi Chari)

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dr. Alex Turbiner, UNAM)

“ $\$BC_{\{1,2\}}$  Elliptic systems and  $\$BC_{\{1,2\}}$  Lamé polynomials”

4:10-5:00PM, SURGE 284

**MATH CLUB**

“Math Videos by Vi Hart”

#### FRIDAY, 12<sup>th</sup>

11:10-12:00PM, SURGE 268

**DIFFERENTIAL GEOMETRY** (Dr. Zhang-Dan Guan, UCR)

“Classification of eight dimensional compact solvmanifolds with symplectic structures”

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Youngsu Kim, Purdue University)

“Quasi-Gorenstein Extended Rees Algebras”



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Graduate Representation Theory Seminar

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**John Dusel**  
**UC Riverside**

“Highest-weight configurations 1”

**Abstract:**

To begin I will review a construction of the crystal base for the negative portion of the quantized enveloping algebra for a symmetrizable Cartan datum. Next I will explain the Kashiwara tensor product rule for abstract crystals and show how it leads to Nakashima and Zelevinsky's polyhedral realizations. Time permitting, I will discuss some geometric aspects of these realizations.

**Wednesday, April 10<sup>th</sup>, 2013**

**Surge 268**

**3:10 p.m. - 4:00 p.m.**



Thursday, April 4<sup>th</sup>, 4:10 - 5:00 p.m.  
in Surge 284:

Undergrad  
Student  
Volunteers:

- Ashley Gregory

“Complex Series at the Radius of Convergence”

John Simanyi, UC Riverside

**Abstract:**

In complex analysis, as in the real case, we can find a radius of convergence for a given series, dividing the complex plane into separate regions of certain convergence and divergence. What happens at the border, on the circle of precisely that radius? We consider a few examples to investigate

There will be snacks and refreshments



Thursday, April 11<sup>th</sup>, 4:10 - 5:00 p.m.  
in Surge 284:

Undergrad  
Student  
Volunteers:

“Math Videos by Vi Hart”

- Ashley Gregory

**Abstract:**

Victoria Hart, commonly known as Vi Hart, is a "Recreational Mathemusician", and is most known for her mathematical videos on YouTube. With 25 million video views on her primary YouTube channel, as well as over 300,000 subscribers, her videos have something for everyone. Join us for a showing of a collection of these fun and interesting math videos.

There will be snacks and refreshments.





# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Commutative Algebra

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**Youngsu Kim**  
Purdue University

“Quasi-Gorenstein Extended Rees Algebras”

**Abstract:**

A ring is called quasi-Gorenstein if it is isomorphic to its own canonical module. A quasi-Gorenstein ring is Gorenstein if and only if it is Cohen-Macaulay. We show that for some classes of extended Rees algebras, the quasi-Gorenstein property implies the Gorenstein property.

**Friday, April 12<sup>th</sup>, 2013**

**Surge 284**

**3:10 p.m. - 4:00 p.m.**



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of April 15<sup>th</sup> – 19<sup>th</sup>, 2013

#### **MONDAY, 15<sup>th</sup>**

3:40-5:00PM, SURGE 284

**COLLOQUIUM** – Dr. Dietmar Bisch, Vanderbilt University  
"Subfactors with small Jones index"

#### **TUESDAY, 16<sup>th</sup>**

8:10-10:00AM, SURGE 268\*

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 284

**FLUIDS SEMINAR** (Dr. James Kelliher)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Moritz Groth, Radboud University Nijmegen)  
"An introduction to Grothendieck derivators"

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

#### **WEDNESDAY, 17<sup>th</sup>**

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

12:10-1:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Ehsan Kamalinejad, UCR)  
"Radial Symmetry of Large Solutions of Semi-linear Elliptic Equations with Convection"

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Dr. Feng Xu)

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:10-4:00PM, SURGE 268

**GRADUATE REPRESENTATION THEORY SEMINAR** (John Dusel, UCR)  
"Highest Weight Configuration 2"

3:40-5:00PM, SURGE 284

**COLLOQUIUM** – Dr. Uwe Nagel, University of Kentucky  
"Blow-up rings associated to Ferrers and threshold graphs"

#### **THURSDAY, 18<sup>th</sup>**

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP** (Leo Vu)  
"Properties of Type 0 Languages and Decidability"

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

2:10-3:00PM, SURGE 284

**GRADUATE STUDENT SEMINAR** (John Dusel)

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dominick Scaletta, UCR)  
"An Introduction to Hopf Algebras, with Key Examples"

4:10-5:00PM, SURGE 284

**MATH CLUB** – Reeve Garrett and Amanda Hoisington, UCR  
"The Path of the Math Major"

#### **FRIDAY, 19<sup>th</sup>**

11:10-12:00PM, SURGE 268

**DIFFERENTIAL GEOMETRY** (Dr. Stefano Vidussi, UCR)  
"Rank gradients of Kaehler groups"

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Dr. David Rush)



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Colloquium

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**Dr. Dietmar Bisch**  
**Vanderbilt University**

“Subfactors with small Jones index”

**Abstract:**

It is well-known that algebras of bounded linear operators on Hilbert space are intimately related to quantum topology. Subfactors capture "quantum symmetries" in a natural way, and many new structures have emerged from subfactor theory. I will describe some of these and report on recent work on the classification of subfactors with Jones index at most 6. The talk will be accessible to non-experts.

**Monday, April 15<sup>th</sup>, 2013**

**Surge 284**

*Tea Time 3:40 p.m. – Talk Begins 4:10 p.m.*



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Topology

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**Dr. Moritz Groth**  
**Radboud University Nijmegen**

“An introduction to Grothendieck derivators”

**Abstract:**

The theory of derivators (going back to Grothendieck, Heller, and others) provides an axiomatic approach to homotopy theory. It addresses the problem that the rather crude passage from model categories to homotopy categories results in a serious loss of information. In the stable context, the typical defects of triangulated categories (non-functoriality of cone construction, lack of homotopy colimits) can be seen as a reminiscent of this fact.

The basic idea behind a derivator is that one should form homotopy categories of diagram categories and also keep track of the calculus of homotopy Kan extensions. In the stable context this calculus allows one to canonically construct triangulations -- emphasizing the idea that stable derivators provide an enhancement of triangulated categories. Moreover, for stable, closed symmetric monoidal derivators one can establish an additivity result for traces -- a result which is known to be false at the level of triangulated categories.

The aim of this talk is to give a short introduction to the theory and to (hopefully) advertise derivators as a convenient, 'weakly terminal' approach to axiomatic homotopy theory.

**Tuesday, April 16<sup>th</sup>, 2013**

**Surge 268**

**11:10 a.m. - 12:00 noon**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Partial Differential Equations & Applied Math

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**Dr. Ehsan Kamalinejad**  
**UC Riverside**

“Radial Symmetry of Large Solutions of Semi-linear  
Elliptic Equations with Convection”

**Abstract:**

We study radial symmetry of large solutions of a family of semi-linear elliptic problems, and we provide sharp conditions under which the problems have radial solutions. The result is independent of the rate of growth of the solution at infinity.

**Wednesday, April 17<sup>th</sup>, 2013**

**Surge 268**

**12:10 noon - 1:00 p.m.**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Colloquium

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**Dr. Uwe Nagel**  
**University of Kentucky**

“Blow-up rings associated to Ferrers and threshold graphs”

**Abstract:**

Starting from the classical Dedekind-Mertens lemma about the content of polynomials, we are lead to consider various rings and ideals associated to Ferrers and threshold graphs. This includes minimal reductions, special fiber and Rees rings. In particular, a generalization of ladder determinantal ideals of a symmetric matrix is studied.

**Wednesday, April 17<sup>th</sup>, 2013**

**Surge 284**

*Tea Time 3:40 p.m. – Talk Begins 4:10 p.m.*



Thursday, April 18<sup>th</sup>, 4:10 - 5:00 p.m.  
in Surge 284:

Undergrad  
Student  
Volunteers:

Reeve Garrett and Amanda Hoisington

- Ashley Gregory

“The Path of the Math Major”

**Abstract:**

Are you a freshman or sophomore math major and not sure what math after calculus is like? Are you not sure what courses you should take next? Are you starting or are about to start upper division math coursework but don't have a clear idea of how it all fits together or in what sequence you should take your courses in? If you answered yes to any of these questions or you are just curious about what upper division math major coursework is like, then this talk is for you! Reeve Garrett and Amanda Hoisington, two Ph.D. program bound graduating seniors who are finishing the Pure Math undergraduate curriculum, will give a rough idea of what various upper division courses are about, briefly outline the interrelation of courses and what they consider to be the best order in which to take courses, and lay out the courses they consider most important for preparation for graduate school.

All are welcome to join us for this presentation, and snacks will be provided.

[mathdept.ucr.edu/mathclub.html](http://mathdept.ucr.edu/mathclub.html)



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of April 22<sup>nd</sup> – 26<sup>th</sup>, 2013

#### MONDAY, 22<sup>nd</sup>

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NO EVENTS

#### TUESDAY, 23<sup>rd</sup>

8:10-10:00AM, SURGE 268\*

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 284

**FLUIDS SEMINAR** (Dr. James Kelliher)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Julie Bergner)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

#### WEDNESDAY, 24<sup>th</sup>

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

12:10-1:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Juhi Jang)

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Dr. Feng Xu)

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:10-4:00PM, SURGE 268

**GRADUATE REPRESENTATION THEORY SEMINAR** (John Dusel)

TBA

3:40-5:00PM, SURGE 284

**COLLOQUIUM**

\*\*\*No Colloquium This Week\*\*\*

#### THURSDAY, 25<sup>th</sup>

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP** (Leo Vu, UCR)

"Turing Machine Variants and Complexity Classes"

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

1:00-2:00PM, SURGE 284

**LIE THEORY** (Dr. Milen Yakimov, Louisiana State University)

"Quantum cluster algebra structures on quantum nilpotent algebras"

2:10-3:00PM, SURGE 284

**GRADUATE STUDENT SEMINAR** (Lisa Schneider, UCR)

TBA

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dominick Scaletta, UCR)

"Shuffle Hopf Algebras and Applications to Feynman's Operational Calculus"

4:10-5:00PM, SURGE 284

**MATH CLUB**

TBA

#### FRIDAY, 26<sup>th</sup>

11:10-12:00PM, SURGE 268

**DIFFERENTIAL GEOMETRY** (Dennis Gumaer, UCR)

"A Jacobi field splitting theorem"

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Dr. Yi Zhang, MSRI, Berkeley)

"Some results on local cohomology in positive characteristic"





# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Lie Theory

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**Dr. Milen Yakimov**  
**Louisiana State University**

“Quantum cluster algebra structures on quantum nilpotent algebras”

**Abstract:**

Cluster Algebras and their quantum counterparts play an important role in representation theory, combinatorics and topology. In relation to noncommutative algebra there are several open problems on the existence of cluster algebra structures on certain families of quantized coordinate rings. We will describe a result that proves the existence of quantum cluster algebra structures on a very general, axiomatically defined class of quantum nilpotent algebras. This has a broad range of applications, among which are a proof of the Berenstein-Zelevinsky conjecture for quantum double Bruhat cells, construction of quantum cluster algebra structures on quantum unipotent groups in full generality, and others.

**Thursday, April 25<sup>th</sup>, 2013**

**Surge 284**

**1:00 p.m. - 2:00 p.m.**



Thursday, April 25<sup>th</sup>, 4:10 - 5:00 p.m.  
in Surge 284:

Undergrad  
Student  
Volunteers:

Amanda Hoisington

- Ashley Gregory

“P-Adics and the Real Numbers”

### Abstract:

The real numbers can be constructed from the rationals, and is a completion of the rationals in that every Cauchy sequence converges to a point in the reals. There is, however, one other way to complete the rationals by using the p-adic metric rather than the usual absolute value. The world of p-adics is the counterpart to real numbers. It's very counter-intuitive, where numbers that are usually far apart with the usual distance on the reals can be very close together. In this presentation, a brief introduction to the usual completion of the rationals will be followed by a survey of this unusual field of numbers, its properties, and uses.

All are welcome to join us for this presentation, and snacks will be provided.

[mathdept.ucr.edu/mathclub.html](http://mathdept.ucr.edu/mathclub.html)



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Commutative Algebra

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**Dr. Yi Zhang**  
**MSRI, Berkeley**

“Some results on local cohomology in positive characteristic”

**Abstract:**

Let  $R = k[x_1, \dots, x_n]$  be a polynomial ring over a field  $k$  of characteristic  $p > 0$ . If  $I$  is an ideal of  $R$ , we denote  $H_I^i(R)$  the  $i$ -th local cohomology module of  $R$  with support in  $I$ . After some introductory material on local cohomology, we will give a lower bound of the dimension of associated primes  $P$  of  $H_I^i(R)$  in terms of the degrees of the generators of  $I$ . Let  $\mathfrak{m} = (x_1, \dots, x_n)$  be the maximal ideal generated by the variables and let  $I_1, \dots, I_s$  be homogeneous ideals of  $R$ . We will describe the grading of  $H_{\mathfrak{m}}^i(H_{I_1}^{j_1} \circ \dots \circ H_{I_s}^{j_s}(R))$  and also give two algorithms to calculate it.

**Friday, April 26<sup>th</sup>, 2013**

**Surge 284**

**3:10 p.m. - 4:00 p.m.**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Differential Geometry

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**Dennis Gumaer**  
**UC Riverside**

“A Jacobi Field Splitting Theorem”

**Abstract:**

Jacobi fields are useful in that they link curvature and geodesics, two fundamental ideas in Riemannian geometry. They arise naturally from a variation of geodesics and are defined via a second order differential equation.

In this talk, the contents of which is joint work with Dr. Wilhelm, I will describe a new rigidity theorem and splitting theorem for Jacobi fields in positive sectional curvature.

**Friday, April 26<sup>th</sup>, 2013**

**Surge 268**

**11:10 a.m. - 12:00 noon**



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of April 29<sup>th</sup> – March 3<sup>rd</sup>, 2013

#### MONDAY, 29<sup>th</sup>

NO EVENTS

#### TUESDAY, 30<sup>th</sup>

8:10-10:00AM, SURGE 268\*

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 284

**FLUIDS SEMINAR** (Dr. James Kelliher)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Daniel Berwick-Evans, UC Berkeley)

“Concordance spaces for sheaves”

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

TBA

#### WEDNESDAY, 1<sup>st</sup>

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

12:10-1:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Thomas Laurent, UCR)

“Dimensionality of structures appearing in systems of interacting particles”

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Andrew Monnot, UCR)

“Operator K-Theory 1”

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:10-4:00PM, SURGE 268

**GRADUATE REPRESENTATION THEORY SEMINAR** (John Dusel)

TBA

3:40-5:00PM, SURGE 284

**COLLOQUIUM**

\*\*\*No Colloquium This Week\*\*\*

#### THURSDAY, 2<sup>nd</sup>

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP** (John Quinn)

TBA

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

TBA

2:10-3:00PM, SURGE 284

**GRADUATE STUDENT SEMINAR** (Oliver Thistlethwaite, UCR)

“Clifford Algebras”

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dr. Michel Lapidus)

TBA

4:10-5:00PM, SURGE 284

**MATH CLUB** – Dr. John Baez, UCR

“5”

#### FRIDAY, 3<sup>rd</sup>

11:10-12:00PM, SURGE 268

**DIFFERENTIAL GEOMETRY** (Dr. Bun Wong)

\*\*\*No Meeting This Week\*\*\*

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Dr. David Rush)



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Topology

---

**Daniel Berwick-Evans**

**UC Berkeley**

“Concordance spaces for sheaves”

**Abstract:**

Classifying spaces encode locally defined geometric data on manifolds such as vector bundles, principal bundles and cohomology cocycles. The transition from the geometry of this local data to the topology of classifying spaces typically loses data. I will define concordance spaces and show how they make aspects of this process precise. After explaining the relation to classical examples I will focus on a conjecture of Stolz and Teichner relating certain supersymmetric field theories to K-theory. This is joint work with Dmitri Pavlov and Pedro Boavida de Brito.

**Tuesday, April 30<sup>th</sup>, 2013**

**Surge 268**

**11:10 a.m. - 12:00 noon**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Partial Differential Equations & Applied Math

---

**Dr. Thomas Laurent**  
**UC Riverside**

“Dimensionality of structures appearing in systems of interacting particles”

**Abstract:**

In this talk we will study the dimensionality of structures arising in large systems of self-assembling particles.

In models arising from material sciences the particles can be molecules, proteins or nano-particles. In applications to biological sciences the particles represent individuals in a social aggregate (e.g., a swarm of insects, a flock of birds, a school of fish or a colony of bacteria). We will see that simple rules of interaction between the particles lead to surprisingly complex patterns and structures. The goal is to understand what type of interaction rule leads to what type of structure. We will present some theorems which predict the dimensionality of these structures.

**Wednesday, May 1<sup>st</sup>, 2013**

**Surge 268**

**12:10 p.m. – 1:00 p.m.**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Graduate Student Seminar

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**Oliver Thistlethwaite**  
**UC Riverside**

“Clifford Algebras”

**Abstract:**

A Clifford algebra is an algebra that is naturally associated to a vector space equipped with a quadratic form. These algebras and their representations play a fundamental role in differential geometry. The goal of this talk is to present various examples of Clifford algebras and discuss their properties. This talk should be accessible to anyone who has taken undergraduate linear algebra.

**Thursday, May 2<sup>nd</sup>, 2013**

**Surge 284**

**2:10 p.m. - 3:00 p.m.**





Thursday, May 2<sup>nd</sup>, 4:10 - 5:00 p.m.  
in Surge 284:

Undergrad  
Student  
Volunteers:

Dr. John Baez, UCR

- Ashley Gregory

**“5”**

**Abstract:**

Different numbers have different personalities. The number 5 is quirky and intriguing, thanks in large part to its relation with the golden ratio, the "most irrational" of irrational numbers. It is impossible to tile the plane with regular pentagons, or form a crystal with perfect 5-fold symmetry... but trying leads to some beautiful things.

There will be snacks and refreshments.



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of May 6<sup>th</sup> – 10<sup>th</sup>, 2013

#### MONDAY, 6<sup>th</sup>

NO EVENTS

#### TUESDAY, 7<sup>th</sup>

8:10-10:00AM, SURGE 268\*

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 284

**FLUIDS SEMINAR** (Dr. James Kelliher)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Greg Chadwick, UCR)

“Infinite loop spaces and generalized cohomology”

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

#### WEDNESDAY, 8<sup>th</sup>

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

1:10-2:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Juhi Jang)

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Andrew Monnot, UCR)

“Operator K-theory 2”

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:10-4:00PM, SURGE 268

**GRADUATE REPRESENTATION THEORY SEMINAR** (John Dusel, UCR)

“Highest-weight configurations 1”

3:40-5:00PM, SURGE 284

**COLLOQUIUM**

\*\*\*No Colloquium This Week\*\*\*

#### THURSDAY, 9<sup>th</sup>

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP** (Tim Cobler, UCR)

TBA

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

2:10-3:00PM, SURGE 284

**GRADUATE STUDENT SEMINAR** (Adam Navas, UCR)

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dr. David Carfi, UNIME)

TBA

4:10-5:00PM, SURGE 284

**MATH CLUB**

\*\*\*No Meeting This Week\*\*\*

#### FRIDAY, 10<sup>th</sup>

11:10-12:00PM, SURGE 268

**DIFFERENTIAL GEOMETRY** (Dr. Arlo Caine, Cal Poly Pomona)

“A Natural Limit of Bruhat Poisson Structure on  $G/B$ ”

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Dr. David Rush)



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Differential Geometry

---

**Dr. Arlo Caine**  
CSU Pomona

“A Natural Limit of Bruhat Poisson Structure on  $G/B$ ”

**Abstract:**

In 1990, Lu and Weinstein, and independently Soibelman, introduced a real algebraic Poisson structure on the complex flag variety  $G/B$  whose symplectic foliation coincided with the decomposition of  $G/B$  into Bruhat cells. We evolve this Poisson structure under a natural flow on  $G/B$ , obtaining a one-parameter family of real algebraic Poisson structures on  $G/B$ . Each Poisson structure in the family is invariant under the action of the compact real torus in  $G$ , but the limiting real Poisson structure turns out to be invariant under the action of the full complex torus. Although, each Poisson structure in the family has the Bruhat cells as symplectic leaves, our main result is that the symplectic foliation of the limiting Poisson structure is different and coincides with the decomposition of  $G/B$  into Richardson varieties. This is joint work with Sam Evens (University of Notre Dame).

**Friday, May 10<sup>th</sup>, 2013**  
**Surge 268**  
**11:10 a.m. - 12:00 noon**



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of May 13<sup>th</sup> – 17<sup>th</sup>, 2013

#### MONDAY, 13<sup>th</sup>

**\*NO EVENTS**

#### TUESDAY, 14<sup>th</sup>

8:10-10:00AM, SURGE 268\*

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 284

**FLUIDS SEMINAR** (Dr. James Kelliher)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Dan Ramras, New Mexico State University)  
TBA

12:40-2:00PM, SURGE 284

**LIE THEORY** (Yuri Bazlov, University of Manchester, United Kingdom)  
"The Kostant Clifford algebra conjecture"

#### WEDNESDAY, 15<sup>th</sup>

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

1:10-2:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Juhi Jang)

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Andrew Monnot, UCR)  
"Operator K-theory 3"

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:10-4:00PM, SURGE 268

**GRADUATE REPRESENTATION THEORY SEMINAR** (John Dusel, UCR)  
"Highest-weight configurations 2"

3:40-5:00PM, SURGE 284

**COLLOQUIUM** – Dr. Inwon Kim, UC Los Angeles  
"Quasi-static evolution and congested crowd motion"

#### THURSDAY, 16<sup>th</sup>

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP** (Dr. Stephen Muir, UCR)  
"Pseudo-Expanding Dynamical Systems"

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Mathew Lunde, UCR)  
TBA

2:10-3:00PM, SURGE 284

**GRADUATE STUDENT SEMINAR** (Daniel Majcherek, UCR)  
TBA

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dr. Akhil Rao)  
"Networks and Contagion"

4:10-5:00PM, SURGE 284

**MATH CLUB** – Jacob West, UCR  
"Category theory (A Gentle Introduction)"

#### FRIDAY, 17<sup>th</sup>

11:10-12:00PM, SURGE 268

**DIFFERENTIAL GEOMETRY** (Dr. AJ Todd, UCR)  
"Hamiltonian Structures on Multisymplectic Manifolds"

\*12:10-2:00PM, SURGE 268

**DISSERTATION DEFENSE** – Dennis Gumaer  
TBA

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Dr. David Rush)



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Lie Theory

---

**Dr. Yuri Bazlov**  
**University of Manchester, United Kingdom**

“The Kostant Clifford algebra conjecture”

**Abstract:**

Let  $\mathfrak{g}$  be a complex simple Lie algebra and  $\mathfrak{h}$  its Cartan subalgebra. The Clifford algebra  $C(\mathfrak{g})$  of  $\mathfrak{g}$  admits a Harish-Chandra map, which turns out to map primitive  $\mathfrak{g}$ -invariants in  $C(\mathfrak{g})$  to  $\mathfrak{h}$ . I will discuss a conjecture of Kostant which says that the image of a certain alternating invariant of degree  $2m+1$  under this map is the zero weight vector of the simple  $(2m+1)$ -dimensional module of the principal  $\mathfrak{sl}_2$ -triple in the Langlands dual of  $\mathfrak{g}$ . My original proof of this conjecture was found to be incomplete if  $\mathfrak{g}$  is not of type A. A complete proof was subsequently given by Joseph and Alekseev-Moreau.

**Tuesday, May 14<sup>th</sup>, 2013**

**Surge 284**

**1:00 p.m. - 2:00 p.m.**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Colloquium

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**Dr. Inwon Kim**  
**UC Los Angeles**

“Quasi-static evolution and congested crowd motion”

**Abstract:**

In this talk we investigate the relationship between Hele-Shaw evolution with a drift and a transport equation with a drift potential, where the density is transported with a constraint on its maximum. The latter model, in a simplified setting, describes the congested crowd motion with a density constraint. When the drift potential is convex, the crowd density is likely to aggregate, and thus if the initial density starts as a patch (i.e. if it is a characteristic function of some set) then it is expected that the density evolves as a patch. We show that the evolving patch satisfies a Hele-Shaw type equation. This is joint work with Damon Alexander and Yao Yao.

**Wednesday, May 15<sup>th</sup>, 2013**

**Surge 284**

*Tea Time 3:40 p.m. – Talk Begins 4:10 p.m.*



Thursday, May 16<sup>th</sup>, 4:10 - 5:00 p.m.  
in Surge 284:

Undergrad  
Student  
Volunteers:

Jacob West, UCR

- Ashley Gregory

“Category theory (A Gentle Introduction)”

### Abstract:

Category theory began in the early 1940's in the work of Samuel Eilenberg and Saunders Mac Lane on algebraic topology. They introduced the notions of category, functor, and natural transformation with the goal of understanding natural transformations. In a sense, category theory is a continuation of the work of Emmy Noether in formalizing and studying abstract processes in terms of the structures they preserve. Since its inception, category theory has rapidly become ubiquitous throughout mathematics. In this talk, I will give a (hopefully) gentle introduction to category theory and indicate the general flavor of categorical mathematics.

There will be snacks and refreshments.

[mathdept.ucr.edu/mathclub.html](http://mathdept.ucr.edu/mathclub.html)



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Differential Geometry

---

**Dr. AJ Todd**  
**UC Riverside**

### “Hamiltonian Structures on Multisymplectic Manifolds”

**Abstract:**

A multisymplectic manifold of degree  $(k+1)$  is an  $n$ -dimensional smooth manifold equipped with a closed, 'nondegenerate'  $(k+1)$ -form. These types of geometries arise naturally in physics from the covariant Hamiltonian formulation of classical field theories and mathematically are a natural generalization of symplectic manifolds.

My particular interest in this area comes from the fact that the exceptional geometries  $G_2$  and  $Spin(7)$  are themselves special cases of multisymplectic geometries. In this talk, I will give a survey of results from multisymplectic geometry as defined and studied by Cantrijn, Ibort, and de Leon including the basic theory of multisymplectic manifolds and results about Hamiltonian structures on multisymplectic manifolds which are generalizations of Hamiltonian vector fields from symplectic geometry.

**Friday, May 17<sup>th</sup>, 2013**  
**Surge 268**  
**11:10 a.m. - 12:00 noon**





# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Dissertation Defense

---

### Dennis Gumaer

“A Jacobi Field Splitting Theorem for Positive Curvature”

#### Abstract:

This defense will present two new rigidity theorems for manifolds with sectional curvature bounded below. The main new result, stated below, is a new splitting theorem for Jacobi fields on manifolds with positive sectional curvature.

**Theorem 1.** Let  $M$  be an  $n$ -dimensional Riemannian manifold with  $\sec \geq 1$ . For  $\alpha \in [0, \pi]$  let  $\gamma : [\alpha, \pi] \rightarrow M$  be a geodesic. Let  $\Lambda$  be an  $(n-1)$ -dimensional family of Jacobi fields on which the Riccati operator  $S$  is self adjoint. If

$$\max\{\text{eigenvalue } S(\alpha)\} \leq \cot \alpha$$

then  $\Lambda$  splits orthogonally into

$\text{span}\{J \in \Lambda \mid J \text{ has a zero before time } \pi\} \oplus \{J \in \Lambda \mid \text{where } J \text{ takes the form } \sin(t) \cdot E(t)\}$

with  $E(t)$  being a parallel field.

**Friday, May 17<sup>th</sup>, 2013**

**12:10 noon – 2:00 p.m.**

**Surge 268**



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of May 20<sup>th</sup> – 24<sup>th</sup>, 2013

#### **TUESDAY, 21<sup>st</sup>**

8:10-10:00AM, SURGE 268\*

**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

**LIE GROUP** (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 284

**FLUIDS SEMINAR** (Dr. James Kelliher)

11:10-12:00PM, SURGE 268

**TOPOLOGY** (Dr. Julie Bergner, UCR)  
"Classifying space constructions"

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Jonas Hartwig, UCR)  
TBA

#### **WEDNESDAY, 22<sup>nd</sup>**

10:10-11:00PM, SURGE 268

**COMBINATORIAL NUMBER THEORY** (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

**TOPICS IN COMMUTATIVE ALGEBRA** (Dr. Lin / Dr. Mantero)

11:10-1:00PM, SURGE 282

**DISSERTATION DEFENSE** – John Quinn  
"Scale Covariance of Fractal Sets and Measures, A Differential Approach to the Box-Counting Function, With Applications"

1:10-2:00PM, SURGE 268

**PDE & APPLIED MATHEMATICS** (Dr. Juhi Jang)

1:10-2:00PM, SURGE 277

**OPERATOR ALGEBRAS & RELATED TOPICS** (Dr. Feng Xu)

2:10-3:30PM, SURGE 284

**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:10-4:00PM, SURGE 268

**GRADUATE REPRESENTATION THEORY SEMINAR** (John Dusel)

3:40-5:00PM, SURGE 284

**COLLOQUIUM** – Dr. Eun Heui Kim, CSU Long Beach  
"Transonic problems in multidimensional conservation laws"

#### **THURSDAY, 23<sup>rd</sup>**

9:40-11:00AM, SURGE 268

**FRACTAL RESEARCH GROUP** (Dr. Stephen Muir, UCR)  
"Pseudo-Expanding Dynamical Systems"

9:40-11:00AM, SURGE 28

**LIE GROUPS** (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

**LIE THEORY** (Dr. Vyjayanthi Chari)

2:10-3:00PM, SURGE 284

**GRADUATE STUDENT SEMINAR** (John Dusel)

3:40-5:00PM, SURGE 268

**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dr. Ben Sanders)  
TBA

#### **FRIDAY, 24<sup>th</sup>**

11:10-12:00PM, SURGE 268

**DIFFERENTIAL GEOMETRY** (Oliver Thistlethwaite, UCR)  
"Seiberg-Witten invariants, Alexander polynomials, and fibred classes"

3:10-4:00PM, SURGE 284

**COMMUTATIVE ALGEBRA** (Dr. David Rush)

4:10-5:00PM, SURGE 268\*

**MATH CLUB** (Edward Burkard, Notre Dame)  
"An Introduction to the Gauss-Bonnet Theorem"



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Dissertation Defense

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### John Quinn

“Scale Covariance of Fractal Sets and Measures, A  
Differential Approach to the Box-Counting Function,  
With Applications”

**Abstract:**

The scale symmetry of self-similarity is a fundamental one in physics and in geometry. We develop a calculus of the scale space evolution of self-similar fractal sets via an analysis of box-counting functions on these structures utilizing the theories of distributions and hyperfunctions. A differential study of the Box-Counting function can account for the oscillations of the local geometry of some examples of such structures, paralleling the theory of the complex dimensions of fractal strings. The algebraic structure on the iterates of the unit interval under an Iterated Function System admits a tensor product representation we develop to define an intrinsic geometry of fractals and an integral calculus on these objects.

**Wednesday, May 22<sup>nd</sup>, 2013**

**11:00 a.m. – 1:00 p.m.**

**Surge 282**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Colloquium

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**Dr. Eun Heui Kim**  
**CSU Long Beach**

“Transonic problems in multidimensional conservation laws”

**Abstract:**

In many applications of engineering and physics, the model problems obey the conservation laws and behave in a self-similar manner. A distinctive feature of multidimensional conservation laws in self-similar coordinates is that they change their type, meaning that they are hyperbolic (supersonic) far from the origin, and mixed (subsonic) near the origin. Hence the problem becomes transonic.

In this talk, we discuss existence and numerical results of a simplified model system of transonic problems for certain configurations.

**Wednesday, May 22<sup>nd</sup>, 2013**

**Surge 284**

*Tea Time 3:40 p.m. – Talk Begins 4:10 p.m.*



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Differential Geometry

---

**Oliver Thistlethwaite**  
UC Riverside

“Seiberg-Witten invariants, Alexander polynomials, and  
fibred classes”

**Abstract:**

Since their introduction in 1994, the Seiberg-Witten invariants have become one of the main tools used in 4-manifold theory. In this talk, we will discuss the invariants as well as show how they provide us with an alternate proof of a theorem of S. Friedl and S. Vidussi concerning sufficient conditions for a 3-manifold to fibre over a circle.

**Friday, May 24<sup>th</sup>, 2013**  
**Surge 268**  
**11:10 a.m. - 12:00 noon**



Friday, May 24<sup>th</sup>, 4:10 - 5:00 p.m.  
in Surge 268:

Undergrad  
Student  
Volunteers:

Edward Burkard, University of Notre Dame

- Ashley Gregory

“An Introduction to the Gauss-Bonnet Theorem”

**Abstract:**

The Gauss-Bonnet theorem is an amazing theorem that draws a, perhaps unexpected, connection between a purely geometric object: the Gaussian curvature, and a purely (combinatorial) topological object: the Euler characteristic. We will define the Euler characteristic and Gaussian curvature of a (2-dimensional) surface and give a proof of the Gauss-Bonnet theorem which should be widely accessible, and easily understood by anyone who has taken Math 10B. Time permitting, we will look at the consequences of the Gauss-Bonnet theorem on the Gaussian curvature on all closed surfaces (up to "homeomorphism").

There will be snacks and refreshments.

[mathdept.ucr.edu/mathclub.html](http://mathdept.ucr.edu/mathclub.html)



# UNIVERSITY OF CALIFORNIA, RIVERSIDE

## Department of Mathematics

### Calendar of Events For the Week of May 27<sup>th</sup> – 31<sup>st</sup>, 2013

#### MONDAY, 27<sup>th</sup>

MEMORIAL DAY

#### TUESDAY, 28<sup>th</sup>

8:10-10:00AM, SURGE 268\*

ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

9:40-11:00AM, SURGE 284

LIE GROUP (Dr. Wee-Liang Gan)

11:10-12:00PM, SURGE 284

FLUIDS SEMINAR (Dr. James Kelliher)

11:10-12:00PM, SURGE 268

TOPOLOGY (Dr. Julie Bergner)

TBA

12:40-2:00PM, SURGE 284

DISSERTATION DEFENSE (Matthew Highfield)

“Twisted Graded Hecke Algebras for Elementary Abelian Groups”

#### WEDNESDAY, 29<sup>th</sup>

10:10-11:00PM, SURGE 268

COMBINATORIAL NUMBER THEORY (Dr. Kevin Costello)

11:10-12:00PM, SURGE 277

TOPICS IN COMMUTATIVE ALGEBRA (Dr. Lin / Dr. Mantero)

1:10-2:00PM, SURGE 268

PDE & APPLIED MATHEMATICS (Dr. Tamar Shinar, UCR)

“Fluid coupling in continuum modeling of microtubule motility assays”

1:10-2:00PM, SURGE 277

OPERATOR ALGEBRAS & RELATED TOPICS (Dr. Feng Xu)

2:10-3:30PM, SURGE 284

MATH IN THE ENVIRONMENT (Dr. John Baez)

3:10-4:00PM, SURGE 268

GRADUATE REPRESENTATION THEORY SEMINAR (John Dusel)

TBA

#### THURSDAY, 30<sup>th</sup>

9:40-11:00AM, SURGE 268

FRactal RESEARCH GROUP (Sean Watson, UCR)

TBA

9:40-11:00AM, SURGE 28

LIE GROUPS (Dr. Wee-Liang Gan)

12:40-2:00PM, SURGE 284

LIE THEORY (Dr. Vyjayanthi Chari)

TBA

2:10-3:00PM, SURGE 284

GRADUATE STUDENT SEMINAR (John Dusel, UCR)

“Möbius inversion in a poset”

3:40-5:00PM, SURGE 268

MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (TBA)

TBA

#### FRIDAY, 31<sup>st</sup>

11:10-12:00PM, SURGE 268

DIFFERENTIAL GEOMETRY (Dr. Pedro Solorzano, UCR)

“Waning and collapse in principal  $SG\mathbb{S}$ -bundles”

3:10-4:00PM, SURGE 284

COMMUTATIVE ALGEBRA (Dr. David Rush)

4:10-5:00PM, SURGE 268\*

MATH CLUB (Dr. Kuei-Nuan Lin, UCR)

“Blowups”



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Dissertation Defense

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### Matthew Highfield

“Twisted Graded Hecke Algebras for Elementary  
Abelian Groups”

**Tuesday, May 28<sup>th</sup>, 2013**

**12:40 p.m. – 2:00 p.m.**

**Surge 284**





# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Partial Differential Equations & Related Topics

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**Dr. Tamar Shinar**  
**UC Riverside**

“Fluid coupling in continuum modeling of microtubule motility assays”

**Abstract:**

Microtubule motility assays, in which molecular motors anchored to a bottom plate drive the gliding motion of filaments in a quasi two-dimensional plane, have been shown to organize in a variety of large-scale patterns. We derive a coarse-grained model of motility assays including the evolution of a rigid filament density, bound and free motor densities and fluid velocity. Our numerical simulations show the emergence of coherent vortices and density fluctuations arising from the far-field hydrodynamic coupling of the fluid and the suspended microstructures.

This is joint work with Christel Hohenegger.

**Wednesday, May 29<sup>th</sup>, 2013**

**Surge 268**

**1:10 p.m. - 2:00 p.m.**



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Differential Geometry

---

**Dr. Pedro Solorzano**  
UC Riverside

“Waning and collapse in principal  $G$ -bundles”

**Abstract:**

I will discuss what happens to the Sasaki metrics over connection metrics when the fibers are collapsed to a point; i.e. when the total space converges to the base via a Cheeger deformation.

**Friday, May 31<sup>st</sup>, 2013**  
**Surge 268**  
**11:10 a.m. - 12:00 noon**



Friday, May 31<sup>st</sup>, 4:10 - 5:00 p.m.  
in Surge 268:

Undergrad  
Student  
Volunteers:

Dr. Kuei-Nuan Lin, UC Riverside

- Ashley Gregory

“Blowups”

**Abstract:**

I will start with the definition of a blowup and why mathematician care about blowups. Then I will give some definitions relative to graph theory. Finally I will talk about how do we find the blowups by using graph theory. This is joint work with Louiza Fouli.

Knowing the definition of a polynomial is what you need to understand this talk.

There will be snacks and refreshments.



# UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

## Partial Differential Equations & Applied Math

---

**Dr. Braxton Osting**  
UC Los Angeles

“Geometric optimization of eigenvalues”

**Abstract:**

In this talk, I'll discuss several geometric optimization problems, where the objective function depends on the eigenvalues of an operator. The optimization variables will be taken to be either (i) a function defined on some fixed domain which is a coefficient in the operator, (ii) the shape of the domain for which the operator is defined, or (iii) the metric of a Riemannian surface.

**Wednesday, June 5<sup>th</sup>, 2013**

**Surge 268**

**1:10 p.m. - 2:00 p.m.**



Friday, June 7<sup>th</sup>, 4:10 - 5:00 p.m.  
in Surge 268:

Undergrad  
Student  
Volunteers:

Reeve Garrett and Amanda Hoisington, University of  
California, Riverside

- Ashley Gregory

“Information Session on the Graduate School Application  
Process, Senior Retrospective, and Feedback Session”

### Abstract:

In this week's math club, two graduating seniors Reeve Garrett and Amanda Hoisington who have been admitted to top 50 Ph.D. programs will discuss the graduate school application process in math (both Masters and Ph.D. programs), including advice to help you stand out, choosing recommenders, choosing schools and programs to apply to, and the resources available to help you prepare and make these important decisions. In addition, they will discuss the application process and selection criteria for National Science Foundation Graduate Research Fellowships and impart their opinions on what they did right and what they would have done differently during their time at UCR had they known then what they know now. Finally, the meeting will conclude with a feedback session and recruitment of volunteers for the 2013-2014 school year.

There will be snacks and refreshments.

[mathdept.ucr.edu/mathclub.html](http://mathdept.ucr.edu/mathclub.html)