### Calendar of Events For the Week of October 1\textsuperscript{st} – 5\textsuperscript{th}, 2012

| **MONDAY, 1\textsuperscript{st}** | 11:10-12:00PM, SURGE 268 | **GRADUATE STUDENT SEMINAR** – Dennis Gumaer & Mathew Lunder TBA |
| | | |
| | 4:10-5:00PM, SURGE 284 | **MATH CLUB** (Dr. Julie Bergner, UCR) Math Club Information Session |
| **TUESDAY, 2\textsuperscript{nd}** | 8:10-9:30AM, SURGE 277 | **ALGEBRAIC GEOMETRY** (Dr. Hwayoung Lee, KIAS) “PT space of YxP^1 and Quantum cohomology of Hilb_m(Y) I” |
| | 11:10-12:00PM, SURGE 268 | **TOPOLOGY** (Dr. Philip Hackney, UCR) “Props” |
| | 12:40-2:00PM, SURGE 284 | **LIE THEORY** (Dr. Vyjayanthi Chari) |
| | 3:30-5:00PM, SURGE 268 | **MATH IN THE ENVIRONMENT** (Dr. John Baez) |
| | 3:40-5:00PM, SURGE 284 | **COLLOQUIUM** No Colloquium this Week |
| **WEDNESDAY, 3\textsuperscript{rd}** | 11:10-12:00PM, SURGE 268 | **COMBINATORIAL NUMBER THEORY** (Dr. Mei-Chu Chang) |
| | 1:10-2:00PM, SURGE 268 | **PDE & APPLIED MATHEMATICS** (Dr. Juhi Jang) |
| **THURSDAY, 4\textsuperscript{th}** | 8:10-9:30AM, SURGE 277 | **ALGEBRAIC GEOMETRY** (Dr. Hwayoung Lee, KIAS) “PT space of YxP^1 and Quantum cohomology of Hilb_m(Y) II” |
| | 10:10-11:00AM, SURGE 284 | **OPERATOR ALGEBRAS & RELATED TOPICS** (Dominick Scaletta, UCR) “The Frobenius-Perron Dimension of Fusion Categories” |
| | 11:10-12:30PM, SURGE 268 | **FRACTAL RESEARCH GROUP** (John Quinn, UCR) “Differentiating (Between) Fractals” |
| | 12:40-2:00PM, SURGE 284 | **LIE THEORY** (Dr. Vyjayanthi Chari) |
| | 3:40-5:00PM, SURGE 268 | **MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Michael Maroun, UCR) “Dynamic Metrics on the Space of Quantum Fields I” |
| **FRIDAY, 5\textsuperscript{th}** | 2:10-3:00PM, SURGE 268 | **DIFFERENTIAL GEOMETRY** (Dr. Zhang-Dan Guan, UCR) “On compact locally conformal Kahler manifolds and Sasakian manifolds” |
| | 4:10-5:00PM, SURGE 268 | **COMMUTATIVE ALGEBRA** (Dr. Kuei-Nuan Lin, UCR) “Hypergraphs and Regularity of Squarefree Monomial Ideals” |
Abstract:

Sub-Riemannian Geometry is a generalization of Riemannian Geometry. We describe how this geometry can arise from contact structures on 3-dimensional Euclidean space and a special space known as the Roto-Translation Group. A large part of current research focuses on finding analogous definitions for quantities such as curvature and minimal surface. We will try and adapt familiar techniques from Riemannian Geometry to accomplish some of these goals.

Snacks and drinks will be served

http://mathdept.ucr.edu/ugrad/ugrad-mathclub.html
Abstract:

This is a joint work in progress with Bumsig Kim and Timothy Logvinenko. PT on the threefold $Y \times \mathbb{P}^1$ and GW of $\text{Hilb}_m(Y)$ are related via wall-crossing of certain twisted quiver bundles over the smooth projective curve. In this talk, $Y$ is a crepant resolution of Kleinian singularity $\mathbb{C}^2/G$ where $G$ is a finite group with $G<\text{SL}(2,\mathbb{C})$. 

Tuesday & Thursday, October 2\textsuperscript{nd} & 4\textsuperscript{th}, 2012
Surge 277
8:10 a.m. -9:30 a.m.
Abstract:

This is joint work with Jason McCullough. We define a new combinatorial object, which we call a labeled hypergraph, associated to every squarefree monomial ideal. Using this new object, we derive combinatorial ways of computing formulas for Castelnuovo-Mumford regularity of large classes of squarefree monomial ideals. We also obtain more general upper bounds and some tighter results for one-dimensional hypergraphs.

Friday, October 5th, 2012
Surge 268
4:10pm-5:00pm
**UNIVERSITY OF CALIFORNIA, RIVERSIDE**  
Department of Mathematics  

**Calendar of Events For the Week of October 8th – 12th, 2012**

**MONDAY, 8th**  
11:10-12:00PM, SURGE 268  
GRADUATE STUDENT SEMINAR (Dennis Gumaer, UCR)  
“Introduction to LaTeX”

2:10-3:00PM, SURGE 268  
GRAD STUDENT REPRESENTATION THEORY (John Dusel, UCR)  
“Cartan data folding”

4:10-5:00PM, SURGE 284  
MATH CLUB (Dennis Gumaer, UCR)  
TBD

**TUESDAY, 9th**  
8:10-9:30AM, SURGE 277  
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

11:10-12:00PM, SURGE 268  
TOPOLOGY (Dr. Greg Chadwick, UCR)  
TBA

12:40-2:00PM, SURGE 284  
LIE THEORY (Dr. Liping Li, UCR)  
“Representations of algebras with group actions II: Representations of finite EI categories”

3:30-5:00PM, SURGE 268  
MATH IN THE ENVIRONMENT (Dr. John Baez)

3:40-5:00PM, SURGE 284  
COLLOQUIUM  
***No Colloquium this Week***

**WEDNESDAY, 10th**  
11:10-12:00PM, SURGE 268  
COMBINATORIAL NUMBER THEORY (Dr. Mei-Chu Chang)

1:10-2:00PM, SURGE 268  
PDE & APPLIED MATHEMATICS (Dr. Thomas Laurent, UCR)  
“Machine learning, Balance cut and Total variation”

**THURSDAY, 11th**  
8:10-9:30AM, SURGE 277  
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

10:10-11:00AM, SURGE 284  
OPERATOR ALGEBRAS & RELATED TOPICS (Dr. Feng Xu)

11:10-12:30PM, SURGE 268  
FRACTAL RESEARCH GROUP (John Quinn, UCR)  
“Differentiating (Between) Fractals II”

12:40-2:00PM, SURGE 284  
LIE THEORY (Dr. Vyjayanthi Chari)

3:40-5:00PM, SURGE 268  
MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (Michael Maroun, UCR)  
“Dynamic Metrics on the Space of Quantum Fields II”

**FRIDAY, 12th**  
11:10-12:00PM, SURGE 268  
DIFFERENTIAL GEOMETRY (Dr. Bun Wong)

4:10-5:00PM, SURGE 268  
COMMUTATIVE ALGEBRA (Dr. David Rush)
Abstract:

This talk will cover the very basics of LaTeX usage. We will start with a download site of the necessary files. By the end of the talk you should be ready to type homework and quizzes for a more professional touch.
Abstract:

A finite EI category is a small category with finitely many morphisms such that every endomorphism is an isomorphism. They include finite groups, posets, quivers as examples, and are studies in Topology (transformation groups), group representations (transporter categories, orbit categories, fusion systems), homological algebra (support varieties). In this talk I will describe representations of finite EI categories, characterize finite EI categories with hereditary category algebras, and discuss their representation types (if time allows).

Tuesday, October 9th, 2012
Surge 284
1:00 p.m. - 2:00 p.m.
Abstract:

Machine Learning is the branch of Artificial Intelligence which is devoted to the design and study of algorithms that learn patterns from large data sets in order to make intelligent decisions. In this talk we will be concerned with the problem of partitioning a large and high dimensional data set into groups of data having "similar behavior". One successful approach is to construct a graph from the data and then to cut this graph in a sensible way. Here we will present a fast algorithm, based off total variation optimization techniques recently developed in image processing, that accomplish this task.

Wednesday, October 10th, 2012
Surge 268
1:10 p.m. - 2:00 p.m.
UNIVERSITY OF CALIFORNIA, RIVERSIDE  
Department of Mathematics

Calendar of Events For the Week of October 15th – 19th, 2012

MONDAY, 15th
11:10-12:00PM, SURGE 268  GRADUATE STUDENT SEMINAR (Oliver Thistlethwaite, UCR)  “The Seiberg-Witten invariants of 4-manifolds”
2:10-3:00PM, SURGE 277*  GRADUATE REPRESENTATION THEORY SEMINAR (John Dusel, UCR)  “Root systems”
4:10-5:00PM, SURGE 284  MATH CLUB (Dr. Julie Bergner, UCR)  TBA

TUESDAY, 16th
8:10-9:30AM, SURGE 277  ALGEBRAIC GEOMETRY (Dr. Ziv Ran)
11:10-12:00PM, SURGE 268  TOPOLOGY (Dr. Greg Chadwick, UCR)  “Structured complex orientations”
1:00-2:00PM, SURGE 284  LIE THEORY (Dr. Jonas Hartwig, UCR)  “Weyl subalgebras and Dynkin diagrams”
3:30-5:00PM, SURGE 268  MATH IN THE ENVIRONMENT (Dr. John Baez)
3:40-5:00PM, SURGE 284  COLLOQUIUM  ***There is no colloquium this week***

WEDNESDAY, 17th
11:10-12:00PM, SURGE 268  COMBINATORIAL NUMBER THEORY (Dr. Mei-Chu Chang)
1:10-2:00PM, SURGE 268  PDE & APPLIED MATHEMATICS (Dr. Cheng Yu, Univ. of Pittsburgh)  “Selected topics in mathematical study of complex fluids”

THURSDAY, 18th
8:10-9:30AM, SURGE 277  ALGEBRAIC GEOMETRY (Dr. Ziv Ran)
10:10-11:00AM, SURGE 284  OPERATOR ALGEBRAS & RELATED TOPICS (Dr. Feng Xu)
11:10-12:30PM, SURGE 268  FRACTAL RESEARCH GROUP (John Rock)  TBA
12:40-2:00PM, SURGE 284  LIE THEORY (Dr. Vyjayanthi Chari)
3:40-5:00PM, SURGE 268  MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (Dr. Stephen Muir, UCR)  “Dynamic Metrics on the Space of Quantum Fields II”

FRIDAY, 19th
2:10-3:00PM, SURGE 268  DIFFERENTIAL GEOMETRY (Dr. Zhang-dan Guan, UCR)  “On Bisectional Negative Curved Compact Kahler-Einstein Surfaces”
4:10-5:00PM, SURGE 268  COMMUTATIVE ALGEBRA (Dr. David Rush)
Abstract:

In the fall of 1996, the physicists Nathan Seiberg and Ed Witten introduced the world to a new set of invariants for compact smooth 4-manifolds. These Seiberg-Witten invariants are based on their work in gauge theory, and have since become one of the main tools in 4-manifold theory. In this talk, we will outline the information necessary to set up the invariants, as well as provide some of the basic results obtained by using them.
Abstract:

This primer on root systems begins with the axioms for the category of root systems. After discussing root configurations we will proceed to bases and Weyl chambers, along with the Weyl group's action on the latter. Examples from the rank 2 case will play a prominent role throughout the talk.

Monday, October 15th, 2012
Surge 277
2:10 p.m. - 3:00 p.m.
Abstract:

In recent joint work with Vera Serganova we found that acyclic Dynkin diagrams with loops parametrize (equivalence classes of) certain embeddings of twisted generalized Weyl algebras (TGWAs) into the $n$:th Weyl algebra. This construction gives new solutions to the consistency relations for TGWAs. Examples include primitive quotients of enveloping algebras related to completely pointed simple weight modules in types $A$ and $C$. We also have some partial results in the super algebra case.

Tuesday, October 16\textsuperscript{th}, 2012
Surge 284
1:00 p.m. - 2:00 p.m.
“Selected topics in mathematical study of complex fluids”

Abstract:

In this talk, we focus on the study of mathematical theory of the complex fluids. In the first part, we discuss the global existence for weak solutions to multidimensional compressible flow of nematic liquid crystals and the incompressible limits. In the second part, we establish global existence and uniqueness results for weak solutions to multidimensional Navier-Stokes-Vlasov equations.

Wednesday, October 17th, 2012
Surge 268
1:10 p.m. - 2:00 p.m.
### Calendar of Events For the Week of October 22\textsuperscript{nd} – 26\textsuperscript{th}, 2012

<table>
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<tr>
<th>DAY</th>
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| **MONDAY, 22\textsuperscript{nd}** | GRADUATE STUDENT SEMINAR (Oliver Thistlethwaite, UCR)  
“The Seiberg-Witten invariants of 4-manifold, Part II”  
GRADUATE REPRESENTATION THEORY (Matt Lunde, UCR)  
TBA  
MATH CLUB (Dr. Julie Bergner, UCR)  
“Visualizing Mathematics” |
| 11:10-12:00PM, SURGE 268 | **TUESDAY, 23\textsuperscript{rd}** | TOPOLOGY (Dr. Reinhard Schultz, UCR)  
“Classifying smooth G-manifolds up to finite ambiguity”  
LIE THEORY (Dr. Jonas Hartwig, UCR)  
“Weyl subalgebras and Dynkin diagrams”  
ALGEBRAIC GEOMETRY (Dr. Kuei-Nuan Lin, UCR)  
“Rees Algebras of Diagonal Ideals”  
MATH IN THE ENVIRONMENT (Dr. John Baez) |
| 11:10-12:00PM, SURGE 268 | 1:00-2:00PM, SURGE 284 | COLLOQUIUM  
***No Colloquium this Week*** |
| 1:10-2:00PM, SURGE 268 | **WEDNESDAY, 24\textsuperscript{th}** | COMBINATORIAL NUMBER THEORY (Dr. Mei-Chu Chang) |
| 11:10-12:00PM, SURGE 268 | PDE & APPLIED MATHEMATICS (Adam Navas, UCR)  
“Improved A priori bounds for Axially Symmetric Solutions to the Navier-Stokes Equations” |
| 1:10-2:00PM, SURGE 268 | **THURSDAY, 25\textsuperscript{th}** | OPERATOR ALGEBRAS & RELATED TOPICS (Andrew Monnot, UCR)  
“Analysis on Locally Compact Groups”  
FRACTAL RESEARCH GROUP (Dr. John Rock)  
“Box Counting and Distance Zeta Functions II”  
LIE THEORY (Dr. Vyjayanthi Chari) |
| 10:10-11:00AM, SURGE 284 | 11:10-12:30PM, SURGE 268 | MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (Rick Niemeyer)  
TBA |
| 12:40-2:00PM, SURGE 284 | **FRIDAY, 26\textsuperscript{th}** | DIFFERENTIAL GEOMETRY (Dr. Bun Wong, UCR)  
“Curvature and Rationality of Projective Varieties”  
COMMUTATIVE ALGEBRA (Dr. David Rush) |
| 2:10-3:00PM, SURGE 268 | 4:10-5:00PM, SURGE 268 | |
“The Seiberg-Witten invariants of 4-manifold; Part II”

Abstract:

In the fall of 1996, the physicists Nathan Seiberg and Ed Witten introduced the world to a new set of invariants for compact smooth 4-manifolds. These Seiberg-Witten invariants are based on their work in gauge theory, and have since become one of the main tools in 4-manifold theory. In this talk, we will outline the information necessary to set up the invariants, as well as provide some of the basic results obtained by using them.

Monday, October 22\textsuperscript{nd}, 2012
Surge 268
11:00 a.m. - 12:00 p.m.
Abstract:

Join us for movie day at the math club next Monday, Oct. 22! Do you know how to turn a sphere inside out without tearing it? Do you like fractals? Get fascinated with all of the information and cool ways of visualizing mathematics! We'll be showing several short movies on a range of topics, and there will be popcorn and drinks!
Abstract:

A set of invariants is said to classify a family of objects up to finite ambiguity if the map from isomorphism types to invariants is finite-to-one. Results of D. Sullivan provide such invariants for closed, simply connected manifolds of dimension at least 5 based upon rational homotopy theory, and subsequent work of M. Rothenberg and G. Triantafillou yields similar results for certain manifolds with smooth finite group actions. We shall describe further results along these lines when certain key hypotheses in the latter work do not hold.
Abstract:

In recent joint work with Vera Serganova we found that acyclic Dynkin diagrams with loops parametrize (equivalence classes of) certain embeddings of twisted generalized Weyl algebras (TGWAs) into the $n$:th Weyl algebra. This construction gives new solutions to the consistency relations for TGWAs. Examples include primitive quotients of enveloping algebras related to completely pointed simple weight modules in types A and $C$. We also have some partial results in the super algebra case.
“Improved A priori bounds for Axially Symmetric Solutions to the Navier-Stokes Equations”

Abstract:
A pointwise, a priori bound for the vorticity of axially symmetric solutions to the three-dimensional Navier-Stokes equations is obtained, using Moser's iteration.

Wednesday, October 24th, 2012
Surge 268
1:10 p.m. - 2:00 p.m.
Abstract:

In Spring we introduced some of the main concepts of C*-algebras. We will now work to discuss various product C*-algebras, including tensor products and crossed products. Before discussing crossed products however, we must take a detour to review some results regarding integration and Fourier analysis on locally compact groups.
Abstract:

Rees algebras of ideals correspond to the blow-up of a variety along subvariety. We will talk about the Rees algebra of diagonal ideals over the determinantal ring. Determinantal rings and varieties have been a central topic in commutative algebra and algebraic geometry. The embedded join of two subschemes $X, Y$ of $\mathbb{P}^n$ is another important subject. When $X = Y$, the join construction yields the classical secant variety. As the special fiber ring of the diagonal ideal is the homogeneous coordinate ring of the embedded join, it is natural to investigate the blow-up along the diagonal, rather than just its special fiber.
Abstract:

Mori and Siu/Yau solved the Frankel/Hartshorne Conjecture in late seventies that a compact Kahler manifold with positive bisectional curvature is biholomorphic to a complex projective space. S.T. Yau proposed a problem to study the rationality of a Kahler manifold under a weaker positivity curvature assumption. We will review the progress in this direction for the past three decades. In particular we will discuss our recent joint work with Gordon Heier on the relationships between rational connectivity and intermediate Ricci /holomorphic sectional curvature.

Friday, October 26th, 2012
Surge 268
2:10 p.m. - 3:00 p.m.
Calendar of Events For the Week of October 29th – November 2nd, 2012

MONDAY, 29th
11:10-12:00PM, SURGE 268
GRADUATE STUDENT SEMINAR (Mathew Lunde, UCR)
“Representation Theory of sl2 and the Quantum Loop Algebra Uq(sl2)”

2:10-3:00PM, SURGE 268
GRADUATE REPRESENTATION THEORY (Mathew Lunde, UCR)
“Representations of Lie algebras, and loop algebras II”

4:10-5:00PM, SURGE 284
MATH CLUB (Dr. Julie Bergner, UCR)
“Integration Bee Prep.”

TUESDAY, 30th
8:10-9:30AM, SURGE 277
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

11:10-12:00PM, SURGE 268
TOPOLOGY (Dr. Zhixu Su, UC Irvine)
“Rational homotopy types of high-dimensional manifolds”

12:40-2:00PM, SURGE 284
LIE THEORY (Dr. Vyjayanthi Chari)

3:30-5:00PM, SURGE 268
MATH IN THE ENVIRONMENT (Dr. John Baez)

3:40-5:00PM, SURGE 284
COLLOQUIUM
***No Colloquium this Week***

WEDNESDAY, 31st
11:10-12:00PM, SURGE 268
COMBINATORIAL NUMBER THEORY (Dr. Hiren Maharaj, Clemson Univ.)
“Modular forms, algebraic geometric codes and curves over finite field with many points”

1:10-2:00PM, SURGE 268
PDE & APPLIED MATHEMATICS (Dr. Juhi Jang)

THURSDAY, 1st
8:10-9:30AM, SURGE 277
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

10:10-11:00AM, SURGE 284
OPERATOR ALGEBRAS & RELATED TOPICS (Dr. Feng Xu)

11:10-12:30PM, SURGE 268
FRACTAL RESEARCH GROUP (Dr. Stephen Muir, UCR)
“The Zeta Function of a Graph Directed Markov System: a Proposed Definition and Directions of Research”

12:40-2:00PM, SURGE 284
LIE THEORY (Dr. Vyjayanthi Chari)

3:40-5:00PM, SURGE 268
MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (Dominick Scaletta, UCR)
TBA

FRIDAY, 2nd
2:10-3:00PM, SURGE 268
DIFFERENTIAL GEOMETRY (Dr. Ivona Grzegorczyk, CS Channel Islands)
“Vector bundles with sections on algebraic curves”

4:10-5:00PM, SURGE 268
COMMUTATIVE ALGEBRA (Dr. David Rush)
“Representation Theory of sl2 and the Quantum Loop Algebra Uq(sl2)”

Abstract:

In this talk, we will discuss the Lie algebra sl2 and a highest weight classification of its finite dimensional irreducible representations. We will also discuss the quantum loop algebra Uq(sl2) and a classification of its irreducible finite dimensional representations in terms of Drinfeld polynomials.

Monday, October 29th, 2012
Surge 268
11:10 a.m. - 12:00 p.m.
“Representations of Lie algebras, and loop algebras II”

Abstract:

We will continue the discussion of Verma modules and use them to classify finite dimensional simple modules of simple lie algebras. Then, we will discuss loop algebras and a bit of their representation theory.

Monday, October 29th, 2012
Surge 268
2:10 p.m. - 3:00 p.m.
Abstract:

Time to brush up on those skills for the integration bee! Join us for a little fun this upcoming Halloween week with a friendly competition. There will be prizes, refreshments, and Halloween candy. See you there!

Remember that solutions to the problem of the month should be turned in by the end of this month, so have it ready Monday if you've got one.
“Rational homotopy types of high-dimensional manifolds”

Abstract:

Rational surgery can be used to study existence of manifold realizing certain rational homotopy type. There exists no manifold along the line of projective planes above the dimension of octonions due to the inexistence of hopf invariant 1 map in higher dimensions. I investigated the existence of manifolds analogous to projective planes in the rational sense, such that the rational cohomology is rank one in dimension 0, 2k and 4k and is zero otherwise. The problem can be reduced to finding possible Pontryagin classes satisfying the Hirzebruch signature formula and a set of congruence relations determined by the Riemann-Roch integrality conditions, which is eventually equivalent to solving a system of Diophantine equations. After a negative answer in dimension 24, the first existence dimension is 32. As a joint work with Jim Fowler (Ohio State), a family of higher dimensions can be ruled out.

Tuesday, October 30th, 2012
Surge 268
11:10 a.m. - 12:00 p.m.
Abstract:

In this survey talk I will explain the role modular curves plays in the theory of error-correction codes and asymptotic results on curves over finite fields with many rational points. In particular I will talk about Elkies' modularity conjecture which states that all asymptotically optimal recursively defined towers over curves over finite fields with square cardinality arise from reductions of modular curves.
Abstract:

We study moduli spaces of stable vector bundles on smooth algebraic curves. We will report on the current state of the Brill-Noether problem, including new examples for bundles of $rk = 2$. We will show new results for calculating dimensions of moduli spaces of stable bundles with fixed determinants, or more general for certain coherent systems.

Friday, November 2\textsuperscript{nd}, 2012
Surge 268
2:10 p.m. - 3:00 p.m.
UNIVERSITY OF CALIFORNIA, RIVERSIDE
Department of Mathematics

Calendar of Events For the Week of November 5th – 9th, 2012

MONDAY, 5th
11:10-12:00PM, SURGE 268
GRADUATE STUDENT SEMINAR (Adam Navas, UCR)
“Applying Moser’s Iteration to the 3D Axially Symmetric Navier Stokes Equations (ASNSE)”

2:10-3:00PM, SURGE 268
GRADUATE REPRESENTATION THEORY (John Dusel, UCR)

4:10-5:00PM, SURGE 284
MATH CLUB (Dr. AJ Todd, UCR)
TBA

TUESDAY, 6th
9:40-11:00AM, SURGE 277*
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

11:10-12:00PM, SURGE 268
TOPOLOGY (Dr. David Ayala, USC)
“Higher categories as sheaves on manifolds”

1:00-2:00PM, SURGE 284
LIE THEORY (Dr. Liping Li, UCR)
“Auslander-Reiten theory: a continuation”

3:30-5:00PM, SURGE 268
MATH IN THE ENVIRONMENT (Dr. John Baez)

3:40-5:00PM, SURGE 284
COLLOQUIUM
***No Colloquium this Week***

WEDNESDAY, 7th
11:10-12:00PM, SURGE 268
COMBINATORIAL NUMBER THEORY (Dr. Hiren Maharaj, Clemson Univ.)
“Introduction to modular curves”

1:10-2:00PM, SURGE 268
PDE & APPLIED MATHEMATICS (Dr. Juhi Jang)

THURSDAY, 8th
9:40-11:00AM, SURGE 277*
ALGEBRAIC GEOMETRY (Yeongrak Kim, KAIST, Daejong, Korea)
“Fibers of generic projections and multisecant loci – I”

10:10-11:00AM, SURGE 284
OPERATOR ALGEBRAS & RELATED TOPICS (Andrew Monnot, UCR)
“Analysis on Locally Compact Groups II”

11:10-12:30PM, SURGE 268
FRACIAL RESEARCH GROUP (Michael Maroun, UCR)
“Bound States of Singular Potentials I”

1:00-2:00PM, SURGE 284
LIE THEORY (Dr. Bernhard Keller, Université Paris 7, France)
“Quiver mutations and quantum dilogarithm identities”

3:40-5:00PM, SURGE 268
MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (Dominick Scaletta, UCR)
TBA

FRIDAY, 9th
2:10-3:00PM, SURGE 268
DIFFERENTIAL GEOMETRY (Dr. AJ Todd, UCR)
“G_2-Geometry, and Contact and Symplectic Geometries”

4:10-5:00PM, SURGE 268
COMMUTATIVE ALGEBRA (Dr. David Rush)
“Applying Moser's Iteration to the 3D Axially Symmetric Navier Stokes Equations (ASNSE)"

Abstract:

Ennio De Giorgi and John Forbes Nash independently solved Hilbert's 19th problem in 1957 and 1958, respectively, using what are now called the De Giorgi and Nash-Moser iteration schemes. In this talk, the ASNSE and corresponding vorticity equations will be derived, then the Nash-Moser iteration technique will be used to derive a local bound on an easier-to-deal-with elliptic partial differential equation.

Monday, November 5th, 2012
Surge 268
11:10 a.m. - 12:00 p.m.
“Higher categories as sheaves on manifolds”

Abstract:

Many proposed higher categories come from geometric situations. This talk will demonstrate a constructive connection between a homotopy theory of local invariants of n-manifolds and that of weak n-categories in the sense of Rezk. The basic construction is that of labeled configuration spaces, so I will draw some pictures. This is a report on joint work with Nick Rozenblyum.

Tuesday, November 6th, 2012
Surge 268
11:10 a.m. - 12:00 p.m.
Auslander-Reiten theory is a central topic of algebraic representation theory. Following the talk given by Jacob West, we continue to explore more aspects of this theory. In this talk I will introduce irreducible morphisms and Auslander-Reiten quivers. They have been proved to be very useful and have a lot of important applications. Topological and combinatorial structures of AR quivers, explored by Riedtmann, Gabriel and others, will be described. Some current developments (AR-triangles, interaction with tilting theory, etc.) will be mentioned as well.
“Introduction to modular curves”

Abstract:

In this talk I will give an overview of the theory of elliptic modular curves. Assuming knowledge of undergraduate algebra, complex analysis and elementary number theory, I will discuss the following topics: Elliptic curves, Modular curves and moduli spaces, Modular curves as Riemann Surfaces, and Modular curves as algebraic curves.
“Fibers of generic projections and multisecant loci - I”

Abstract:

Fibers of a projection of a projective variety are highly related to the complexity of the ideal corresponding to the given variety. In the first talk, I will briefly introduce the result on fibers of generic projections, done by Beheshti-Eisenbud(2010). In the next talk, I will explain how it can be applied on multisecant loci of smooth projective varieties.

Thursday, November 8th, 2012
Surge 277
9:40 a.m. - 11:00 a.m.
Abstract:

Quiver mutation is an elementary operation on quivers which appeared in physics in Seiberg duality in the 1990s and in mathematics in Fomin-Zelevinsky's definition of cluster algebras in 2002. In this talk, I will show how, by comparing sequences of quiver mutations, one can construct identities between products of quantum dilogarithm series. These identities generalize Faddeev-Kashaev-Volkov's classical pentagon identity and the identities obtained by Reineke. Morally, the new identities follow from Kontsevich-Soibelman's theory of Donaldson-Thomas invariants. They can be proved rigorously using the theory linking cluster algebras to quiver representations.
Abstract: I will begin the talk with a quick review of a few facts from G_2-geometry. G_2-geometry occurs specifically in dimension 7, and because these geometries occur in this specific (odd) dimension, a natural question is, does a given a 7-manifold with G_2-structure admit a contact structure? I will review the basic definitions of almost contact (metric) structure, then give the constructions and results of Arikan, Cho and Salur that show any manifold with G_2-structure admits an almost contact (metric) structure.

From a different point of view, G_2-geometry is the geometry of a nondegenerate (in some sense), closed 3-form; symplectic geometry is the geometry of a nondegenerate, closed 2-form. Generally, we can ask, can we recreate any of the results of symplectic geometry in G_2 geometry? This portion of the talk is based on joint work with Sema Salur and Hyunjoo Cho, and specifically, I will give recent ideas dealing with an analogue of the theory of Hamiltonian vector fields and Hamiltonian functions in symplectic geometry. I will end with a brief discussion of some questions in this area that we have been thinking about and give an indication of some very exciting future work in this direction.

Friday, November 9th, 2012
Surge 268
2:10 p.m. - 3:00 p.m.
MONDAY, 12th - Holiday
11:10-12:00PM, SURGE 268
GRADUATE STUDENT SEMINAR
***Holiday***

2:10-3:00PM, SURGE 268
GRADUATE REPRESENTATION THEORY
***Holiday***

4:10-5:00PM, SURGE 284
MATH CLUB
***Holiday***

TUESDAY, 13th
8:10-9:30AM, SURGE 277
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

11:10-12:00PM, SURGE 268
TOPOLOGY (Dr. Ben Antieau, UCLA)
“Brauer spaces of commutative ring spectra”

1:00-2:00PM, SURGE 284
LIE THEORY (Dr. Tomoki Nakanishi, Nagoya University)
“Tropicalization method in cluster algebras”

3:30-5:00PM, SURGE 268
MATH IN THE ENVIRONMENT (Dr. John Baez)

3:40-5:00PM, SURGE 284
COLLOQUIUM
***No Colloquium this Week***

WEDNESDAY, 14th
11:10-12:00PM, SURGE 268
COMBINATORIAL NUMBER THEORY (Dr. Mei-Chu Chang, UCR)
“Multiplicative order for large characteristic”

1:10-2:00PM, SURGE 268
PDE & APPLIED MATHEMATICS (Dr. Juhi Jang)

THURSDAY, 15th
8:10-9:30AM, SURGE 277
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

10:10-11:00AM, SURGE 284
OPERATOR ALGEBRAS & RELATED TOPICS (Dr. Feng Xu)

11:10-12:30PM, SURGE 268
FRACTAL RESEARCH GROUP (Michael Maroun, UCR)
“Box Counting and Distance Zeta Functions II”

12:40-2:00PM, SURGE 284
LIE THEORY (Dr. Vyjayanthi Chari)

3:40-5:00PM, SURGE 268
MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (Dominick Scaletta, UCR)
TBA

FRIDAY, 16th
2:10-3:00PM, SURGE 268
DIFFERENTIAL GEOMETRY (Dr. Qi Zhang, UCR)
“Volume non-inflating property of the Ricci flow and G-H convergence of Kaehler Ricci flow”

4:10-5:00PM, SURGE 268
COMMUTATIVE ALGEBRA (Dr. David Rush)
Abstract:

I will describe a topological space that encodes some arithmetic information about a connective commutative ring spectrum. Its points are modules for Azumaya algebras. The fundamental group at a point is related to the Picard group. The higher homotopy groups are related to the original homotopy groups of the ring. There is a spectral sequence to compute the homotopy groups of the Brauer space, and this will allow me to show that the Brauer group of the sphere spectrum vanishes. This can be interpreted as a rigidity result for the stable homotopy category.
“Tropicalization method in cluster algebras”

Abstract:

In cluster algebras, after making several mutations of seeds, you may sometimes end up with the initial seed. That is the periodicity phenomenon in cluster algebras. Periodicity is a rare event, but once you have it, you can also get the associated dilogarithm identity, plus its quantum version, for free!

There are two basic questions for periodicity: How to find it and how to prove it? The answer to the second question is given by the tropicalization method, which I explain in this talk by several examples.

The first question is more difficult, and I do not know the answer. However, we are lucky to have several (infinitely many) conjectured periodicities from the Bethe ansatz method in 90's, even before the birth of cluster algebras, and they are recently proved by the tropicalization method. There is always some root system behind the scene.

The talk is based on the work with R. Inoue, O. Iyama, B. Keller, and A. Kuniba.

Tuesday, November 13th, 2012
Surge 268
1:00 p.m. - 2:00 p.m.
Abstract:

We present the so called volume non-inflating property of the Ricci flow, which can be regarded as the opposite statement of Perelman's kappa non-collapsing property. On consequence of the result is that Kaehler Ricci flow in the positive Chern class case sub-converges in Gromov Hausdorff sense to a metric space.

Friday, November 16th, 2012
Surge 268
2:10 p.m. - 3:00 p.m.
# Calendar of Events For the Week of November 19th – 23rd, 2012

## Monday, 19th
11:10-12:00PM, SURGE 268  
**GRADUATE STUDENT SEMINAR** (Matthew Highfield, UCR)  
"Introduction to Sage"

2:10-3:00PM, SURGE 268  
**GRADUATE REPRESENTATION THEORY** (John Dusel)

4:10-5:00PM, SURGE 284  
**MATH CLUB** (Dr. Michele Intermont, Kalamazoo College)  
"Data, Data Everywhere!"

## Tuesday, 20th
8:10-9:30AM, SURGE 277  
**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)

11:10-12:00PM, SURGE 268  
**TOPOLOGY** (Dr. Michele Intermont, Kalamazoo College)  
"The Shape of Data"

1:00-2:00PM, SURGE 284  
**LIE THEORY** (Matthew Highfield, UCR)  
"Introduction to PI Algebras"

3:30-5:00PM, SURGE 268  
**MATH IN THE ENVIRONMENT** (Dr. John Baez)

3:40-5:00PM, SURGE 284  
**COLLOQUIUM**
  ***No Colloquium this Week***

## Wednesday, 21st
11:10-12:00PM, SURGE 268  
**COMBINATORIAL NUMBER THEORY** (Dr. Mei-Chu Chang)

1:10-2:00PM, SURGE 268  
**PDE & APPLIED MATHEMATICS** (Dr. Juhi Jang)

## Thursday, 22nd
8:10-9:30AM, SURGE 277  
**ALGEBRAIC GEOMETRY** (Dr. Ziv Ran)  
***Holiday***

10:10-11:00AM, SURGE 284  
**OPERATOR ALGEBRAS & RELATED TOPICS** (Dr. Feng Xu)  
***Holiday***

11:10-12:30PM, SURGE 268  
**FRACTAL RESEARCH GROUP** (Dr. Michel Lapidus)  
***Holiday***

12:40-2:00PM, SURGE 284  
**LIE THEORY** (Dr. Vyjayanthi Chari)  
***Holiday***

3:40-5:00PM, SURGE 268  
**MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** (Dr. Michel Lapidus)  
***Holiday***

## Friday, 23rd
2:10-3:00PM, SURGE 268  
**DIFFERENTIAL GEOMETRY** (Dr. Bun Wong)  
***Holiday***

4:10-5:00PM, SURGE 268  
**COMMUTATIVE ALGEBRA** (Dr. David Rush)  
***Holiday***
Abstract:

Sage is free, open source math software available for download or use online at www.sagemath.org. We will explore a few features from its very large feature set, and see some reasons besides cost why one might (or might not) prefer it to Mathematica or a chalkboard and a piece of chalk. We will take a brief look at:

- The sage interface with LaTeX and the Python programming language
- A computational problem from my own research on twisted graded Hecke algebras
- Applications in Lie theory
- and more

Monday, November 19th, 2012
Surge 268
11:10 a.m. - 12:00 noon
"Unique factorization of tensor products for Kac-Moody algebras"

Abstract:

Suppose V is a finite dimensional representation of a complex finite dimensional simple Lie algebra that can be written as a tensor product of irreducible representations. A theorem of C.S. Rajan states that the irreducible factors that occur are uniquely determined, up to reordering, by the isomorphism class of V. I will present an elementary proof of Rajan's theorem, which generalizes with no extra effort to the integrable category O representations of Kac-Moody Lie algebras. This is joint work with S. Viswanath.

Monday, November 19th, 2012
Surge 268
2:10 p.m. - 3:00 p.m.
Abstract:

Everywhere we look these days there seem to be huge piles of data being generated. People collect this data, but how does it get analyzed? Recently, people have begun looking at the branch of mathematics known as topology to help organize and give some shape to data. Applied topology is still a new field, and in this talk, we'll give an introduction to it as well as to topology itself, and talk a little bit about research in progress in applying some of these ideas to biological questions.

— Free Snacks and Drinks!

mathdept.ucr.edu/mathclub.html
Abstract:

Increasingly, topological ideas are being applied to large data sets in an attempt to organize and gain new insight into the data. In this talk, we’ll give an introduction to the field of Topological Data Analysis, and talk about some current work in bacterial genomics.

Tuesday, November 20th, 2012
Surge 268
11:10 a.m. - 12:00 noon
MONDAY, 26th
11:10-12:00PM, SURGE 268
GRADUATE STUDENT SEMINAR (John Dusel, UCR)
“Cones and semigroups”

2:10-3:00PM, SURGE 268
GRADUATE REPRESENTATION THEORY (John Dusel, UCR)
“Crystals, cones, and semigroups”

4:10-5:00PM, SURGE 284
MATH CLUB (Dr. Julie Bergner, UCR)
TBA

TUESDAY, 27th
9:40-11:00AM, SURGE 277
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

11:10-12:00PM, SURGE 268
TOPOLOGY (Jonathan Campbell, Stanford University)
“Topological Hochschild Homology and Koszul Duality”

12:40-2:00PM, SURGE 284
LIE THEORY (Dr. Vyjayanthi Chari)

3:30-5:00PM, SURGE 268
MATH IN THE ENVIRONMENT (Dr. John Baez)

WEDNESDAY, 28th
11:10-12:00PM, SURGE 268
COMBINATORIAL NUMBER THEORY (Dr. Kevin Costello, UCR)
“Invertibility of Random Circulant Matrices”

1:10-2:00PM, SURGE 268
PDE & APPLIED MATHEMATICS (Dr. Blake Hunter, UCLA)
“Social Network Clustering of Sparse Data”

THURSDAY, 29th
9:40-11:00AM, SURGE 277
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

10:00-11:00AM, SURGE 284
OPERATOR ALGEBRAS & RELATED TOPICS (Dr. Feng Xu)

11:10-12:30PM, SURGE 268
FRACTAL RESEARCH GROUP (Rolando Santiago)
“Zeta functions of recursive strings and their algebraic structure”

1:00-2:00PM, SURGE 284
LIE THEORY (Dr. Robert Marsh, Univ. of Leeds, United Kingdom)
“Reflection group presentations arising from cluster algebras”

3:40-5:00PM, SURGE 268
MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS (Robert Giza)
“Generalized Fibonacci Strings”

FRIDAY, 30th
2:10-3:00PM, SURGE 268
DIFFERENTIAL GEOMETRY (Dr. Stefano Vidussi, UCR)
“K=0”

4:10-5:00PM, SURGE 268
COMMUTATIVE ALGEBRA (Dr. David Rush)
Abstract:

An integer sequence satisfying a set of linear inequalities gives a lattice point in a polyhedral convex cone. Associated to such a cone is an affine semigroup; through this correspondence geometric and algebraic information are connected. We will discuss strongly convex rational polyhedral cones, associated affine semigroups, and their respective generators. The next step in this program is to introduce affine toric varieties. We will go into this if time permits.

Monday, November 26th, 2012
Surge 268
11:10 a.m. - 12:00 noon
Abstract:

A combinatorial description of the crystal $B(\infty)$ can be found via bijective parametrizations by lattice points in a polyhedral convex cone (Kashiwara 1993, Nakashima and Zelevinsky 1997). After a review of crystals we will discuss these parameterizations and how they are used in my research.

Monday, November 26th, 2012
Surge 268
2:10 p.m. - 3:00 p.m.
Abstract:

Topological Hochschild Homology (THH) is an invariant of ring spectra related both to K-theory and topological field theories. In this talk I'll state and prove a theorem concerning the relationship between THH and Koszul duality. I'll introduce the necessary definitions, and in particular say what I mean by "Koszul duality". I will also introduce some $(\infty,1)$-categorical background that will be necessary for the proof. Finally, I'll discuss some related results that I believe to be true, and applications of the work above to topological field theories.
Abstract: Trillions of devices around the world are continuously producing exabytes of data every day. The impact of search engines has been enormous, but there is also a parallel development in the applications of these methods to other related problems concerning the extraction of knowledge from large datasets. Data mining is the mathematics, methodologies and procedures used to extract knowledge from large datasets. While this includes topics related to search engines it is mainly devoted to the more general problem of finding features and structure in a dataset. There are many active scientific fields, including pure and applied mathematics, statistics, computer science and engineering with numerous applications such as finance, the social sciences, and the humanities. Spectral embedding uses eigenfunctions of a Laplace operator (or related graph affinity matrix) for extracting the underlying global structure of a dataset. This talk will give an introduction to spectral embeddings. Applications presented will include clustering LA street gang members based on sparse observations of where and who they are seen with.

Wednesday, November 28th, 2012
Surge 268
1:10 p.m. - 2:00 p.m.
Abstract:

Topological analogues of common algebraic notions, such as the idea of being a group, are not invariant when one passes between spaces which are homotopy equivalent. What should a “group up to homotopy” mean? The exploration of homotopy invariant versions of categorical and algebraic structures has been ongoing since the early days of algebraic topology.

Our focus will be on the interface between category theory and homotopy theory. In joint work with Julie Bergner we have proven rigidification theorems for weak operads with group actions. In work with Marcy Robertson we have laid the foundation for a homotopy theory of props, which includes establishing a model category structure on the category of simplicial props.

Wednesday, November 28th, 2012
Surge 284
Tea Time 3:40 p.m. – Talk Begins 4:10 p.m.
Abstract:

We give a presentation of a finite crystallographic reflection group in terms of an arbitrary seed in the corresponding cluster algebra of finite type and interpret the presentation in terms of companion bases in the associated root system. (This is joint work with Michael Barot.)
UNIVERSITY OF CALIFORNIA, RIVERSIDE  
Department of Mathematics  

Calendar of Events For the Week of December 3rd – 7th, 2012

**MONDAY, 3rd**
11:10-12:00PM, SURGE 268  
GRADUATE STUDENT SEMINAR (Dr. Jonas Hartwig, UCR)  
“Yangians and their applications”

2:10-3:00PM, SURGE 268  
GRADUATE REPRESENTATION THEORY (John Dusel)  
TBA

4:10-5:00PM, SURGE 284  
MATH CLUB (Mark Matthews of DreamWorks)  
“Mathematics in Movies: The Art and Science of Computer Animation”

**TUESDAY, 4th**
9:40-11:00AM, SURGE 277  
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

11:10-12:00PM, SURGE 268  
TOPOLOGY (Viraj Nakaval, UCLA)  
“G-Theory of a Local Ring of Finite CM Type”

12:40-2:00PM, SURGE 284  
LIE THEORY (John Dusel, UCR)  
TBA

3:30-5:00PM, SURGE 268  
MATH IN THE ENVIRONMENT (Dr. John Baez)

**WEDNESDAY, 5th**
11:10-12:00PM, SURGE 268  
COMBINATORIAL NUMBER THEORY (Dr. Kevin Costello, UCR)  
“Invertibility of Random Circulant Matrices, Continued”

1:10-2:00PM, SURGE 268  
PDE & APPLIED MATHEMATICS (Dr. Juhi Jang)

4:10-5:00PM, SURGE 284  
COLLOQUIUM – Dr. Gung-Min Gie, UCR  
“Boundary layers of the Navier-Stokes equations”

**THURSDAY, 6th**
9:40-11:00AM, SURGE 277  
ALGEBRAIC GEOMETRY (Dr. Ziv Ran)

10:10-11:00AM, SURGE 284  
OPERATOR ALGEBRAS & RELATED TOPICS (Dr. Feng Xu)

11:10-12:30PM, SURGE 268  
FRACTAL RESEARCH GROUP  
TBD

12:40-2:00PM, SURGE 284  
LIE THEORY (Dr. Vyjayanthi Chari)

3:40-5:00PM, SURGE 268  
MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS  
TBD

**FRIDAY, 7th**
2:10-3:00PM, SURGE 268  
DIFFERENTIAL GEOMETRY (Dr. Tommy Murphy, Universite Libre de Bruxelles)  
“Rigidity Results in Hermitian geometry”

4:10-5:00PM, SURGE 268  
COMMUTATIVE ALGEBRA (Dr. David Rush)
Monday, December 3\textsuperscript{rd}, 4:10 - 5:00 p.m. in Surge 284:

Mark Matthews of DreamWorks


Snacks and drinks will be served!

mathdept.ucr.edu/mathclub.html
Abstract:

Yangians are certain algebras closely related to Lie algebras and have many applications to representation theory and mathematical physics. In this talk I will give a brief introduction to these algebraic structures; explain their historic origin, discuss their kinship with other quantum groups, and show some applications. No previous knowledge of Lie algebras or quantum groups will be assumed.

Monday, December 3rd, 2012
Surge 284
11:10 a.m. - 12:00 noon
Abstract:

Let R be a complete local ring of finite CM type -- for example, the complete local ring of functions at a simple complex hypersurface singularity. A classical theorem of Auslander and Reiten describes a presentation of the Grothendieck group of the category mod(R) of finitely generated R-modules. I will explain this theorem and describe how the group presentation arises from a homotopy fiber sequence of certain K-theory spectra. I will also show how the homotopy fiber sequence can be used to obtain quite explicit descriptions of the higher K-groups of mod(R).
Abstract:

In most practical applications of fluid mechanics, it is the interaction of the fluid with the boundary that is most critical to understanding the behavior of the fluid. Physically important parameters, such as the lift and drag of a wing, are determined by the sharp transition the air makes from being at rest on the wing to flowing freely around the airplane near the wing. Mathematically, the behavior of such flows is modeled by the Navier-Stokes equations. In this talk, I will discuss the asymptotic behavior of solutions to the Navier-Stokes equations at small viscosity under various boundary conditions.
Abstract:

I will outline recent work deriving rigidity results for various classes of Hermitian-Einstein metrics. The common theme is the study of a linear differential operator introduced by A. Gray on the unit sphere bundle of a given manifold $M$, whose coefficients are determined by the sectional curvatures of $M$. I will also display a new upper bound for the first non-zero eigenvalue of the Laplacian of any closed Kahler-Einstein manifold. This is joint work with Stuart Hall.

Friday, December 7th, 2012
Surge 268
2:10 p.m. - 3:00 p.m.