

Mathematics Newsletter, Fall 2016



University of California, Santa Cruz

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Welcome to Fall 2016!

Prelim Exam Dates

- **Friday 9-23-2016 -** Geometry Prelim Exam 9 am 2 pm McHenry Room 4130
- **Friday 9-30-2016 -** Algebra Prelim Exam 9 am 2 pm McHenry Room 4130
- **Friday 10-7-2016 -** Analysis Prelim Exam 9 am 2 pm McHenry Room 4130

Colloquium/Seminar Schedule

- Mondays Undergraduate Colloquium 5 6 pm McHenry Room 4130
- **Tuesdays -** Math Tea Time 3:30 4 pm Tea Room 4161
- **Tuesdays** Math Colloquium 4 5 pm McHenry Room 4130
- Wednesdays Graduate Colloquium 4 5 pm McHenry Room 4130
- **Thursdays** Geometry & Analysis Seminars 4 5 pm McHenry Room 4130
- **Fridays** Algebra & Number Theory Seminars 12 pm 1 pm McHenry Room 1240

Important Dates (* denotes mandatory for new graduate students)

September 17, 2016 - Fall Quarter Begins
September 19, 2016 - International Scholar and Student Services (ISSS) Mandatory Orientation at 9 am – 4 pm, Baskin SOE Auditorium
September 20, 2016 - Campus Graduate Division TA & Union Orientation 8:30 am – 2 pm Classroom Unit 2*
September 21, 2016 - Mandatory Math Graduate Orientation 10 am – 12 pm McHenry Room 4130
September 21, 2016 - Grad Student Welcome and Welcome Back Lunch 12 pm -2 pm – Location TBA
September 21, 2016 - Incoming Math Grad TA Training 2- 5pm, McHenry Room 4130
September 22, 2016 - Instruction Begins
September 29, 2016 - All TA Fall Mandatory Workshop with Frank Bäuerle

September 28, 2016 - Sections Begin

Highlights of Our Research Activities

In the past year we held **special Mathematics Colloquia** featuring distinguished mathematicians from around the world as well as prominent researchers from other departments on campus. We also hosted the **Bay Area Differential Geometry Seminar** and the **Bay Area Algebraic Number Theory Days**. These are some of the highlights of scientific events that reflect the strong research environment in the Department.

Special Colloquium Speakers from on campus:

Ilan Benjamin: He is a Distinguished Professor and the Chair at the Department of Chemistry and Biochemistry. His research interests are in theoretical chemistry, molecular dynamics of chemical reactions in liquids and at interfaces. His talk was on *"Challenges in Computational Chemistry: Molecular simulations of reactions at liquid surface"*.

Dan Friedman: He is a Distinguished Professor in the Department of Economics at UC Santa Cruz. His research interests are in applied economic theory, learning and evolution, and financial markets. He received his Ph.D. in Math at UC Santa Cruz. His talk was on *"Partial Differential Equation and Models of Speciation"*.

David Haussler: David Haussler's research lies at the interface of Mathematics, Computer Science, and Molecular Biology. He is founder of the Biomolecular Engineering Department and the principal researcher in the world leading Human Genome Project at UC Santa Cruz. His talk was on *"Elementary Mathematics behind phenomena like the evolution of life"*.

Special Colloquium Speakers from outside:

Sun-Yung Alice Chang: She is a member of the American Academy of Sciences and world known mathematician at Princeton University. Her research fields are harmonic analysis, partial differential equations and differential geometry. Her talk was on "Q-curvature, some survey and recent developments", which introduced the new development in the study of conformal geometry in relation to the so-called AdS/CFT correspondence.

Martin Hairer is a world renowned mathematician at the University of Warwick. He received the Fields Medal in 2014, for his contribution to the theory of stochastic partial differential equations and for the creation of a theory of regularity structures for such equations. He spoke on "Taming infinities", which introduced his research in renormalization that is often encountered in mathematics and theoretic physics.

Gang Tain is a member of the American Academy of Art and Sciences and an academician at the Chinese Academy of Sciences. His research fields are geometric analysis symplectic and complex geometry. He spoke about the "K-stability and CM-stability", which covered the core issues in the very recent progress in the resolution to the Yau-Tian-Donaldson conjecture.

Craig Tracy is a Distinguished Professor at UC Davis and both a Polya and Wiener award winner for his joint work with **Harold Widom** on asymptotic analysis for the Toeplitz determinants. The important Tracy-Widom distribution is named after them. He talked on "Stochastic Growth Processes and KPZ Universality", Which told the story on why the measurements are related to certain distributions in random matrix theory.

What's New?

Welcome to the UC Santa Cruz Mathematics Department!

New Faculty Profile: Francois Monard

Francois grew up near Marseille and tumbling Annecy (France), and snowboarding. He did his undergraduate studies at a French "classe preparatoire" (transl.: math and physics bootcamp) then at a school of Engineering in Aeronautics and Space in Toulouse, before embarking on a US journey for graduate school in 2007. After graduate years at Columbia and postdocs at University of Washington and University of Michigan, Francois moved to Santa Cruz in August 2016, to join the Mathematics faculty.

Francois' research in inverse problems involves analysis of partial differential equations, integral geometry and numerical simulations, with applications to imaging sciences, or how to noninvasively image a body (a human, the Earth, etc...) for medical/geophysical purposes. When he is not doing math, he might be folding paper, playing capoeira angola, climbing, or doing something that involves bending, twisting and flipping. New Graduate Students Fall _2016:

- Philip Barron
- Xu Gao
- Andreas Hayash
- Alvin Jin
- Cisil Karaguzel
- Glen McDermott
- Nathan Marianovsky
- Bora Olcken
- Matthew Salinger
- Rodney Swearengin
- Wen Zheng



Francois Monard

NEW Resource for UCSC Students:

Mathematics Self-Advising Resources Webpage

- Do you have a **question** about your Mathematics major?
- Any **problems** with **enrollment** for Fall 2016?
- **Need help** making a 4-year degree plan as a first-year or transfer student?
- **Want to know** about the combined Mathematics majors in Physics or Economics?
- **Confused** about transferring course credit, requesting DRC accommodations or preparing to graduate?

For answers to these and other common Mathematics questions, visit <u>http://www.math.ucsc.edu/undergraduate</u> /self-advising-resources.html and be your own advisor!

Math Staff Updates and More

- □ Lessening the impact of math staff shortages, **Rondi Robison** is helping out at the Mathematics Department as a Department Assistant. We are so grateful to have Rondi with us!
- □ **Kathryn Baldwin** left the Mathematics Department in September 2016 since she accepted a position in the Jack Baskin School of Engineering. Kathryn is now the Department Manager for the Technology and Information Management Department. Congratulations, Kathryn, and thank you so much for your valuable contributions to the Mathematics Department!
- □ 3rd year undergraduate student **Julia Dunn** worked this summer as an Administrative Assistant in the Mathematics Department. She developed new resources for mathematics students and faculty that will be available this academic year!
- □ Late Breaking News! The Mathematics Department has a new Undergraduate Mathematics Advisor! Welcome Ben Fisher!

Exchange Scholar Program Visitors

Jingyong Zhu:

Feb. 2015 – Feb. 2017 Visiting PhD student from University of Science and Technology of China

Returning Faculty Spotlight: Marty Weissman

Marty Weissman is returning to the math department at UCSC, after a 3-year leave in Singapore. While in Singapore, he served on the inaugural faculty at Yale- NUS College, a new liberal arts college founded as a partnership between Yale University and the National University of Singapore. He looks forward to working again with colleagues and students at Santa Cruz and around the Bay Area.

Meet Frank Bäuerle: 2016-17 Mathematics Undergraduate Vice Chair

About Frank

Frank Bäuerle was born and raised in southern Germany. He grew up in Weinsberg, a small town amid castle ruins from the middle ages and vineyards that were first cultivated by the Romans when they occupied the land some two thousand years ago.

He did his undergraduate work in Mathematics and Computer Science at the Technische Hochschule in Karlsruhe, Germany, after which he received his Ph.D. in Mathematics from The University of California at San Diego. Frank did research work in Recursion theory and Complexity theory, an area lying at the intersection of Applied Logic and Theoretical Computer Science.

He has lived and worked in Germany, England, Australia and the United States as a researcher, programmer, social worker and, of course, mostly as a teacher. Frank has traveled extensively in Europe, the United States and South America.

His passion for teaching and interest in working with students brought him, in 1994, to UC Santa Cruz as a lecturer. He has since spent most of his professional life in Santa Cruz, teaching a wide variety of undergraduate courses from Algebra and Precalculus to Logic and Set Theory.

Frank is married with two children (a freshman in college and a senior in high school). His favorite sport is soccer, but he also enjoys hiking in the beautiful California wilderness, playing darts with his friends and wishes he had more time to use his telescope to look at the night sky.

O & A

Q: What are you most excited about in the coming year for Mathematics at UCSC?

"The most exciting news for undergraduate students in Mathematics is probably that undergraduate advising will return to the department after an 8 year hiatus. We are in the process of hiring a staff member whose primary role will be advising students in the major."

Q: What are your thoughts/plans/directions for the UGVC for this upcoming year?

"The first year in this transition of undergraduate advising in Mathematics will primarily be about integrating our new staff adviser into the department. I plan to work closely with our new advisor as well as with our students.

Some concrete plans are:

a) To host quarterly in-person informational sessions for current and prospective students in the major.

b) Improve our web presence and the general flow of information."



Q & A with Danquynh Nguyen, UCSC <u>Mathematics Graduate Student</u>

Q: What was the highlight of your summer in China?

A: "I had two months to completely focus on math. I learned a lot of new concepts and got a better, deeper understanding of my research project.

I also got to witness a very active math scene in China, with many summer schools, workshops, meetings, etc. organized for graduate students from all over the country. I really appreciated that math graduate students receive a great deal of support from their institutions...I went to the US Embassy in Chengdu.

My first week was in Beijing at the fellowship orientation and I got to learn about Chinese culture, development and education. I also got to go to tourist places like the Great Wall and the next 3 weeks I was at Sichuan University. Our group had a 3-week long seminar in Vertex Operator Algebras (VOAs).

The EAPSI Fellowship gave me the opportunity to be a part of a very diverse group of U.S. graduate students who got to spend their summer doing research abroad. During the first and the last weeks of my trip, I got to meet the other fellows and hear about their projects, which widely range from medicine to physics to agriculture and more. This was another highlight of my summer!"

Q: What are you looking forward to this year?

A: "I hope to make significant progress on my project with what I learned this summer. I also have plans to revive and grow the Noetherian Ring, which was originally created to bring together female graduate students, postdocs, and professors in the Mathematics Department at UCSC.

I plan to use my ARCS fellowship to go to more math conferences, and I hope to invite female mathematicians to talk at UCSC."

Welcome back, Danquynh!



COSMOS 2016 | 7/10-8/6

See photos on page 14!

The California State Summer School for Mathematics and Science

Five Fast Facts:

- □ COSMOS is a 4-week summer residential program for high school scholars with demonstrated interest and achievement in math and science.
- □ This intensive experience is intended to encourage the brightest and most promising young minds to continue their interest in these fields.
- COSMOS provides students with an unparalleled opportunity to work side-by-side with outstanding researchers and university faculty, covering topics that extend beyond the typical high school curriculum.
- □ The program is also open to exceptionally advanced and emotionally mature 8th graders capable of participating in a one- month program away from home.
- COSMOS exists at 4 University of California campuses: Davis, Irvine, Santa Cruz, and San Diego.

Q & A with Joe Ferrara, COSMOS Math Instructor

What role do you have in COSMOS?

"I am one of the two instructors for cluster 1. I taught the students for 2-3 hours everyday in the morning. In the class, we covered some topics in discrete math. Specifically, the students got an introduction to naive set theory, enough to learn about sizes of infinity. Then we did a little bit of graph theory, covering the seven bridges of Konigsberg problem and planar graphs. After that, we used the modular arithmetic that the students learned in the number theory course to do cryptography, ending with RSA."

What were the highlights of COSMOS this summer?

"The students really enjoyed learning about infinity. It is a fun subject for young people to learn about. Also, during COSMOS the students are put into groups of three or four and given projects to work on. It is a highlight for me to see them present their projects to another group of students at the end of COSMOS. All the students are really charismatic, and during the presentations, their math skills shine through."

What do you enjoy about working with COSMOS?

"Two aspects of COSMOS that I enjoy are getting to teach interesting math and being able to teach it in an environment where there is no pressure of tests and grades. This gives the freedom to teach interesting things, and because the students like math and want to learn, they are very responsive. On top of that, it is nice to have the opportunity to share something that I enjoy, mathematics, with interested students." **Cluster 1:** Number Theory and Discrete Math Cluster 2 Nanochemistry Cluster 3: Marine Mammals and Global Climate Change Cluster 4: Marine Ecosystems and Challenges Cluster 5: Video Games Design: From Concept to Code Cluster 6: **Computer Networking** and Robotics Cluster 7: Astrophysics Cluster 8: Marine Mammals and Oceanography

Mathematics Award Recipients 2016

J.W.T. Youngs Memorial Undergraduate Award in Mathematics: Michael Kraut and Jackson Vanover

Michael Kraut and Jackson Vanover were selected by Mathematics faculty as recipients of this year's *J.W.T. Youngs Memorial Undergraduate Award in Mathematics!* Both received \$1,000 awards in recognition of their accomplishments in the Mathematics major—Pure Mathematics concentration. We are honored to recognize their hard work and thrilled to present them with an award.

This summer, Michael has been participating in an REU program at SUNY Potsdam in New York to study Algebraic Graph Theory, and this upcoming year he will be studying abroad in Sweden, taking advanced courses and applying for graduate school.

In the fall, Jackson will begin a full-time position as Assistant Director and Tutor at Sage Educators in Marin County. He'll also be composing, recording, and performing his own original music in the Bay area.

Congratulations, Michael and Jackson!

Excellence in Teaching Award: Richard Mitchell

The Excellence in Teaching Awards given each year by the UC Santa Cruz Academic Senate Committee on Teaching are among the highest honors faculty members can receive. On June 2⁻⁻⁻, Richard Mitchell was honored in an awards ceremony luncheon hosted by Chancellor Blumenthal. The committee received approximately 600 nominations for 350 faculty members and elected nine to receive teaching awards. The awards include a \$500 prize, with the exception of the Ron Ruby Award for Teaching Excellence in the Physical and Biological Sciences, which includes a \$750 prize.

Mitchell has been teaching a range of mathematics courses at UC Santa Cruz for 32 years including math for non-math majors along with higher-level math for math majors. He teaches with the goal of helping students understand the "strangely beautiful realm of thought" encompassed by mathematics.

Notably, Mitchell is committed to altering students' perceptions of math if they've previously endured bad experiences with the subject. To do so, Mitchell works to dismantle the stereotypes about mathematics and those who study it, and in turn, Mitchell helps build confidence in students who have thought they are incapable of understanding math. Primarily, he practices a process called "demystification," which entails helping students decode the language of mathematics. This proves successful when students begin showing deep conceptual understanding and appreciation for mathematics.

Congratulations, Richard!

Achievement Rewards for College Scientists (ARCS) Scholarship: Danquynh Nguyen Danquynh was selected as a scholarship recipient from the ARCS Foundation. There were 11 scholarships awarded this year which include a \$10,000 fellowship, Awards Ceremony in San Francisco and the Scholar Symposium in Spring 2017.

Danquynh has assisted with Transfer Orientation for incoming transfer students in mathematics, helped organized the Math department's graduation ceremony, and has set out to bring back the currently inactive Women in Mathematics group. She spent this past summer in China (see page 4) conducting research on integral forms--her primary interests lie in Vertex Operator Algebra theory.

After receiving her Ph.D. at UCSC, Danquynh wants to continue her research and teach at a university. "Over the years, I have encountered many students who are afraid of math," she says. "Knowing first-hand how a great teacher can change this, I strive to be one and be part of what makes math education better."

ARCS Foundation, Inc. is a national organization dedicated to supporting the brightest U.S. graduate and undergraduate scholars by providing financial awards in science, engineering and medical research. The ARCS Foundation believes that support of STEM education is essential to US economic growth and technological competitiveness, and helps to ensure continued US leadership in global innovation, health and quality of life.

Congratulations, Danquynh!

Mathematics Diagnostic Testing Project (MDTP)

UC/CSU Mathematics Diagnostic Testing Project (UC/CSU-MDTP), one of ten regional sites in California (sponsored by the California Academic Partnership Program [CAPP]), offers free mathematics achievement, diagnostic testing and analysis services to pre-collegiate schools and pre-collegiate outreach programs.

The UC Santa Cruz site of the UC/CSU MDTP has served North Monterey, northern San Benito, Santa Clara and Santa Cruz counties for over 28 years.

The MDTP tests are designed to assist teachers in measuring student readiness for a broad range of mathematics courses.

These tests are used as an integral part of a formative assessment process for middle school and high school mathematics teachers.

A series of readiness tests for college preparatory mathematics courses are available at seven levels from Pre-algebra to Calculus.

UC Santa Cruz scores the students' responses and provides summary and diagnostic information on student results.

The diagnostic tests are used to assess students' mastery of key concepts that are requisite for success in mathematics classes.

Individual diagnostic reports are provided for students as well as detailed item analyses and summary reports for teachers.

The student reports indicate areas in which students did well and those areas in which the test results suggest a need for further study in order to be prepared for future coursework.

The summary reports are used by teachers to help identify areas of the curriculum that seem to be working well and other areas or topics where changes may be needed.

The diagnostic information provided enhances the teachers' ability to strengthen their curricula.

Serving Local Students

Monterey Bay Area Mathematics Project (MBAMP)

The Monterey Bay Area Mathematics Project (MBAMP) exists to increase the academic achievement of students in mathematics (grades K – 12), via professional development programs (PD) for teachers.

These PD programs enhance the content knowledge and teaching skills of classroom teachers.

As overall student achievement rises, MBAMP programs will reduce achievement gaps in the mathematics performance of student populations.

Core to the improvement efforts sought by MBAMP programs are the partnerships developed between MBAMP and local school districts, the Santa Cruz, San Benito, Monterey and Santa Clara County Offices of Education (COEs), the mathematics faculty of UCSC and other organizations concerned about mathematics education.

MBAMP is dedicated to providing students a rich, rigorous, and coherent mathematics curriculum taught by competent and confident mathematics teachers who foster all students' proficiency in mathematics—achieving equity in quality.

All teachers and students become competent mathematical thinkers as they investigate, conjecture and justify in their pursuit of mathematical knowledge.

Common Questions

Q: I just completed an ALEKS assessment that is supposed to place me in a certain math class, but the system still won't let me enroll in the class even though I just finished it a few minutes ago. What's wrong?

A: ALEKS placement scores are only uploaded every so often, and you won't be able to enroll in the math class until your score has been posted to MyUCSC. ALEKS assessments completed by 11:59pm* on the date listed below will be posted for the next enrollment period.

Completed by:	Posted by 5pm:
July 17	July 18 th for the start of summer orientation for new students
July 31	August 1st for all non-orientation attendee incoming students
September 5	September 6 th after summer session grades post
September 20	September 21 st before Fall 2016 classes begin

Q: Multiple scores appear in MyUCSC portal. Which one is used to satisfy enrollment prerequisites?

A: Of the scores that appear, your highest score is the one used to satisfy your math enrollment prerequisites.

Q: If I place into a course I do not feel prepared for, can I still enroll in a lower-level math course?

A: Yes, your math placement score indicates the highest level of math you may enroll in. If you are not prepared for that course, you may enroll in a lower-level course, but it is highly discouraged for students to enroll in a math course lower than the course into which they have tested.

aleks@ucsc.edu

ALEKS at a Glance

How does ALEKS work?

- As of spring 2015, continuing and newly admitted students completed mathematics placement using ALEKS-PPL.
- Through this new placement process, students assess, practice using customized learning modules, and then reassess to improve their placement in Mathematics courses.
- As the assessment proceeds, ALEKS uses students' responses to construct a model of their "knowledge space", and adapts the questioning to refine and validate that model. After students take the initial assessment they have access to an ALEKS Prep and Learning Module.
- The learning modules are adaptive comprehensive tutorials, individually tailored to the students' needs, as they are based on students' assessment results. Students use the learning modules to prepare for reassessment and to review for Mathematics courses. The online assessment in ALEKS allows students to complete up to five assessments.

What's my **score**? What's my **class**?

ALEKS assessment	MP SCORE:	Allows enrollment in:
below 60%	100	MATH 2
60 - 69%	200	MATH 3
70 - 74%	300	MATH 11A
75 - 84%	400	MATH 11A or 19A*
85 - 100%	500	MATH 19A or 20A

Putnam Exam 2016

History of the Putnam Exam

- The competition began in 1938 and is designed to stimulate a healthful rivalry in mathematical studies in the colleges and universities of the United States and Canada
- It exists because Mr. William Lowell Putnam had a profound conviction in the value of organized team competition in regular college studies. Mr. Putnam, a member of the Harvard class of 1882, wrote an article for the December 1921 issue of the Harvard Graduates' Magazine in which he described the merits of an intellectual intercollegiate competition.
- To establish such a competition, his widow, Elizabeth Lowell Putnam, in 1927 created a trust fund known as the William Lowell Putnam Intercollegiate Memorial Fund.
- The first competition supported by this fund was in the field of English and a few years later a second experimental competition was held, this time in mathematics between two institutions.
- It was not until after Mrs. Putnam's death in 1935 that the examination assumed its present form and was placed under the administration of the Mathematical Association of America.

Description of the Exam

- The examination will be constructed to test originality as well as technical competence
- It is expected that the contestant will be familiar with the formal theories embodied in undergraduate mathematics.
- It is assumed that such training, designed for mathematics and physical science majors, will include somewhat more sophisticated mathematical concepts than is the case in minimal courses.
- Thus the differential equations course is presumed to include some references to qualitative existence theorems and subtleties beyond the routine solution devices.
- Questions will be included that cut across the bounds of various disciplines, and self-contained questions that do not fit into any of the usual categories may be included.
- It will be assumed that the contestant has acquired a familiarity with the body of mathematical lore commonly discussed in mathematics clubs or in courses with such titles as "survey of the foundations of mathematics."
- It is also expected that the self-contained questions involving elementary concepts from group theory, set theory, graph theory, lattice theory, number theory, and cardinal arithmetic will not be entirely foreign to the contestant's experience.

7 students participated in the Putnam Exam this year—we are proud of their mathematical ambition!

2016 Slugs United by Mathematics (SUM) Math Celebration June 9, 2016



About Slugs United by Mathematics (SUM)

- o SUM is the official undergraduate math club at the University of California, Santa Cruz.
- o Founded in 2013
- We hold weekly meetings to share new and interesting mathematics problems and give presentations and seminars about our research and more
- Our purpose is to expose students to new math, provide guidance for interested students, and discuss interesting math problems.

"Slugs United by Mathematics (SUM) is a club founded by math-loving students wanting a space outside of our classes to come together, talk math, and enjoy being a student here at UCSC. We are open to all students who love math, regardless of their major, and we enjoy seeing how math applies itself to various disciplines. Our meetings consist of talks given by students and professors, game days, construction competitions, all with the aim of having fun and exploring math's beauty. The love for math is what gave birth to this club and is the motivation that keeps it going strong!"

~ Shay Gilpin, Slugs United by Mathematics president

2016-17 Officers

- Shay Gilpin, President
- Maria Vizcaino, Vice President
- Drake Pitts, Secretary
- Connor Pryor, Treasurer
- Jackson Hsu, Events Coordinator

Want to Join?

- SUM is always looking for new members!
- Fall 2016 meeting days/locations TBD
- Email: <u>ucscmathclub@gmail.com</u> and look out for announcements in your math classes at the start of the quarter.
- Stay tuned for SUM's biggest event of the year, March 14th: Pi Day!







TOP LEFT/BOTTOM LEFT: **Tadashi Tokieda** of University of Cambridge and Stanford University delivers a colloquium entitled "Science from a sheet of paper" on October 6, 2015. By folding, stacking, crumpling and tearing paper, Tokieda led the audience to explore math through physical experiments. COSMOS Cluster #1 TOP RIGHT: COSMOS students playing a logic game BOTTOM RIGHT: Group photo





The UCSC Mathematics Department wishes you a successful new academic year!

