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EDUCATION

- ▷ **University of California, San Diego**, La Jolla, CA. Fall 2004 – Present
Ph.D. Mathematics, Expected Spring 2010 (Advisor: Ron Graham)
- ▷ **Virginia Tech**, Blacksburg, VA. Fall 2000 – Spring 2004
M.S. Mathematics, Spring 2004 (Advisor: Mark Shimozono)
B.S. Computer Science, Graduated Summa Cum Laude, Spring 2004
B.S. Mathematics, Graduated Summa Cum Laude, Spring 2003

RESEARCH INTERESTS

My main areas of focus in my research have been geometric and integral combinatorics. In a typical problem in these areas, there is some clearly defined process or object, the properties of which are complicated and difficult to quantify; for instance, the spread of disease throughout a population, a deck of cards when shuffled, or the hidden structure in a random binary string.

For many of these problems, computer simulations give a clear indication of the true properties of the system in question – these properties can then be rigorously proved by hand. In cases for which clear answers are unavailable (common for combinatorial functions), genetic algorithms are important in proving new bounds. In particular, simulated annealing is key to many existing bounds on combinatorial functions whose value is unknown; I employ these techniques in my research to determine the values of these functions.

WORK EXPERIENCE

- ▷ **Teaching Assistant** Fall 2004 – Summer 2009
University of California, San Diego *La Jolla, CA.*
I have been a teaching assistant for differential, integral, and vector calculus, as well as advanced calculus, linear algebra, numerical integration, complex analysis, and statistics. As a teaching assistant, I explained concepts to students and helped lead them through exercises, in addition to grading their exams.
- ▷ **Instructor** Spring 2008
University of California, San Diego *La Jolla, CA.*
I was the instructor for a precalculus course, in which I designed and delivered lectures, trying always to use interesting examples to illustrate concepts. I also managed a teaching assistant and a grader, and determined the students' final grades.
- ▷ **Teaching Assistant and Tutor** Fall 2003 – Spring 2004
Virginia Tech's Math Emporium *Blacksburg, VA.*
At the Math Emporium, students used computers to work on linear algebra and other basic math courses. My task was to help the students use their resources to find answers for themselves, and to nudge them in the right direction when they were having trouble.

▷ **Intern**

U.S. Naval Research Laboratory

Summer 2003
Washington, D.C.

My job at the Naval Research Lab was to help design a protocol for communication among distributed software agents in a network; I primarily codified this protocol using SOAP, which is based on the flexible XML markup language.

PUBLICATIONS

▷ **Monochromatic triangles in \mathbb{E}^2** , to appear in *Geombinatorics*.

We examine the current state of a long-standing conjecture about partitions of the Euclidean plane, and present a few new results.

▷ **Open problems in Euclidean Ramsey theory**, submitted (with Ron Graham).

This book chapter is a survey of open problems in Euclidean Ramsey theory, with emphasis on recent activity in the field.

▷ **Intersecting domino tilings**, to appear in *The Fibonacci Quarterly* (with Steve Butler and Paul Horn).

We examine a variant of the classical Erdős-Ko-Rado problem concerning maximal intersecting families of sets. In our construction, we consider tilings of $2 \times n$ and $3 \times 2n$ strips by dominos, and say that any two tilings intersect if they have a domino in common. We completely characterize the maximal intersecting families of these tilings.

▷ **The first nontrivial Hales-Jewett number is four**, to appear in *Ars Combinatoria* (with Neil Hindman).

We give a proof by hand of the first nontrivial Hales-Jewett number, previously unknown. We also provide an algorithm that can prove this result quickly, as well as produce lower bounds for other Hales-Jewett numbers.

PRESENTATIONS

▷ **What is Ramsey theory?**, UCSD open house, Spring 2009.

This talk was a basic overview of Ramsey theory, in which I presented most of the important ideas in the field and discussed some open problems.

▷ **Hat-guessing games**, UCSD graduate student research colloquium, Fall 2008.

Hat-guessing games are thinly-disguised problems in information sharing and logical deduction. They range from simple to devious, and can provide a basis for discussing serious mathematical ideas.

▷ **The solution to Conway's Angel problem**, UCSD graduate student research colloquium, Fall 2007.

Conway's famous "Angel problem" was first introduced in 1982. In 2006, two complete solutions and two partial solutions were published nearly simultaneously, all different. In this talk I gave one of the full solutions, due to Oddvar Kloster.