



Pacific Institute for the  
Mathematical Sciences

# PIMS 20th Anniversary Celebration

## *WILLIAM MARTIN* *Worcester Polytechnic Institute*



**Title:** ALMOST ORTHOGONAL VECTORS

**ABSTRACT:**

How many lines may one arrange through the origin in  $\mathbf{R}^{10}$  in such a way that any two of them are at least  $89^\circ$  apart? How about in  $\mathbf{R}^{57}$ ? Or  $\mathbf{R}^n$  as  $n$  tends to infinity? Using this simply stated problem as a point of departure, I will explore various areas of pure and applied mathematics where “almost orthogonal” vectors play a role. Our discussion will touch on some challenging unsolved problems and some important questions. We will have the opportunity to discuss problems in combinatorics, geometry, algebra, communications, quantum information theory, and compressive sensing (which might be viewed as a subdiscipline of data science). While some fairly simple jargon will be introduced, the talk should be accessible to a general mathematics audience at the graduate level or above and much of it will make perfect sense to the talented undergraduate.

**BIO:** Dr. William Martin is a Professor of Mathematical Sciences (and Computer Science, and Bioinformatics, and Computational Biology) at Worcester Polytechnic Institute in Worcester, MA (arriving in 2000). He has held visiting positions at University of Vermont, University of Waterloo, Massachusetts Institute of Technology, Pohang University of Science and Technology, University of Delaware, and Brown University. He has visited 25 countries and has given invited lectures in a dozen countries. He is a Fellow of the Institute for Combinatorics and its Applications and a member of the editorial board of its Bulletin. Bill's mathematical interests span a continuum from algebraic combinatorics to theoretical computer science. His main research areas are Delsarte Theory -- the study of codes and designs in association schemes -- and cryptographic hardware. He is also interested in complexity theory and quantum information theory. Outside of mathematics, Bill enjoys food, movies and cultural phenomena from around the world, and still occasionally plunks on his guitar at very high volume. His other jobs over the years have included delivering milk, helping at a printing press, managing a warehouse, repairing windows, and flipping steaks.

Friday—March 31, 2017

12:00—12:50 pm

UHall D634

\*\*\* Sandwiches and cookies \*\*\*