

FACULTY SPOTLIGHT: KENNETH GOLDEN



If you ask most people to imagine the lifestyle of a mathematician, chances are that mental picture will not include traveling on an icebreaker through the Western Weddell Sea off the coast of Antarctica! For Dr. Kenneth M. Golden, however, this is an essential part of his life’s work: the mathematical study of sea ice and climate. To say Ken’s research is ‘interdisciplinary’ would be an understatement; his work has utilized methods from such varied fields as fractal geometry, composite materials, remote sensing, functional analysis, microbial ecology, and statistical physics. He refers to the strategy of transferring mathematical methods between unrelated areas of science as “cross-pollination,” which cultivates new ideas and areas of study.

Ken’s excitement is contagious when speaking about his work, evidence of a lifelong passion for his field. Born and raised in College Park, Maryland (a few minutes from the university), Ken had his first taste of research while participating in an NSF Summer Science Training Program at the Institute for Arctic and Alpine Research in Colorado after the 11th grade. His work involved coring peat bogs for paleoclimate analysis and studying the physics of snow melt. This led to work the following school year with Jay Zwally of NASA, where he began to study Antarctic sea ice using a combination of mathematics and satellite imagery. Ken then attended Dartmouth for his undergraduate studies, where he received his B.A. in mathematics and physics. During this time, he began working under Steve Ackley of CRREL (Cold Regions Research and Engineering Laboratory), where he focused on methods of measuring the thickness of sea ice. This culminated in Ken’s senior year with his first trip to Antarctica aboard the USCGC Polar Sea. This was one of the first expeditions into the Western Weddell Sea since Ernest Shackleton’s ill-fated voyage in 1914. It would be the first of many such trips for Ken, whose globe-hopping research has taken him to six continents, including seven trips to Antarctica and eleven trips to the Arctic.

Dr. Golden received his Ph.D. in mathematics from NYU’s Courant Institute; his thesis was Bounds for Effective Parameters of Multicomponent Media by Analytic Continuation. He has gone on to publish over 70 papers across a variety of fields (including six papers with his college mentor, Steve Ackley). He was one of the first researchers to combine rigorous mathematics with the observation that sea ice should be treated as a multiscale composite material when considering its role in the Earth’s climate system.

Dr. Golden has received numerous grants and awards throughout his career that not only bring attention to his work, but to the University of Utah and the Mathematics Department as a whole. In total, Ken has been part of 28 grants, responsible for over \$14 million in funding. In fact, Ken, along with co-PIs Elena Cherkaev and Tom Alberts, received a new NSF grant this year to study random matrix theory in the context of homogenization for composites. Ken was the Guest of Honor at the Institut des Hautes Études Scientifiques (IHÉS) Gala hosted by the French Ambassador to the US on November 18, 2013. He is also an Inaugural Fellow of the American Mathematical Society, a SIAM Fellow, and has received the University of Utah’s Distinguished Teaching Award (the U’s highest

teaching award), to name just a few of his prestigious awards. Ken has also been invited to speak at various prominent venues. He has given the SIAM Invited Address at the Joint Math Meeting (AMS-MAA-SIAM), the Houghton Lectures in Earth, Atmospheric and Planetary Sciences at MIT, and has even presented his research on sea ice and climate change to the US Congress on three separate occasions. However, perhaps the one award that most stands out is his election as a Fellow of the Explorers Club, an international multidisciplinary professional society dedicated to the advancement of field research and the ideal that it is vital to preserve the instinct to explore. Ken is only the fourth math professor since 1904 to become a member of this elite society, which includes astronaut Neil Armstrong, test pilot Chuck Yeager, Mount Everest conqueror Sir Edmund Hillary, and primatologist Jane Goodall.

Ken also serves as a valued research mentor and advisor to undergraduates, masters students, Ph.D. candidates, and postdoctoral fellows — fifty-eight university students and postdocs in total, with majors of the undergraduates spanning eleven departments in the Colleges of Science, Engineering, and Mines and Earth Sciences. One former student once commented: “By treating me more like a colleague than a student, Dr. Golden aided my research successes throughout my undergraduate career.” Perhaps most notable is Ken’s mentorship of nine high school students, giving them an opportunity to publish even before deciding on an undergraduate program. This has proven to be a great way to pay-forward the opportunity Ken had to work on research at an early age. Ken also values speaking at general STEM gatherings, where the “cross-pollination” of ideas benefits everyone in the audience. Such experiences led Elena and Ken to investigate the similarity between the structure of sea ice and bone tissue, leading to a new way of electromagnetically monitoring the progress of osteoporosis.

Dr. Golden was recently honored with the title of Distinguished Professor of Mathematics for his outstanding accomplishments in research, teaching, and community outreach. Ken’s career path and success has stemmed in part from his belief that “mathematics is the operating system of science and engineering,” like Unix, Mac OS or Windows. As a result, he would be hard pressed to advise a future scientist not to pursue classes in higher level mathematics. However, he also advises students to find something they love to do. Combining these two pieces of advice leads to the following feedback loop Ken believes applied mathematicians should follow: find an important real-world problem, develop the mathematics to solve it, see what new real-world problems and mathematical questions are revealed, and repeat!

