

1. **Long term dedication to teaching introductory calculus.** Since 2001, Golden has taught over 6,000 students in 41 sections of Calculus I, II, or III, mostly freshmen and sophomores, with the goal of getting students excited about mathematics, making it relevant to their lives, and showing them how calculus provides the platform, or the operating system, upon which science and engineering are built. (Pretty much every semester there are waiting lists to get into Professor Golden's sections.) Over his career, since his first year in graduate school in 1981, he has taught over 8,000 students in introductory calculus, engineering math, and differential equations at New York University, Rutgers University and Princeton University, as well as at Utah since arriving here in 1991.

Evidence of Golden's outstanding talent in the classroom includes receiving an Excellence in Teaching Award from the Princeton Engineering Council when he was an assistant professor in mathematics there, and the University Distinguished Teaching Award at the U as a full professor. Further evidence lies in the course evaluations of so many students over the years who have written that Golden is the "best math professor" or even the "best professor" they have ever had, and the many students who became math majors or minors, citing Golden's calculus as a key influencing factor.

(See attached citation for University Distinguished Teaching Award.)

Here are some quotes from course evaluations from Math 2210 (Calculus III) in Fall 2019: "Dr. Golden was an excellent professor and I would absolutely take him again because he does a fantastic job of inspiring you to truly want to learn more about the subject." "I love the way Professor connected everything to the real world. It helped what we learned in class feel more important. I also liked the practice exams he made. They were very helpful." "This was the best math class ever, and actually one of the best classes in general." "Professor Golden gets very excited when talking about math which in turn makes me more excited to learn about it. He also clearly wanted people to succeed in the class so he did his best to make sure we were prepared for exams, including doing a several hour review session for anyone interested before every exam. This helped me be much more prepared for tests than I would have been studying on my own." "Outstanding professor! He was passionate about the material he taught and really cared if his students understood the content. His exams covered the most important topics and most relevant to real life scenarios."

2. **Course Development.** In 2014 Golden developed a course called *Mathematics and Climate*, to provide an introduction to the mathematical study of Earth's climate system, which he first taught in Spring 2014 listed as both undergraduate Math 5750 and graduate Math 6880. He has taught it every other year since then. The course has modest prerequisites of only calculus and basic differential equations to make it accessible to undergraduate majors in science and engineering, and has attracted students from Math, Physics, Chemistry, Biology, Atmospheric Sciences, Geology and Geophysics, and Engineering (of various types). Enrollment has grown to 24 this past Spring semester of 2020. This class grew out of Golden's role as a Principal Investigator of an NSF funded (\$5M) Math Climate Research Network of 12 hubs at major research universities across the U.S., including the U, with one of the goals being to develop educational materials for the emerging field of *climate math*.

Here are some quotes from course evaluations from this past Spring 2020: "Fascinating subject and great class structure built on learning and not testing. class participation in discovery and discussions was great." "I appreciated learning about climate from a math-modeling point of view from an expert in the field. Dr. Golden did a fantastic job teaching in person, inviting discussion, and encouraging further interest in the field. When we had to change to an online format Dr. Golden did a wonderful job transitioning the experience. He made videos for

us to use to continue to learn and was understanding and easy to talk to.” “Ken has so much energy and is so passionate about mathematics in the climate! It makes the discussions very engaging and he explains the mathematical concepts very well without rushing. Moving everything online was a very abrupt change, but I think the optional Zoom conference calls gave us plenty of time to ask questions. The remainder of the semesters material was all available on Canvas as well, which was very nice!” “Ken is one of the most enthusiastic professors I have had. I love his attitude about the course. He is very knowledgeable about the course material and made class a lot of fun!” “Probably the most outgoing and passionate professor I have had at the U.”

Golden has also developed the materials for and given graduate level classes in topics not typically taught in a math department, such as statistical mechanics, composites materials, and sea ice. In 2013 he even helped develop the material for and was an instructor for the University of Alaska Fairbanks course on field techniques in sea ice research, held in Barrow, Alaska and on nearby sea ice in the Arctic Ocean.

3. **ACCESS.** In 1991 the original ACCESS Program for Women in Science and Mathematics was established in the College of Science, with a goal of “priming undergraduate women for academic and career success in science disciplines.” In addition to an intensive 2 month program the summer before freshman year, where each department in the College of Science would run their own sub-program for two weeks independent of the other departments, the students are placed with a professor for a research experience during the spring of their freshman year. Starting in 2016 four ACCESS students have been placed with Golden. In 2018 the program was broadened to include participation from the Colleges of Engineering and Mines and Earth Sciences, and updated with an overall theme of climate change, to provide “freshmen and transfer students, from a variety of backgrounds, with a supportive path into STEM degrees and careers.” Golden was asked to lead development of the new Mathematics week and has run the math component of ACCESS each summer since then, which includes introductions to the climate system and energy balance models, melting polar ice, fractals in nature, mathematics of energy production, and Brownian motion and diffusion processes. Golden involved some of his graduate students to help develop the materials and serve as mentors during Math ACCESS week, and Professor Jon Chaika to represent pure mathematics.

Here are some quotes from the feedback on the Math Module in ACCESS, Summer 2020: “I really enjoyed learning about how to apply math to the real world and learning about fractals and surfaces was actually super fun and interesting.” “This week was enlightening. The topics discussed and the harsh reality that is climate change was never introduced to me in high school and I was so oblivious/ignorant. This brought real things to the forefront and changed my perception of math (something, before, I felt I couldn’t do). This week gave me confidence. My most favorite part was witnessing how the pure math (concepts we worked on a day before) would mesh with the applied math content the next day. That was a great structure because something that seemed so unrealistic was involved in everything we discussed in applied math. ... I genuinely have no improvements for this week. It was foundational and led me to consider a double major or minor in math, specifically applied math” “I really enjoyed being able to do the after sessions with Professor Golden. I want to go into applied math, so his session was fun and informative. It helped me solidify my major and my plans for my undergrad.” “My favorite things about the math module were Professor Golden’s presentations. Not only did it provide insight into applied mathematics, but also allowed me to learn more about sea ice, its environment, the melting of it, and how it all relates to climate change. I also really enjoyed the panel at the end of the week.” “One

of my favorite things about the curriculum presented during the Math module is the variety of ways that math was presented within the environment. I enjoyed learning about how ice can be modeled by math in various ways. ... I found the math module quite insightful and engaging, it also helped me make further connections to climate change and how the world around us is changing.” “I loved learning about the math in sea ice, and had never considered that sea ice could be so interesting! I also really enjoyed learning about areas of math that were completely new to me, like topology or fractal math. Overall, while very challenging, this week was fantastic!” “I really loved how I was shown all the different applications of math and different topics of pure math that I hadn’t really thought of before!” “I thought that the post-class session with Prof. Golden was very informative as well, and I am thankful that he was so generous with his time and support.” “Really enjoyed this week, I was already considering majoring in something related to math, now I feel almost certain I’ll double major in applied math/another science.”

4. **Research mentor** to over 80 young investigators – postdoctoral fellows, graduate students, undergraduates from majors across science and engineering, and high school students (see CV for a list). Twelve of the students and postdocs, including eight undergraduates, participated in sea ice field experiments in the Arctic or Antarctic, with some traveling to the polar regions multiple times. In 2018 Golden’s research student Rebecca Hardenbrook won the College of Science Research Scholar Award, the highest research honor given to an undergraduate in the College of Science. In 2020, another of Golden’s research students, Delaney Mosier, who was graduating as a Junior (see letter), won the same award and gave the COS commencement address. Moreover, Golden’s recent Ph.D. students have been particularly successful on the job market, obtaining postdoctoral positions at Courant Institute NYU, UNC Chapel Hill, and U. Texas Austin (student co-advised with Katya Epshteyn). The high school students who did research with Golden went to universities such as Yale, MIT, Columbia and Princeton. In 2012 Golden won the Myriad Faculty Award for Research Excellence in the College of Science (\$20,000), for fostering undergraduate research and providing learning experiences for students.
5. **Educational administration.** Golden has been very active as an educational administrator, serving in various positions in the Math Department (see CV), such Director of Undergraduate Studies (2002-2008), Chair of the Undergraduate Curriculum Committee and Coordinator for Calculus classes and Engineering Math classes. As Director of Undergraduate Studies, Golden initiated development of a major in applied math to make it easier for science and engineering majors to double major along with applied math, since they are already required to take a significant amount of mathematics. From 2003 to 2007 Golden served as the Department’s Research Experiences for Undergraduates (REU) Program Coordinator, and led the undergraduate research component of a successful effort to obtain a \$3.5M NSF grant (VIGRE) to invigorate the educational and research programs in mathematics at Utah.
6. **Outreach through public lectures and media coverage.** Golden is a renowned research lecturer and public speaker who has been invited to give some of the most high profile public and keynote lectures in Mathematics, such as the Porter Public Lecture at the Joint Math Meetings, the largest math conference in the world each year (and he has chaired the committee to select the Porter Lecturer). After the *San Diego Union-Tribune* published an article the morning of the lecture on the “Indiana Jones of Mathematics,” Golden signed autographs for two hours at the convention center, much to his surprise! Golden has been a featured speaker at venues such as the First National Math Festival at the Smithsonian Institution in Washington DC, the National Museum of Mathematics in New York City, Dartmouth’s 250th

anniversary, and the 2013 Institut des Hautes Études Scientifiques (IHÉS) Gala, *Mathematics: Mind of the Earth*, hosted by the French Ambassador to the US in New York City, where Golden was also the guest of honor. He has given around 450 invited lectures on six continents (including Antarctica!), and three presentations in the US Congress where he represented the American Mathematical Society and the Society for Industrial and Applied Mathematics. At numerous international scientific and mathematical conferences Golden has been asked to give a lecture for the public communicating the themes of the conference, such as at recent meetings on Pattern Formation, Stochastic Processes, Climate Change, Discrete Systems and Mathematics of Planet Earth. Golden has given many public lectures at universities in the US and abroad, and numerous presentations to student groups ranging from elementary school to high school and college, and groups of business leaders and policy makers.

Finally, Golden's work has generated significant media interest, so he has communicated with the public extensively in this way. His research and polar expeditions have been featured in over 55 newspaper, magazine, and web articles, including profiles of Golden and his work in *Science*, *Scientific American*, *Science News*, and *Physics Today*. He has been interviewed about 20 times on radio, television, and the web, and featured in videos produced by NSF, SIAM, and NBC News. Recent coverage includes several articles on how Golden adapted a 100 year old model for magnetic materials to accurately predict the geometry of ponds on melting Arctic sea ice, in publications such as *Scientific American*, *EOS*, the news publication of the American Geophysical Union, and *Wired* magazine.