

Polymath

From mathematics to literature to psychology to math again, Danny Calegari has found his calling.



Photo courtesy Danny Calegari

In 1993 Danny Calegari appeared on the front page of his hometown newspaper, the Melbourne (Australia) *Age*, as the winner of its prestigious short story competition. The occasion marked a turning point on a path that both began and culminated with mathematics, albeit via the scenic route.

His parents were college-math teachers, and Calegari's own teachers encouraged him to enter local competitions where students solved problems "with some strategy" rather than by rote, which, Calegari says, is as analogous to math as "spelling competitions are to literature."

Thanks to an overflow of books his parents stored in his room, Calegari—who joined UChicago's mathematics faculty in 2012—also developed a taste for literature. He experimented with fiction writing, partially as a form of youthful rebellion against his father. When his father died from non-Hodgkin's lymphoma when Calegari was a teenager, the rebellion continued. "I wasn't interested in mathematics," he says. "I wanted to do arts or something." After high school and a year of travel, he enrolled at Melbourne University to study English and psychology.

While at university, Calegari submitted his short story "The Green Light," inspired by Saul Bellow's (X'39) *The Victim*, to the *Age's* annual competition. The 20-year-old beat out 1,558 other applicants, winning \$1,500 in prize money and his picture on the front page—it showed him sporting a ponytail and strumming his acoustic guitar on his bed. "They really played up the fact that I was this young kid rather than a serious writer, who was going to go and buy cassette tapes." His newfound fame impressed the girl he was dating, who eventually became his wife and the mother of his three children.

The success also caused him to rethink his desire to write. More of a reader at heart, "I realized I wasn't particularly excited by writing," he says. "What I was interested in was psychology." Specifically, he wanted to study cognitive psychology, which he calls "the science of how the mind processes information and makes sense of the world."

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Yet the mathematical aspect of his psychology classes frustrated him, taught by arts teachers who viewed mathematics as a “necessary evil.” Calegari says, “It was clear that the experimental design was inadequate. I wanted to know a bit more about it.”

He sat in on some mathematics classes to better understand the design of abstract networks in neuropsychology. He found one course particularly riveting: a third-year introduction to topology. Calegari describes the teacher, Craig Hodgson, as brilliant: “Every lecture was just a gem: a beautiful idea clearly explained.” He admired how topology has “a hundred-year-old history where there’s a beautiful edifice of interlocking ideas from hundreds of mathematicians.” Calegari had found his calling, ultimately deciding to focus on geometric topology, which can be used to perform qualita-

tive analysis of fluid flows, such as ocean currents; to study magnetic fields in the sun’s heliosphere; and to study theoretical physics, quantum gravity, and string theory.

Calegari keeps psychology in mind while teaching subjects like algebraic topology and advancing the concept that “geometry is a psychological attitude.” The brain is hardwired for the subject, with neurons that detect objects’ boundaries, specifically finding horizontal and vertical lines, which, he says, “leads naturally to the Cartesian coordinate and the laws of perspective in art.”

Outside the classroom, Calegari is “currently thinking about how to build interesting subgroups of hyperbolic groups,” which involves “trying to build an interesting geometric structure out of basic pieces, like building something out of

Lego.” This approach is emblematic of Calegari’s preferred visual, hands-on way of tackling problems. When it comes to research, he says, “I like thinking kinetically, of taking something and manipulating it and gluing things together.”

Calegari, who held professorships at Caltech and the University of Cambridge before joining UChicago, appreciates that “the mathematics department trusts our judgment about what is important.” In his winter 2013 course Agol’s Virtual Haken Theorem, for example, he included some “hot-off-the-presses material” on geometric group theory. Conveying such fresh information to students, he passes on the passion for the subject he learned from Hodgson and the other teachers who helped him rediscover his academic calling.—*Claire Zulkey*

