

students from a mix of communications, journalism, education, business, finance, marketing, and music.”

Krista Schumacher, a junior majoring in elementary education at the University of St. Thomas and a lead education researcher for the Playful Learning Lab, says, “AnnMarie has taught me a multitude of things, but the most important is the ability to apply each person’s unique strengths in our work.” For Schumacher, that has translated into designing exhibits at the Minnesota Children’s Museum and working on a mathematics-



Members of the rock band OK Go experiment with zero gravity in their music video “Upside Down & Inside Out.”

educator guide to accompany OK Go’s slow-motion “The One Moment” music video.

Collin Goldbach, a senior in mechanical engineering and lead engineering researcher for the lab, has worked on projects as diverse as embedding sensors and microcontrollers to accentuate the performance of trapeze artists and building life-size pop-up books for exhibits at local children’s museums. “While we all have some capacity to bring change, the effect when we work together is greater than the sum of its parts,” says Goldbach, who then adds that he learned that lesson from Thomas.

As a St. Thomas undergraduate, Rachel Gehlhar worked with Thomas on a project with Chicago’s Michelin three-star restaurant Alinea to measure the organic volatiles of black and white truffles. She says Thomas gave me “oppor-

tunities as an undergraduate to lead a graduate-level research project and connected me with people I couldn’t have dreamed of meeting on my own.” Gehlhar is now a graduate student at Caltech in the lab of another St. Thomas alum, Aaron Ames, Bren Professor of Mechanical and Civil Engineering and Control and Dynamical Systems.

Play, in the Playful Learning Lab, is defined by Thomas as “joy, whimsy, surprise, and new people.” The lab rules are: “Be kind, play well with others, and clean up your messes.” By having her students take responsibility for marketing, budgets, travel, and lab operations, as well as for the research and design work, Thomas hopes to help them develop competency in many areas.

She says she is less concerned with her students’ grades than with the meaningful work they are accomplishing. When she was a student herself, Thomas says, she excelled at doing projects in classes because she was able to organize and bring together the right mix of people. “If the class didn’t have a major project component, though, whether it was a physics class or a math class, I struggled and did not get an A and probably did not even get a B.”

As a child, Thomas had widely varying interests (“I was a little odd,” she admits) and in high school was convinced she would be a painter or an actress or a musician. Her bachelor’s degree from MIT was in ocean engineering, but she earned a minor in music composition. And while at Caltech, though her PhD was in mechanical engineering, she also took classes at ArtCenter College of Design, even becoming a faculty member there in her third year of graduate school, teaching bioinspired design and robotics as well as collaborating on installation artwork with exhibitions director Stephen Nowlin.

Though Thomas was hardly a typical Caltech graduate student, she says the experience worked for her largely because she found an understanding adviser in mechanical engineering professor Joel Burdick, who “let me do a lot of things.” Burdick, who calls Thomas “a tornado with glasses,” says he knew early on that she was interested in teaching and public outreach, and encouraged her teaching at ArtCenter as well as her leadership role with the Caltech Robotics Outreach Program. He is not surprised that his hardworking and productive graduate student, whose thesis involved robotic jet propulsion, has continued to lead and innovate. “What does surprise me,” he says, “is her ability to juggle so many different things.”

As Thomas tells it, she began to find her true calling after the move to Minnesota, when she invented the conductive, insulating Squishy Circuits as a way for her daughter to play with circuitry. When that took off, she began to realize she had found her sweet spot. At around the same time, she taught a class on the physics of circus

arts, where she had students learn circus skills and then wear sensors while they performed, and later analyze the data they recorded. “And once you’re that professor, then other weird things start happening,” says Thomas.

Thomas glows with pride as she talks about Code + Chords, the software project students in her lab have created, and the awards and published papers that have resulted from this open-source coding library that creates real-time visual displays based on vocal inputs. She lights up still more when she describes the science workshops her students have conducted at the Metro Deaf School in St. Paul and how the students there are now learning to code using the music software from the earlier project.

Add to that a newly established five-year residency at the Minnesota Children’s Museum, where Thomas and her team spend one day a week studying how families interact in the museum and designing new exhibits and experiences, plus a partnership with Jeff Bezos’s space company Blue Origin that will send children’s art designs into space, and it is not hard to see why a colleague recently said to Thomas, “I’d be happy with just one of your projects.” “So would I,” replied Thomas wryly, though she also believes that as stand-alones they would have less impact.

“All the projects I do are related,” she says. “Learning is about curiosity and pulling together unusual things. How do you take things that seem unrelated, be they music and coding, physics and circuses, rock stars and preschoolers, or chemistry and chefs, and smash them together in new ways? That’s our happy spot: we take all these different things and try to see them in new ways.”

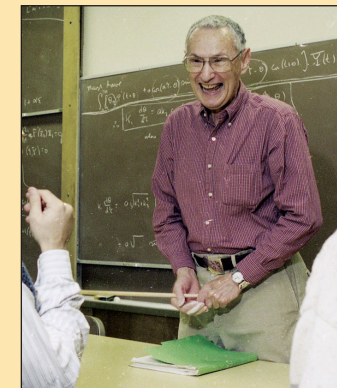
As much as her work focuses on play, Thomas takes collaboration seriously. Too often, she says, people say they collaborate when they are simply calling on someone who has the right piece of software or knows the right math equation. “That’s not collaboration,” she says, “that’s consulting.” She will only agree to a project when she has had a “playdate” with the people involved, and they have started to dream up ideas together.

Naturally, given Thomas’s personality, those early get-to-know-you sessions often end up being playful. When her team was considering working on a music-visualization software project with an a cappella group, she insisted on meeting every member of the group first. “I got to the coffee shop before them and wired up the coffee spoons to a circuit board so they could play music with their spoons,” she says. “With everything I do, it’s about how you bring play to a situation, whether it’s a course or a topic or a project.” Or a meeting with an a cappella group about software. ☺

Learn more about OK Go Sandbox and watch OK Go videos at [okgosandbox.org](http://okgosandbox.org)

# In Memoriam

Read more about their lives at [magazine.caltech.edu/post/in-memoriam](http://magazine.caltech.edu/post/in-memoriam)



## Donald S. Cohen 1934-2020

Donald S. Cohen, Charles Lee Powell Professor of Applied Mathematics, Emeritus, passed away on January 9. Cohen was one of the first faculty members recruited for Caltech’s newly formed applied mathematics program in 1965, earning tenure in 1971. Colleagues and former students remember Cohen’s outgoing personality, quick wit, and engaging lectures. Cohen’s research on nonlinear differential equations, pattern formation, stability, and bifurcations had a significant impact on mathematical biology and chemical engineering.



## Shirley Marneus 1935-2020

Shirley Marneus, who founded Theater Arts at the California Institute of Technology (TACIT) and directed stage productions at Caltech for more than 20 years, died on January 13. Before coming to Caltech, Marneus worked for the Pasadena Playhouse and NBC’s *Jack Benny Show*. Marneus created TACIT in the mid-1980s to provide students a formal theater program with a didactic purpose as well as an entertainment purpose.

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