

- Balto the nimble robot
- Meet Caltech's new librarian
- Volcanoes and Victorians
- Mapping seismic motion

## Off the Wall

Of all the murals adorning the hallways of Ruddock House, which include a Monopoly board and a giant depiction of an astronaut, the copy of M.C. Escher's woodcut *Metamorphose* is one of the most complex. Tom Berto (BS '83) recalls the process of painting it, which began at the start of his junior year: "I bought a copy, mail-order, of the woodcut as a very long, rolled-up poster and enlarged it by a factor calculated to allow it to fit within the available length. Because it is such a long, long woodcut, it was ideal for a long hallway. At the beginning, about four people worked on it, but within a week or two, after just a few feet, the help tailed off, and it was just me. The pattern started out geometric and was easy to enlarge and 'draft' onto the wall with rulers, compass, and pencil, but it quickly became more complicated, and I eventually settled on laying out important reference points on the wall, projecting close-up Kodachrome slides onto the wall, and painting the projected image. I don't think I got to the end of the first wall during my junior year, junior years being what they are at Caltech. In my senior year, my course load eased up, and so I was able to work on it more. I completed it in the last week or two before graduation. I think I spent about 230 hours on it. I painted myself into the mural: about 15 feet from the end there is a seaside village with a promenade, and I added myself, riding a bike. ... I have had a long career as a mechanical engineer: at Hewlett-Packard, then Agilent, then Keysight Technologies. But the painting urge came out as a painting avocation that has been satisfying and durable, if not financially rewarding."

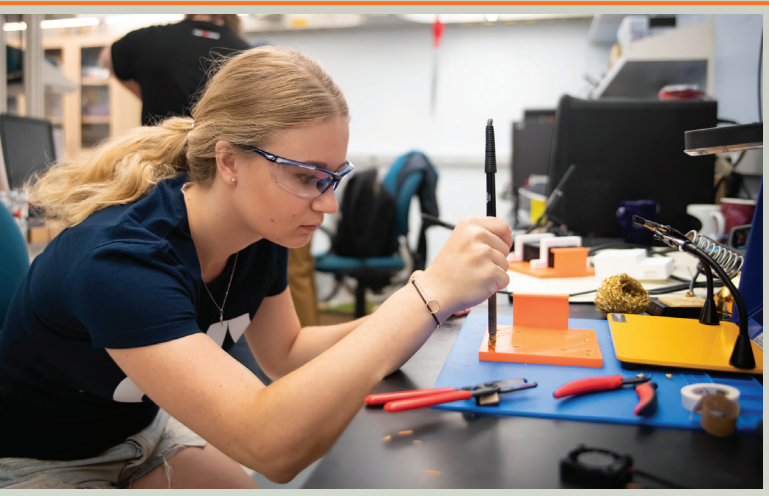
See more of Tom Berto's art at [sonic.net/~monicab/tom](https://sonic.net/~monicab/tom)





# BALTO- Portrait of a Robot

Last summer, Balto, a robot designed and built by undergraduate and graduate students at Caltech in collaboration with robotics researchers at JPL, took to the field in the first phase of the Defense Advanced Research Projects Agency (DARPA) Subterranean (SubT) Challenge. This international competition advances technologies to autonomously map, navigate, and search underground environments. The Caltech-JPL team took second place in that contest and then, in February, claimed first place in the Urban Circuit phase of the competition. Balto, named after a famous rescue dog, was built atop a commercial radio control car and is one of a fleet of robots designed for the competition. Smaller, lighter, and faster than its peers, Balto is deployed primarily as a ground-based scout.



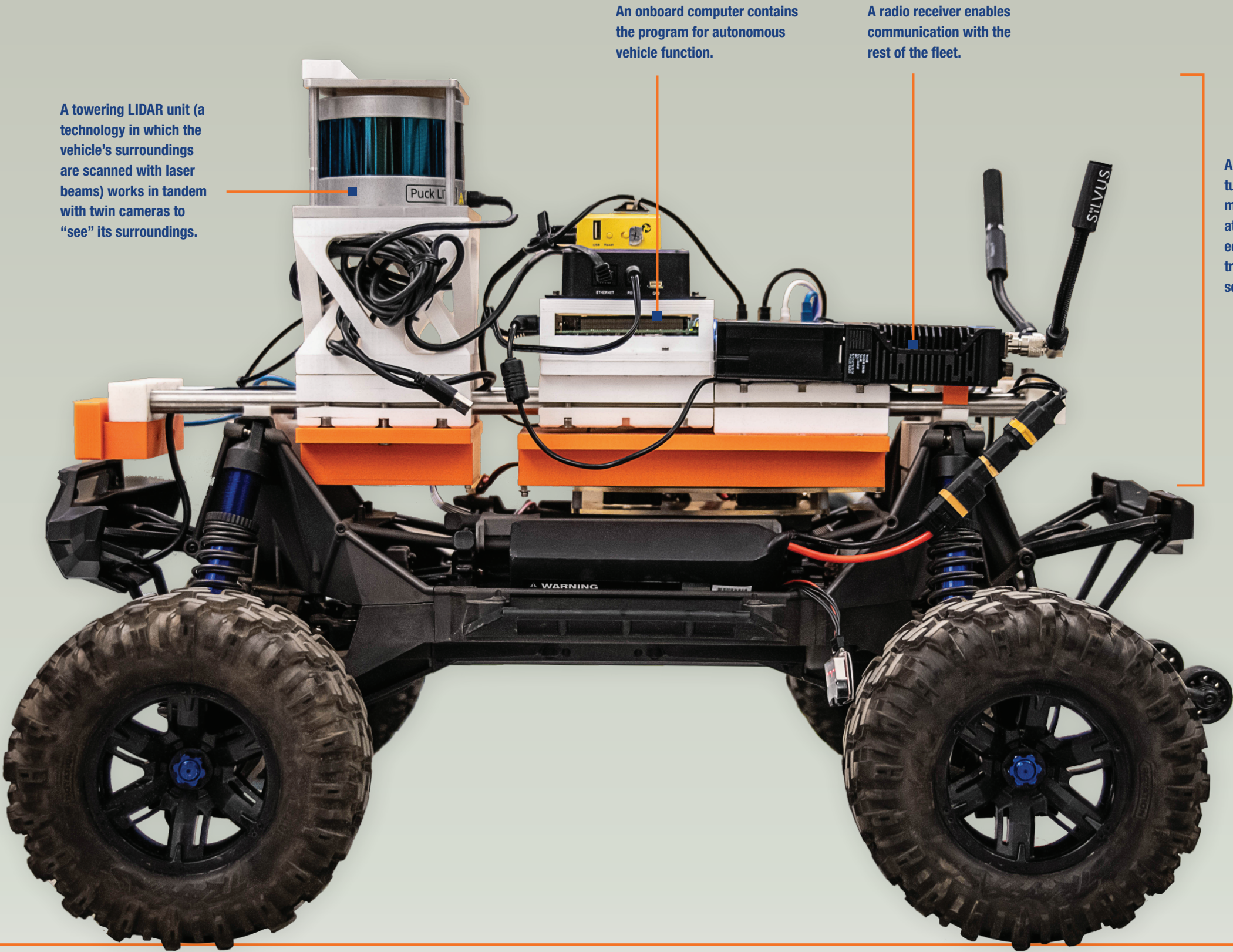
Caltech senior Alexandra Bodrova fabricates custom parts for Balto.

Length: 1 meter

Weight: 12 kilograms

Able to navigate slopes of up to 40 degrees.

Can reach speeds of 55 miles per hour.



A towering LIDAR unit (a technology in which the vehicle's surroundings are scanned with laser beams) works in tandem with twin cameras to "see" its surroundings.

An onboard computer contains the program for autonomous vehicle function.

A radio receiver enables communication with the rest of the fleet.

A removable superstructure (built using milling machines and 3-D printers at Caltech) houses the equipment necessary to transform an R/C car into a self-guided robot explorer.



## Class Act:

## Volcanoes and Victorian Media

Three Questions for:  
Kara Whatley

Caltech's new university librarian, Kara Whatley, came to the Institute from New York City, where she was head of science and engineering library services for NYU. *Caltech* magazine talked with Whatley about modern librarianship and her goals for supporting Caltech's researchers.



## 1. Why did Caltech seem like a good fit for you?

As a science librarian, this is the dream job. Also, even though I've always worked in large research institutions, I attended a small liberal arts college. This is the best of both those worlds: a small institution with an outsized research reputation. That means I can realistically accomplish my goal to meet all the faculty during my first year here, whereas I'm not sure that would have been possible at the other institutions I've worked in. So, the scale of this place and the ability to design library services to closely fit the needs of the researchers and students in almost a boutique kind of way was really appealing to me.

## 2. How have academic libraries changed since you were an undergraduate?

As the mode of communication has changed, the way libraries collect and provide access to information has changed, [but] the job is still, at its core, collecting and providing discoverability and access to research communications.

I think of libraries as having one foot in the 21st century and one in the 19th century because in many ways we are still supporting traditional formats and traditional access to those formats. There are certain disciplines, including mathematics and humanities, where the mode of communication is still a print book.

## 3. What are some of the challenges for librarians today?

I think grappling with what preservation means in a digital age is key. I was having a conversation with one of our division chairs earlier this week, and it turns out that division has lab notebooks from a famous Caltech scientist sitting on the shelves in one of its rooms. And so, of course, I'm interested in what we can do to help preserve those. But in some ways, that's an easy solution, because paper is a pretty good preservation format.

On the other hand, when I was cleaning out my desk at NYU, one of the things I found in the corner of my desk drawer was a stack of floppy disks held together with rubber bands. There were files on there, of course, but I didn't have any way to read them. That's the kind of challenge that we have with born-digital information.

Last fall, Caltech undergraduates had the opportunity to take two new courses offered by Anne Sullivan, the Weisman Postdoctoral Instructor in Visual Culture.

The new classes, *Volcanoes* and *Consuming Victorian Media*, are part of the new Caltech-Huntington Program in Visual Culture, which was established in 2018 with a grant from the Andrew W. Mellon Foundation. The program is designed to expand Caltech students' exposure to different forms of artistic media through coursework, guest lectures, field trips, and artists-in-residence.

## Collaborative classrooms

Sullivan says her classes are based on her own academic interests in 19th-century British literature and culture as well as previous experiences as a writing instructor at UC Riverside.

"When I'm designing classes, I find what I am really excited about but then make it relevant to everybody," she says. "What's great about working at Caltech and close to The Huntington is that I can enrich my own work in scientific literature and culture. These are collaborative classrooms where students learn from one another and the instructor, and the instructor learns from the students as well."

## "Too scintillating"

The course on Victorian media looks at historical concerns around the consumption of media, which at that time included books, art, and live entertainment. The students read *Northanger Abbey* by Jane Austen, in which the main character becomes obsessed with Gothic

novels. "Similar to the way we are concerned with screen time now and how we consume media, 19th-century people had concerns about media consumption, such as of Gothic novels, which were thought to be overly stimulating and too scintillating," she says. The students also read *Dracula* by Bram Stoker, which includes mentions of typewritten notes, telegrams, and phonograph recordings, items that, according to Sullivan, would have been considered new forms of media technology at the time.

## Lava, bonfires, and fireworks

The volcanoes class focused on various forms of media that depict famous disasters brought on by the eruption of volcanoes, including Mount Vesuvius in AD 79, which destroyed the Italian city of Pompeii; Indonesia's Mount Tambora in 1815, one of the largest eruptions in recorded human history; and Mount Krakatoa, also in Indonesia, whose 1883 eruption changed the color of sunsets worldwide for some time afterward. Students studied "pyro-dramas" of the 1880s and 1890s, big outdoor shows that dramatized the Vesuvius eruption for crowds of thousands of people; the shows used bonfires and fireworks along with water-pump systems to create the effects of lava. The course also included a field trip to the Getty Villa in Malibu to see the exhibit *Buried by Vesuvius: Treasures from the Villa dei Papiri*.

"I remember learning about these disasters as a kid and being horrified, but now I am fascinated," says Sullivan. "By examining literary and visual representations of disasters, students engaged with larger questions about how we perceive the past and how we conceptualize our relationship with nature."



*Vesuvius from Portici* by Joseph Wright of Derby, in the collection of The Huntington Library, Art Museum, and Botanical Gardens.

**"I did what I love to do: I started learning. ... I voraciously read files, conducted research in the Archives, and read (and indexed) the official records of the Board of Trustees, starting with 1891 and continuing through to today. I observed and emulated the behaviors and management styles of the people I admired. I reflected on the lessons that I had learned, the challenges that I met, and, most importantly, the mistakes that I made (and, yes, there have been plenty). Where better to be a lifelong learner than at Caltech?"**



— Mary Webster (pictured with Caltech president Thomas Rosenbaum) on assuming the role of secretary of the Board of Trustees in 1987. Webster, who joined the Institute in 1966 as a clerk stenographer at JPL, retired in January 2020.



# Daniel Mukasa (first-year graduate student)

**#SoCaltech** is an occasional series that celebrates the diverse individuals who give Caltech its spirit of excellence, ambition, and ingenuity. Know someone we should profile? Send nominations to [magazine@caltech.edu](mailto:magazine@caltech.edu).

Daniel Mukasa is a graduate student in materials science. He was introduced to Caltech through the WAVE Fellows program, which aims to foster diversity through increased participation of underrepresented students in science and engineering PhD programs.

“I was originally interested in combining medical technology with physics and materials science because my uncle, who is a professor, does work in medical engineering, specifically to help the nation of Uganda, where my family is from. I met Wei Gao [a Caltech assistant professor of medical engineering] and was really interested in how very innovative technology that would not be used necessarily in America can make a dramatic difference in developing countries. I wanted to follow that path. If you can apply technology [like his low-cost sweat-based diagnostics] in a developing country, you can make a substantial change to life expectancy just by being able to monitor people’s health statistics and provide preventive care.”



## History Relocated

As part of the Tianqiao and Chrissy Chen Neuroscience Research Building construction project, the Wilson Court bungalows, originally located on the southeast corner of Del Mar Boulevard and Wilson Avenue, were transported in 2018 two blocks away to the northeast corner of Catalina Avenue and San Pasqual Street. Late in 2019, restoration of the exteriors of the historic bungalow court was completed. The Spanish Colonial Revival–style court was originally built in 1923, with five of the buildings arranged around a central landscaped courtyard. Two additional structures were built to one side of the main court, an unusual feature for a bungalow court and one that adds to its historical significance. As part of the relocation project, Caltech repaired and restored the terracotta tile parapets, lime plaster exterior walls, wooden window trim, French entry doors with arched transoms, and other historical features.

## Quake Map

A decade ago, Caltech earthquake scientists and engineers rolled out a network of low-cost, easy-to-install seismometers. With around 800 sensors now in the L.A. area, the Community Seismic Network (CSN) recently expanded westward with another hundred, thanks to new funding from the Conrad N. Hilton Foundation and Computers & Structures, Inc.

Most of the sensors are situated on L.A. Unified School District campuses, which brings distinct advantages, says Monica Kohler (PhD ’95), a research professor of mechanical and civil engineering. “When an earthquake happens and the waves propagate, we like to see this very coherent picture of what the wave is doing as it travels across the L.A. Basin. And having all of these stations roughly equidistant, at half a kilometer spacing, gives us that information.”

In addition to the LAUSD sensors, the network also includes a 52-story tower in downtown L.A. and several other mid- and high-rise buildings with instruments on every floor. The network provided highly granular and detailed information about how the Ridgecrest earthquake series shook the Los Angeles area and how different buildings responded to the quakes. “For our next batch of stations, we want to focus on the area around West Los Angeles,” says Kohler, “to capture what the effects would be on those high-rises.”

