

A Mind for Sound

Kedar Shashidhar '15, '16 (KEY), one of Rochester's first audio and music engineering graduates, is on the forefront of three-dimensional sound.

Interview by Kristine Thompson

As a high school student in Corning, New York, **Kedar Shashidhar** '15, '16 (KEY) was accepted into the Eastman School of Music for classical saxophone performance. His parents told him he could attend on one condition: that he coupled it with a degree in engineering.

Shashidhar complied, and was admitted as well into the College, where at a required orientation program for students who planned to study engineering, he learned about a soon-to-be-offered major in audio and music engineering.

Shashidhar knew this was the program for him. He withdrew from Eastman and became one of the very first audio and music engineering majors at Rochester.

Today, in addition to designing audio-only games at his studio, Blackout VR, Shashidhar puts his skills to work at OSSIC Studios, a Kickstarter-funded company in San Diego that's developing three-dimensional audio headphones. As the company's associate creative director, he has a range of responsibilities, from product and software tool development, to working directly with designers, musicians, and game developers, to building virtual reality experiences to showcase 3-D audio's potential.

What is three-dimensional audio?

Three-dimensional, or 3-D, audio is about experiencing sound as we hear it in the world. Think about it: sound exists in a particular location; it has directionality. In that way, 3-D audio allows us to experience truly immersive worlds

Ready for a New Reality?

Three-dimensional sound is a basic component of the computer-based experiences known as virtual reality and augmented reality—usually called VR/AR.

VR “allows people to immerse themselves in different worlds,” says Shashidhar. “You can move around in a different reality and even interact in it.” AR “combines reality with the virtual” by allowing users to place virtual items, through a smartphone app, in their “real” environment.

What are some of the best examples of virtual or augmented reality applications that are widely available to consumers now? Here are a few of Shashidhar's favorites.

Google Tilt Brush allows you to paint and create in a 3-D space, then to share your artwork as “room-scale VR masterpieces” or GIFs. Equipment needed: HTC Vive or Oculus Rift virtual reality headset.

Google Blocks can help you create 3-D objects with a simple set of tools. Equipment needed: HTC Vive or Oculus Rift.

TheWaveVR, essentially a giant online wave, is reinventing the concert experience and lets you view, host, and socialize in a virtual environment. Equipment needed: HTC Vive and a computer.

while sitting at the movies, watching TV at home, playing a video game on a gaming console, phone, or computer, or listening to music through any type of device. Even while creating music or composing musical scores.

Can we hear 3-D audio now? If so, where?

It's already creeping into our daily lives. For instance, Dolby is using it in music now. Games are also featuring it. YouTube and Facebook support 3-D audio now when watching 360 videos, too, but there's a ways to go on the technology. Although you can plug in a normal pair of headphones and experience spatial audio from 360-video content that's already there, you might experience spatial blur. This happens when you're trying to pinpoint a sound source, but its location is unclear. It makes it difficult to tell if a sound is coming from in front or behind your head, or directly above or below it. These problems arise because the spatial audio is created using a model of the average human head and ears. In actuality, our individual anatomical differences are key to our ability to tell clearly where a sound is coming from.


Besides entertainment, what are potential applications for 3-D audio?

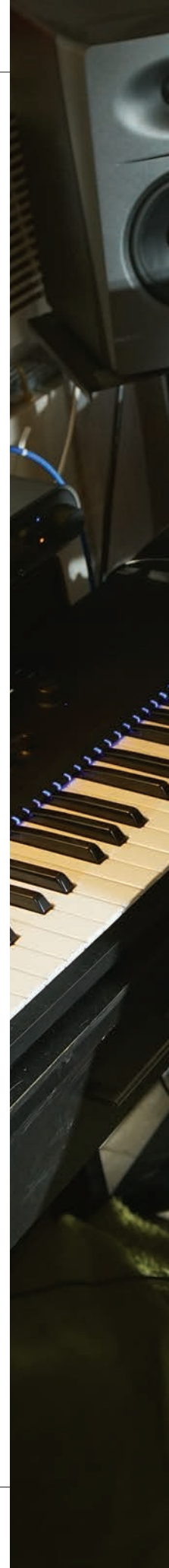
It's certainly of particular interest to a number of industries, such as aerospace or military communication. Imagine, for example, that you're a pilot. Sounds come from many directions inside the cockpit. When sounds are spread out so they aren't coming from one source, our auditory comprehension improves, which can improve pilot reaction times.

Or, say you are on a Skype call with 12 other people from around the country. You hear voices on top of each other and it's nearly impossible to distinguish them. With 3-D audio, you can distinguish among voices that are coming from in front of you, behind you, and to the left or right of you.

What special considerations are involved in developing 3-D headphones?

The OSSIC X headphones we're developing are full of technology that “understands” the distinctive aspects of each listener's anatomy—aspects like head shape and width—that help us figure out where sounds are coming from. An individual's ear for example, is as unique as a fingerprint.

Our headphones also feature head-tracking technology. This helps users confirm where a sound is coming from. It's like when we rotate our heads to get visual confirmation of where a sound is coming from. When we hear a car honking, for example, we turn our heads to locate the car. This head-tracking, paired with the headphone's ear calibration, allows us to create accurate 3-D sound that actually lives outside of our heads. It's the evolution of both the 3-D audio technology you might find on YouTube and the surround sound technology you might find in your movies. 





MULTIDIMENSIONAL: As both a musician and an engineer, Shashidhar is steeped in sound. When he's not working to develop state-of-the-art 3-D headphones and audio-only games, the one-time classical saxophone student—and pioneering audio and music engineering major—sings in a San Diego barbershop quartet.



Systems and Sensibility

C. Mike Lindsey '08, '09 (T5) harnesses his passion for improving systems as an urban agricultural entrepreneur.

By Jim Mandelaro

After working in veterinary medicine for seven years, **C. Mike Lindsey** '08, '09 (T5) was looking for a way to apply his knowledge of animals and biological systems that would have a greater impact.

He discovered it as cofounder of an urban agriculture start-up company.

The company, NexLoop, is the producer of AquaWeb, a system that can be retrofitted onto buildings and that emulates spider webs and cacti to harness rain and fog for use in urban farms. Last fall, NexLoop was awarded \$100,000 in seed money at the

AN ABSORBING PROJECT: With his partners at the start-up NexLoop, Lindsey helps develop systems that harness rain and fog for urban agricultural use—and that are integrated right into the built environment.

Bioneers Conference in San Francisco after winning the Biomimicry Institute's Global Design Challenge.

"We're taking a whole systems approach to the local-food conversation," says Lindsey, who lives in Brooklyn. "Where does your water come from? What if, even in a desert, we could think about irrigation as little as we think about breathing?"

Municipal water is cheap, but there are problems in New York City and many other cities with outdated sewer systems. "If it rains, the streets are flooded within 10 minutes, causing debris to flow directly into surrounding waterways," he says.

Creating soil-based green roofs and other absorptive infrastructure soaks up water and harnesses a free resource for urban farmers. "It also allows an off-the-grid farmer in rural Montana to gather their own water for less than the cost of a well," he adds.

Lindsey is accustomed to thinking broadly, and to making connections across disciplines that might elude others. During his sophomore year at Rochester, the Wisconsin native created

an interdisciplinary major called “integrative neurobiology,” studying the biological and neurological factors contributing to animal behavior and cognition.

“I started taking classes in brain and cognitive sciences and psychology and got pulled into the neuroscience world,” he says. He spent a fifth year completing a Take Five program called “Understanding Bilingual Representation,” in which he analyzed how language is organized in the brain.

His Take Five advisor was Jeffrey Runner, a professor of linguistics and now dean of the College.

“I remember C. Mike as someone who was very creative and very outgoing,” Runner says. “He got the most out of his Rochester experience.”

Lindsey had long wanted to be a veterinarian, and sought experience in the field after graduation. In roles at veterinary hospitals and zoos, “I helped with everything from diabetic cats, to dogs hit by cars, to an anteater’s endoscopy, and even autopsies on endangered species like a clouded leopard and a maned wolf,” he says. The work fascinated him, but “it’s a stressful field and really tough emotionally.”

Not one to limit his pursuits, Lindsey was at the same time following Brooklyn Grange—the largest soil-based rooftop farm in the world—on Instagram. In 2015, he added an apprenticeship there to his routine, as a change of pace.

“It was idyllic, and a stark contrast to stressful days in the emergency room,” he says. “At 5 a.m., I’d watch the sun rise over the New York skyline while picking tomatoes and salad greens in the middle of the city.”

A friend from Rochester connected Lindsey with Jacob Russo, a recent Carnegie Mellon graduate who is completing a master’s program in biomimetic architecture in Germany. They teamed with Anamarija Frankic, an ecology research professor in Croatia who specializes in coastal water ecosystems. NexLoop was formed.

Lindsey’s life course—from Rochester to veterinary work to his role at NexLoop, focused on business and customer development—may seem like it’s taken twists and turns. And yet, some basic elements have been pretty constant. “The common thread in all of this,” he says, “is that I really enjoy using different perspectives to improve systems.”



BUFFALO-BOUND: Daboll has been named offensive coordinator for the Buffalo Bills. He served in that same role in 2017 for the national champion University of Alabama Crimson Tide.

New Game Planner for Buffalo

Brian Daboll '97 has been named offensive coordinator for the Buffalo Bills. The position places him second-in-command behind head coach Sean McDermott.

Daboll won five Super Bowl rings as an assistant coach with the New England Patriots before becoming offensive coordinator at the University of Alabama in 2017 and helping the Crimson Tide win its fifth national championship in nine years.

A Buffalo native who grew up rooting for the Bills, Daboll majored in economics at Rochester and played two football seasons as a safety before an injury in the 1995 season finale ended his playing days. He spent his senior season as a student assistant before beginning his coaching career at the College of William & Mary in 1997.

A Winning Sports Journalist

Ron Thomas '71, a veteran sports reporter and director of the Morehouse College Journalism and Sports Program, won the 2017 Legacy Award from the National Association of Black Journalists. The award is presented annually to “a black print, broadcast, digital or photo journalist of extraordinary accomplishment who has broken barriers and blazed trails.” Thomas—who reported for *USA Today* and the *San Francisco Chronicle*, and is the author of *They Cleared the Lane: The NBA's Black Pioneers* (Bison Books, 2004)—was cited for his own work in addition to his role as an educator and mentor.

Thomas has also been celebrated for work that places sports and the business of sports in social and cultural context. In 2011 he won the Lifetime Achievement Award for Excellence in Sports Journalism from Northeastern University School of Journalism and its educational and consulting center, Sport in Society.



TRAILBLAZER: Thomas is honored by the National Association of Black Journalists.

A Times-Honored Musician

A violinist is named a ‘New Yorker of the Year.’

When a *New York Times* metro columnist asked readers which New Yorkers had made an outsized impact on the city in 2017, readers responded with more than 100 names. Among the four who were ultimately honored in the “New York Today” column was violinist **Kelly Hall-Tompkins** ’93E.


Hall-Tompkins “earned acclaim last year as the fiddler in the Broadway revival of *Fiddler on the Roof*,” wrote columnist Alexandra Levine. “But more than a decade ago, well before she would have imagined landing the coveted violin soloist gig, she was playing chamber music in soup kitchens.”

Hall-Tompkins founded Music Kitchen—Food for the Soul, an organization she started in 2005 that has grown to include nearly 200 chamber musicians—including Hall-Tompkins herself—who offer intimate classical music performances in city shelters, soup kitchens, and other venues. Music Kitchen has expanded to offer performances in other cities as well.

The idea for Music Kitchen “came to me while preparing for a series of solo concerts in February of 2004,” she writes on Musickitchennyc.org. “Having just experienced the passing of a friend, I had not had time to arrange to play through my concert repertoire for my usual friends and colleagues.”

At the urging of her husband, Joe, a volunteer coordinator at a homeless shelter, she played her repertoire at the shelter. “The experience was very rewarding for me. Some had never heard classical music before and some were knowledgeable about it, but all seemed interested and moved by the music.”

Hall-Tompkins is an active soloist, chamber, and orchestral musician. Her soloist role in Broadway’s *Fiddler on the Roof* featured music composed specifically for her.

She has also performed for several years as concertmaster for the Gateways Music Festival, which, in association with the Eastman School of Music, brings together professional classical musicians of African descent. 

—KAREN MCCALLY



QUEEN OF THE HILL, TOP OF THE HEAP: Recognized for making a big impact in the Big Apple, Hall-Tompkins also receives applause for her role as concertmaster of the orchestra of Gateways Music Festival, held in association with the Eastman School of Music.



Joining the Cable (Hall of Fame) Lineup



Naomi Miron Bergman

Naomi (Nomi) Miron Bergman '85, senior executive at the media company Advance/Newhouse, has been named to the Cable Center's Cable Hall of Fame.

Based in Denver, the Cable Center launches exhibits and preserves archives on the history of the industry. The non-profit organization also operates as a hub for industry leaders to help shape cable's future.

Bergman, a University trustee, got her start in the cable business at Bright House Networks, where she became a recognized leader in high-speed data and on improving customer experience.

Alumni Advancing Science

For a brief period this past winter, the president and president-elect of one of the world's leading organizations for the advancement of science were both Rochester alumni.

Steven Chu '70 was named president-elect of the American Association for the Advancement of Science (AAAS) in January. **Susan Hockfield** '73 completed her term as president of the association in February, after which she became chair of its board of directors. Under AAAS rules, the president-elect serves one year in the role before assuming the presidency.



Steven Chu

The AAAS, founded in 1848, is one of the world's largest scientific societies, with more than 120,000 members. With the goal "to advance science, engineering, and innovation throughout the world for the benefit of all people," the association publishes a network of peer-reviewed journals, including *Science*, operates educational programs, and works to inform public policy and lobby on behalf of scientific freedom and cooperation.

Chu, the William R. Kenan Jr. Professor of Physics and Professor of Molecular and Cellular Physiology at Stanford University, won the Nobel Prize for Physics in 1997 and served as secretary of energy during President Barack Obama's first term in office.



Susan Hockfield

Hockfield is a professor of neuroscience at the Massachusetts Institute of Technology and served as president of MIT from 2004 to 2012.

"As secretary of energy, I was reminded daily that science must continue to be elevated and integrated into our national life and throughout the world," Chu wrote in his candidacy statement. "Never has there been a more important time than today for AAAS to communicate the advances in science, the methods we use to acquire this knowledge and the benefits of these discoveries to the public and our policymakers."

—Karen McCally