UC SANTA BARBARA
THE Current

February 19, 2020
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Laser Focus

Honored for his innovations in ultra low-loss photonic integrated circuits and their applications, Daniel Blumenthal, a professor of electrical and computer engineering at UC Santa Barbara, has been awarded the 2020 C.E.K. Mees Medal by The Optical Society of America (OSA). He will receive the medal March 10 during the annual Optical Fiber Communications Conference in San Diego.

Blumenthal leads the Optical Communications and Photonic Integration Group and UC Santa Barbara's Terabit Optical Ethernet Center.

"This is a huge honor, not just for me but for my lab group, for UC Santa Barbara and the College of Engineering, and for our collaborators and colleagues," said Blumenthal, who received the news on his birthday. "Charles Townes, who invented the laser, was a recipient."

"We at the College of Engineering offer sincere congratulations to Dan Blumenthal upon receiving this extremely prestigious award," said Dean Rod Alferness. "The C.E.K. Mees Medal recognizes a record of optics research that is marked not only by pioneering innovation, but also by widespread impact in diverse areas. We are deeply proud of Professor Blumenthal for his continuing contributions, and are delighted for him to receive this most-deserved recognition."

Blumenthal's research spans optical communications and optical packet switching, integrated ultra-narrow-linewidth (sub-Hz) Brillouin lasers, optical gyroscopes, highly integrated, ultra-low-loss indium photonic integrated circuits, integrated atom

cooling, atomic clock photonics, nano-photonics and microwave photonics. His lab develops new devices and system hardware to solve complex communications, transmission, switching and signal-processing problems that are beyond the reach of current technologies.

Blumenthal and his colleagues have a particular focus on integrating new bench-scale functions on small chips, called photonic circuits, which are then used to build networks in ways that save energy and increase the scale of connectivity and bandwidth of data centers and the internet. Their work in developing lasers characterized by having spectrally pure, ultra-stable light sources and ultra-low wave-guide losses is finding increasingly widespread application.

“The technology is becoming pervasive, which is validation of what we’ve thought for a long time and what has been one of my passions,” Blumenthal said, “that being able to put ultra-low-loss and ultra-narrow-linewidth lasers in photonic circuits on chips was the future for a wide variety of applications across a broad range of disciplines.”

Recently, much of Blumenthal’s photonics research has been in the area that he refers to as “beyond silicon.”

“We work in ultra-low-loss, wide-band-gap materials — including silicon nitride, tantalum pentoxide and aluminum oxide,” he explained. “We use these materials to fabricate lasers, waveguides and other photonic circuit components. Now, we are working to impart actuation to them, that is, being able to modulate the phase or the amplitude. We’re making building blocks that people could use to make a table-top atomic clock or optical tweezers, taking all those pieces — the nuts and bolts that people put out on tables with racks full of systems — and moving those functions onto the chip.”

In addition to his research in energy-efficient photonics for communications, Blumenthal has served as the principal investigator for large-scale research programs including the DARPA/MTO-funded CSWDM, Label-Switched Optical Router (LASOR), and iPhod projects. He also has served on the board of directors for National LambdaRail and on the Internet2 Architecture Advisory Council. He has been a guest and associate editor for multiple journal issues put out by the Institute of Electronic and Electrical Engineers (IEEE) and an organizer and technical program committee member for multiple international world-renowned conferences, including

the Conference on Optical Fiber Communications.

Blumenthal holds three degrees in electrical engineering: a bachelor of science from the University of Rochester, a master of science from Columbia, and a doctorate from the University of Colorado, Boulder. He was named a fellow of the National Academy of Inventors in 2017 and is a fellow of both the IEEE and the Optical Society. He received a Presidential Early Career Award for Scientists and Engineers from the White House in 1999, a National Science Foundation Young Investigator Award in 1994 and an Office of Naval Research Young Investigator Program Award in 1997. Blumenthal has authored or co-authored more than 460 papers, holds 22 patents and is co-author of “Tunable Laser Diodes and Related Optical Sources” (New York: IEEE–Wiley, 2005).

OSA President Stephen D. Fantone, founder and president of the Optikos Corporation, described Blumenthal as “an excellent choice for the C.E.K. Mees Medal. He is an innovator who continues to push boundaries in the use of electronic and photonic materials.”

The Mees Medal recognizes an original use of optics across multiple fields and honors the memory of Mees, who contributed preeminently to the development of scientific photography and was a charter member of OSA. The British-born Mees co-developed the first panchromatic photographic plates and was the founder and first director of Kodak Research Laboratories in Rochester, New York.

About UC Santa Barbara

The University of California, Santa Barbara is a leading research institution that also provides a comprehensive liberal arts learning experience. Our academic community of faculty, students, and staff is characterized by a culture of interdisciplinary collaboration that is responsive to the needs of our multicultural and global society. All of this takes place within a living and learning environment like no other, as we draw inspiration from the beauty and resources of our extraordinary location at the edge of the Pacific Ocean.