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UNIVERSITY<sup>®</sup>

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MSEC SEMINAR AND COMMERCIALIZATION FORUM



INVITED SPEAKER:

**DR. WILLIAM O'BRIEN**

“INDUSTRIAL R&D PERSPECTIVES IN  
QUANTUM COMPUTING AND SILICON PHOTONICS”



**March 13<sup>th</sup>, 2020**

**1:30 – 3:00 PM**

RFM 3224

**Abstract:**

Two active fields of research with near-term commercial implications are Silicon Photonics (SiP) and Quantum Computing (QC). In this seminar, an in-depth and diversified perspective on technology development will be shared, drawing from experiences spanning quantum computing hardware development in a well-funded Silicon Valley start-up (Rigetti Quantum Computing) to hybrid Si-III/V laser development in a big company (Intel Corporation). Details on the technical challenges will be presented, along with commentary on cultures and norms in the different companies and technology fields.

In the first half, the concept of Quantum Computing will be explained, with some examples of near-term applications and implications for our society. The focus will be on the superconducting QC implementation. Technical challenges for quantum hardware are illustrated through the development of Superconducting Through-Si Vias, which were improved from single-digit yields to 90%+ by materials engineering.

FOR MORE INFORMATION OR IF YOU WOULD LIKE TO HAVE LUNCH WITH THE SPEAKER,  
PLEASE CONTACT DR. SHANNON WEIGUM AT [SWEIGUM@TXSTATE.EDU](mailto:SWEIGUM@TXSTATE.EDU)



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The remaining time will illuminate the Silicon Photonics enterprise at Intel, which operates as an internal start-up, and has succeeded in bringing 20 years of in-house Si photonics research and a laser on silicon to high volume. The focus will be on the latest SiP product release, which is an optical transceiver for 5G wireless (operating from -40C to 85C), linking cellular antennae to data centers. The fabrication process, device physics and materials science behind Intel optical transceivers and hybrid Si-III/V lasers will be explained. Results approved for public release will be presented, demonstrating world-class capabilities in competitive domains beyond CPUs.

**Biography:**

After engaging early in research on optoelectronic devices and Molecular Beam Epitaxy as an undergraduate at University of California Santa Barbara, William A. O'Brien continued to gain depth in electronic materials at the University of Notre Dame, earning an M.S. in EE in 2012 and Ph.D. in 2016. His graduate work included 3D strain engineering on Ge membranes and development of embedded Ge quantum dot photonic devices, for which he received the Best Manuscript Award at the 2014 Electronic Materials Conference.

William went on to complete a graduate internship at Intel Corporation in Santa Clara, where he worked on high speed optoelectronic measurements and data analytics to support Hybrid (Si/III-V) Laser development. He then joined Rigetti Quantum Computing as a founding member of the fabrication team, developing a process for high-yield Superconducting Through-Si Vias and repeatable flip chip bonding for qubit shielding and 3D connectivity. William is now a Sr. Development Integration Engineer at the Intel HVM fab in New Mexico. He currently drives Hybrid Laser experiments at high volume, develops the process for new devices/components, and is responsible for the quality of all III-V laser material used on Intel Silicon Photonics products in development.

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