Third Annual Holonyak Workshop

University of Illinois Urbana-Champaign

September 10-11, 2026

Holonyak Micro & Nanotechnology Laboratory
The Grainger College of Engineering
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

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Thursday, September 10, 2026

8:00 – 9:00 AM	**8:00 – 8:45 AM** Check-in and Breakfast **8:45 – 8:55 AM** Opening Remarks
9:00 – 10:40 AM	**Session 1: Next-Generation AI Interconnects** **Joy Laskar, Attotude Inc. - Plenary** "THz Transmission over Dielectrics for 448Gb/s Data Center Connectivity" **Andrew Kim, New Silicon** "Silicon’s next layer: Lightwire & the integration of compound semiconductors into silicon chips" **Chun Lei, Lumentum Inc. - Plenary** "Scaling Semiconductor Lasers for AI Infrastructure: From Innovation to High-Volume Manufacturing" **Hooman Mohseni, Northwestern** "Heterogeneous Integration of Ultra-Low-Energy Optoelectronics on CMOS for Next-Generation Quantum and AI Systems"
10:40 – 11:00 AM	**Coffee Break**
11:00 AM – 12:00 PM	**Session 2: Wide- and ultra-wide bandgap materials and devices I** **Hongping Zhao, OSU** "Advancing Wide- and Ultra-Wide-Bandgap Semiconductors for Power, RF, and Emerging Electronics" **Shubra Passayat, U. Wisconsin** "Doping of ultrawidebandgap III-N materials with MOCVD" **Siddharth Rajan, OSU** "Heterostructure and Device Engineering for High-Performance Ultra-Wide Bandgap AlGaN Transistors"

Thursday, September 10, 2026

12:00 – 1:30 PM	**Lunch Break**
1:30 – 3:10 PM	**Session 3: Lasers and integrated photonics**
	Yung-Chung Kao, IntelliEpi - Plenary "Production-scale MBE development to support future III-V devices/ICs for AI"
	Paul Leisher, University of Central Florida "Exploring the physical limitations of brightness, power, and efficiency in edge-emitting semiconductor lasers"
	Di Liang, U. Michigan "Lighting the Path to AI Computing: Heterogeneous Photonic Light Sources and Beyond"
	Richard Mirin, UCSB "Integrated Semiconductor Lasers for Quantum Systems"
3:10 – 3:30 PM	**Coffee Break**
3:30 – 5:10 PM	**Session 4: Wide- and ultra-wide bandgap materials and devices II**
	James Speck, UCSB - Plenary "Understanding the Efficiency of GaN-Based Violet, Blue, Green, and Red LEDs"
	Can Bayram, UIUC "VISION: Visible Interconnects for Scalable Integrated Optical Networks"
	Rongming Chu, UIUC "Gallium Nitride Electronics for Higher Voltage and Higher Temperature"
	Marko Radosavljević, Notre Dame "300mm GaN MOSHEMT for RF applications"

Thursday, September 10, 2026

5:10 – 5:30 PM	**Day one closing remarks and announcements**
5:30 – 7:30 PM	**Poster Session & Networking Reception at HMNTL**
7:30 – 9:30 PM	**Banquet for speakers, organizers, sponsors, and special guests (invitation only)**

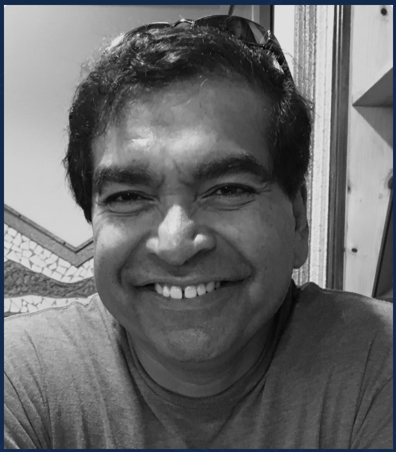
Friday, September 11, 2026

8:00 – 9:00 AM	**Check-in and Breakfast**
9:00 – 10:10 AM	**Session 5: High-speed systems- an industry perspective** **Ray Milano, formerly Vitesse Semiconductor - Plenary** "Vitesse Semiconductor: A 1984 GaAs IC Start-up" **John Calvin, Keysight - Plenary** "Standards and technology roadmap to 3.2Tbps I/O systems"
10:10 – 10:45 AM	**Coffee Break**
10:45 AM – 12:00 PM	**Session 6: Student and postdoc contributed talks** **Abdelghany Abouelnagga (PI: Can Bayram)** **Devon Lee (PI: Minjoo Larry Lee)** **Emily Becher (PI: John Dallesasse)** **Fanming Liu (PI: Rongming Chu)** **Ze-Wei Chen (PI: Hyunseok Kim)**
12:00 – 12:15 PM	**Day 2 closing remarks**
12:15 PM	**Box Lunch**

Joy Laskar, Attotude Inc.
Plenary

THz Transmission over Dielectrics for 448Gb/s Data Center Connectivity

The next generation of AI interconnect technologies, need to deliver the bandwidth, efficiency, and scalability that support future AI infrastructure for per-lane data rates of 200G, 400G, and 800G. Scale-up interconnects for AI are currently served by copper, but reach halves with every doubling of lane speed due to signal loss, limiting today's links to 1–2 m. TThe AttoTude scale-up interconnect extends this reach by combining RF, sub-THz, and THz ASICs with dielectric waveguides in compact, high-density cable assemblies.



Joy Laskar is co-founder and CTO of Attotude, which is developing ASIC over Dielectrics for Data Center Interconnects. A former distinguished professor, Laskar is renowned for his groundbreaking work in radio frequency electronics. His inaugural venture delivered the primary power amplifier solution for Intel’s Centrino platform. He subsequently established several companies that propelled advancements in CMOS power amplifier technology, active cable interconnects and low-power millimeter wave gigabit wireless circuits. Dr. Laskar has served in executive capacities including CTO and CEO, fostering innovation in wireless connectivity and sensor products across multiple industries. He holds 70+ patents (issued or pending) and has authored 600+ publications. Dr. Laskar is an IEEE Fellow and distinguished alumni of both his alma maters, earning a B.S. from Clemson University and Ph.D. from the University of Illinois at Urbana-Champaign.

Chun Lei, Lumentum Inc.
Plenary

Scaling Semiconductor Lasers for AI Infrastructure: From Innovation to High-Volume Manufacturing

The rapid growth of AI infrastructure is driving unprecedented demand for high-speed optical connectivity and creating new requirements for semiconductor laser manufacturing. This talk will discuss the journey from technology innovation to high-volume production, drawing on experiences across multiple laser technologies. It will highlight the challenges and strategies required to achieve scale, performance, quality, and cost, and explore how advances in manufacturing technology, automation, data, and AI are helping enable the next generation of photonics.

Chun Lei is Group Vice President of Global Wafer Fabs at Lumentum, leading operations across the U.S., U.K., and Japan. With more than 30 years in photonics and semiconductor technology, she has worked across R&D, product and process development, technology scale-up, and high-volume manufacturing. Her career includes leadership and technical roles at Lumentum, Emcore, Intel, Finisar, and HP. She holds a Ph.D. in Electrical Engineering from The University of Texas at Austin.

Yung-Chung Kao, IntelliEPI
Plenary

Production-scale MBE development to support future III-V devices/ICs for AI

IntelliEPI is a leading provider of epitaxial materials, enabled by a scalable, multi-wafer molecular beam epitaxy (MBE) production platform. The company serves the electronic and optoelectronic markets with epitaxial wafers based on GaAs, InP, GaSb, and III-N material systems. Key capabilities include GaAs pHEMT, InP HBT and HEMT, PIN photodetectors and electro-absorption modulators (EAMs) for AI and data center interconnect applications, avalanche photodiodes (APDs), lasers, VCSELs, infrared detector materials for focal plane array (FPA) imaging, and GaN for ohmic contact regrowth.

As data-intensive applications in communication networks demand ever higher bandwidth and capacity, the performance requirements for optoelectronic and RF devices are outpacing what current epi-tools can provide. To achieve higher power, efficiency, and speed, the epitaxial industry needs to expand its capabilities and relax restrictions to support 5G/6G, AI, and beyond.

Recent progress in MBE VCSEL and quantum dot (QD) epitaxy will be highlighted, with an emphasis on material uniformity, scalability, and device integration. The presentation will also discuss IntelliEPI’s production MBE strategy, focusing on how process design, tool configuration, inter-system linkage, cluster tool connection, and manufacturing philosophy adapt to the evolving demands of the commercial epitaxial wafer landscape. We will demonstrate how a traditional MBE chamber can be integrated with a metallization chamber and/or a hydrogen chamber for post-growth metallization and pre-growth low-temperature cleaning for regrowth, respectively.

Acknowledgment: Paul Pinsukanjana, Wei Li, Juan Li, Everett Fraser, Chen-Yu Chen, Jiayi Shao, Mukul Debnath, Joseph Middlebrooks, Kevin Vargason, and Patrick Chin.

Dr. Yung-Chung Kao is the Chairman/CEO of IntelliEPI, a leading merchant supplier of III-V compound semiconductor epitaxial materials produced by Molecular Beam Epitaxy (MBE) technology for the electronic and optoelectronic industries. The company was founded in 1999 and is currently listed on the Taipei Exchange.

Dr. Kao has 40 years of extensive technical experience in compound semiconductor materials development and manufacturing. Previously, he was at Texas Instruments, Inc., from 1987 to 1998, where he served as a Senior Member of the Technical Staff and headed the III-V MBE group at TI Central Research Laboratory. Dr. Kao has authored or co-authored over 100 technical publications and 2 book chapters, and has been granted 13 US patents in areas ranging from MBE technology development and semiconductor materials to advanced MMIC devices. He received his Ph.D. in Electrical Engineering from UCLA in 1987, his MSEE from Texas A&M University in 1982, and his BS in Physics from National Tsing Hua University, Hsinchu, Taiwan, in 197

James S. Speck, University of California Plenary

Understanding the Efficiency of GaN-Based Violet, Blue, Green, and Red LEDs

GaN-based light emitting diodes have revolutionized lighting and display. In this presentation we consider progress in the wall plug efficiency (WPE) η_{WPE} of blue, green and red LEDs. The WPE is given as the product of the light extraction efficiency η_{IQE}, internal quantum efficiency η_{IQE}, and electrical efficiency η_{elec}

$$\eta_{WPE}=\eta_{LEE}\ \eta_{IQE}\ \eta_{elec}$$

where the "ABC" model is often used to describe the IQE, where

$$\eta_{IQE}=(Bn^2)/(An+Bn^2+Cn^3)$$

The internal quantum efficiency is determined by competition between radiative recombination ("B-coefficient") and nonradiative recombination. At low carrier density, namely due to Shockley-Read-Hall recombination ("A-coefficient") at still poorly identified point defects of either intrinsic or extrinsic origin, and Auger-Meitner (A-M) three body (eeh or ehh) recombination at high carrier density ("C-coefficient"). We discuss the results of differential carrier lifetime measurements on designer SQW violet, blue, and green LEDs to quantitatively determine the A, B, and C coefficients and their surprising trend with increasing indium content in the InGaN QWs.

We present the important result of lateral injection by V-defects and their major impact on reducing the forward voltage of green, yellow and red LEDs. We discusss the importance of the junction voltage (usually close to the photon "voltage" V_{ph} $=h\nu/q$) in efficiency and possible carrier overflow. Today's SOA LEDs have junction voltages far below the diodes built-in voltage V_{BI} and thus electron or hole overflow is nearly impossible at all operating temperatures.

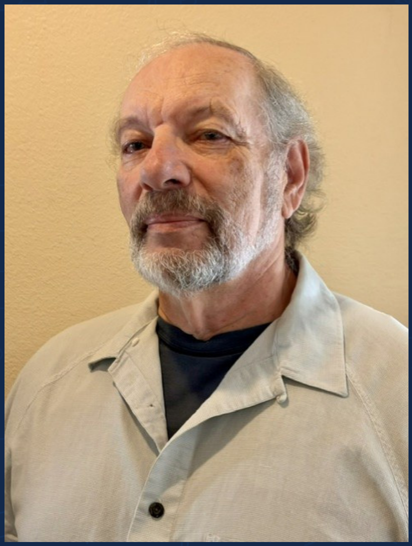
In this talk we highlight work on electron emission spectroscopy for the direct measurement of hot electrons resulting from eeh recombination and quantitative demonstration of the n^3 dependence of the emitted electron current.

James S. Speck is a Distinguished Professor in the Materials Department at the University of California Santa Barbara. He received as Bachelors of Science and Metallurgical Engineering in 1983 and his S.M. and Sc.D. from the Massachusetts Institute of Technology in 1985 and 1989, respectively. He joined UCSB in 1990 as an Asst. Professor. Speck's early work focused on epitaxial oxide films on semiconductors, ferroelectric thin films, and strain relaxation in highly misfitting epitaxial systems. He has worked extensively on the materials science of GaN and related alloys. Major aspects of his work on nitrides include elucidating basic growth modes and defect generation, the development of MBE growth of GaN, and the development of nonpolar and semipolar GaN, revealing the nonradiative processes in GaN LEDs, and a large body of early work on β-Ga2O3. He was the recipient of the Quantum Device Award from the International Symposium on Compound Semiconductors,the IEEE Photonics Society – Aron Kressel Award, and the North American MBE Conference James S. Harris award. Recently he was a recipient of a Vannevar Bush Faculty Fellow from the U.S. Department of Defense. He is an inaugural Fellow of the Materials Research Society, a Fellow of the American Physical Society, and a Fellow of the National Academy of Inventors.

Ray Milano, formerly Vitesse Semiconductor Plenary

Vitesse Semiconductor: A 1984 GaAs IC Start-up

Following a period of intense basic research, GaAs went through a significant development phase for both electronic and optical applications. The demonstration of MESFET and HBT transistors with superior high frequency performance resulted in strong interest in the creation of optimized devices and circuits for both commercial and defense systems. Several new companies were started with private and venture capital. In addition, DARPA funded three GaAs IC pilot lines at existing aerospace companies. Vitesse Semiconductor successfully developed a volume manufacturing IC process based on enhancement and depletion mode MESFETs. The primary markets served were commercial applications in computing and communications. They became a dominant supplier of communications products by providing higher performance as compared to ECL products. This presentation will focus on the significant technical challenges involved with formulating a GaAs IC process capable of LSI/VLSI complexity products, and the competition and market conditions which impacted technology development and product strategies.



Ray Milano is an experienced technologist and entrepreneur specializing in semiconductor materials and devices, technology development from inception to proof of concept, and the transition of new technologies to volume production. His experiences span the development and commercialization of GaAs integrated circuits, high efficiency solar cells, and optical communications systems. These include the first monolithic optical receivers for the implementation of GbE data communications, thin film GaAs solar cells with record-setting efficiency of > 29%, design and construction of advanced process tools for solar cell manufacturing, and optical communications modules for 1.2Tb/s data transmission.

Ray received a PhD in electrical engineering from the University of Illinois at Urbana-Champaign under the supervision of Prof. Gregory Stillman.

John Calvin, Keysight
Plenary

Standards and technology roadmap to 3.2Tbps I/O systems

The finalization of the 1.6T specifications at 224Gbps and the rapid transition to 3.2T 448Gbps specifications has required advances in test and measurement science and techniques. We will cover major measurement changes occurring at 224Gbps that have been incorporated into standards specifications as well as discuss thought leadership around what will be needed at 448Gbps and 100+GHz instrumentation.

John Calvin is a strategic planner and DataCom technology lead for Keysight Technologies. John has been bridging the measurement science gaps of emerging Telecom and DataCom development efforts for 20 years. He serves on the Ethernet Alliance board of directors and is a senior member of IEEE 802.3, OIF-CEI, InfiniBand, and PCIe development efforts. John holds a BSEE from Washington State University.

Andrew Kim, New Silicon Corp.

Silicon's next layer: Lightwire & the integration of compound semiconductors into silicon chips

As AI applications amalgamate ever increasing compute resources, off-chip bandwidth – not compute – has become the main constraint on system performance.

The miniaturization of packaged fiber optic links is giving reach to bandwidth closer to core processor and memory, but link density and energy are orders of magnitude away from supplanting the high performance electrical links that connect processor and memory today.

This talk introduces Lightwire, an optical link fabricated into silicon chips with a monolithic, full-wafer process that integrates front-end silicon and compound semiconductor devices via silicon back-end interconnects. Lightwire chips drop into existing 2.5D packaging to interconnect modern chiplets with link density and efficiency rivaling electrical interconnects, while providing meter scale reach.

Andrew is CEO of NSC. He was a member of the Scientific Advisory Board for the Low Energy Electronic Systems (LEES) program in the Singapore-MIT Alliance for Research and Technology (SMART) where the foundational technology for NSC was developed. He contributed to the rise of solid-state lighting during a 16 year career at Lumileds in leadership positions in both R&D and operations. He then co-founded Glint Lighting, a leader in advanced lighting whose flagship product, Hero, won every possible major industry and design award and is featured in prominent installations worldwide; he later led the acquisition of Glint in 2024. He chairs the SEMI HB-LED technical committee and is a member of numerous other industry and technical boards. He is a recognized expert in semiconductors, epitaxy, integration, and lighting and holds 16 U.S. patents in these fields. Andrew received his S.B. and Ph.D. degrees from the Massachusetts Institute of Technology.

Hooman Mohseni, Northwestern University

Heterogeneous Integration of Ultra-Low-Energy Optoelectronics on CMOS for Next-Generation Quantum and AI Systems

The next generation of quantum and AI systems are constrained by the heat generation and bandwidth cost of moving information. This talk presents our work at the Mohseni Lab on heterogeneous integration of ultra-low-energy optoelectronic and photonic devices directly onto CMOS. By co-integrating III–V and two-dimensional materials, we build sensitive detectors and optical interconnects while preserving CMOS manufacturability. I will describe nanoscale phototransistor, modulators, and 2D arrays on CMOS readout, bonding strategies that mitigate cryogenic thermomechanical strain, and femtojoule-per-bit optical links for energy-limited applications.

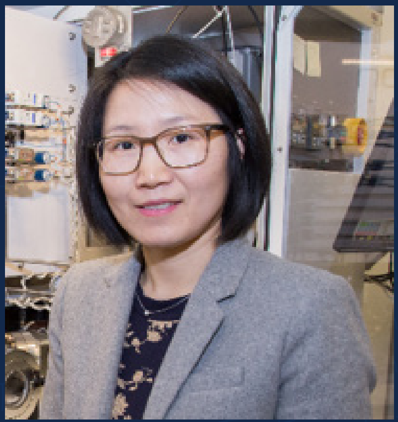
Hooman Mohseni is the AT&T Chair Professor of Electrical and Computer Engineering and Professor of Physics and Astronomy at Northwestern University. He is the recipient of several research and teaching awards including W.M. Keck Foundation Award, NSF CAREER Award, DARPA Young Faculty Award, and Northwestern Faculty Honor Roll. Mohseni has served on many international conference committees, scientific review panels, and editorial boards. He has published over 275 articles in major journals including Nature, Science, Nature Photonics, and Nature Astronomy. Mohseni has been involved in several startups as founder and CTO. He holds 87 US and International patents. He is a Fellow of National Academy of Inventors (NAI), SPIE, and OSA.

Dr. Hongping Zhao, Ohio State University

Advancing Wide- and Ultra-Wide-Bandgap Semiconductors for Power, RF, and Emerging Electronics

Wide- and ultra-wide-bandgap (WBG/UWBG) semiconductors are enabling advances in power/RF electronics, optoelectronics, and other emerging electronic technologies. Their large bandgaps and high breakdown fields provide opportunities for higher efficiency, greater power density, and operation in extreme conditions.

This talk will discuss our recent efforts on the development of WBG and UWBG semiconductors using metalorganic chemical vapor deposition (MOCVD). I will start with gallium nitride (GaN), where progress in epitaxial growth, defect control, and device design has enabled the development of vertical power devices with record high voltage capability. The talk will also cover emerging nitride semiconductors beyond conventional III-nitrides. In particular, II-IV-nitrides offer an expanded platform for band structure engineering and device design. Recent developments in the growth and properties of a series of II-IV-N2 will be presented, along with their potential applications in electronics and ferroelectrics. In addition, recent progress in UWBG gallium oxide and related oxide semiconductors will be discussed. Topics include epitaxial growth, doping and impurity control, charge transport, alloy development, phase stabilization, and heterostructure design.



Hongping Zhao is a Professor in the Department of Electrical and Computer Engineering and the Department of Materials Science and Engineering at The Ohio State University. She received her Ph.D. in Electrical Engineering from Lehigh University in 2011. Her research focuses on wide- and ultra-wide bandgap semiconductor materials and devices, covering III-nitrides, II-IV-nitrides, Gallium Oxide, and related materials for applications in power electronics, RF electronics and ferroelectric devices. Prof. Zhao serves as an Associate Editor for Applied Physics Letters and Journal of Crystal Growth. She also actively serves on technical program committees for major conferences. Prof. Zhao served as General Chair for GOX2024 and as a member of the steering committee for GOX2025. She currently serves as Program Chair for IWGO 2026.

Shubhra Pasayat, UW Madison

Doping of ultrawidebandgap III-N materials with MOCVD

AlN, an ultra-wide bandgap semiconductor, possesses significant potential for power electronic and deep UV emitter applications, owing to its ultra-wide bandgap (6.1 eV) and high thermal conductivity (319 W /mK). However, AlN-based devices face challenges regarding doping control. In particular, Si-doped n-AlN deposited by metal-organic chemical vapor deposition (MOCVD) suffer from severe carrier compensation arising from the formation of compensating defects, such as aluminum vacancy, aluminum vacancy-Si complex, DX centers, and unintentional carbon incorporation on nitrogen site. Dr. Pasayat will present how her group's recent efforts have resulted in breakthrough results in realization of low sheet resistance n-AlN layers deposited on both bulk AlN and AlN on sapphire substrates. The outcomes of the studies performed by her group highlight the development of new n-AlN material process deposition regime using traditional MOCVD chambers, enabling improved electrical performance without the application of external stimuli during the deposition process.

Shubhra S. Pasayat is the Dugald C. Jackson Assistant Professor at UW Madison and has extensive experience in III-N MOCVD with numerous important research outcomes in the field of III-Nitrides including first demonstration of elastic strain manipulation in III-Nitrides as well as light electron and light hole demonstration, record low sheet resistance in AlGaN/GaN HEMTs, record n-AlN conductivity with MOCVD and one of the best reported AlGaN channel HEMT results. She has received multiple recognitions for her accomplishments, including the DARPA Young Faculty Award, NSF CAREER award, Harold M. Manasevit Young Investigator Award from the American Association of Crystal Growth, and the Early Career Innovator Award from University of Wisconsin.

Siddharth Rajan, Ohio State University

Heterostructure and Device Engineering for High-Performance Ultra-Wide Bandgap AlGaN Transistors

Wide bandgap semiconductors such as GaN and SiC have transformed RF and power electronics, but emerging ultra-wide bandgap (UWBG) materials such as AlGaN offer the potential to extend performance far beyond what conventional GaN devices can achieve (Fig. 1). The study of ultra-wide bandgap AlGaN opens several exciting new scientific opportunities for a deeper understanding of carrier transport, breakdown, and thermal effects in these novel heterostructure systems. Engineering high-performance semiconductor devices using ultra-wide bandgap AlGaN also requires new design approaches for contacts, heterostructures, dielectric interfaces, and device topologies. The presentation will discuss recent progress in understanding the properties of AlGaN heterostructures, and building high-performance transistors based on these materials.

Siddharth Rajan is Distinguished Professor of Engineering with joint appointments in Electrical and Computer Engineering and Materials Science and Engineering departments at The Ohio State University, where he joined the faculty in 2008. He received his PhD in Electrical and Computer Engineering from University of California, Santa Barbara, and has held research positions at UC Santa Barbara and GE Global Research. Rajan's research focuses on wide and ultra-wide bandgap semiconductor materials and devices. He has co-authored 8 book chapters, over 220 journal papers, and delivered over 150 invited presentations.

Paul Leisher, University of Central Florida

Exploring the physical limitations of brightness, power, and efficiency in edge-emitting semiconductor lasers

Semiconductor lasers are a key component in numerous emerging photonics-enabled technologies. Modern high power semiconductor lasers are extremely good at converting electricity into light, but these devices are fundamentally limited by low coherence and poor beam quality which arise from effects such as thermal- and carrier-induced lensing. As a result, they are commonly employed as pumps for solid-state and fiber lasers, rather than as direct sources. These systems could be greatly improved and simplified if semiconductor lasers could be directly utilized, but this can only be made possible by addressing the fundamental physical limitations of beam quality and coherence in a manner that does not compromise the semiconductor laser's inherent ability to scale power and brightness with high efficiency. This talk explores recent progress in the development of high-performance semiconductor lasers. We will examine the physical mechanisms that limit power scalability, coherence, beam quality, and efficiency and review semiconductor laser architectures designed to mitigate these effects. By pushing the limits of brightness and coherence, this research opens the door to more simplified, efficient, and robust laser systems to accelerate their deployment into next-generation technologies and enable new frontiers in science.

Paul Leisher is a leading authority on high-power semiconductor lasers and currently serves as Professor of Optics and Photonics at the University of Central Florida (UCF) College of Optics and Photonics (CREOL) in Orlando, Florida. Dr. Leisher is also an active industrial consultant in the field of photonics and semiconductor lasers and works with companies ranging from small domestic photonics startups to large multinational corporations in the automotive and industrial manufacturing fields; he serves in a technical advisory role to the boards of several companies and is a limited strategic partner with a California-based venture capital firm.

Prior to joining UCF, Dr. Leisher served as Vice President of Research and a Fellow at Luminar Technologies Inc. in Orlando, FL, where he was responsible for leading the company's research and development of laser sources for LIDAR. Prior to its acquisition by Luminar in 2022, he served as Vice President of Research at Freedom Photonics in Santa Barbara, CA where he was focused on the development of the world's highest brightness laser diodes. Dr. Leisher held previous positions as Chief Engineer for Diode Lasers at Lawrence Livermore National Laboratory, Associate Professor of Physics and Optical Engineering at Rose-Hulman Institute of Technology, and Manager of Advanced Technology at nLight Corporation. He received his B.S. degree in electrical engineering from Bradley University (Peoria, Illinois) in 2002, and M.S. and Ph.D. in electrical and computer engineering from the University of Illinois at Urbana-Champaign in 2004 and 2007, respectively.

Dr. Leisher's research interests include the design, fabrication, characterization, and analysis of high-power semiconductor lasers and other photonic devices. He has served as principal investigator / principal business official on over $43M in research programs to date and authored/co-authored over 300 technical patents, journal articles, and conference presentations. Dr. Leisher serves on the technical committee of many conferences and is an active reviewer for most journals in the field. Dr. Leisher is a Fellow of SPIE and senior member of IEEE.

Di Liang, University of Michigan

Lighting the Path to AI Computing: Heterogeneous Photonic Light Sources and Beyond

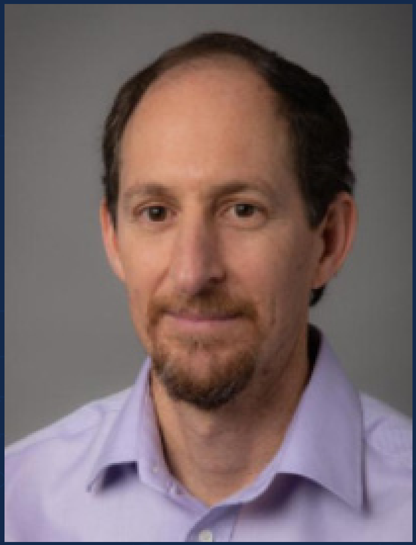
Integrated photonics, particularly Silicon-based photonics, has become a disruptive force reshaping optical communications over the past decade. By marrying silicon with other functional photonic materials, such as compound semiconductors or nonlinear crystals, heterogeneous integration enables not only the combination of complementary material advantages, but also the creation of new device concepts and system capabilities. As the world enters the AI era, heterogeneous integrated photonics, with its broad versatility and scalability, is poised to play a transformative role in communication and computing infrastructures for AI clusters. The growing success of silicon photonics is also propelling advances across the broader field of integrated photonics, spanning diverse material platforms (e.g., III-nitride wide-bandgap materials) and enabling many other exciting applications. This talk will highlight this potential through representative examples of heterogeneous-integration-enabled lasers, densely integrated photonic circuits, novel functionalities, and emerging integrated photonic platforms.

Di Liang joined the University of Michigan, Ann Arbor as a professor in Jan. 2024 after two years leading silicon-photonics product development at Alibaba Cloud (U.S.). Previously, he was a Distinguished Technologist at Hewlett Packard Labs, where he built and led advanced R&D in heterogeneous integrated silicon photonics for energy-efficient optical interconnects and high-performance computing. Upon earning his Ph.D. in Electrical Engineering from the University of Notre Dame, he was a core member of the University of California, Santa Barbara - Intel collaboration in 2007-2009 to develop the world’s first scalable heterogeneous III-V/silicon photonic integration platform. He has authored or coauthored one edited book, seven book chapters, and more than 360 journal and conference papers, and he is an inventor on 70+ issued patents with 40+ pending. He is a Fellow of IEEE and Optica. He currently holds multiple editorial appointments with leading journals of Nature Publishing Group, IEEE, and Optica.

Richard Mirin , UCSB

Integrated Semiconductor Lasers for Quantum Systems

Wafer bonding is a method of integrating III-V semiconductor gain media with other materials to develop integrated semiconductor lasers. While InGaAs/InP heterostructures have been wafer bonded to Silicon for ~1550 nm telecom lasers for almost 20 years, there are significant challenges in adopting this technology to shorter wavelengths, less than ~1100 nm, where Silicon is absorptive. In this talk I will discuss the need for high-performance integrated semiconductor lasers that can address quantum systems such as atoms, ions, and quantum dots. Integrated lasers at 980 nm using a tantalum pentoxide photonic integrated circuit will be shown.



Prof. Richard Mirin received a BS in EECS from UC Berkeley in 1990 and an MS and PhD in ECE from UC Santa Barbara in 1992 and 1996, respectively. In the fall of 1996, he joined the Optoelectronics Division of the National Institute of Standards and Technology (NIST) in Boulder, CO. In January 2026, he returned to the ECE Dept at UC Santa Barbara. Prof. Mirin is a Fellow of Optica and IEEE and an Associate Editor of Optica.

Can Bayram, University of Illinois, Urbana-Champaign

VISION: Visible Interconnects for Scalable Integrated Optical Networks

The 21st century is the age of semiconductors. In all aspects of modern life, we utilize semiconductor technologies. From lighting to communication and computing to transportation, we rely on semiconductors for comfort, safety, and sustainability. Today, we are switching to solid-state lighting for halving our lighting electricity usage, 5G communication for networked devices, and autonomous systems for land/sea/air transportation. Our reliance on semiconductors is only to evolve as solid-state lighting extends into horticulture and medicine, new communication spectra above 95 gigahertz open opportunities for 6G and beyond networking, quantum technologies replace traditional ones, and space exploration leads to space settlements. Prof. Bayram understands, controls, and exploits semiconductor technologies and creates an innovative research and education platform considering the needs of not only the current but also of the next generation. In this talk, he will share his group's recent breakthroughs on cubic III-nitride and diamond electronic and photonic devices for reaching carbon neutrality by 2050.

Prof. Can Bayram is a Professor and an Intel Alumni Endowed Faculty Scholar in the Department of Electrical and Computer Engineering and a resident faculty at the Nick Holonyak, Jr Micro and Nanotechnology Laboratory, University of Illinois at Urbana-Champaign, IL. He is an expert in III-V materials and photonic and electronic devices. His current research interests lie in the intersection of (ultra)wide bandgap materials, their hetero-structures, and photonic and electronic semiconductor devices. As a faculty, he was recognized as the International Union of Pure and Applied Physics Young Scientist Medalist, the IEEE Nanotechnology Council Early Career Awardee, the IEEE Electron Devices Society Early Career Awardee, an NSF CAREER Awardee, an AFOSR Young Investigator Awardee, amongst others. Prior to (2014 - present) ECE Illinois, he was at the IBM Watson Research Center (2011 - 2014). He received the PhD'11 in EECS, Northwestern University, IL.

Rongming Chu, University of Illinois, Urbana-Champaign

Gallium Nitride Electronics for Higher Voltage and Higher Temperature

This talk presents our recent learnings on pushing the limits of GaN electronic devices toward higher voltage and higher temperatures. The first part covers how we designed and implemented the GaN super-heterojunction to extend the voltage-blocking capability of GaN diodes and transistors to the 10+ kV regime. It addresses several questions we have been trying to answer: (1) can a super-heterojunction extend breakdown voltage; (2) what limits the breakdown voltage of GaN super-heterojunction devices; (3) can a super-heterojunction mitigate dynamic on-resistance degradation; and (4) how low-mobility holes affect switching transients. The second part introduces our efforts to bring GaN devices and ICs to operation at temperatures up to 800 °C. Our results suggest that the performance of GaN electronic devices at 800 °C is not limited by the bandgap, but by metals, dielectrics, and metal–dielectric–semiconductor interactions. Understanding and addressing these interactions enabled us to achieve a high ION/IOFF ratio of over 4000 for GaN transistors operating at 800 °C. Based on these high-temperature devices, we have built an amplifier IC with a unity-gain bandwidth of over 1 MHz at 800 °C.

Rongming Chu is a Professor of Electrical & Computer Engineering at the University of Illinois Urbana–Champaign. Prior to joining UIUC, he was a Professor of Electrical Engineering at The Pennsylvania State University from 2018 to 2025. From 2010 to 2018, he served as a Senior Research Staff Member at HRL Laboratories LLC, where he led research and development in GaN power electronics. Earlier, from 2008 to 2010, he was with Transphorm Inc., contributing to the conception and implementation of the company's first GaN power switch prototype. He received his Ph.D. in 2008 from the University of California, Santa Barbara, with a focus on GaN microwave transistors.

Marko Radosavljević , University of Notre Dame

300mm GaN MOSHEMT for RF applications

Advanced GaN materials and transistor technologies, with their high figure-of-merits (FoM=Ron·QGG, fT·BV) versus Si and III-V transistors, are transforming power delivery at the high-performance compute/datacenter, and RF data communication. 300mm GaN-on-Silicon technology is driving an inflection point in this journey. By harnessing Moore's law scaling and most advanced 300mm process technologies, GaN transistor performance and density can be significantly enhanced. Industry's first 300mm GaN-on-Silicon process at a leading CMOS fab at Intel led to demonstrations of efficient and compact converters capable of delivering ultra high-power density, which makes it especially suited for use in high performance compute in datacenters. Beyond using Si just as a substrate, the team has pioneered the monolithic approach of integrating GaN and Si CMOS by 3D layer transfer on 300mm wafers. This technology has enabled new device concepts that were not feasible before. Such demonstrations include industry's first single-die GaN mmWave beamformer solution, complete with integrated PA, LNA, Switches, VGA and Phase-shifter with CMOS Digital-to-Analog Controllers. These innovations in GaN are creating exciting opportunities for integration of high-performance GaN solutions with Silicon CMOS.

Marko Radosavljević is a Professor in the Department of Electrical Engineering at the University of Notre Dame, which he joined in January of 2026. He received PhD in physics from University of Pennsylvania in 2001, followed by 2 years as a postdoc at IBM T.J. Watson Research Center in New York. In 2003, he joined the Components Research (CR) division of Intel Corporation in Oregon. Marko's research has been focused on non-Si transistors, such as InP, InSb, GaN material families as well as carbon nanotubes for applications in logic, RF and power delivery. Between 2019 and 2025, he led a monolithic 3D integration group in CR, enabling new functionalities and providing ultimate transistor density improvements. He is a senior member of IEEE and serves the community as distinguished lecturer for IEEE/EDS, editor of IEEE Transactions of Materials for Electron Devices after serving as editor of EDL and committee member for IEDM conference.

Student Talks

Abdelghany Abouelnagga (PI: Can Bayram)
Scaling InGaN/GaN Micro-LEDs from Discrete Devices to Dense Arrays and GHz-Class Emitters for High-Speed Optical Links

Devon Lee (PI: Minjoo Larry Lee)
Periodic Supply Epitaxy to Enhance InP Selective Area Growth for Surface Emitting Lasers

Emily Becher (PI: John Dallesasse)
Dielectric DBRs and a Tunable PZT Phase-Matching Layer for 1550 nm VCSELs

Fanming Liu (PI: Rongming Chu)
3 kV Hard Switching of GaN Lateral Superjunction Transistor

Ze-Wei Chen (PI: Hyunseok Kim)
Graphene-assisted selective-area epitaxy of antiphase boundary-free GaAs on on-axis Ge(100)

Posters

Title: Thermal oxide desorption behavior of dry-etched GaSb for epitaxial regrowth
Authors: Sarah Su-O Youn, Xizheng Fang, Adrian Birge, and Minjoo Larry Lee

Title: Diamond Photoconductive Semiconductor Switches
Authors: Hubert Elly, Zhuoran Han, Jaekwon Lee, Berre Vize, Shiyue Deng, Jean Pierre-Leburton, Fang Luo, Andrey Mironov, and Can Bayram

Title: Graphene-assisted selective-area epitaxy of antiphase boundary-free GaAs on on-axis Ge(100)
Authors: Ze-Wei Chen, Zidan Cai, Soo Ho Choi, Qi Chen

Title: Scalable Heterogeneous Integration of III–V Laser Membranes on Silicon Photonics via Lift-Off and Self-Assembly
Authors: Jun Young Jeon, Batu Yesilyurt, Xizheng Fang, Yiteng Wang, Hyunseok Kim (PI), Minjoo Larry Lee(PI)

Title: Cubic GaN for Green Light-Emitting Diodes: Solving the Green Gap for Ultimate Solid-State Lighting
Authors: Keith Chang, Can Bayram

Title: Evolution of stepped-and-terraced surfaces of sapphire via thermal annealing
Authors: A. Upah, J. Hayes, and M. L. Lee

Title: Remote epitaxial InAs QD laser on GaAs/a-C/GaAs template
Authors: Xizheng Fang, Yiteng Wang, Adrian Birge, Corey White, Soo Ho Choi, Jisung Seo, Anik Mazumder, Hyunseok Kim, John Dallesasse, Tobias Henkmeier, Dirk Reuter, Minjoo Larry Lee.

Title: 3D TCAD Simulation of Heavy Ion Single-Event Effects in GaN Transistors
Authors: Yuxin Du

Title: Cubic GaN on Silicon for Scalable Optoelectronics
Authors: Johnathan Wright, Keith Chang, Jaekwon Lee, Yu-Chieh Chiu, and Can Bayram

Title: Integrated Red Lasers and Guiding Structures on Transparent Substrates via Epitaxial Transfer
Authors: Gabriel Inojosa, Leah Espenhahn, Jason Flanagan, John Dallesasse

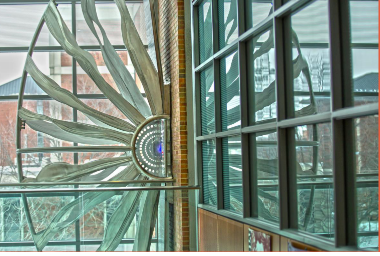
Title: Dielectric DBRs and a Tunable PZT Phase-Matching Layer for 1550 nm VCSELs
Authors: Emily Becher, Jason Flanagan, John M. Dallesasse

Title: Diamond Photoconductive Semiconductor Switches
Authors: B. Vize, Z. Han, J. Lee, E.Cheng, S. Messing, T. Reboli, A. Mironov, C. Bayram

Title: Transistor Injected Quantum Cascade Lasers with Independent Control of Optical Power and Wavelength: Past Developments and Current Progress
Authors: Robert B. Kaufman, Anik Mazumder, and John M. Dallesasse

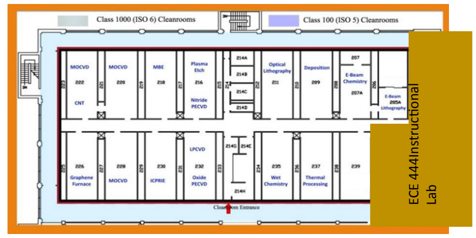
Title: Thermally controlled growth of crystalline rubrene for Graphene-Organic semiconductor heterostructure
Authors: Chia-Che Lai, Shu-Jen Wang

Title: Crystalline III-N Membrane Release from Sapphire by Amorphous Carbon Interlayer
Authors: Jisung Seo, Qi Chen, Sean Chen, Hyunseok Kim



Cleanroom Facilities at HMNTL

The HMNTL cleanroom was built in 1989 and has 15 labs. With both class 100 and class 1000 cleanroom space in over 9000 square feet, the opportunities are endless for fabrication of high-performance devices involving a wide range of applications. Please see the list of tools outlined below.



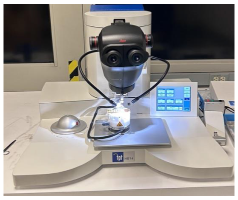
Lithography tools:
Heidelberg maskless writer
EVG 620 mask aligner
MJB-3 Karl Suss mask aligner
Diener RIE plasma cleaner
HMDS vapor prime oven
Headway Spinners
Elionix 150 keV E-Beam Lithography

Chemical Vapor Deposition tools:
Aixtron MOCVD Gan, AlGaN, InGaN
Oxford Dual Frequency PECVD
Trion Orion PECVE
Veeco Nanotech ALD

Etch tools:
Xactix XeF_2
Oxford Chlorine ICP-RIE
Oxford Freon ICP-RIE
Oxford Freon RIE
Oxford Freon and Chlorine ICP RIE w/ Atomic Layer Etch

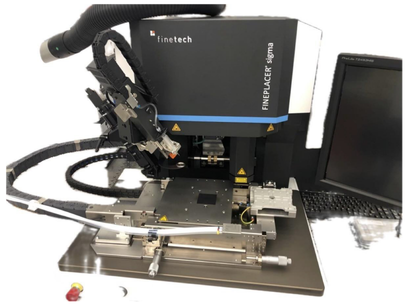
Thermal tools:
Ag 610 RTP
Diffusion/Oxidation Furnaces
Leica Critical Point Dryer
Vacuum Oven

Characterization Lab tools:
Accent HL5500PC Hall Effect Measurement System Renishaw Raman/PL Micro-spectroscopy System K&S 4524AD Ball Wire Bonder HTP HB16 Ball and Wedge Wire Bonder



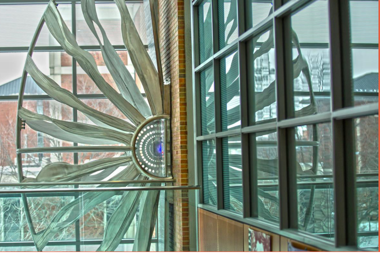
Metrology tools:
DekTak DXT-A
Hitachi S-4800 Field Emission SEM
Jandel RM3000 Four Point Probe
Park System NX20 AFM
Triple Wavelength Ellipsometer
M-Probe Thin Film Thickness Measurement

Physical Vapor Deposition tools:
Lesker Clean Metals E-Beam Evaporator
Lesker Contact Metals E-Beam Evaporator
Lesker Dielectric Sputterer
Lesker Metals DC Magnetron Sputterer
Denton Dielectric E-Beam Evaporator
CHA SEC-600 E-Beam Evaporator



Heterogeneous Integration and Advance Packaging tools:
Suss BA8 Gen4 Bond Aligner
EVG 301 Megasonic Cleaner with IR Inspector
EVG 810 Surface Activating Plasma
Finetech Sigma Fineplacer
LPKF Printed Circuit Board Maker
Pelco LatticeAx 420 Cleaving Tool

To inquire about using the HMNTL shared labs or for foundry work, please contact:
Dr. Glennys Mensing, Director for Cleanroom Operations: gmensing@Illinois.edu



Bionanotechnology Lab (BNL) at HMNTL

Facilitate the interdisciplinary biological and micro and nanotechnology research experiments to be carried out simultaneously—all under the same roof.

- Support the research in the area of photonics, microelectronics, biotechnology, and nanotechnology.
- Shared-use Academic & Corporate access.
- 24/7 Access.
- Biosafety 2+ Rated.

OUR LAB STAFF:

- Offers hands-on assistance to researchers.
- Specializes in virology and microbiology.
- Provides proposal-writing assistance.

LAB LAYOUT: FACILITIES

About 2,500 square feet of lab space divided into six labs:
- Processing Lab: where most of biosensors' work is done.
- Tissue culture Lab: for cell culture and viruses work.
- Microscopy: for cell culture and tissue imaging.
- Pathogen Lab: BLS 2+ for pathogenic viruses.
- Fluoroscopy Lab: for cell staining.
- Pattern Lab: PCR and Confocal Microscopy.

***Fluidigm C1 – single-cell Preparation system**

**Images: https://www.standardbio.com/support/instrument-support/c1-support*

WHAT MAKES THE BNL UNIQUE?

- All the essential cell biology, microbiology (bacteria and virus), molecular biology,microscopy, and lithography setting underone roof.
- Plenty of open spaces for experimental work and samples storage.
- Low entry fees ($18/day university,
- $32/day industry).
- We provide free training for all instruments.
- Free supplies such as pipette tips, serological pipettes, well- plates, gloves, flasks, centrifuge tubes,...etc.

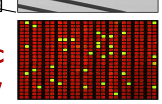
HOW TO BENEFIT FROM BNL:

- You can send your students to work in the lab.
- You can get customized training for your students.
- We can help do some experiments and collect data for you.

FOR THE LAB EQUIPMENT LIST:

Please visit the lab website at: https://mntl.illinois.edu/facilities/bionanotech-lab

***Digital PCR with Microfluidic Array Plate (MAP)Technology**



**Images: https://www.thermofisher.com*

GUIDED TOURS:

Take a free tour of the Lab: contact the Lab manager, Dr. Elbashir Araud, at: Phone: (217) 300-0098
Email:earaud@illinois.edu - Website: https://hmntl.illinois.edu/- Address: 208 North Wright Street Urbana, IL 61801

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Nanotechnology Laboratory
The Grainger College of Engineering
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN