Theodore J. Ronningen
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Professional Preparation

Wabash College	Indiana, USA	Chemistry	BA, 1999
The Ohio State University	Ohio, USA	Chemical Physics	PhD, 2005

Professional Appointments:

2017-Present	Research Scientist	Ohio State University, Columbus, Ohio
2005-2017	Senior Research Scientist	Battelle, Columbus, Ohio

Research Interests and Expertise:

As a technical leader, I apply spectroscopy, infrared sensing, and data analysis to solve complex, systems- and component-level problems. I have designed, executed, and led research and development for the past 22 years. As a project manager, I apply project management principles to support research teams by quantifying their progress and mitigating risks to budget, schedule, and scope. The projects I support in either role emphasize multi-investigator, multi-disciplinary collaborations to address the needs of Government sponsors and commercial clients.

Selected Relevant Publications:

1. Lee, S., Jin, X., Jung, H., Lewis, H., Liu, Y., Guo, B., Kodati, S.H., Schwartz, M., Grein, C.H., Ronningen, T.J., David, J.P.R., Campbell, J.C. and Krishna, S., "**High Gain, Low Noise, Room Temperature 1550 nm GaAsSb/AlGaAsSb Avalanche Photodiodes**," Optica, 2023. https://doi.org/10.1364/OPTICA.476963
2. Arquitola, A., Jung, H., Lee, S., Ronningen, T.J. and Krishna, S., "**Assessment of Surface Recombination in Mid-Wave Infrared InAsSb nBn Detectors using Transient Microwave Reflectance**," AIP Advances, 2023. https://doi.org/10.1063/5.0137126
3. Lee, S., Guo, B., Kodati, S.H., Jung, H., Schwartz, M., Jones, A.H., Winslow, M., Grein, C.H., Ronningen, T.J., Campbell, J.C. and Krishna, S., "**Random alloy thick AlGaAsSb avalanche photodiodes on InP substrates**," Appl Phys Lett, 2022. https://doi.org/10.1063/5.0067408
4. Guo, B., Jin, X., Lee, S., Ahmed, S.Z., Jones, A.H., Xue, X., Liang, B., Lewis, H.I.J., Kodati, S.H., Chen, D., Ronningen, T.J., Grein, C.H., Ghosh, A.W., Krishna, S., David, J.P.R. and Campbell, J.C., "**Impact Ionization Coefficients of Digital Alloy and Random Alloy $Al_{0.85}Ga_{0.15}As_{0.56}Sb_{0.44}$ in a Wide Electric Field Range**," Journal of Lightwave Technology, 2022. https://doi.org/10.1109/JLT.2022.3169008
5. Rygała, M., Ryczko, K., Smołka, T., Kujawa, D., Martyniuk, P., Ronningen, T.J., Krishna, S. and Motyka, M., "**Investigating the physics of higher-order optical transitions in InAs/GaSb superlattices**," Phys Rev B, 2021. https://doi.org/10.1103/PhysRevB.104.085410

6. Kodati, S.H., Lee, S., Guo, B., Jones, A.H., Schwartz, M., Winslow, M., Pfiester, N.A., Grein, C.H., Ronningen, T.J., Campbell, J.C. and Krishna, S., "**AlInAsSb avalanche photodiode on InP substrate**," Appl Phys Lett, 2021. https://doi.org/10.1063/5.0039399
7. Fragasse, R., Tantawy, R., Smith, D., Specht, T., Taghipour, Z., Hooser, P.V., Taylor, C., Ronningen, T.J., Fuller, E., Reyner, C., Duran, J., Ariyawansa, G., Krishna, S. and Khalil, W., "**Signal and Noise Analysis of an Open-Circuit Voltage Pixel for Uncooled Infrared Image Sensors**," IEEE Transactions on Circuits and Systems I:Regular Papers, 2021. https://doi.org/10.1109/TCSI.2021.3068595
8. Specht, T.R., Duran, J.M., Taghipour, Z., Fragasse, R., Tantawy, R., Ronningen, T.J., Ariyawansa, G., Reyner, C., Smith, D.S., Fuller, E., Khalil, W. and Krishna, S., "**Open-circuit voltage photodetector architecture for infrared imagers**," Appl Phys Lett, 2020. https://doi.org/10.1063/5.0020000
9. Lee, S., Jo, H.J., Mathews, S., Simon, J.A., Ronningen, T.J., Kodati, S.H., Fink, D.R., Kim, J.S., Winslow, M., Grein, C.H., Jones, A.H., Campbell, J.C. and Krishna, S., "**Investigation of carrier localization in InAs/AlSb type-II superlattice material system**," Appl Phys Lett, 2019. http://doi.org/10.1063/1.5127198
10. Bartko, A. P. and T. J. Ronningen (2018). "**Explosives detection using optical spectroscopy**", US Patent 9,983,138
11. Ronningen, T. J., J. M. Schuetter, J. L. Wightman and A. Murdock (2014). "**Raman spectroscopy for biological identification**" Biological Identification: DNA Amplification and Sequencing, Optical Sensing, Lab-On-Chip and Portable Systems: 313.
12. Morrow, C. A. and T. J. Ronningen (2013). "**Fiber bundle for high efficiency, spatially resolved coupling**" US Patent 8,553,224
13. Ronningen, T.J. and De Lucia, F.C., "**Helium induced pressure broadening and shifting of HCN hyperfine transitions between 1.3 and 20 K**," J Chem Phys, 2005. https://doi.org/10.1063/1.1895905

Synergistic Activities and Honors:

Ohio Federal Research Network ALTITUDE Project. In a collaboration with three universities and a small business, Ohio State is leading the demonstration of a new lidar technology incorporating novel avalanched photodiodes to detect 1550 or 2000 nm return pulses. I am the systems engineer and the testing lead for the laboratory demonstration of the 1550 nm lidar system.

NSF X-*lites* AccelNet. Ohio State is leading the development of a new network of researchers who are users and operators of "extreme light" facilities. Over the last decade, significant investments have been made to build facilities that provide access to state-of-the-art light at the extremes of time resolution, spatial coherence, and intensity. X-*lites* is addressing an opportunity to improve these facilities, users' experience of them, and the rate of scientific discovery they can support. I am the project manager for this project.

NSF Light Addressable Thin Film Sensor System for High Resolution Imaging. Chemical engineering professor Jinghua Li has demonstrated a novel, photo-responsive sensor for chemical and biochemical

analysis. This project is developing the capability to use this sensor in an imaging modality, measuring the distribution and concentration of chemical targets over an area. The sensor has the potential to be a portable, wearable, and highly flexible transducer of chemical targets. I am a senior personnel on this project guiding the implementation of the supporting optical system and the assessment of the system against traditional imaging metrics.

NSF NeXUS Mid-Scale Facility. Ohio State researchers proposed and won a grant to build an international user facility enabling research in ultrafast dynamics of materials and chemicals. Ohio State was awarded a 5-year grant (2019-2024) to design, build, verify, and validate the NeXUS System for conducting these measurements and the NeXUS Facility to support users. I am the project manager and safety lead for this development.

DE-JTO Low Excess-Noise Avalanche Photodetectors with Superlattices (LEAPS). Ohio State has led this 5-year initiative to develop room-temperature avalanche photodiodes (APDs) to detect 1550 nm light. This project is a collaboration with MIT Lincoln Labs (Erik Duerr), the University of Virginia (Joe Campbell), and the University of Illinois at Chicago (Christoph Grein). It has led to the demonstration of several candidate structures that are competitive with the commercial state-of-the-art in infrared APDs. I have been the project manager and overseen the implementation of new test capabilities at Ohio State.

Natural Gas Imager R&D. In support of a corporate safety initiative, an OSU collaboration demonstrated the feasibility of standoff, quantitative imaging of methane clouds. I was the technical lead for this effort. Our team used commercial near infrared and short-wave infrared sources and imagers, with custom analysis and software, to capture live images of methane clouds.

Open Circuit Voltage Photodetector (VocP). The Krishna group (Ohio State), the Khalil group (Ohio State), and a small business collaborated to design and demonstrate a novel infrared photodetector that achieves superior signal to noise at small pixel sizes by relying on the open circuit voltage response. I was the project manager and testing lead for a seedling project sponsored by DARPA to support the modeling and characterization of the detector.