

## Relevant Expertise

- field deployed dual comb spectroscopy with a team for detection of various gases in collab. With MIT, JPL, and Thorlabs [1,6,13]
- Rydberg physics and electromagnetic sensing [under review]
- material science and shape memory alloys [5,12]
- spectroscopy in outdoor environments, both single point detection and integrated path [1]
- spectroscopy in combustive environments and vacuum chambers that I constructed [3, 4]
- spectroscopy for medical purposes [9] and cavity enhanced techniques [10]
- development of post-processing algorithms for DCS for improving SNR and also for multi-species simultaneous detection [8, 13]

## Education

Ph.D. in Electrical Engineering, Princeton University	Graduated October 2023	
B.S. in Electrical Engineering, Boise State University	Graduated 2015	GPA: 3.9 (152 credits)

## Employment

Post-doctoral researcher	NIST Boulder	03/25/24-current
Assistant project manager	Princeton University	03/05/2024-current
Electrical Engineering Ph.D. Researcher	Wysocki Pulse Princeton University	09/01/2015-10/30/2023
Lab Research Assistant	Müllner Research Group at BSU	10/15/2011-08/31/2015
Web-Designer	Just1 Web Design	07/01/2011-01/30/2012

## Coding Languages Used

- **Matlab**
- **C++, C**
- Java
- Python
- **SolidWorks**
- HTML
- **LabVIEW**
- Spice (engineering tool)
- SimuLink (engineering tool)
- COMSOL (engineering tool)

## Professional Accomplishments

### Awards and Special Honors

- NSF Award 2017
- Graduated at Top of Engineering Class
- Two Gold Medals from National Latin Exams
- Dean's List with highest honors at BSU
- Award of Merit in Honors college at BSU

### Activities and Leadership Positions

- Soccer Tournaments around the Northwest
- National placement in team drama and band, in Fine Arts National Competition
- National placement in Teen Quiz
- First place in Public Speaking 5 years out of 6 in Regional Fine Arts District Competitions

## Additional Expertise

- ferromagnetic shape memory alloy material science [5, 11, 12]
- audio amplifier design and fabrication
- neural network interface design and fabrication
- Applied Electromagnetics
  - Antenna Design Simulation
  - Fabry-Perot Interferometer Simulation
- Radio Frequency (RF) design
  - Varactor-tuned Oscillator Design
  - Phase-locked loop design

## References/Publications

- [1] J. Liu, C. Teng, Y. Chen, C. Patrick, et al. "Field deployment of a multi-pass cell based mid-IR quantum cascade laser dual-comb spectrometer." CLEO: Applications and Technology. Optical Society of America, 2021.
- [2] L. Sterczewski, J. Westberg, L. Patrick, et al, *Multiheterodyne spectroscopy using interband cascade lasers*, Optical Engineering 57(1) (2017), p. 011014.
- [3] H. Zhong, C. Patrick, et al, *Kinetic study of plasma-assisted n-dodecane/O<sub>2</sub>/N<sub>2</sub> pyrolysis and oxidation in a nanosecond-pulsed discharge*. Proceedings of the Combustion Institute 38.4 (2021): 6521-6531.
- [4] H. Zhao, W. Lingnan, Z. Zunhua, C. Patrick, et al, *Study of Kinetic Effect of NO<sub>x</sub> Sensitization on the Low Temperature Oxidation of N-pentane in a Jet Stirred Reactor*, AIAA Aerospace Sciences Meeting (2018), p. 0139.
- [5] A. Hobza, C. L. Patrick, et al, *Sensing strain with Ni-Mn-Ga*. *Sensors and Actuators A: Physical* 269 (2018), pp. 137-144.
- [6] J. Westberg, L. Sterczewski, L. Patrick, G. Wysocki, *Broadband mid-infrared and THz chemical detection with quantum cascade laser multi-heterodyne spectrometers*, Next-Generation Spectroscopic Technologies X. Vol. 10210. International Society for Optics and Photonics (2017).
- [7] C. L. Patrick, et al. *Multi-heterodyne spectroscopy using Fabry-Perot interband cascade lasers for trace gas detection: a feasibility assessment*. *Novel In-Plane Semiconductor Lasers XVI*. Vol. 10123. International Society for Optics and Photonics (2017).
- [8] L. Sterczewski, J. Westberg, L. Patrick, G. Wysocki, *Computational adaptive sampling for multiheterodyne spectroscopy*. *Lasers and Electro-Optics (CLEO)*, 2017.
- [9] L. Patrick, et al, "Time-resolved breath oxygen monitor for critical care-clinical prototype development." *Applied Industrial Spectroscopy*. Optical Society of America, 2020.
- [10] C.L.Patrick, J. Westberg, G. Wysocki, *Cavity attenuated phase shift Faraday rotation spectroscopy*. *Analytical chemistry*, 91(3), pp. 1696-1700 (2018).
- [11] N. J. Kucza, C.L. Patrick, D. C. Danand, P. Müllner, *Magnetic-field-induced bending and straining of Ni-Mn-Ga single crystal beams with high aspect ratios*, *Acta Materialia* (2015), pp. 284-290.
- [12] P. Lindquist, A. Hobza, C. Patrick, P. Müllner, *Efficiency of energy harvesting in Ni-Mn-Ga shape memory alloys*, *Shape Memory and Superelasticity* (2018).
- [13] L. Patrick, et al, *Quantum cascade laser frequency combs covering up to 80 cm-1 for dual-comb spectroscopy at 8um*. CLEO: Applications and Technology. Optical Society of America, 2022.