

Relevant Expertise

- Quantum sensor design, build, and testing
- Field deployed DCS systems with a team of other engineers [1]
- Dual comb spectroscopy with ~40 FP-QCLs, provided in collab. with MIT, ETH-Zurich, Jet Propulsion Lab., and Thorlabs [1, 6, 13]
- Spectroscopy in outdoor environments, both single point detection and integrated path [1]
- Spectroscopy in combustive environments [3, 4]
- Spectroscopy for medical purposes [9] and cavity enhanced techniques [10]
- I have developed 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

Senior Scientist	Frequency Electronics Inc	05/05/2025–Present
Postdoctoral Researcher	NIST Boulder Electromagnetics Group	02/01/2024–05/04/2025
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
Hod Carrier	Carter Construction	08/08/2011–11/01/2011
Landscape Laborer	Boise Basin Landscaping	05/29/2011–09/01/2011

Coding Languages Used

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|----------|--------------|-------------------------------|
| • Matlab | • JavaScript | • Simulink |
| • C++, C | • HTML | • COMSOL |
| • Java | • LabVIEW | • Altium |
| • Python | • Spice | • Solidworks/Inventor/FreeCAD |

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
- National placement in Teen Quiz
- First place in Public Speaking (5 of 6 years)

Additional Expertise

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| <ul style="list-style-type: none"> • Ferromagnetic shape memory alloy material science [5, 11, 12] • Audio amplifier design and fabrication • Neural network interface design and fabrication | <ul style="list-style-type: none"> • Applied Electromagnetics <ul style="list-style-type: none"> – Antenna Design Simulation – Fabry-Perot Interferometer Simulation • Radio Frequency (RF) design <ul style="list-style-type: none"> – Varactor-tuned Oscillator Design – Phase-locked loop design |
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References/Publications

- [1] J. Liu, **C. Patrick**, et al. “Field deployment of a multi-pass cell...” CLEO, 2021.
- [2] L. Sterczewski, **L. Patrick**, et al, Optical Engineering 57(1) (2017).
- [3] H. Zhong, **C. Patrick**, et al, Proc. Combustion Institute 38.4 (2021).
- [4] H. Zhao, **C. Patrick**, et al, AIAA Aerospace Sciences Meeting (2018).
- [5] A. Hobza, **C. L. Patrick**, et al, Sensors and Actuators A: Physical 269 (2018).
- [6] J. Westberg, **L. Patrick**, et al, Next-Gen Spectroscopic Tech. X (2017).
- [7] **C. L. Patrick**, et al, Novel In-Plane Semiconductor Lasers XVI (2017).
- [8] L. Sterczewski, **L. Patrick**, et al, CLEO, 2017.
- [9] **L. Patrick**, et al, Applied Industrial Spectroscopy, 2020.
- [10] **C. L. Patrick**, et al, Analytical chemistry, 91(3) (2018).
- [11] N. J. Kucza, **C. L. Patrick**, et al, Acta Materialia (2015).
- [12] P. Lindquist, **C. Patrick**, et al, Shape Memory and Superelasticity (2018).
- [13] **L. Patrick**, et al, CLEO: Applications and Technology, 2022.

Full List of Publications

- Hayden, J., Westberg, J., **Patrick, C.L.**, et al., 2018a. Frequency-locked cavity ring-down Faraday rotation spectroscopy. *Opt. Lett.*, 43, 5046–5049. [10.1364/OL.43.005046](#)
- Hobza, A., **Patrick, C.L.**, et al., 2018. Sensing strain with Ni-Mn-Ga. *Sensors and Actuators A: Physical* 269, 137–144. [10.1016/j.sna.2017.11.002](#)
- Kosan, N., **Patrick, L.**, et al., 2022. QCL Dual-Comb Spectrometer Intensity Noise Comparison. *CLEO*, Paper JW3A.62. [10.1364/CLEO_AT.2022.JW3A.62](#)
- Kucza, N.J., **Patrick, C.L.**, et al., 2015. Magnetic-field-induced bending and straining of Ni-Mn-Ga. *Acta Materialia* 95, 284–290.
- Liu, J., **Patrick, C.L.**, et al., 2021b. Field deployment of a multi-pass cell based mid-IR QCL dual-comb spectrometer. *CLEO*, Paper AW2S.1.
- Patrick, C.**, Westberg, J., Wysocki, G., 2020. **System and Method for Mainstream Exhaled Oxygen Sensor**. Patent: WO2020227394.
- Patrick, C.L.**, et al., 2019. Cavity Attenuated Phase Shift Faraday Rotation Spectroscopy. *Anal. Chem.* 91, 1696–1700. [10.1021/acs.analchem.8b04359](#)
- Patrick, L.**, Wysocki, G., 2023. Compact laser spectroscopic sensor head prototype for time-resolved breath oxygen monitoring. *J. Breath Res.* 17, 026003. [10.1088/1752-7163/acb07a](#)
- Shashaty, K., **Patrick, L.**, Wysocki, G., 2023. Balanced wavelength modulated Zeeman spectroscopy for oxygen detection. *Opt. Express*, 31, 7226–7236.
- Sterczewski, L. A., **Patrick, L.**, et al., 2017. Computational adaptive sampling for multiheterodyne spectroscopy. *CLEO*.
- Zhao, H., **Patrick, C.**, et al., 2018a. Studies of low temperature oxidation of n-pentane. *Combustion and Flame* 197, 78–87.
- Zhong, H., **Patrick, C.L.**, et al., 2021. Kinetic study of plasma-assisted n-dodecane/O₂/N₂ pyrolysis and oxidation. *Proc. Combustion Institute*, pp. 6521–6531.

In Prep

- Wysocki, G., **Patrick, L.**, et al. Urban open-air chemical sensing using a mobile QCL dual-comb spectrometer (2023), in prep.
- Patrick, L.**, and Wysocki, G., Faraday Enhanced Dual comb spectroscopy with quantum cascade lasers (2023), in prep.