

Gregory B. Rieker

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Associate Professor, Mechanical Engineering
University of Colorado-Boulder

August 2019 - Present
Boulder, Colorado

Co-founder and Chief Technology Officer
LongPath Technologies, Inc. (spin-out from lab)

April 2018 – Present
Boulder, Colorado

Joint and Courtesy Appointments

National Institute of Standards and Technology

National Renewable Energy Laboratory

Environmental Engineering Program, University of Colorado

Expertise: Diagnostics for Harsh Environments, Lasers, Combustion, Design, Energy Systems, Industrial Systems, Atmospheric Systems

AWARDS (State, National, International)

Colorado Photonics Company of the Year (LongPath)	October 2021
National Academy of Inventors, Senior Member	February 2021
National Academy of Engineering Frontiers in Engineering Symposium	February 2021
Colorado Governor's Award for High-Impact Research	October 2019
Hiroshi Tsuji Early Career Researcher Award	April 2019
US Early Career Combustion Investigator Award	March 2019
Peter Werle Early Career Scientist Award	September 2018
National Science Foundation CAREER Award	March 2015
National Research Council (NRC) Research Associateship	March 2012

AWARDS (University of Colorado)

CEAS Faculty Research Award	December 2023
CU Boulder Provost's Faculty Achievement Award	October 2023
Discovery Learning Apprenticeship Outstanding Mentor	August 2022
Mechanical Engineering Faculty Outstanding Research Award	September 2019
Woodward Outstanding Faculty Award	August 2018
Research and Innovation Faculty Fellowship	December 2017
Vogel Family Faculty Fellowship	December 2017

EDUCATION

Doctor of Philosophy in Mechanical Engineering **June 2009**
Stanford University (Advisor: R. K. Hanson) *Stanford, California*
Thesis: Wavelength-Modulation Spectroscopy for Measurements of Gas Temperature and Concentration in Harsh Environments

Master of Science in Mechanical Engineering **September 2004**
Stanford University *Stanford, California*

PRIOR PROFESSIONAL EXPERIENCE

Assistant Professor, Mechanical Engineering August 2013 – July 2019
University of Colorado-Boulder Boulder, Colorado

National Research Council Research Associate July 2012 – August 2013
National Institute of Standards and Technology (Advisor: N. Newbury) Boulder, Colorado

- Development of frequency comb spectrometers for gas-phase measurements in atmospheric systems

Co-Founder, Scientist 2010 – 2012
Fluence, LLC Newark, California

- Design and experimental characterization of a compact, high-energy plasma accelerator for medical applications

Postdoctoral Fellow June 2009 – December 2009
Stanford University (Advisor: M.A. Cappelli) Stanford, California

- Development of optical emission and solid-state nuclear track diagnostics for particle velocity and contaminant identification in plasma accelerators

PEER-REVIEWED PUBLICATIONS

*Graduate student in Rieker lab

**Postdoc / Research staff/ Visiting Scholars in Rieker lab

70. (Cover article) D. Long, M. Cich, C. Mathurin*, A. Heiniger, G. Mathews**, A. Frymire*, **G. Rieker**, “Nanosecond Time-resolved Dual-comb Absorption Spectroscopy,” *Nature Photonics* 18, 127-131 (2024). <https://doi.org/10.1038/s41566-023-01316-8>
69. N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, R.A. Shaik, P. Lynch, S. Diddams, **G. Rieker**, “GHZ Repetition Rate Mid-Infrared Frequency Comb Spectroscopy of Fast Chemical Reactions,” *Optica* (2024).
68. M. Walsh, E. Baumann, N. Malarich*, S. Egbert*, R. Cole*, **G. Rieker**, N. Newbury, I. Coddington, K. Cossel, J. Genest, “Pulse interaction induced systematic errors in dual comb spectroscopy,” *Optics Express*, Vol. 32, Issue 11, 19837-19853 (2024). <https://doi.org/10.1364/OE.523623>
67. D. Yun*, S. Egbert*, A. Frymire*, S. Coburn**, J. France, K. Rice, J. Donbar, **G. Rieker**, “Single-Beam Velocimetry with Dual Frequency Comb Absorption Spectroscopy,” *Optics Express* 32, 18650-18663 (2024). <https://doi.org/10.1364/OE.523451>
66. S. Egbert*, K. Sung, S. Coburn**, B. Drouin, **G. Rieker**, “Water-Vapor Absorption Database using Dual Comb Spectroscopy from 300-1300 K Part I: Pure H₂O, 6600 to

- 7650 cm⁻¹,” *Journal of Quantitative Spectroscopy and Radiative Transfer* 318, 108940 (2024). <https://doi.org/10.1016/j.jqsrt.2024.108940>
65. A. Makowiecki*, S. Coburn**, S. Sheppard, B. Bitterlin*, T. Breda*, A. Dawlatzai*, R. Giannella*, A. Jaros*, C. Kling*, E. Kolb, C. Lapointe, S. Simons-Wellin, H. Michelsen, J. Daily, M. Hannigan, P. Hamlington, J. Farnsworth, **G. Rieker**, “WindCline: Sloping Wind Tunnel for Characterizing Flame Behavior Under Variable Inclines and Wind Conditions,” *Review of Scientific Instruments* 95, 025103 (2024). <https://doi.org/10.48550/arXiv.2312.01510>
64. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, “Thermometry and velocimetry in a ramjet using dual comb spectroscopy of the O₂ A-band,” *Optics Express* 31, 42571- 42580 (2023). <https://doi.org/10.1364/OE.507647>
63. R. Cole*, H. Tran, N. Hoghooghi**, **G. Rieker**, “Temperature-dependent CO₂ Line Mixing Models using Dual Frequency Comb Absorption and Phase Spectroscopy up to 25 bar and 1000 K,” *Journal of Quantitative Spectroscopy and Radiative Transfer* 297, 108488, (2023). <https://doi.org/10.1016/j.jqsrt.2023.108488>
62. D. Yun*, N. Malarich*, R. Cole*, S. Egbert*, J. France, J. Liu, K. Rice, M. Hagenmaier, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker**, “Supersonic Combustion Diagnostics with Dual Comb Spectroscopy,” *Proceedings of the Combustion Institute* 39, 1299-1306, (2023). <https://doi.org/10.1016/j.proci.2022.07.103>
61. D. Yun*, R. Cole*, N. Malarich*, S. Coburn**, N. Hoghooghi**, J. Liu, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, “Spatially Resolved Mass Flux Measurements with Dual-comb Spectroscopy,” *Optica* 9, 1050-105, (2022). <https://doi.org/10.1364/OPTICA.459009>
60. N. Hoghooghi**, S. Xing, P. Chang, D. Lesko, A. Lind, **G. Rieker**, S. Diddams, “Broadband 1-GHz Mid-infrared Frequency Comb,” *Light: Science & Applications* 11, 1-7, (2022). <https://doi.org/10.1038/s41377-022-00947-w>
59. A. Anderson, E. Strong*, S. Coburn**, **G. Rieker**, J. Gopinath, “Orbital Angular Momentum-based Dual-comb Interferometer for Ranging and Rotation Sensing,” *Optics Express* 30, 21195-21210, (2022). <https://doi.org/10.1364/OE.457238>
58. J. Glusman, C. B. Lapointe, A. S. Makoweicki*, S. Simons-Wellin, **G. Rieker**, J.W. Daily, P. E. Hamlington, “Validation of Computationally Efficient Simulations of Douglas Fir Pyrolysis and Combustion Using Time-Resolved Frequency Comb Laser Measurements,” *Frontiers in Forests and Global Change* 8, (2022). <https://doi.org/10.3389/ffgc.2022.758689>
57. N. Malarich*, **G. Rieker**, “Resolving nonuniform temperature distributions with single-beam absorption spectroscopy. Part II: Implementation with Broadband Spectra,” *Journal of Quantitative Spectroscopy and Radiative Transfer* 272, 107805 (2021). <https://doi.org/10.1016/j.jqsrt.2021.107805>

56. C. Lapointe, N.T. Wimer, S. Simons-Wellin, J.F. Glusman, **G.B. Rieker**, P.E. Hamlington, "Efficient Simulations of Propagating Flames and Fire Suppression Optimization Using Adaptive Mesh Refinement," *Fluids* 6, (2021). <https://doi.org/10.3390/fluids6090323>
55. N. Malarich*, D. Yun*, K. Sung, S. Egbert*, S. Coburn**, B. Drouin, **G. Rieker**, "Dual frequency comb absorption spectroscopy of CH₄ up to 1000 Kelvin from 6770 to 7570 cm⁻¹," *Journal of Quantitative Spectroscopy and Radiative Transfer* 272, 107812 (2021). <https://doi.org/10.1016/j.jqsrt.2021.107812>
54. R. Cole*, N. Hoghooghi**, B. Drouin; **G. Rieker**, "High-temperature absorption line shape parameters for CO₂ in the 6800-7000 cm⁻¹ region from dual frequency comb measurements up to 1000 K," *Journal of Quantitative Spectroscopy and Radiative Transfer* 276, 107912 (2021). <https://doi.org/10.1016/j.jqsrt.2021.107912>
53. A. Rybchuk*, C. Alden**, J. Lindquist, **G. Rieker**, "A Statistical Evaluation of WRF-LES Trace Gas Dispersion Using Project Prairie Grass Measurements," *Monthly Weather Review*, Vol 149, Issue 5 (2021). <https://doi.org/10.1175/MWR-D-20-0233.1>
52. R. Cole*, A. Draper*, P. Schroeder*, C. Casby, A. Makowiecki*; S. Coburn**, J. Steinbrenner, N. Hoghooghi**, **G. Rieker**, "Demonstration of a uniform, high-pressure, high-temperature gas cell with a dual frequency comb absorption spectrometer," *Journal of Quantitative Spectroscopy*, Vol 268, 107640 (2021). <https://doi.org/10.1016/j.jqsrt.2021.107640>
51. E. Strong*, A. Anderson, M. Brenner, B. Heffernan, N. Hoghooghi**, J. Gopinath, **G. Rieker**, "Angular velocimetry for fluid flows: an optical sensor using structured light and machine learning," *Optics Express*, Vol. 29, Issue 7, pp. 9960-9980 (2021) <https://doi.org/10.1364/OE.417210>
50. A.Q. Anderson, E. Strong*, B. Heffernan, M. Siemens, **G. Rieker**, J. Gopinath, "Observation of the rotational Doppler shift with spatially incoherent light," *Optics Express* 29, 4058-4066 (2021). <https://doi.org/10.1354/OE.415580>
49. N. Malarich*, **G. Rieker**, "Resolving non-uniform temperature distributions with single-beam absorption spectroscopy. Part I: Theoretical capabilities and limitations," *Journal of Quantitative Spectroscopy and Radiative Transfer* 260, 107455 (2021). <https://doi.org/10.1016/j.jqsrt.2020.107455>
48. J. Christopher*, O. Doronina, D. Petrykowski*, T. Hayden*, C. Lapointe, N. Wimer, I. Grooms, **G. Rieker**, P. Hamlington, "Flow Parameter Estimation Using Laser Absorption Spectroscopy and Approximate Bayesian Computation," *Experiments in Fluids* 62, 43 (2021). <https://doi.org/10.1007/s00348-020-03122-2>
47. N. Hoghooghi**, R. Cole*, **G. Rieker**, "11- μ s Time-resolved, Continuous Dual-Comb Spectroscopy with Spectrally Filtered Mode-locked Frequency Combs," *Applied Physics B* 127, 1-10 (2021). <https://doi.org/10.1007/s00340-020-07552-y>

46. A. Makowiecki*, D. Herman, N. Hoghooghi**, E. Strong*, R. Cole*, G. Ycas, F. Giorgetta, C. Lapointe, J. Glusman, J. Daily, P. Hamlington, N. Newbury, I. Coddington, **G. Rieker**, "Mid-Infrared Dual Frequency Comb Spectroscopy for Combustion Analysis from 2.8 to 5 Microns," Proceedings of the Combustion Institute 38, 1627-1635 (2021). <https://doi.org/10.1016/j.proci.2020.06.195>
45. P. Schroeder*, A. Makowiecki*, M. Kelley, R. Cole*, N. Malarich*, R. Wright**, J. Porter, **G. Rieker**, "Temperature and concentration measurements in a high-pressure gasifier enabled by cepstral analysis of dual frequency comb spectroscopy," Proceedings of the Combustion Institute 38, 1561-1569 (2021). <https://doi.org/10.1016/j.proci.2020.06.011>
44. C. Alden**, R. Wright**, S. Coburn**, D. Caputi, G. Wendland**, A. Rybchuk*, S. Conley, I. C. Faloon, **G. Rieker**, "Temporal Variability of Emissions Revealed by Continuous, Long-Term Monitoring of an Underground Natural Gas Storage Facility," Environmental Science & Technology 54, 14589-14597 (2020). <https://doi.org/10.1021/acs.est.0c03175>
43. E. Strong*, A. Anderson, J. Gopinath, **G. Rieker**, "Centering a beam of light to the axis of rotation of a planar object," Review of Scientific Instruments 91, 105101 (2020). <https://doi.org/10.1063/5.0010160>
42. N. Wimer, M. Day, C. Lapointe, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, P. Hamlington, "Numerical Simulations of Buoyancy-Driven Flows Using Adaptive Mesh Refinement: Structure and Dynamics of a Large-Scale Helium Plume," Theoretical and Computational Fluid Dynamics, (2020). <https://doi.org/10.1007/s00162-020-00548-6>
41. E. Hannah*, W. Swann, J. Ellis, M. Bodine, M. Carter, N. Kuczun, N. Newbury, L. Sinclair, A. Muschinski, **G. Rieker**, "Optical timing jitter due to atmospheric turbulence: comparison of frequency comb measurements to predictions from micrometeorological sensors," Optics Express 28, 25664-27209 (2020). <https://doi.org/10.1364/OE.400434>
40. C. Goldenstein, G. Matthews, R. Cole*, A. Makowiecki*, **G. Rieker**, "Cepstral Analysis for Baseline-Insensitive Absorption Spectroscopy Using Light Sources with Pronounced Intensity Variations," Applied Optics 59, 7865-7875 (2020). <https://doi.org/10.1364/AO.399405>
39. A. Makowiecki*, J. Steinbrenner, N. Wimer, J. Glusman, C. LaPointe, P. Hamlington, J. Daily, **G. Rieker**, "Dual frequency comb spectroscopy of solid fuel pyrolysis and combustion: Quantifying the influence of moisture content in Douglas fir," Fire Safety Journal, 103185 (2020). <https://doi.org/10.1016/j.firesaf.2020.103185>
38. (Top download, August 2020; OSA Spotlight on Optics review) D. Lesko, A. Lind, N. Hoghooghi**, A. Kowligy, H. Timmers, P. Sekhar, B. Rudin, F. Emaury, **G. Rieker**, S. A. Diddams, "Fully phase-stabilized 1 GHz turnkey frequency comb at 1.56 μm ," OSA Continuum 3, 2070-2077 (2020). <https://doi.org/10.1364/OSAC.396597>
37. A. Makowiecki*, R. Cole*, N. Hoghooghi**, **G. Rieker**, "Pressure Scaling of Measured Absorption Cross-Sections by Modifying the Molecular Free Induction Decay Signal,"

- Journal of Quantitative Spectroscopy and Radiative Transfer 254, 107189 (2020).
<https://doi.org/10.1016/j.jqsrt.2020.107189>
36. A. Anderson, E. F. Strong*, B. M. Heffernan, M. E. Siemens, **G. Rieker**, J. T. Gopinath, "Detection technique effect on rotational Doppler measurements," *Optics Letters* 45, 2636- 2639 (2020). <https://doi.org/10.1364/OL.390425>
 35. N. Wimer, C. Lapointe, J. Christopher*, S. Nigam, T. Hayden*, A. Upadhye, M. Strobel, **G. Rieker**, P. Hamlington, "Scaling of the Puffing Strouhal Number for Buoyant Jets and Plumes," *Journal of Fluid Mechanics* 895, A26 (2020).
<https://doi.org/10.1017/jfm.2020.271>
 34. C. Lapointe, N. Wimer, J. Glusman, A. Makowiecki*, J. Daily, **G. Rieker**, P. Hamlington, "Efficient Simulation of Turbulent Diffusion Flames in OpenFOAM Using Adaptive Mesh Refinement," *Fire Safety Journal* 111, 102934 (2020).
<https://doi.org/10.1016/j.firesaf.2019.102934>
 33. T. Hayden*, N. Wimer, C. Lapointe, J. Christopher*, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, "Characterization of a buoyant jet from a catalytic combustor using wavelength modulation spectroscopy," *Combustion Science and Technology* 192, 997-1014 (2019). <https://doi.org/10.1080/00102202.2019.1604518>
 32. (Editor's pick) R. Cole*, A. Makowiecki*, N. Hoghooghi**, and **G. Rieker**, "Baseline-free Quantitative Absorption Spectroscopy Based on Cepstral Analysis," *Optics Express* 27, 37920-37939 (2019). <https://doi.org/10.1364/OE.27.037920>
 31. (Top 15 downloaded frequency comb article in Optica from 2019-2021) N. Hoghooghi**, R. Wright**, A. Makowiecki*, W. Swann, E. Waxman, I. Coddington, and **G. Rieker**, "Coherent broadband cavity-enhanced dual-comb spectroscopy for detection of multiple gas species," *Optica* 6, 28 (2019). <https://doi.org/10.1364/OPTICA.6.000028>
 30. A. Draper*, R. Cole*, J. Mohr, A. Zdanawicz, A. Marchese, N. Hoghooghi**, and **G. Rieker**, "Broadband Dual Frequency Comb Spectroscopy in a Rapid Compression Machine," *Optics Express* 27, 10814-10825 (2019). <https://doi.org/10.1364/OE.27.010814>
 29. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, E. Perez, E. Hoenig, K. Prasad, I. Coddington, and **G. Rieker**, "Single-blind quantification of natural gas leaks from 1 km distance using frequency combs," *Environmental Science and Technology* 53, 2908-2917 (2019). <https://doi.org/10.1021/acs.est.8b06259>
 28. T. Hayden*, N. Malarich*, D. Petrykowski*, S. Nigam, J. Christopher*, C. LaPointe, N. Wimer, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, "OH radical measurements in combustion environments using wavelength modulation spectroscopy and dual frequency comb spectroscopy near 1491 nm," *Applied Physics B* 125, 226 (2019). <https://doi.org/10.1007/s00340-019-7341-6>
 27. T. Hayden*, D. Petrykowski*, A. Sanchez*, S. Nigam, C. Lapointe, J. Christopher*, N. Wimer, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, "Characterization of OH, H₂O, and temperature profiles in industrial flame treatment systems interacting with

- polymer films,” Proceedings of the Combustion Institute 37 (indexed, peer reviewed), 1571-1578 (2019). <https://doi.org/10.1016/j.proci.2018.05.058>
26. J. Glusman, K. Niemeyer, A. Makowiecki*, N. Wimer, C. Lapointe, **G. Rieker**, P. Hamlington, and J. Daily, “Reduced Gas-Phase Kinetic Models for Burning of Douglas Fir,” *Frontiers in Mechanical Engineering* 5, 40 (2019). <https://doi.org/10.3389/fmech.2019.00040>
25. (Top 15 highly cited frequency comb articles in Optica) S. Coburn**, C. Alden**, R. Wright**, K. Cossel, G. Truong, E. Baumann, F. Giorgetta, C. Sweeney, N. Newbury, K. Prasad, I. Coddington, and **G. Rieker**, “Regional trace-gas source attribution using a field-deployed dual frequency comb spectrometer,” *Optica* 5, 320 (2018). <https://doi.org/10.1364/OPTICA.5.000320>
24. J. Christopher*, N. Wimer, C. LaPointe, T. Hayden*, I. Grooms, **G. Rieker**, and P. Hamlington, “Parameter estimation for complex thermal-fluid flows using approximate Bayesian computation,” *Physical Review Fluids* 3, 104602 (2018). <https://doi.org/10.1103/PhysRevFluids.3.104602>
23. J. Yang*, P. Schroeder*, M. Cich, B. Drouin, F. Giorgetta, W.C. Swann, I. Coddington, N. Newbury, and **G. Rieker**, “Speed-dependent Voigt Lineshape Parameter Database from Dual Frequency Comb Measurements up to 1305K. Part II: Argon-broadened H₂O Absorption, 6801-7188 cm⁻¹,” *Journal of Quantitative Spectroscopy and Radiative Transfer* 217, 189 (2018). <https://doi.org/10.1016/j.jqsrt.2018.02.025>
22. P. Schroeder*, M. Cich, J. Yang*, F. Giorgetta, W.C. Swann, I. Coddington, N. Newbury, B. Drouin, and **G. Rieker**, “Speed-dependent Voigt Lineshape Parameter Database from Dual Frequency Comb Measurements up to 1305K. Part I: Pure H₂O Absorption, 6801-7188 cm⁻¹,” *Journal of Quantitative Spectroscopy and Radiative Transfer* 210, 240 (2018). <https://doi.org/10.1016/j.jqsrt.2018.02.025>
21. C. Alden**, S. Ghosh, S. Coburn**, C. Sweeney, A. Karion, R. Wright**, I. Coddington, **G. Rieker**, and K. Prasad, “Bootstrap inversion technique for atmospheric trace gas source detection and quantification using long open-path laser measurements,” *Atmospheric Measurement Techniques* 11, 1565 (2018). <https://doi.org/10.5194/amt-11-1565-2018>
20. E. Mitchell, M. Hoehler, F. Giorgetta, T. Hayden*, **G. Rieker**, N. Newbury, E. Baumann, “Coherent laser ranging for precision imaging through flames,” *Optica* 5, 988 (2018). <https://doi.org/10.1364/OPTICA.5.000988>
19. P. Schroeder*, M. Cich, J. Yang*, W. Swann, I. Coddington, N. Newbury, B. Drouin, and **G. Rieker**, “Broadband, high-resolution investigation of advanced absorption lineshapes at high temperature,” *Physical Review A* 96, 022514 (2017). [doi:10.1103/PhysRevA.96.022514](https://doi.org/10.1103/PhysRevA.96.022514)
18. P. Schroeder*, D. Pfoth*, J. Yang*, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, and **G. Rieker**, “High temperature comparison of the HITRAN2012 and HITEMP2010 water vapor absorption databases to frequency comb measurements,”

- Journal of Quantitative Spectroscopy and Radiative Transfer 203, 194–205 (2017).
[doi:10.1016/j.jqsrt.2017.04.023](https://doi.org/10.1016/j.jqsrt.2017.04.023)
17. K. Cossel, E. Waxman, F. Giorgetta, M. Cermak, I. Coddington, D. Hesselius, S. Ruben, W. Swann, G. Truong, **G. Rieker**, and N. Newbury, “Spatially-scanned open-path dual comb spectroscopy to an airborne retroreflector,” *Optica* 4, 724-728 (2017).
[doi:10.1364/OPTICA.4.000724](https://doi.org/10.1364/OPTICA.4.000724)
 16. E. Waxman, K. Cossel, G. Truong, F. Giorgetta, W. Swann, S. Coburn**, R. Wright**, **G. Rieker**, I. Coddington, and N. Newbury, “Comparison of open-path dual frequency comb spectroscopy for high-precision atmospheric gas measurements,” *Atmospheric Measurement Techniques* 10, 3295-3311 (2017). [doi:10.5194/amt-2017-62](https://doi.org/10.5194/amt-2017-62)
 15. P. Schroeder*, R. Wright**, S. Coburn**, B. Sodergren*, K.C. Cossel, S. Droste, G.W. Truong, E. Baumann, F.R. Giorgetta, I. Coddington, N.R. Newbury, and **G.B. Rieker**, “Dual Frequency Comb Laser Absorption Spectroscopy in a 16 MW Gas Turbine Exhaust,” *Proceedings of the Combustion Institute* 36 (indexed, peer reviewed), 4565–4573 (2017). [doi:10.1016/j.proci.2016.06.032](https://doi.org/10.1016/j.proci.2016.06.032)
 14. T. Hayden*, **G. Rieker**, “Large Amplitude Wavelength Modulation Spectroscopy for Sensitive Measurements of Broad Absorbers,” *Optics Express* 24, 27910 (2016).
[doi:10.1364/OE.24.027910](https://doi.org/10.1364/OE.24.027910)
 13. F. Giorgetta, **G. Rieker**, E. Baumann, W. C. Swann, L. C. Sinclair, J. Kofler, I. Coddington, and N. R. Newbury, “Broadband Phase Spectroscopy over Turbulent Air Paths,” *Physical Review Letters* 115, 103901 (2015).
[DOI:10.1103/PhysRevLett.115.103901](https://doi.org/10.1103/PhysRevLett.115.103901)
 12. **G. Rieker**, F. Giorgetta, W. Swann, J. Kofler, A. Zolot, L. Sinclair, E. Baumann, C. Cromer, G. Petron, C. Sweeney, P. Tans, I. Coddington, N. Newbury, “Frequency Comb-Based Remote Sensing of Greenhouse Gases over Kilometer Air Paths,” *Optica* 1, 290-298 (2014). <https://doi.org/10.1364/OPTICA.1.000290>
 11. L. Sinclair, I. Coddington, W. Swann, **G. Rieker**, A. Hati, K. Iwakuni, and N. Newbury, “Operation of an Optically Coherent Frequency Comb Outside the Metrology Lab,” *Optics Express* 22, 6996 (2014). <https://doi.org/10.1364/OE.22.006996>
 10. **G. Rieker**, F. Poehlmann, and M. Cappelli, "A Thomson-type mass and energy spectrometer for characterizing ion energy distributions in a coaxial plasma gun operating in a gas-puff mode," *Physics of Plasmas* 20, 073115 (2013). [doi: 10.1063/1.4816028](https://doi.org/10.1063/1.4816028)
 9. F. Poehlmann, M. Cappelli, and **G. Rieker**, “Current Distribution Measurements Inside an Electromagnetic Plasma Gun Operated in a Gas-puff Mode,” *Physics of Plasmas* 17, 123508 (2010). <https://doi.org/10.1063/1.3526603>
 8. **G. Rieker**, J. Jeffries, and R. Hanson, "Calibration-Free Wavelength Modulation Spectroscopy for Measurements of Gas Temperature and Concentration in Harsh Environments," *Applied Optics* 48, 5546-5560 (2009).
<https://doi.org/10.1364/AO.48.005546>

7. **G. Rieker**, J. Jeffries, R. Hanson, M. Gruber, T. Mathur, and C. Carter, "Diode Laser-based Detection of Combustor Instabilities with Application to a Scramjet Engine," Proceedings of the Combustion Institute 32 (indexed, peer reviewed), 831-838 (2009). <https://doi.org/10.1016/j.proci.2006.07.158>
6. **G. Rieker**, J. Jeffries, R. Hanson, "Measurements of High-pressure CO₂ Absorption Near 2.0 μm and Implications on Sensor Design," Applied Physics B 94, 51-63 (2009). [DOI:10.1007/s00340-008-3280-3](https://doi.org/10.1007/s00340-008-3280-3)
5. **G. Rieker**, H. Li, J. Jeffries, R. Hanson, M. Allen, S. Wehe, P. Mullhall, and H. Kindle, "A Diode Laser Sensor for Rapid, Sensitive Measurements of Gas Temperature and Water Vapor Concentration at High Temperatures and Pressures," Measurement Science and Technology 18, 1195-1204 (2007). <https://doi.org/10.1088/0957-0233/18/5/005>
4. **G. Rieker**, H. Li, X. Liu, J.T.C. Liu, J. Jeffries, R. Hanson, M. Allen, S. Wehe, P. Mullhall, H. Kindle, A. Kakulo, K. Sholes, T. Matsuura, and S. Takatani, "Rapid Measurements of Temperature and H₂O Concentration in IC Engines with a Spark Plug-Mounted Diode Laser Sensor," Proceedings of the Combustion Institute 31 (indexed, peer reviewed), 3041-3049 (2007). <https://doi.org/10.1016/j.proci.2006.07.158>
3. **G. Rieker**, X. Liu, H. Li, J. Jeffries, and R. Hanson, "Measurements of Near-IR Water Vapor Absorption at High Pressure and Temperature," Applied Physics B 87, 169-178 (2007). <https://doi.org/10.1007/s00340-006-2523-4>
2. H. Li, **G. Rieker**, X. Liu, J. Jeffries, and R. Hanson, "Extension of Wavelength Modulation Spectroscopy to Large Modulation Depth for Diode Laser Absorption Measurements in High-Pressure Gases," Applied Optics 45, 1052-1061 (2006). <https://doi.org/10.1364/AO.45.001052>
1. J.T.C. Liu, **G. Rieker**, J. Jeffries, R. Hanson, M. Gruber, T. Mathur, and C. Carter, "Near-Infrared Diode Laser Absorption Diagnostic for Temperature and Water Vapor in a Scramjet Combustor," Applied Optics 44, 6701-6711 (2005). <https://doi.org/10.1364/AO.44.006701>

SUBMITTED MANUSCRIPTS

*Graduate student in Rieker lab

**Postdoc / Research staff/ Visiting Scholars in Rieker lab

1. S. Coburn**, N. Harris*, E. Miller*, S. Droste, K. Knabe, **G. Rieker**, "Measuring Methane Destruction Efficiency in Gas Flares with Dual Comb Spectroscopy," submitted.
2. C. Callahan*, E. Gatica*, S. Coburn**, G. Hampson, **G. Rieker**, "Compact, Real-Time Exhaust Gas Recirculation Rate Sensor for Use in Natural Gas Combustion Engine Control," submitted.
3. S. Simons-Wellin, C. Lapointe, S. Coburn**, S. Sheppard, J. Farnsworth, **G. Rieker**, P. Hamlington, "Improvement and Validation of Large Eddy Simulations of Transitional Jet

Diffusion Flames in Crossflow Using Data from Near-Infrared Dual Comb Spectroscopy,” submitted.

PATENTS

*Graduate student in Rieker lab

**Postdoc / Research staff/ Visiting Scholars in Rieker lab

14. **G. Rieker**, Sean Coburn**, “System and Method for Differentiating Gas Sources Based on Temperature,” U.S. Patent Application No. 63/547,062 filed November 2, 2023.
13. (Patent Family) **G. Rieker**, C. Alden**, R. Wright**, S. Coburn**, “Systems and Methods for Dual Comb Spectroscopy,” U.S. Patent No. US 11,686,622; Filed September 16, 2020, Issued June 27, 2023. Also Canadian Patent Application No. 3,093,345.
12. **G. Rieker**, C. Alden**, S. Coburn**, D. Wilson, “Optical Spectroscopy for Characterizing Atmospheric Emissions,” PCT Patent Application No. PCT/US23/15386; Filed March 16, 2023.
11. C. Callahan*, **G. Rieker**, “Spectroscopic Gas Sensing with Locality-sensitive Hashing of Measured Spectra,” PCT Patent Application No. PCT/US23/11240; Filed January 20, 2023.
10. R. Wright**, S.C. Coburn**, C. Alden**, **G. Rieker**, “Dual-Beam Optomechanical Steerer and Associated Methods,” PCT Patent Application No. PCT/US2022/023996; Filed April 8, 2022.
9. (Patent Family) C. Alden**, R. Wright**, S. Coburn**, **G. Rieker**, “Systems and Methods for Characterizing Atmospheric Emissions,” PCT Application No. PCT/US2021/063782; Nationalized: US, Canada, Australia, Saudi Arabia, UAE. Filed: December 16, 2021.
8. E. Strong*, **G. Rieker**, J. Gopinath, A.Q. Anderson, “Structured-Light Velocimeter and Velocimetry Method,” U.S. Patent Application No: 17/998,262; Filed November 9, 2022; Priority date: May 10, 2021.
7. A. Makowiecki*, R. Cole*, N. Hoghooghi**, **G. Rieker**, “Baseline-Free Quantitative Absorption Spectroscopy,” U.S. Patent No: 11,614,402; Filed March 10, 2020; Issued: March 28, 2023.
6. (Patent Family) C. Alden**, K. Prasad, S. Coburn**, R. Wright**, **G. Rieker**, “Apparatus and Methods for Location and Sizing of Trace Gas Sources,” U.S. Patent No. 10,690,562; Issued June 23, 2020. Also Canadian Patent No. 3,079,192.
5. **G. Rieker**, I. Coddington, N. Newbury, K. Prasad, A. Karion, “Hub And Spoke System For Detecting And Locating Gas Leaks,” U.S. Patent No. 10,473,818; Issued November 12, 2019.

4. K. Prasad, C. Alden**, S. Ghosh, **G. Rieker**, R. Wright**, S. Coburn**, “Determining a Location and Size of Gas Source with a Spectrometer Gas Monitor,” US Patent 10,240,998; Issued March 26, 2019.
3. **G. Rieker**, I. Coddington, N. Newbury, K. Prasad, A. Karion, “Hub And Spoke System For Detecting And Locating Gas Leaks,” U.S. Patent No: 10,228,490, Issued November 12, 2019.
2. F. Poehlmann, M. Cappelli, **G. Rieker**, “Method and Apparatus for Inductive Amplification of Ion Beam Energy,” U.S. Patent No: 8,558,461; Issued October 15, 2013.
1. **G. Rieker**, V. Vasudevan, U. Kumar, W. Croisettier, W. Bragg, G. Mekikian, R. Whyte, “Method and Apparatus to Prevent Esophageal Damage,” U.S. Patent No: 8,454,588; Issued June 4, 2013.

CONFERENCE PRESENTATIONS (Oral, with proceedings as indicated)

3 plenary, 49 invited, 72 with proceedings

*Graduate student in Rieker lab

**Postdoc / Research staff/ Visiting Scholars in Rieker lab

168. (Invited) **G. Rieker**, “Practical Dual Comb Spectroscopy to Improve Energy Systems: Navigating the Interfaces Between Science, Engineering, and Industry,” *13th Advanced Lasers and Photon Sources Conference (ALPS2024) in the framework of the OPTICS & PHOTONICS International Congress 2024 (OPIC2024)*, Yokohama, Japan, April 2024 (Oral).
167. (Invited) N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, R. Shaik, P. Lynch, S. Diddams, **G. Rieker**, “Chemical kinetics study with a GHz mid-infrared dual-comb spectrometer,” *2024 CLEO Technical Conference*, Charlotte, North Carolina, May 2024 (w/ proceedings).
166. S. Egbert*, D. Yun*, J. France, N. Malarich*, R. Cole*, J. Liu, K. Rice, M. Hagenmaier, N. Hoghooghi**, S. Coburn**, J. Donbar, **G. Rieker**, “Dual Comb Spectroscopy for High-temperature Ramjet Mass Flux Measurements,” *JANNAF 52nd Combustion, 40th Airbreathing Propulsion Meeting*, Salt Lake City, Utah, December 2023 (w/ proceedings).
165. L. Shannon, S. Coburn**, **G. Rieker**, P. Hamlington, J. Farnsworth, “Characterization of a Novel Inclinable Wind Tunnel for the Fundamental Study of Wildfire Combustion,” *2023 APS Division of Fluid Dynamics Annual Meeting*, Washington D.C., November 2023.
164. P. Bevington, L. Shannon, S. Simons-Wellin, C. Lapointe, S. Coburn**, **G. Rieker**, J. Farnsworth, and P. Hamlington, “Large Eddy Simulation of Turbulent Fire Spread in a Douglas Fir Fuel Array,” *2023 Fall Technical Meeting of the Western States Section of The Combustion Institute*, Northridge, CA, October 2023 (w/ proceedings).

163. S. Simons-Wellin, C. Lapointe, S. Coburn**, S. Sheppard, J. Farnsworth, **G. Rieker**, P. Hamlington, “Non-Unity Lewis Number Simulations of a Low Reynolds Number Jet Diffusion Flame in Crossflow,” *2023 Fall Technical Meeting of the Western States Section of The Combustion Institute*, Northridge, CA, October 2023 (w/ proceedings).
162. (Plenary) **G. Rieker**, “Practical Dual Comb Spectroscopy: Navigating the Interfaces Between Science, Engineering, and Industry,” *Optica Sensing Congress*, Munich, Germany, July 2023.
161. M. Walsh, P. Chang, F. Emaury, **G. Rieker**, N. Newbury, F. Giorgetta, S. Diddams, J. Genest, “Mode-resolved, shot noise limited, dual-comb spectroscopy with independent free running lasers,” *Fourier Transform Spectroscopy (FTS), Optica Sensing Congress*, Munich, Germany, July 2023 (w/ proceedings).
160. (Invited) N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, R. Ishrak, R. Reddy, P. Lynch, S. Diddams, **G. Rieker**, “GHz repetition rate mid-infrared lasers for dual-comb spectroscopy,” *Optica Sensing Congress*, Munich, Germany, July 2023 (w/ proceedings).
159. (Invited Hot Topic) S. Egbert*, N. Hoghooghi**, P. Chang, A. Lalko*, S. Coburn**, S. Diddams, **G. Rieker**, “Broadband, High-Resolution, Portable Dual Comb Spectrometer From 3-5 μm ,” *Gordon Research Conference, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023.
158. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, “O₂ A-Band Thermometry and Velocimetry in a Ramjet with Dual Comb Spectroscopy,” *Gordon Research Seminar, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023.
157. C. Callahan*, D. Long, S. Coburn**, **G. Rieker**, “GPU Accelerated Absorption Simulation (GAAS),” *5th QUADMARTS Workshop*, Estes Park, Colorado, June 2023.
156. S. Egbert*, N. Hoghooghi**, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, “High-Resolution Near- and Mid-IR Dual Comb Spectroscopy for High-Temperature Database and Field Measurements,” *5th QUADMARTS Workshop*, Estes Park, Colorado, June 2023.
155. K. Rozmiarek, T. Jones, I. Overeem,, Y. Oh, B. Vaughn, V. Morris, E. Miller*, **G. Rieker**, C. Brashear, “Working Towards a Better Understanding of Hotpot Methane Emissions from Big Trail Lake, Goldstream Valley, Alaska,” *6th European Conference on Permafrost (EUCOP 2023)*, Puigcerdà, Spain, June 2023.

154. D.A. Long, M.J. Cich, C. Mathurin*, A.T. Heiniger, G.C. Mathews**, A. Frymire*, **G. Rieker**, “High speed mid-infrared dual comb spectroscopy with a single optical parametric oscillator,” *CLEO/Europe*, Munich, Germany, June 2023.
153. S. Egbert*, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, “High-Resolution Dual Comb Spectroscopy to Validate High-Temperature H₂O Absorption Models,” *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2023, (w/ proceedings).
152. N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, P. Lynch, S. Diddams, **G. Rieker**, “Mid-Infrared Dual-Comb Spectroscopy for High-Speed Chemical Kinetics Measurements in a Shock Tube,” *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2023, (w/ proceedings).
151. (Invited) **G. Rieker**, R. Wright, S. Coburn**, C. Alden, I. Dickinson, “Large-Scale Mitigation of Methane Emissions from Oil and Gas Operations with Dual Frequency Comb Spectroscopy” *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2023.
150. P. Chang, N. Hoghooghi**, S. Swartz, D. Lesko, R. Ishark, S. Egbert*, J. Biegert, R. Reddy, **G. Rieker**, S. Diddams, “Mid-Infrared Hyperspectral Microscopy With Broadband 1-GHz Dual-Comb Spectroscopy,” *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2023, (w/ proceedings).
149. C. Mathurin*, D. Long, G. Mathews**, M. Cich, A. Heiniger, K. Souders, A. Frymire*, P. Hamlington, **G. Rieker**, “High Speed Velocity Measurements with Mid-Infrared Electro-Optic Modulated Dual Comb Spectroscopy” *13th U.S. National Combustion Meeting*, College Station, Texas, 2023, (w/ proceedings).
148. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, “Temperature and Velocity in a Ramjet with O₂ Dual Comb Spectroscopy” *13th U.S. National Combustion Meeting*, College Station, Texas, 2023, (w/ proceedings).
147. (Invited) N. Hoghooghi**, P. Chang, M. Burch, S. Egbert*, S. Diddams, P. Lynch, **G. Rieker**, “1-GHz MIR dual-comb spectrometer for high-speed chemical kinetics studies,” *IEEE Photonics Conference IPC*, Vancouver, Canada, November 2022.
146. (Invited) **G. Rieker**, S. Coburn**, N. Hoghooghi**, “Advancements in Dual Frequency Comb Spectroscopy for Sensing in Harsh and Remote Environments,” *Field Laser Applications in Industry & Research (FLAIR)*, Aix les Bains, France, September 2022.
145. N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, P. Lynch, S. Diddams, **G. Rieker**, “High-speed mid-infrared dual-comb spectrometer based on mode-locked fiber combs,” *Field Laser Applications in Industry & Research (FLAIR)*, Aix les Bains, France, September 2022.
144. D. Yun*, R. Cole*, N. Malarich*, S. Egbert*, W. Sabin*, J. France, J. Liu, M. Hagenmaier, K. Rice, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker**, “Mass Flux

Measurements with Dual Frequency Comb Spectroscopy," *Field Laser Applications in Industry & Research (FLAIR)*, Aix les Bains, France, September 2022.

142. R. Cole*, H. Tran, N. Hoghooghi**, **G. Rieker**, "Temperature-dependent CO₂ Lin Mixing Models using Dual Frequency Comb Absorption and Phase Spectroscopy up to 25 bar and 1000 K," *ASA-HITRAN Conference*, Reims, France, August 2022.
141. (Invited) **G. Rieker**, "Free Range Frequency combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing," *IEEE Photonics Society Summer Topicals Meeting*, Cabo San Lucas, Mexico, July 2022.
140. D. Yun*, N. Malarich*, R. Cole*, S. Egbert*, J. France, J. Liu, K. Rice, M. Hagenmaier, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker**, "Hypersonic Combustion Diagnostics with Dual Comb Spectroscopy," *39th International Symposium on Combustion*, Vancouver, B.C., Canada, July 2022.
139. C. Callahan*, S. Coburn**, **G. Rieker**, "The GPU Accelerated Absorption Simulation (GAAS) Platform," *75th International Symposium on Molecular Spectroscopy*," Champaign-Urbana, Ill, June 2022.
138. S. Egbert*, P. Chang, S. Diddams, **G. Rieker**, N. Hoghooghi**, "High-Speed, High-Resolution, Broadband Dual-Comb Spectrometer From 3-5 μm ," *75th International Symposium on Molecular Spectroscopy*," Champaign-Urbana, Ill, June 2022.
137. (Invited) **G. Rieker**, "From Rocket Engines to Exoplanets: Dual Frequency Comb Spectroscopy of High Temperature and Pressure Lineshapes in Support of Extreme Environment Diagnostics," *ICSLS (International Conference on Spectral Line Shapes)*, Caserta, Italy, June 2022.
136. E. Strong*, S. Coburn**, A. Anderson, R. Cole*, S. Becker, J. Gopinath, **G. Rieker**, "Broadband Spectroscopic Imaging Using Dual Frequency Comb Spectroscopy and Compressive Sensing," *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2022, (w/ proceedings).
135. A. Anderson, E. Strong*, S. Coburn**, **G. Rieker**, J. Gopinath, "Dual Comb Ranging and Rotation Sensing with Orbital Angular Momentum," *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2022, (w/ proceedings).
134. D. Yun*, R. Cole*, N. Malarich*, S. Coburn**, N. Hoghooghi**, J. France, K. Rice, J. Donbar, **G. Rieker**, "Velocity Measurements in a Ground-test Ramjet using Dual Frequency Comb Spectroscopy," *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2022, (w/ proceedings).
133. P. Chang, N. Hoghooghi**, S. Egbert*, S. Xing, D. Lesko, A. Lind, **G. Rieker**, S. Diddams, "1 GHz Mid-infrared Dual-comb Spectrometer Spanning More Than 30 THz," *CLEO: Conference on Lasers and Electro-Optics*, San Jose, CA, May 2022, (w/ proceedings).

132. D. Yun*, R. Cole*, N. Malarich*, S. Egbert*, J. France, J. Liu, M. Hagenmaeier, K. Rice, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker**, “2D Mass Flux Profile of an Oblique Shock Train in a Scramjet Isolator via Dual-Frequency Comb Spectroscopy,” *AIAA SciTech Forum and Exposition*, San Diego, CA, January 2022 (w/ proceedings).
131. (Best student paper award) R.Cole*, N. Hoghooghi**, **G. Rieker**, “Improving absorption models for CO₂ at high pressure and temperature using dual frequency comb spectroscopy,” *2021 OSA Optical Sensors and Sensing Congress*, virtual, July 19-23 2021 (w/ proceedings).
130. (Invited) **G.B. Rieker**, “The Value of Continuous Methane Monitoring Using Dual Frequency Comb Lasers: Success Stories from Long-term Industry Deployments,” *2021 OSA Optical Sensors and Sensing Congress*, 19-23 July, virtual, 2021 (w/ proceedings).
129. J.F. Glusman, C.B. Lapointe, A.S. Makowiecki, S. Simons-Wellin, **G.B. Rieker**, J.W. Daily, P.E. Hamlington, “Computationally efficient simulations of Douglas Fir pyrolysis and combustion” *12th U.S. National Combustion Meeting*, virtual, 2021 (w/ proceedings).
128. N.A. Malarich, **G.B. Rieker**, “Measuring temperature nonuniformity through a diffusion flame with single-beam absorption spectroscopy,” *12th U.S. National Combustion Meeting*, virtual, 2021 (w/ proceedings).
127. N. A. Malarich*, D. Yun*, K. Sung, S. C. Egbert*, S. C. Coburn**, B. R Drouin, **G. B. Rieker**, “Examination of Spectroscopic Databases via Dual Frequency Comb Absorption Spectroscopy of CH₄ from 6770-7630 cm⁻¹ up to 1000 K,” *International Symposium on Molecular Spectroscopy*, Champagne-Urbana, June 2021.
126. S.C. Egbert*, N. Malarich*, D. Yun*, K. Sung, S.C. Coburn**, B. R. Drouin, **G.B. Rieker**, “Speed-Dependent Voigt Lineshape Parameter Database Using Dual Frequency Comb Laser Absorption Measurements Of Pure And Air-Broadened H₂O From 6656-7540 CM-1 Up To 1100 K,” *International Symposium on Molecular Spectroscopy*, Champagne-Urbana, June 2021.
125. R. Cole*, N. Hoghooghi**, **G. B. Rieker**, “Dual Frequency Comb Absorption Spectroscopy of CO₂ at High Pressure And Temperature,” *International Symposium on Molecular Spectroscopy*, Champagne-Urbana, June 2021.
124. E. Strong*, A. Q. Anderson, B. M. Heffernan, M. P. Brenner, N. Hoghooghi**, J. T. Gopinath, **G. B. Rieker**, “Sensing Angular Velocity with Optical Orbital Angular Momentum and Machine Learning,” *OSA Optical Sensors and Sensing Congress*, Vancouver, Canada, July 2021 (w/ proceedings).
123. N. Hoghooghi**, A. Lind, D. Lesko, S. Xing, P.Chang, **G.Rieker**, S. Diddams, “Intra-pulse difference frequency generation spanning 7 to 14 μm with a 1-GHz mode-locked laser comb,” *CLEO: Conference on Lasers and Electro-Optics*, May 2021, (w/ proceedings).

122. A. Anderson, E. Strong*, B. Heffernan, M. Siemans, **G. Rieker**, J. Gopinath, "Rotation Measurement Using Spatially Incoherent Light and the Rotational Doppler Shift," *CLEO: Conference on Lasers and Electro-Optics*, May 2021, (w/ proceedings).
121. A. Rybchuk*, C. Alden**, J. Lundquist, **G. Rieker**, "Evaluating the Accuracy of WRF-LES for Natural Gas Monitoring Applications," *101st Annual Meeting of the American Meteorological Society*, January 2021.
120. P. Schroeder*, A. Makowiecki*, M. Kelley, R. Cole*, N. Malarich*, R. Wright**, J. Porter, **G. Rieker**, "Temperature and concentration measurements in a high-pressure gasifier enabled by cepstral analysis of dual frequency comb spectroscopy," *38th International Symposium on Combustion*, Adelaide, Australia, virtual, January 2021.
119. A. Makowiecki, D. Herman, N. Hoghooghi**, E. Strong*, R. Cole*, G. Yeas, F. Giorgetta, C. Lapointe, J. Glusman, J. Daily, P. Hamlington, N. Newbury, I Coddington, **G. Rieker**, "Mid-Infrared Dual Frequency Comb Spectroscopy for Combustion Analysis from 2.8 to 5 Microns," *38th International Symposium on Combustion*, Adelaide, Australia, virtual, January 2021.
118. (Invited) D. Yun, R. Cole, S. Coburn, K. Rice, J. Donbar, **G. Rieker**, N. Malarich, S. Egbert, N. Hoghooghi, J. France, J. Liu, M. Hagenmaier, "Non-intrusive Measurement of High Speed Flows." *AIAA: SciTech Forum*, virtual, January 2021 (w/ proceedings)
117. D. Yun*, N. Malarich*, R. Cole*, S. Egbert*, S. Coburn**, N. Hoghooghi**, J. France, K. Rice, J. Donbar, **G. Rieker**, "Velocity Measurements in a Ground-test Scramjet using Dual Frequency Comb Spectroscopy," *JANNAF 50th CS/38th APS, 38th EPSS/ 32nd ESHS Joint Subcommittee Meeting*, virtual, December 2020.
116. (Invited) **G. Rieker**, N. Malarich*, D. Yun*, R. Cole*, S. Egbert*, S. Coburn**, N. Hoghooghi**, J. France, K. Rice, J. Donbar, "Dual Frequency Comb Spectroscopy for CFD validation in High speed Combustion," *JANNAF 50th CS/38th APS, 38th EPSS/ 32nd ESHS Joint Subcommittee Meeting*, virtual, December 2020.
115. A. Rybchuk*, C. Alden**, J. Lundquist, G. Rieker, "A Comparison of Trace Gas Dispersion from WRF-LES to Project Prairie Grass," *Rocky Mountain Fluid Mechanics Research Symposium*, August 2020.
114. (Invited) S. Coburn**, C. Alden**, R. Wright**, D. Wilson, G. Wendland, A. Rybchuk*, N. Sietz, D. Doran, I. Coddington, I. Faloona, and G. Rieker, "Continuous Observations of Methane Emissions from Oil and Natural Gas Infrastructure Using a Dual Frequency Comb Based Monitoring System," *OSA Optical Sensors and Sensing/Imaging and Applied Optics Congress*, virtual, June 2020.
113. (Invited) N. Hoghooghi**, A. Makowiecki*, D. Herman, E. Strong*, R. Cole*, G. Ycas, F. Giorgetta, N. Newbury, I. Coddington, **G. Rieker**, "Mid-infrared Dual-comb Spectroscopy for Wildfire Combustion Analysis," *OSA Optical Sensors and Sensing/Imaging and Applied Optics Congress*, virtual, June 2020.

112. E. Hannah*, W. Swann, J. Ellis, M. Bodine, C. Mak, N. Kuczun, N. Newbury, L. Sinclair, A. Muschinski, **G. Rieker**, “Retrieval of the Refractive Index Structure Parameter from Frequency Comb Timing Jitter Data,” *2020 OSA Optical Sensors and Sensing Congress*, Vancouver, Canada, June 2020 (w/ proceedings).
111. M. Ruiz-Llata**, **G. Rieker**, “Independent Component Analysis for Spectral Signature Separation in Dual-comb Spectroscopy,” *2020 OSA Optical Sensors and Sensing Congress*, Vancouver, Canada, June 2020 (w/ proceedings).
110. E. Hannah*, W. Swann, J. Ellis, M. Bodine, N. Newbury, L. Sinclair, A. Muschinski, **G. Rieker**, “Impact of Outdoor Atmospheric Turbulence on Optical Timing Jitter,” *CLEO: Conference on Lasers and Electro-Optics*, Orlando Florida, May 2020 (w/ proceedings).
109. E. Strong*, A. Anderson, B. Heffernan, M. Brenner, J. Gopinath, **G. Rieker**, “An angular velocity sensor using machine learning and optical orbital angular momentum,” *CLEO: Conference on Lasers and Electro-Optics*, Orlando Florida, May 2020 (w/ proceedings).
108. (Invited) A. Makowiecki*, N. Hoghooghi**, D. Herman, E. Strong*, R. Cole*, G. Ycas, F. Giorgetta, N. Newbury, I. Coddington, **G. Rieker**, “Mid-Infrared Dual-Comb Spectroscopy of Biomass Pyrolysis,” *CLEO: Conference on Lasers and Electro-Optics*, Orlando, Florida, May 2020 (w/ proceedings).
107. (Invited) **G. Rieker**, “Emission Inventories from Natural Gas Storage Facilities Using Regional Frequency Comb Laser Monitoring and Aircraft Flyovers,” *Carbon Capture, Utilization and Storage, and Oil and Gas Technologies Integrated Review Meeting 2019*, Pittsburgh, PA, August 2019.
106. (Invited) **G. Rieker**, C. Alden**, S. Coburn**, R. Wright**, N. Seitz, D. Doran, D. Wilson, A. Rybchuk*, G. Wendland*, J. Genest, A. Tourigny-Plante, J.D. Deschenes, I. Coddington, K. Osadetz, “Greenhouse Gas Source Attribution Over Multiple Square Kilometer Regions Using Dual Frequency Comb Lasers,” *CAMI Subscribers Meeting 2019*, Calgary, Alberta, Canada, August 2019.
105. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, G. Rieker, “Baseline Free Absorption Spectroscopy,” Gordon Research Conference, Les Diablerets, Switzerland, July 2019.
104. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, G. Rieker, “Baseline Free Absorption Spectroscopy,” Gordon Research Seminar, Les Diablerets, Switzerland, July 2019.
103. D. Yun*, N. Malarich*, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, “Updating High Temperature Methane Absorption Databases Using Dual Comb Spectroscopy Data,” *Rocky Mountain Fluid Mechanics Symposium*, Boulder, Colorado, July 2019.
102. C. Alden**, **G. Rieker**, S. Coburn**, R. Wright**, N. Seitz, D. Doran, D. Wilson, A. Rybchuk*, G. Wendland*, J. Genest, A. Tourigny-Plante, J.D. Deschenes, I. Coddington, K. Osadetz, “Greenhouse Gas Source Attribution Over Multiple Square Kilometer

Regions Using Dual Frequency Comb Lasers,” *COSIA/Oil Sands Innovation Summit 2019*, Calgary, Alberta, Canada, June 2019.

101. N. Malarich*, D. Yun*, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, “High Temperature Methane Absorption With A Dual Frequency Comb Spectrometer,” *International Symposium on Molecular Spectroscopy*, Champaign-Urbana, Illinois, June 2019.
100. R. Cole*, A. Makowiecki*, N. Hoghooghi**, **G. Rieker**, “Baseline-free Measurement of Temperature, Pressure, and Concentration from Molecular Free Induction Decay,” *International Symposium on Molecular Spectroscopy*, Champaign-Urbana, Illinois, June 2019.
99. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, **G. Rieker**, “Baseline Free Absorption Spectroscopy,” *Gordon Research Conference*, Les Diablerets, Switzerland, July 2019.
98. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, **G. Rieker**, “Baseline Free Absorption Spectroscopy,” *Gordon Research Seminar*, Les Diablerets, Switzerland, July 2019.
99. (Plenary) **G. Rieker**, “Frequency Combs in Combustion,” *QUADMARTS*, Nancy, France, May 2019.
98. N. Hoghooghi**, R. Wright**, W. Swann, I. Coddington, and **G. Rieker**, “Broadband Coherent Cavity-Enhanced Dual-Comb Spectroscopy,” *Cavity Enhanced Spectroscopy Conference 2019*, Madison, WI, June 2019.
97. (Invited) E. Baumann, E. Mitchell, M. Hoehler, F. Giorgetta, T. Hayden*, **G. Rieker**, N. Newberry, “Imaging through Flames with Coherent Laser Ranging,” *Conference on Lasers and Electro-Optics, (CLEO)*, San Jose, California, May 2019.
96. (Postdeadline) R. Cole*, A. Makowiecki*, N. Hoghooghi**, **G. Rieker**, “Baseline-free Quantitative Absorption Spectroscopy, Based on Molecular Free Induction Decay,” *Conference on Lasers and Electro-Optics, (CLEO)*, San Jose, California, May 2019 (w/ proceedings).
95. N. Hoghooghi**, R. Cole*, A. Makowiecki*, and **G. Rieker**, “GHz Dual-comb Spectroscopy with 110- μ s Time Resolution,” *CLEO 2019*, San Jose, CA, May 2019 (w/ proceedings).
94. C. Lapointe, N. Wimer, M. Day, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, P. Hamlington, “The Study of Fire at Small Scales Using Adaptive Mesh Refinement,” 17th International Conference on Numerical Combustion, SIAM, Aachen, Germany, May 2019.
93. (Invited) **G. Rieker**, “Leveraging Lasers for Carbon Reduction,” *21st Century Energy Transitions Symposium*, Denver, CO, April 2019.

92. (Plenary) **G. Rieker**, “Frequency Combs in Combustion,” *11th US National Combustion Meeting*, Pasadena, CA, March 2019.
91. N. Malarich*, Torrey Hayden*, and **G. Rieker**, “Capturing spatial temperature distributions with broadband single-beam absorption spectroscopy,” *11th US National Combustion Meeting*, Pasadena, CA, March 2019 (w/ proceedings).
90. A. Makowiecki*, J.E. Steinbrenner, N.T. Wimer*, C.B. Lapointe, J.F. Glusman, J.W. Daily, P.E. Hamlington, **G. Rieker**, “Comparison of Flame Temperatures to Mass Flux Rates for Wildland Fire Fuels,” *11th US National Combustion Meeting*, Pasadena, CA, March 2019 (w/ proceedings).
89. C. Lapointe, N. Wimer, J. Glusman, A. Makowiecki*, J. Daily, **G. Rieker**, and P. Hamlington, “Progress Towards High Fidelity Simulations of Large-Scale Fires,” *11th US National Combustion Meeting*, Pasadena, CA, March 2019 (w/ proceedings).
88. (Invited) **G. Rieker**, S. Coburn**, C. Alden**, R. Wright**, S. Conley, I. Faloona, K. Prasad, and I. Coddington, “Multi-facility methane leak detection with a long-distance frequency comb laser system,” *EUCI Stakeholder Symposium on Mitigating Methane Emissions*, Los Angeles, CA, March 2019.
87. N. Wimer, M. Day, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, and P. Hamlington, “Low Mach Number AMR Combustion Simulations with PeleLM,” Conference on Computational Science and Engineering, SIAM, Spokane, WA, February 2019.
86. A. Draper*, R. Cole*, J. Mohr, A. Zdanawicz, C. Gould, A. Marchese, N. Hoghooghi**, and **G. Rieker**, “Progress Toward Dual Frequency Comb Spectroscopy in a Rapid Compression Machine,” *AIAA Science and Technology Exhibition and Forum*, San Diego, CA, January 2019 (w/ proceedings).
85. (Invited) **G. Rieker**, R. Cole*, N. Hoghooghi**, and A. Draper*, “Dual-frequency comb spectroscopy for dynamic, high-pressure combustion systems,” *Fourier Transform Spectroscopy*, Singapore, Singapore, November 2018.
84. J. Christopher*, D. Petrykowski*, T. Hayden*, C. Lapointe, N. Wimer, S. Nigam, I. Grooms, P. Hamlington, and **G. Rieker**, “Parameter Estimation using Wavelength Modulation Spectroscopy Temperature Measurements and Approximate Bayesian Computation,” *OSA Optics and Photonics for Energy & the Environment (E2)*, Singapore, Singapore, November 2018 (w/ proceedings).
83. R. Cole*, A. Draper*, P. Schroeder*, and **G. Rieker**, “Dual Frequency Comb Absorption Spectroscopy of Extreme Pressure and Temperature Environments,” *Field Laser Applications in Industry and Research (FLAIR)*, Assisi, Italy, September 2018.
82. C. Alden**, S. Coburn**, R. Wright**, A. Rybchuk*, G. Wendland**, K. Cossel, E. Baumann, K. Prasad, I. Coddington, and **G. Rieker**, “New monitoring and detection methodology for methane emissions from oil and gas,” *2nd annual National Enforcement Investigation Center (NEIC) Technical Information Exchange*, Denver, CO, August 2018.

81. I. Coddington, G. Truong, E. Waxman, K. Cossel, P. Schroeder*, R. Wright**, S. Coburn**, C. Alden**, E. Baumann, F. Giorgetta, W. Swann, **G. Rieker**, N.R. Newbury, “Dual-comb spectroscopy for precision green-house gas measurement”, *24th International Conference on Optics*, Tokyo, Japan, August 2018.
80. T. Hayden*, D. Petrykowski*, A. Sanchez*, S. Nigam, C. Lapointe, J. Christopher*, N. Wimer, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, “Characterization of OH, H₂O, and temperature profiles in industrial flame treatment systems interacting with polymer films,” *37th International Symposium on Combustion*, Dublin, Ireland, July 2018.
79. N. Malarich* and **G. Rieker**, “Theoretical limits of nonuniform temperature retrievals with single-beam absorption spectroscopy,” *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)*, Orlando, FL, July 2018 (w/ proceedings).
78. (Invited) **G. Rieker**, S. Coburn**, C. Alden**, R. Wright**, S. Conley, I. Faloona, K. Prasad, and I. Coddington, “Dual Frequency Comb Methane Leak Detection at Operational Oil and Gas Facilities,” *73rd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2018.
77. R. Cole*, P. Schroeder*, A. Draper*, M. Cich, B. Drouin, and **G. Rieker**, “Dual Frequency Comb Spectroscopy for Development and Testing of High Pressure, High Temperature Absorption Models,” *73rd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2018.
76. E. Waxman, K. Cossel, F. Giorgetta, G. Truong, M. Cermak, W. Swann, D. Hesselius, **G. Rieker**, N. Newbury, I. Coddington, “Dynamic Regional and City Scale Sensing of GHG’s using a Dual-comb Spectrometer,” *73rd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2018.
75. (Invited) **G. Rieker**, P. Schroeder*, R. Cole*, J. Yang*, A. Draper*, M. Cich, B. Drouin, “Frequency Comb Lasers in High-temperature Spectroscopy: Spectral Database Development to Practical Field Measurements,” *15th International HITRAN conference*, Cambridge, MA, June 2018.
74. (Invited) **G. Rieker**, S. Coburn**, C. Alden**, R. Cole*, A. Draper*, P. Schroeder*, R. Wright**, I. Coddington, K. Cossel, E. Baumann, K. Prasad, N. Newbury, “Novel Uses of Stabilized Optical Frequency Combs: from Regional Methane Leak Source Identification to Diagnostics for Extreme Combustion,” *IEEE International Frequency Control Symposium*, Squaw Valley, CA, May 2018. (w/ proceedings).
73. (Invited) N. Hoghooghi**, R. Wright**, W. Swann, I. Coddington, N. Newbury, and **G. Rieker**, “Sensitive Detection of Multiple Gas Species using a Cavity Enhanced Dual-Comb Spectrometer,” *CLEO 2018*, San Jose, CA, May 2018 (w/ proceedings).
72. S. Coburn**, C. Alden**, R. Wright**, E. Baumann, K. Cossel, N. Newbury, K. Prasad, I. Coddington, and **G. Rieker**, “Quantifying methane emissions among simulated gas wells with a dual-frequency comb spectrometer,” *CLEO 2018*, San Jose, CA, May 2018 (w/ proceedings).

71. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, C. Sweeney, A. Karion, I. Coddington, **G. Rieker**, “Single-blind testing of a regional, continuous monitoring system for finding methane leaks from oil and gas operations,” *NOAA/ESRL Laboratory Global Monitoring Annual Conference*, Boulder, CO, May 2018.
70. N. Wimer, A. Makowiecki*, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, and P. Hamlington, “Direct Numerical Simulation of a Turbulent Helium Plume and Methane Pool Fire,” *The Fire Continuum Conference*, Missoula, MT, May 2018.
69. I. Coddington, K. Cossel, E. Waxman, F. Giorgetta, M. Cermak, D. Hesselius, S. Ruben, W. Swann, G. Truong, **G. Rieker**, and N. Newbury, “Regional sensing with an open-path dual comb spectroscopy and a UAS,” *SPIE Defense + Security*, Orlando, FL, April 2018. (w/ proceedings).
68. I. Coddington, C. Alden**, E. Baumann, S. Coburn**, K. Cossel, F. Giorgetta, D. Herman, K. Prasad, N. Newbury, **G. Rieker**, E. Waxman, R. Wright**, G. Ycas, “Fiber frequency combs for remote sensing”, *SPIE Photonics Europe*, Srasbourg, France, April 2018.
67. P. Schroeder*, M. Cich, J. Yang*, B. Drouin, R. Cole*, A. Draper*, and **G. Rieker**, “Study of High Temperature Absorption Lineshapes using Frequency Comb Lasers,” *Western States Section Combustion Institute (WSSCI) Spring Meeting*, Bend, OR, March 2018 (w/ proceedings).
66. J. Glusman, A. Makowiecki*, N. Wimer, K. Niemeyer, **G. Rieker**, P. Hamlington, J. Daily, “A Chemical Kinetic Mechanism Reduction and Pyrolysis Model for Wildland Fire Direct Numerical Simulation,” *Western States Section Combustion Institute (WSSCI) Spring Meeting*, Bend, OR, March 2018 (w/ proceedings).
65. N. Wimer, A. Mackowiecki*, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, and P. Hamlington, “Examination of Wildland Fire Spread at Small Scales Using Direct Numerical Simulations and High-Speed Laser Diagnostics,” *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.
64. (Invited) S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, F. Giorgetta, G. Truong, N. Newbury, I. Faloon, S. Conley, S. Ghosh, K. Prasad, I. Coddington, and **G. Rieker**, “Quantification of Variable Trace Gas Emissions across Large Regions using a Field-deployed Dual-comb Spectrometer”, *OSA Optics and Photonics for Energy & the Environment (E2)*, Boulder, CO, November 2017 (w/ proceedings).
63. (Invited) **G. Rieker**, “Prospects for Laser-Based Sensing in Solar Reactors”, *Optics for Solar Energy (SOLAR)*, Boulder, CO, November 2017.
62. T. Hayden*, N. Wimer, C. Lapointe, J. Christopher*, S. Nigam, P. Hamlington, **G. Rieker**, “Wavelength Modulation Spectroscopy of OH Radical in an Industrial Flame”, *OSA Optics and Photonics for Energy & the Environment (E2)*, Boulder, CO, November 2017 (w/ proceedings).

61. A. Makowiecki*, N. Wimer, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, P. Hamlington, and **G. Rieker**, “Examination of Wildland Fire Spread at Small Scales using Frequency Comb Laser Diagnostics and Direct Numerical Simulations,” *7th International Fire Ecology and Management Conference Smoke Management and Modeling*, Orlando, FL, November, 2017.
60. J. Christopher*, N. Wimer, C. Lapointe, T. Hayden*, I. Grooms, **G. Rieker**, P. Hamlington, “A Parameter Estimation for a Pulsating Turbulent Buoyant Jet Using Approximate Bayesian Computation”, *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, CO, November 2017.
59. N. Wimer, A. Makowiecki*, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, P. Hamlington, “Direct Numerical Simulation of Wildland Fires at Small Scales”, *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, CO, November 2017.
58. S. Nigam, C. Lapointe, J. Christopher*, N. Wimer, T. Hayden*, **G. Rieker**, P. Hamlington, “Flame Structure and Dynamics for an Array of Pre-mixed Methane-Air Jets,” *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, CO, November 2017.
57. (Invited) **G. Rieker**, “Tackling the Grand Challenge of Fugitive Methane Emissions from Oil and Gas Production,” *21st Century Energy Transition Symposium*, Fort Collins, CO, October 2017.
56. N. Wimer, A. Makowiecki*, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, P. Hamlington, “Direct Numerical Simulation of Wildland Fires at Small Scales”, *Western States Section Combustion Institute (WSSCI) Fall Meeting*, Laramie, WY, October 2017 (w/ proceedings).
55. (Invited) **G. Rieker**, “Frequency Combs in Combustion,” *Gordon Conference on Laser Diagnostics in Combustion*, Mt. Snow, VT, August 2017.
54. A. Draper*, R. Cole*, P. Schroeder*, **G. Rieker**, “Design and Evaluation of a High-Temperature and High-Pressure Spectroscopic Cell”, *Rocky Mountain Fluids Meeting*, Boulder, CO, August 2017.
53. A. Makowiecki*, T. Hayden*, M. Nakles, N. Pilgram, N. MacDonald, W. Hargus, **G. Rieker**, “Wavelength modulation spectroscopy for measurements of temperature and species concentration downstream from a supersonic nozzle,” *53rd AIAA/SAE/ASEE Joint Propulsion Conference*, 2017 AIAA Propulsion and Energy Forum and Exposition, Atlanta, GA, July 2017 (w/ proceedings).
52. P. Schroeder*, M. Cich, J. Yang*, B. Drouin, **G. Rieker**, “Multispectral fitting validation of the speed dependent Voigt profile at up to 1300K in water vapor with a dual frequency comb spectrometer”, *72nd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2017.
51. T. Hayden*, N. Wimer, C. Lapointe, J. Christopher*, P. Hamlington, **G. Rieker**, “Characterization of the Output from a Catalytic Combustor Using Wavelength

- Modulation Spectroscopy”, *2017 AIAA Aviation and Aeronautics Forum and Exposition (AIAA AVIATION Forum)*, Denver, CO, June 2017 (w/ proceedings).
50. J. Christopher*, C. Lapointe, T. Hayden*, N. Wimer, I. Grooms, **G. Rieker**, P. Hamlington, “Parameter Estimation for a Turbulent Buoyant Jet with Rotating Cylinder Using Approximate Bayesian Computation”, *Computational Fluid Dynamics Conference*, Denver, CO, June 2017.
 49. C. Lapointe, J. Christopher*, N. Wimer, T. Hayden*, **G. Rieker**, P. Hamlington, “Optimization for Internal Turbulent Compressible Flows Using Adjoint”, *2017 AIAA Aviation and Aeronautics Forum and Exposition (AIAA AVIATION Forum)*, Denver, CO, June 2017 (w/ proceedings).
 48. N. Wimer, C. Lapointe, T. Hayden*, J. Christopher*, **G. Rieker**, P. Hamlington, “Near- and Far-Field Properties of High-Temperature Turbulent Buoyant Jets”, *2017 AIAA Aviation and Aeronautics Forum and Exposition (AIAA AVIATION Forum)*, Denver, CO, June 2017 (w/ proceedings).
 47. (Invited) **G. Rieker**, “Methane Leak Detection with Fielded Frequency Comb Lasers,” *CLEO 2017*, San Jose, CA, May 2017.
 46. N. Malarich*, **G. Rieker**, “Resolving gas temperature distributions with single-beam dual-comb absorption spectroscopy,” *CLEO 2017*, San Jose, CA, May 2017 (w/ proceedings).
 45. P. Schroeder*, D. Pfoth*, J. Yang*, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, **G. Rieker**, “Comparison of dual frequency comb absorption spectra of air-broadened water vapor up to 1300K with HITRAN Online and HITEMP 2010 Models,” *CLEO 2017*, San Jose, CA, May 2017 (w/ proceedings).
 44. T. Hayden*, C. Lapointe, N. Wimer, J. Christopher*, P. Hamlington, and **G. Rieker**, “Characterization of a Jet Above a Catalytic Combustor Using Wavelength Modulation Spectroscopy”, *10th US National Combustion Meeting*, College Park, MD, April 2017 (w/ proceedings).
 43. J. Christopher*, C. Lapointe, N. Wimer, T. Hayden*, I. Grooms, **G. Rieker**, and P. Hamlington, “Parameter Estimation for a Turbulent Buoyant Jet Using Approximate Bayesian Computation,” *AIAA Science and Technology Exhibition and Forum*, Grapevine, TX, January 2017 (w/ proceedings).
 42. A. Makowiecki*, T. Hayden*, M. Nakles, N. Pilgram, N. MacDonald, W. Hargus, and **G. Rieker**, “Wavelength Modulation Spectroscopy for Measurements of Temperature in a Simulated Thruster Plume,” *JANNAF 8th Spacecraft Propulsion Meeting*, Phoenix, AZ, December 2016 (w/ proceedings).
 41. T. Hayden* and **G. Rieker**, “Ultra-large amplitude wavelength modulation spectroscopy,” *Optics and Photonics for Energy and the Environment (E2)*, Leipzig, Germany, November 2016 (w/ proceedings).

40. P. Schroeder*, J. Yang*, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, and **G. Rieker**, “Dual frequency comb spectroscopy of high temperature water vapor: absorption model development for combustion sensors,” *Fourier Transform Spectroscopy*, Leipzig, Germany, November 2016 (w/ proceedings).
39. (Invited) I. Coddington, G. Truong, E. Waxman, K. Cossel, P. Schroeder*, S. Coburn**, R. Wright**, F. Giorgetta, W. Swann, **G. Rieker**, and N. Newbury, “Dual-Comb spectroscopy for GHG quantification,” *Optics and Photonics for Energy and the Environment (E2)*, Leipzig, Germany, November 2016 (w/ proceedings).
38. (Invited) E. Baumann, F. Giorgetta, **G. Rieker**, W. Swann, L. Sinclair, I. Coddington, G. Truong, K. Cossel, E. Waxman, and N. Newbury, “Dual Comb Outdoor Spectroscopy for Complex Molecular Response Retrieval.” *Fourier Transform Spectroscopy*, Leipzig, Germany, November 2016 (w/ proceedings).
37. (Invited) **G. Rieker**, “Combustion and Environmental Science Applications of Fieldable Frequency Combs,” *Field Laser Applications in Industry and Research (FLAIR)*, Aix-les-Bains, France, September 2016.
36. N. Wimer, C. Lapointe, T. Hayden*, J. Christopher*, **G. Rieker**, and P. Hamlington, “Effects of Exit Variability on Near-field Statistics for Turbulent Buoyant Jets,” *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, OR, November 2016.
35. J. Christopher*, N. Wimer, T. Hayden*, C. Lapointe, I. Grooms, **G. Rieker**, and P. Hamlington, “Parameter Estimation for a Turbulent Buoyant Jet Using Approximate Bayesian Computation,” *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, OR, November 2016.
34. C. Lapointe, N. Wimer, T. Hayden*, J. Christopher*, **G. Rieker**, and P. Hamlington, “Scaling Analysis of Temperature Variability Between a Rotating Cylinder and a Turbulent Buoyant Jet,” *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, OR, November 2016.
33. P. Schroeder*, R. Wright**, S. Coburn**, B. Sodergren, K. Cossel, S. Droste, G. Truong, E. Baumann, F. Giorgetta, I. Coddington, N. Newbury, and **G. Rieker**, “Dual Frequency Comb Laser Absorption Spectroscopy in a 16 MW Gas Turbine Exhaust,” 36th International Symposium on Combustion, Seoul, South Korea, July 2016.
32. (Invited) **G. Rieker**, P. Schroeder*, S. Coburn**, C. Alden**, R. Wright**, K. Cossel, G. Truong, E. Baumann, F. Giorgetta, W. Swann, I. Coddington, and N. Newbury “Combustion diagnostics and chemical sensing with frequency comb lasers,” Paper LW2G–1, *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)*, Heidelberg, Germany, July 2016.
31. (Invited) **G. Rieker**, “Open-path Dual-comb Spectroscopy for Localizing Fugitive Gas Sources,” *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)*, Heidelberg, Germany, July 2016.

30. (Invited) **G. Rieker**, “Localizing Gas Sources with Kilometer-scale Open-path Dual-comb Spectroscopy and High-resolution Transport Modeling,” *OSA Incubator on Precision Atmospheric Measurements*, Washington D.C., May 2016.
29. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, G. Truong, E. Baumann, S. Ghosh, K. Prasad, N. Newbury, I. Coddington, and **G. Rieker**, “Dual frequency comb spectroscopy and atmospheric modeling for the detection of methane leaks at oil and gas production sites,” *18th Coherent Laser Radar Conference*, Boulder, CO, June 2016.
28. S. Coburn**, R. Wright**, K. Cossel, G. Truong, E. Baumann, I. Coddington, N. Newbury, C. Alden**, S. Ghosh, K. Prasad, and **G. Rieker**, “Methane Detection for Oil and Gas Production Sites Using Portable Dual-comb Spectrometry,” *71st International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2016.
27. K. Cossel, E. Waxman, G. Truong, F. Giorgetta, W. Swann, S. Coburn**, R. Wright**, **G. Rieker**, I. Coddington, and N. Newbury, “A portable dual frequency comb spectrometer for atmospheric applications,” *71st International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2016.
26. (Invited) I. Coddington, G. Truong, E. Waxman, K. Cossel, P. Schroeder*, R. Wright**, S. Coburn**, B. Sodergren, F. Giorgetta, W. Swann, **G. Rieker**, and N. Newbury, “Frequency Comb Measurements Through Turbulent Paths,” *CLEO 2016*, San Jose, CA, May 2016 (w/ proceedings).
25. K. Cossel, G. Truong, E. Waxman, E. Baumann, F. Giorgetta, **G. Rieker**, L. Sinclair, W. Swann, I. Coddington, and N. Newbury, “Long-path Atmospheric Measurements Using Dual Frequency Comb Spectroscopy,” *American Geophysical Union Fall Meeting*, San Francisco, CA, Dec. 2015.
24. (Invited) **G. Rieker**, F. Giorgetta, W. Swann, P. Schroeder*, J. Kofler, L. Sinclair, E. Baumann, G. Petron, C. Sweeney, P. Tans, I. Coddington, and N. Newbury, “Precision atmospheric trace gas monitoring with frequency comb lasers,” *Frontiers in Optics/Laser Science*, San Jose, CA, October 2015.
23. E. Baumann, F. Giorgetta, **G. Rieker**, L. Sinclair, I. Coddington, W. Swann, and N. Newbury, “Dual-comb Spectrometer for Direct Phase Spectroscopy of Greenhouse Gases across an Open Air Path,” *Advanced Solid State Lasers*, Berlin, Germany, October 2015 (w/ proceedings).
22. P. Schroeder*, D. Pfoth*, and **G. Rieker**, “Dual Frequency Comb Spectroscopy of High Temperature Water Vapor Absorption,” *Rocky Mountain Fluid Mechanics Research Symposium*, Boulder, CO, August 2015.
21. (Invited) I. Coddington, **G. Rieker**, A. Klose, S. Diddams, F. Giorgetta, L. Sinclair, E. Baumann, G. Truong, G. Ycas, W. Swann, N. Newbury, “Dual-comb Spectroscopy in the Open Air,” *International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2015.

20. F. Giorgetta, **G. Rieker**, L. Sinclair, E. Baumann, I. Coddington, W. C. Swann, and N. R. Newbury, "Phase Spectroscopy of Atmospheric Gases across a 2-km Open-Air Path by Dual-Comb Spectroscopy," *Imaging and Applied Optics 2015*, Arlington, VA, June 2015 (w/ proceedings).
19. **G. Rieker**, F. Giorgetta, W. Swann, L. Sinclair, C. Cromer, E. Baumann, I. Coddington, and N. R. Newbury, "Dual-Frequency Comb Measurements of Atmospheric Absorption: Comparison with HITRAN Database Parameters," *CLEO 2015*, San Jose, CA, May 2015 (w/ proceedings).
18. T. Hayden*, P. Schroeder*, and **G. Rieker**, "Large Amplitude Wavelength Modulation Spectroscopy for Sensitive Measurements of Broad Absorbers," *CLEO 2015*, San Jose, CA, May 2015 (w/ proceedings).
17. **G. Rieker**, F. Giorgetta, I. Coddington, W. Swann, L. Sinclair, C. Cromer, E. Baumann, A. Zolot, N.R. Newbury, J. Kofler, G. Petron, C. Sweeney, and P. Tans, "Frequency Comb Spectroscopy of CO₂, CH₄, H₂O, and Isotopes Over a 2km Outdoor Path: Concentration Retrievals Using Different Absorption Models," *13th International HITRAN conference*, Cambridge, MA, June 2014.
16. I. Coddington, F. Giorgetta, **G. Rieker**, W. Swann, A. Zolot, L. Sinclair, E. Baumann, C. Cromer N.R. Newbury, "CO₂ phase and amplitude spectra measured over 2 km outdoor path with a dual-comb spectrometer," *Infrared Remote Sensing and Instrumentation XXII*, 921907, September 2014 (w/ proceedings).
15. (Invited) I. Coddington, **G. Rieker**, F. Giorgetta, W.C. Swann, L.C. Sinclair, C. Cromer, E. Baumann, A. Zolot, and N.R. Newbury, "Dual Frequency Comb Spectroscopy for Accurate and Precise Carbon Monitoring over Multi-kilometer Paths," *PIERS 2014*, Guangzhou, China, August 2014.
14. F. Giorgetta, **G. Rieker**, I. Coddington, W. Swann, A. Zolot, L. Sinclair, E. Baumann, C. Cromer, N. Newbury, "High-Resolution CO₂ Phase Spectra Measured over an Open Air Path with a Dual-Comb Spectrometer," *6th EPS-QEOD Europhoton Conference*, Neuchatel, Switzerland, August 2014 (w/ proceedings).
13. (Invited) N. Newbury, **G. Rieker**, F. Giorgetta, W. Swann, L. Sinclair, E. Baumann, A. Zolot, and I. Coddington, "Dual-Comb Spectroscopy of Greenhouse Gases Over a 2-km Outdoor Path," *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)*, Seattle, Wa, July 2014.
12. L. Sinclair, I. Coddington, W. Swann, L. Sonderhouse, **G. Rieker**, A. Hati, K. Iwakuni, and N. Newbury, "A frequency comb that maintains optical coherence under significant vibrations," *CLEO 2014*, San Jose, CA, June 2014 (w/ proceedings).
11. **G. Rieker**, F. Giorgetta, I. Coddington, W.C. Swann, L.C. Sinclair, C. Cromer, E. Baumann, A. Zolot, N.R. Newbury, J. Kofler, G. Petron, C. Sweeney, and P. Tans, "Measurements of CO₂, CH₄, H₂O, and HDO over a 2-km Outdoor Path with Dual-Comb Spectroscopy," A24B-05, *American Geophysical Union Fall Meeting*, San Francisco, CA, Dec. 2013.

10. (Invited) **G. Rieker**, F. Giorgetta, I. Coddington, W. Swann, L. Sinclair, C. Cromer, E. Baumann, A. Zolot, and N. Newbury, "Dual-Comb Spectroscopy of Greenhouse Gases Over a 2-km Outdoor Path," *Optical Instrumentation for Energy and Environmental Applications (E2)*, Tucson, AZ, Nov. 2013.
9. (Invited) I. Coddington, A. Zolot, E. Baumann, F. Giorgetta, **G. Rieker**, J. Nicholson, W. Swann, and N. Newbury, "High-resolution Frequency Comb Molecular Spectroscopy," *Optical Instrumentation for Energy and Environmental Applications (E2)*, Tucson, AZ, Nov. 2013.
8. E. Baumann, A. Zolot, **G. Rieker**, F. Giorgetta, I. Coddington, W. Swann, K. Knabe, P. Williams, and N. Newbury, "Coherent Comb-based Spectroscopy in the Mid and Near-infrared," *Mid-infrared Coherent Sources (MICS)*, Paris, France, Oct. 2013 (w/ proceedings).
7. (Invited) **G. Rieker**, F. Giorgetta, I. Coddington, E. Baumann, A. Zolot, W. Swann, L. Sinclair, C. Cromer, and N. Newbury, "Frequency Comb-based Laser Sensors for Precision Ranging, Spectroscopy and Frequency Transfer," (given by G. Rieker in place of N. Newbury), *Optical Sensors*, Rio Grande, Puerto Rico, July 2013.
6. (Postdeadline) **G. Rieker**, F. Giorgetta, W. Swann, I. Coddington, L. Sinclair, C. Cromer, E. Baumann, A. Zolot, and N. Newbury, "Open-Path Dual-Comb Spectroscopy of Greenhouse Gases," *CLEO 2013*, San Jose, CA, June 2013 (w/ proceedings).
5. N. R. Newbury, A. Zolot, E. Baumann, I. Coddington, F. Giorgetta, **G. Rieker**, W. Swann, "Precision spectroscopy with coherent dual frequency combs", *CLEO Europe 2013*, Munich, Germany, May 2013.
4. M. Constantin, D. Constantin, J. Perl, P. Keall, F. Poehlmann, **G. Rieker**, M. Cappelli, "Monte Carlo Simulations of Beam Characteristics for a Compact Plasma Proton Accelerator," *52nd AAPM Annual Meeting*, 2010.
3. M. Gruber, C. Carter, M. Ryan, **G. Rieker**, J. Jeffries, R. Hanson, J. Liu, and T. Mathur, "Laser-Based Measurements of OH, Temperature, and Water Vapor Concentration in a Hydrocarbon-Fueled Scramjet," *Proceedings of the 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, 2008 (w/ proceedings).
2. **G. Rieker**, J. Jeffries, R. Hanson, T. Mathur, C. Carter, and M. Gruber, "Comparison of Wavelength Modulation and Direct Absorption Spectroscopy for Measurements of Gas Temperature in a Scramjet Combustor," *Proceedings of the 5th U.S. National Combustion Meeting*, 2007 (w/ proceedings).
1. **G. Rieker**, J.T.C. Liu, J. Jeffries, R. Hanson, T. Mathur, M. Gruber, and C. Carter, "Diode Laser Sensor for Gas Temperature and H₂O Concentration in a Scramjet Combustor Using Wavelength Modulation Spectroscopy," *Proceedings of the 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, 2005 (w/ proceedings).

SEMINARS

63. “Real-time laser sensors for feedback control of engine systems,” April 2024, *John Deere Global Technical Forum*.
62. “Practical Dual Comb Spectroscopy to Improve Energy Systems: Navigating the Interfaces Between Science, Engineering, and Industry,” April 2024, *Institute for Laser Science Seminar, University of Electro-Communications, Chofu, Japan*.
61. “The Long Path to LongPath Technologies” March 2024, Keynote, *Destination Startup*.
60. “What is Quantum Sensing?” February 2024, Panelist, *AAAS Annual Meeting*.
59. “How do we grow partnerships between higher education institutions and industry and national labs, and government?” October 2023, Panelist, *University of Colorado Quantum Convening*.
58. “Toward Sharks with Laser Beams on Their Heads,” October 2023, *University of Colorado Mechanical Engineering Seminar*.
57. “Networked Methane Monitoring of Oil and Gas Infrastructure,” September 2023, *Buff Gold Ventures Annual Meeting*.
56. “CU Quantum Technology: from Nobel Prize to commercial climate change mitigation,” August 2023, *University of Colorado Boulder Global Ambassadors Meeting*.
55. “CU Quantum Technology: from Nobel Prize to commercial climate change mitigation,” June 2023, *Board of Regents Meeting, University of Colorado Boulder*.
54. “Methane Mitigation from Oil and Gas Infrastructure,” June 2023, Keynote, *Baker Hughes Energy Summit*.
53. “Mobilizing frequency comb lasers for precision sensing in energy and climate applications,” March 2023, *Pennsylvania State University Mechanical Engineering Seminar Series*.
52. “Scaling Up with SCALEUP,” Main stage panelist, March 2023, *ARPA-E Summit*.
51. “Recent Progress in Frequency Comb-based Diagnostics for Combustion,” February 2023, *Multi-Agency Coordinating Committee for Combustion Meeting*.
50. “You Can’t Improve What You Don’t Measure – Mobilizing frequency comb lasers for precision sensing in energy and climate applications,” February 2023, *Brigham Young University Physics Colloquium*.
49. “Frequency Comb Spectroscopy: from Nobel Prize to Practical Application,” February 2023, *University of Colorado Analytical, Environmental, & Atmospheric Chemistry Division Seminar*.

48. “Strategies for Leveraging Government Funding while Building a Company,” June 2022, *Innosphere Webinar Series*.
47. “Free Range Frequency Combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing,” April 2022, *Texas A&M University, J. Mike Walker '66 Department of Mechanical Engineering Seminar Series*.
46. “Grazers, Gas and Garbage: The history and future of LongPath monitoring with frequency combs,” March 2022, *Stanford Methane Emissions Technology Alliance Seminar*.
45. “Free-range frequency combs: mobilizing frequency comb laser technology for energy and climate applications from atmospheric sensing to wildland fire research,” February 2022, *University of Colorado Physics Colloquium*.
44. “Have 100,000 lasers, will travel – mobilizing frequency comb laser technology for climate applications from atmospheric sensing to wildland fire research”, December 2021, *Cornell University Atkinson Center for Sustainability*.
43. “Practical Dual Comb Spectroscopy: Lessons Learned at the Interface Between Science, Engineering, and Industry”, September 2021, *University of Colorado Q-SENSE Convergence Seminar*.
43. “Free Range Frequency Combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing”, November 2021, *KAUST University Seminar*
42. “High precision sensing through the mobilization of frequency comb laser technology for climate applications ranging from atmospheric sensing to wildland fire research,” September 28, 2021, *Cornell University Civil and Environmental Engineering Seminar*.
41. "Optimizing Career Paths in Optics: The Guide for Young Professionals," May 9, 2021, *OSA CLEO Conference*, virtual.
40. “Free Range Frequency Combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing,” January 5, 2021, *Caltech Chemical Physics Seminar*, virtual.
39. “Launching LongPath Technologies: A CU/NIST Tech transfer Success,” January 23, 2020, *NIST Boulder, CO with VTC to Gaithersburg West Square*.
38. “Frequency Comb Laser Diagnostics for Hypersonic Propulsion,” January 16, 2020, Presentation to AFOSR Director and Chief Science Officer Seminar, Boulder, CO.
37. “Low-cost Multi-Sensor Networks for Determining the Location and Size of Renegade Gas Sources”, November 5, 2019, Operational Renegade Gas Working Group, Boulder, CO.
36. “High Temperature Laboratory Spectroscopy in Support of Improved Modeling of Exoplanet Atmospheres,” May 2, 2019, NExSS Working Group Meeting, Santa Cruz, CA.

35. "The Long Road to LongPath Technologies," April 24, 2019, Innovation After Hours, Boulder, CO.
34. "Advanced Lineshapes in Laser Absorption Diagnostics for Combustion and Propulsion," April 15, 2019, AFOSR Spectroscopy Workshop, Arlington, VA.
33. "Have 100,000 Lasers, Will Travel – The Path to Frequency Comb Spectroscopy in Combustion," January 25, 2019, *Air Force Research Laboratory – Wright-Patterson Air Force Base*, Dayton, OH.
32. "Decoding the Stories of Distant Planets," October 17, 2018, *RIO Faculty Fellow TED-style Talks at the Dairy Performing Arts Center*, Boulder, CO.
31. "Laser Spectroscopy for Combustion and Atmospheric Systems," October 12, 2018, *National Renewable Energy Laboratory*, Golden, CO.
30. "Have 100,000 lasers, will travel – Frequency comb spectroscopy of atmospheric and combustion systems," September 28, 2018, *George Washington University*, Washington D.C.
29. "An introduction to the work of the Precision Laser Diagnostics Laboratory at the University of Colorado," September 10, 2018, *Universite Grenoble Alpes and CNRS-Grenoble*, Grenoble, France.
28. "Spinning Technologies Out of the Laboratory: A Tale of Two Ventures," July 24, 2018, CU Venture Partners Lunch and Learn, Boulder, CO.
27. "Frequency Comb-based Methane Detection Network," July 13, 2018, *Operational Renegade Gas Working Group Meeting*, Boulder, CO.
26. "Regional Methane Monitoring with Frequency Combs," December 21, 2017, *Breakthrough Energy Coalition*, Boulder, CO.
25. "A Different Path to the Professorship," October 18, 2017, *University of Colorado Advocates Meeting*, Boulder, CO. (short presentation and discussion of entrepreneurial faculty pathways)
24. "Frequency Combs in Combustion," September 26, 2017, *Zolo Technologies*, Lafayette, CO.
23. "High precision GHG measurement in the open air," July 11, 2017, *EPA Regional Science Council Seminar*, Denver, CO.
22. "Frequency Comb-based Methane Detection Network," May 22, 2017, *Operational Renegade Gas Working Group Meeting*, Boulder, CO.
21. "Progress on frequency comb spectroscopy of atmospheric trace gases," April 18, 2017, *NOAA Global Monitoring Carbon Cycle Group Seminar*, Boulder, CO.

20. "Have 100,000 lasers, will travel – Frequency comb spectroscopy of atmospheric trace gases," April 10, 2017, *NCAR Atmospheric Chemistry Observations and Modeling Seminar*, Boulder, CO.
19. "A Different Path to the Professorship," February 1, 2017, *University of Colorado Chancellor's Cabinet*, Boulder, CO. (short presentation and discussion of entrepreneurial faculty pathways)
18. "Practical Frequency Comb Spectroscopy in Combustion and Atmospheric Research," January 20, 2017, *California Institute of Technology / Jet Propulsion Laboratory*, Pasadena, CA.
17. "Probing Harsh Environments with Lasers: Sensing in 3M-relevant Combustion Systems," November 3, 2016, *3M Technical Forum*, St. Paul, MN.
16. "Frequency Comb-based Methane Detection Network," September 28, 2016, *Methane Monitoring Open Forum*, Fort Collins, CO.
15. "Have 100,000 Lasers, Will Travel – Field Applications of Frequency Combs from Methane Detection to Combustion," August 17, 2016, *Colorado State University Energy and Environment Seminar*, Fort Collins, CO.
14. "Fire, Lasers, and Saving the World – How Engineering Led Me to the Coolest Job Ever," July 14, 2016, *BOLD Aspire Summer Bridge Program*, Boulder, CO.
13. "Free Range Frequency Combs: Field Applications of NIST Technology from Methane Detection to Combustion," March 17, 2016, *NIST Time and Frequency Seminar Series*, Boulder, CO.
12. "Have (100,000) Lasers, Will Travel – Frequency Comb Lasers for Trace Gas Monitoring," November 16, 2015, *Institute for Arctic and Alpine Research Seminar*, Boulder, CO.
11. "Fire, Lasers, and Saving the World – How Engineering Led Me to the Coolest Job Ever," July 15, 2015, *BOLD Aspire Summer Bridge Program*, Boulder, CO.
10. "Probing Harsh Environments with Lasers: from Field-Deployed Diodes to Frequency Combs," June 29, 2015, *Air Force Research Laboratories – Edwards AFB*, CA.
9. "Frequency Comb Laser Systems for Continuous, Multi-site Methane Monitoring," April 7, 2015, *RPSEA First Protocol Development Workshop*, National Oceanic And Atmospheric Administration, Boulder, CO.
8. "Greenhouse Gas Concentration Measurements over a 2-km Outdoor Path using Dual-comb Spectroscopy," January 14, 2014, *Mechanical Engineering Graduate Seminar Series*, University of Colorado-Boulder, Boulder, CO.

7. "Probing Harsh Environments with Lasers: from Field-deployed Diodes to Frequency Combs," November 15, 2013, *Optical, Electronic, and Quantum Systems Seminar*, University of Colorado-Boulder, Boulder, CO.
6. "Greenhouse Gas Concentration Measurements over a 2-km Outdoor Path using Dual-comb Spectroscopy," November 7, 2013, *Collaborative for Air Quality Research Seminar*, University of Colorado-Boulder, Boulder, CO.
5. "Oh, The Places Your Laser Beam Will Go – Optical Sensing in Harsh Environments," October 29, 2013, *Boulder Fluids Seminar*, University of Colorado-Boulder, Boulder, CO.
4. "Intermediate-path Sensing of Greenhouse Gases with Dual Comb Spectroscopy," April 30, 2013, *Carbon Cycle Greenhouse Gases Group Seminar*, National Oceanic and Atmospheric Administration, Boulder, CO.
3. "Frequency comb laser sources and their prospects for practical sensing," Nov. 16, 2012, *Institute for Combustion and Gas Dynamics Seminar Series*, University of Duisburg-Essen, Duisburg-Essen, Germany.
2. "Practical Laser-based Sensors for Harsh Combustion Environments," Sept. 20, 2012, *Mechanical Engineering Graduate Seminar Series*, University of Colorado-Boulder, Boulder, CO.
1. "Innovations in Particle Beam Generation with Plasmas," Oct. 2010, *Program in Radiation Biology Seminar*, Stanford University, Stanford, CA.

CONFERENCE PRESENTATIONS (Poster)

*Graduate student in Rieker lab

**Postdoc / Research staff/ Visiting Scholars in Rieker lab

49. D. Long, M. Cich, C. Mathurin*, A. Heiniger, G. Mathews**, A. Frymire*, **G. Rieker**, "Nanosecond mid-infrared dual comb spectroscopy", *Frontiers in Optics & Laser Science (FIOLS)*, Tacoma, Washington, October 2023.
48. L. Shannon, A. Makowiecki*, P. Hamlington, **G. Rieker**, J. Farnsworth, "Parting the Flames: Interactions of a Flame Sheet with a Juncture Flow," *APS Gallery of Fluid Motion*, September 2023.
47. S. Egbert*, N. Hoghooghi**, P. Chang, A. Lalko*, S. Coburn**, S. Diddams, **G. Rieker**, "Broadband, High-Resolution, Portable Dual Comb Spectrometer From 3-5 μm ," *Gordon Research Conference, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023.
46. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, "O₂ A-Band Thermometry and Velocimetry in a Ramjet with Dual Comb Spectroscopy," *Gordon Research Seminar, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023

45. **G. Rieker**, P. Lynch, N. Hoghooghi**, P. Chang, S. Egbert*, S. Diddams, “High-speed, broadband mid-infrared dual comb spectrometer based on mode-locked fiber combs for combustion studies,” (Work in Progress Posters), *39th International Symposium on Combustion*, Vancouver, Canada, July 2022.
44. C. Alden**, R. Wright**, S. Coburn**, D. Wilson, N. Seitz, D. Doran, I. Dickinson, **G. Rieker**, “Network-based continuous methane emissions monitoring mitigates gas losses at scale,” *American Geophysical Union Fall Meeting*, December 2021.
43. **G. Rieker**, “Laser Technologies to Transform and Improve Our Future”, *US Frontiers of Engineering Symposium*, National Academy of Engineering, virtual, February 2021.
42. C. Alden**, G. Gannaway, S. Coburn**, R. Wright**, David Wilson, Nick Seitz, Dan Doran, **G. Rieker**, “Continuous monitoring of methane emissions on 14 Permian basin natural gas production facilities, links to operations and mitigation,” *American Geophysical Union Fall Meeting*, virtual, December 2020.
41. A. Anderson, E. Strong*, B. Heffernan, M. Siemens, **G. Rieker**, J. Gopinath, “Detection Strategies for Measuring Rotation with the Rotational Doppler Effect,” *CLEO Conference*, virtual, May 2020.
40. C. Alden**, S. Coburn**, R. Wright**, D. Caputi, A. Rybchuk*, G. Wendland**, I. Coddington, S. Conley, I. Faloon, **G. Rieker**, “High time variability of emissions observed at a natural gas storage site,” AGU Fall Meeting, San Francisco, CA, December 2019.
39. **G. Rieker**, R. Wright**, C. Alden**, S. Coburn**, N. Seitz**, A. Rybchuk*, G. Wendland**, A. Goldstein, A. Tourigney-Plante, J. Genest, J. Deschenes, I. Coddington, K. Osadetz, “Greenhouse gas source attribution and quantification over multiple square kilometer regions using dual frequency comb lasers,” IEA Greenhouse Gas Combined Monitoring and Environmental Research Network Meeting, Calgary, Canada, August 2019.
38. S. Coburn**, C. Alden**, R. Wright**, A. Rybchuk*, G. Wendland*, I. Coddington, **G. Rieker**, “Frequency Comb-based Methane Observation Network,” 2019 ARPA-E Energy Innovation Summit, Denver, CO, July 2019 (hosted a demo booth).
37. **G. Rieker**, “Recent Advancements in Frequency Comb Diagnostics for Combustion,” *Gordon Research Conference*, Les Diablarets, Switzerland, July 2019.
36. N. Hoghooghi**, R. Cole, **G. Rieker**, “Microsecond Dual-Comb Spectroscopy Using Spectrally Filtered Fiber Mode-locked Lasers,” *Gordon Research Conference*, Les Diablarets, Switzerland, July 2019.
35. O. Rybchuk*, C. Alden, **G. Rieker**, “Modeling Ground- and Aircraft-based Methane Monitoring Systems for Natural Gas Storage Facilities using LPDM-LES,” *NOAA GMAC Conference*, Boulder, CO, May 2019.

34. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, C. Sweeney, A. Karion, K. Prasad, I. Coddington and **G. Rieker**, “Regional, Continuous Methane Leak Detection Using Dual Frequency Comb Lasers and Atmospheric Inversions,” *American Geophysical Union Fall Meeting*, Washington D.C., December 2018.
33. N. Wimer, M. Day, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, and P. Hamlington, “Progress Towards Direct Numerical Simulations of Plumes and Pool Fires,” 71st Annual meeting, Division of Fluid Dynamics, American Physical Society, Atlanta, GA, November 2018.
32. **G. Rieker**, S. Coburn**, C. Alden**, R. Wright**, N. Hoghooghi**, R. Cole*, P. Schroeder*, N. Malarich*, A. Makowiecki*, A. Rybchuk*, G. Wendland**, M. Cich, B. Drouin, and I. Coddington, “The Expanding Reach of Fielded Dual Frequency Comb Spectrometers: from Kilometer-scale Measurements of Oil & Gas Fields to Model Development for Exoplanet Spectroscopy,” *Field Laser Applications in Industry and Research (FLAIR)*, Assisi, Italy, September 2018.
31. A. Makowiecki*, J. Steinbrenner, J. Glusman, N. Wimer, J. Daily, P. Hamlington and **G. Rieker**, “Dual Frequency Comb Spectroscopy for the Investigation of Ignition Behaviour of Wildland Fire Fuels,” *Field Laser Applications in Industry and Research (FLAIR)*, Assisi, Italy, September 2018.
30. N. Hoghooghi**, R. Cole*, and **G. Rieker**, “GHz Frequency Comb Generation Using Spectral Mode Filters for Rapid Dual-comb Spectroscopy,” *Field Laser Applications in Industry and Research (FLAIR)*, Assisi, Italy, September 2018.
29. N. Wimer, C. Lapointe, M. Day, A. Poludnenko, J. Glusman, A. Makowiecki*, J. Daily, **G. Rieker**, and P. Hamlington, “Progress Towards Direct Numerical Simulations of Fire Using Adaptive Mesh Refinement,” *37th International Symposium on Combustion*, Dublin, Ireland, July 2018.
28. A. Makowiecki*, J. Steinbrenner, J. Glusman, N. Wimer, J. Daily, P. Hamlington, and G. Rieker, “Diagnostics Suite for Benchmark Data of Wildland Fire Fuels for Application to Physics-Based Models,” *37th International Symposium on Combustion*, Dublin, Ireland, July 2018.
27. J. Glusman, A. Makowiecki*, N. Wimer, K. Niemeyer, G. Rieker, P. Hamlington, and J. Daily, “Experimental Comparison of Small-Scale Biomass Pyrolysis and Reduced Chemical Kinetic Models for Direct Numerical Simulations of Wildland Fires,” *37th International Symposium on Combustion*, Dublin, Ireland, July 2018.
26. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, G. Truong, N. Newbury, K. Prasad, I. Coddington, T. Weaver and **G. Rieker**, “Frequency Comb-based Methane Observation Network,” *2018 ARPA-E Energy Innovation Summit*, Washington D.C., March 2018 (hosted a demo booth).
25. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, C. Sweeney, S. Ghosh, N. Newbury, K. Prasad, I. Coddington and **G. Rieker**, “Continuous time-resolved regional methane leak detection with on-line background estimation using a novel combination of

- dual frequency comb laser spectroscopy and atmospheric inversions”, *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.
24. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, G. Truong, N. Newbury, K. Prasad, I. Coddington, T. Weaver and **G. Rieker**, “Frequency Comb-based Methane Observation Network,” *CH4 Connections*, Ft. Collins, CO, December 2017 (hosted a demo booth).
 23. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, G. Truong, N. Newbury, K. Prasad, I. Coddington, T. Weaver and **G. Rieker**, “Regional scale monitoring of methane emissions using sensitive open path laser measurements and an atmospheric inversion technique,” *SPARK 2017*, Edmonton, Canada, November 2017.
 22. N. Wimer, A. Makowiecki*, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, G. Rieker, and P. Hamlington, “Examination of Wildfire Spread at Small Scales Using Direct Numerical Simulations and Frequency Comb Laser Diagnostics,” *Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) Symposium*, Washington, D.C., November 2017.
 21. R. Cole*, P. Schroeder*, A. Draper*, and **G. Rieker**, “Dual Frequency Comb Absorption Spectroscopy at High Pressures and Temperatures: Toward Model Improvement for Laser Diagnostics in Extreme Environments,” *Gordon Research Conference on Laser Diagnostics in Combustion*, Mt. Snow, VT, August 2017.
 20. A. Makowiecki*, N. Hoghooghi**, N. Wimer, J. Daily, P. Hamlington, **G. Rieker**. “Cavity Enhanced Dual Frequency Comb Spectroscopy for Characterization of Biomass Pyrolysis.” *Gordon Research Conference on Laser Diagnostics in Combustion*, Mt. Snow, VT, August 2017.
 19. N. Wimer, A. Makowiecki*, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, and P. Hamlington. “Examination of Wildland Fire Spread at Small Scales Using Direct Numerical Simulations and Frequency Comb Laser Diagnostics,” *12th International Symposium on Fire Safety Science*, Lund University, Sweden, June 2017.
 18. C. Alden**, S. Coburn**, R. Wright**, S. Ghosh, I. Coddington, C. Sweeney, A. Karion, N. Newbury, K. Prasad, G. Rieker, “Continuous, regional approach to methane source detection and sizing using dual frequency comb laser spectroscopy and atmospheric inversions,” *Global Monitoring Annual Conference 2017*, Boulder, Colorado, May 2017.
 17. C. Alden**, R. Wright**, K. Prasad, T. Weaver, and **G. Rieker**, “Regional Methane Leak Detection with Frequency Comb Lasers,” *2017 ARPA-E Energy Innovation Summit*, Washington D.C., March 2017 (hosted a demo booth).
 16. S. Coburn**, R. Wright**, K. Cossel, G. Truong, E. Baumann, I. Coddington, N. Newbury, C. Alden**, S. Ghosh, K. Prasad, and **G. Rieker**, “Portable Dual-comb Spectrometer for Stable Detection of Methane Leaks over Kilometer Scale Paths at Oil and Natural Gas Production Sites,” *AGU 2016*, December 2016.

15. C. Alden**, K. Prasad, S. Ghosh, A. Karion, C. Sweeney, S. Coburn**, R. Wright**, K. Cossel, G. Truong, E. Baumann, I. Coddington, N. Newbury, and **G. Rieker**, "A new method for top-down quantification of methane and pollutant emissions from natural gas production," *AGU 2016*, December 2016.
14. A. Makowiecki*, T. Hayden*, M. Nakles, N. Pilgram, N. MacDonald, W. Hargus, and **G. Rieker**, "Wavelength Modulation Spectroscopy in a Supersonic Ammonia Jet," *Colorado Photonics Industry Association Annual Meeting*, November 2016.
13. **G. Rieker**, I. Coddington, "Frequency Comb-based Methane Detection Network," *Rice University Natural Gas Industry Day*, October 2016.
12. A. Torres*, P. Schroeder*, D. Pfothner*, and **G. Rieker**, "The Design of a High-Temperature, High-Pressure Spectroscopic Cell," *Discovery Learning Apprenticeship Annual Review*, May 2016.
11. K. Cossel, E. Waxman, G. Truong, **G. Rieker**, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, "A portable dual frequency comb spectrometer for atmospheric applications," *EGU 2016*, April 2016.
10. C. Alden**, K. Prasad, S. Ghosh, A. Karion, C. Sweeney, S. Coburn**, R. Wright**, E. Baumann, G. Truong, K. Cossel, I. Lopez Coto, I. Coddington, **G. Rieker**, "Continuous Monitoring of Pollutant Emissions at Site- to Regional- Scales," *44th Annual Global Monitoring Conference*, March 2016.
9. **G. Rieker**, C. Alden**, S. Coburn**, R. Wright**, K. Prasad, S. Ghosh, I. Coddington, "Frequency Comb-based Methane Detection Network," *2016 ARPA-E Energy Innovation Summit*, February 2016.
8. **G. Rieker**, P. Schroeder*, D. Pfothner*, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, "Transitioning Frequency Comb Laser Diagnostics from the Lab to the Combustor," *Gordon Research Conference on Laser Diagnostics in Combustion*, August 2015.
7. P. Schroeder*, **G. Rieker**, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, "Dual Frequency Comb Spectroscopy of High Temperature Water Vapor Absorption," *Gordon Research Conference on Laser Diagnostics in Combustion*, August 2015.
6. T. Hayden*, **G. Rieker**, "Large Amplitude Wavelength Modulation Spectroscopy for Sensitive Measurements of Broad Absorbers," *Rocky Mountain Fluid Mechanics Research Symposium*, August 2015.
5. P. Schroeder*, **G. Rieker**, "Combining Science and Engineering: Spectroscopy of Water Vapor in a Coal Gasifier Using Frequency Comb Lasers." *CU Energy Frontiers Conference*, March 2015. People's choice award.
4. P. Schroeder*, **G. Rieker**, "Combining Science and Engineering: Spectroscopy of Water Vapor in a Coal Gasifier Using Frequency Comb Lasers." *Colorado Photonics Industry Association Annual Meeting*, November 2014. Award for best poster.

3. **G. Rieker**, S. Cauble, F. Poehlmann, and M. Cappelli, “Medical imaging isotope production using a novel compact plasma accelerator,” *Center for Biomedical Imaging at Stanford Symposium*, April 2012.
2. M. Constantin, P. Keall, J. Perl, F. Poehlmann, **G. Rieker**, M. Cappelli, “Monte Carlo Simulations of Compact Plasma Accelerators for Proton Radiotherapy,” *51st AAPM Annual Meeting*, 2009.
1. **G. Rieker**, J. Jeffries, R. Hanson, T. Mathur, M. Gruber, and C. Carter, “Calibration-Free Wavelength-Modulation Spectroscopy for Measurements of Temperature and H₂O Concentration in Harsh, Non-Uniform Environments,” *Gordon Research Conference on Laser Diagnostics in Combustion*, 2007.

PRESS RELEASES AND MEDIA COVERAGE

<https://www.colorado.edu/researchinnovation/2024/01/21/quantum-seed-grants-awarded-advance-industry-and-university-innovation-projects-colorado>

<https://www.axios.com/pro/climate-deals/2024/01/08/methane-leak-tech>
Methane Leak is Having a Moment, Axios Pro: Climate Deals (January 8, 2024)

<https://content.govdelivery.com/accounts/USDOELPO/bulletins/3833a5b> Energy.Gov: LPO Breaking News: Up to \$189 Million Conditional Commitment to LongPath to Support U.S. Methane Emissions Monitoring (January 2024)

<https://physicsworld.com/a/frequency-comb-identifies-molecules-every-20-nanoseconds/>
Physics World (December 2023)

[CU Boulder leads \\$5.9 million marine carbon dioxide removal monitoring effort | Electrical, Computer & Energy Engineering | University of Colorado Boulder](#) (November 2023)

[New Frequency Comb Can Identify Molecules in 20-Nanosecond Snapshots | NIST](#)
NIST News (October 2023)

Q-SEnSE: An NSF Quantum Leap Challenge Institute
<https://www.youtube.com/watch?v=KZACoFKmiTs&t=210s> (May 2023)

Wired Magazine, The Arctic’s Permafrost-Obsessed Methane Detectives
<https://www.wired.com/story/arctic-permafrost-obsessed-methane-detectives/> (April 6, 2023)

Scaling Up with Scale Up <https://www.arpae-summit.com/Press/2023-Summit-Videos%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B> (March 22, 2023)

New Buff Venture Fund makes landmark investments in CU Boulder startups
<https://www.colorado.edu/venturepartners/2023/03/21/internal-news/new-buff-venture-fund-makes-landmark-investments-cu-boulder-startups>

Meeting and technology demonstration with U.S. Senator John Hickenlooper, Methane Emissions Technology Evaluation Center (October 25, 2022)

CU Boulder Lasers Go Supersonic, <https://www.colorado.edu/engineering/2022/10/13/cu-boulder-lasers-go-supersonic> (October 13, 2022)

QEI Collaboration lab opening to foster high-impact research in quantum engineering, <https://www.colorado.edu/engineering/2022/10/10/qei-collaboration-lab-opening-foster-high-impact-research-quantum-engineering> (October 10, 2022)

Digital Wildcatters Podcast, <https://youtu.be/ecWdz25q3Qc> (September 12, 2022)

CU Today (June 28, 2022) Colorado's Quantum Revolution: How scientists exploring a universe of tiny things are transforming the state into a new Silicon Valley <https://www.colorado.edu/today/2022/quantum-revolution>

Daily Camera (June 27, 2022) LongPath Technologies employs lasers to detect oil and gas leaks <https://www.dailycamera.com/2022/06/25/a-win-win-for-industry-environment-boulders-longpath-technologies-employs-lasers-to-detect-oil-and-gas-leaks/>

CU Boulder Today (June 8, 2022) Methane leaks are a major factor in climate change. One start-up wants to stop them <https://colorado.edu/today/2022/06/08/methane-leaks-are-major-factor-climate-change-one-startup-wants-stop-them>

Testimony for U.S. House of Representatives Committee on Science, Space and Technology hearing on Detecting and Quantifying Methane Emissions, <https://science.house.gov/hearings/detecting-and-quantifying-methane-emissions-from-the-oil-and-gas-sector> (June 6, 2022) Additional [coverage](#)

ARPA E Energy Innovation Summit, meeting with Secretary of Energy Jennifer Granholm, Denver Colorado (May 25, 2022)

U.S. House of Representatives Committee on Science, Space and Technology in person meeting at NIST (May 4, 2022)

ASEE First Bell (January 2022) CU Boulder Researchers Replicate Exoplanet Climates to Help Look For Life. <https://mailview.bulletinmedia.com/mailview.aspx>

YouTube Video "Finding Life Outside our Solar System" (December 2021) https://www.youtube.com/watch?v=kjg_RIj-LRc&t=4s

Phys.org (December 2021) <https://phys.org/news/2021-12-space-lab-replicate-climates-exoplanets.html>

Interesting Engineering (December 2021)

<https://interestingengineering.com/researchers-replicate-exoplanet-climates-in-lab-to-help-look-for-life>

Fuentitech.com (December 2021)

<https://fuentitech.com/researchers-replicate-the-climate-of-extraterrestrial-planets-to-help-find-extraterrestrial-life/426667/>

NPR Marketplace (November 2021)

<https://www.marketplace.org/2021/11/02/stepping-up-the-technology-to-find-methane-leaks/>

E&E News: Energy Wire (October 2021)

<https://www.eenews.net/articles/the-key-for-epa-rules-inside-the-methane-tech-revolution/>

physicsworld Biomedical Devices Research Update (October 2021)

<https://physicsworld.com/a/ultrasensitive-frequency-comb-breathalyser-targets-real-time-disease-diagnosis/>

CU Engineering Weekly Digest (Oct 23, 2021)

Quantum Engineering Initiative

<https://www.colorado.edu/engineering-facultystaff/newsletter/engineering-communications-marketing/oct-23-2021>

CU Boulder Today (September 2021) Colorado General Assembly – Joint Technology Committee Presentation

<https://www.colorado.edu/today/2021/09/13/philip-makotyn-presents-colorado-general-assemblys-joint-technology-committee>

The Insider from Venture Partners at CU Boulder News (March 2021)

<https://www.longpathtech.com/news/longpath-wins-5m-in-doe-funding-for-continuous-methane-leak-detection>

The Insider from Venture Partners at CU Boulder Emerging Innovations (March 2021)

<https://www.colorado.edu/venturepartners/2021/03/23/structured-light-velocimetry-sensing-angular-velocity>

CU Boulder Today Feature Story (February 2021)

<https://www.colorado.edu/researchinnovation/2021/02/10/faculty-innovators-recognized-national-academy-inventors>

Boulder Daily Camera Front Page Story (July 2020)

<https://www.dailycamera.com/2020/07/23/cu-boulder-receives-25m-to-study-sciences-grand-challenges/>

CU Boulder Today Feature Story (July 2020)

<https://www.colorado.edu/today/2020/07/21/new-25-million-center-advance-quantum-science-and-engineering>

Venture Partners at CU Boulder Feature Story (June 2020)

<https://www.colorado.edu/venturepartners/2020/06/11/inventions-keep-powering-cu-boulder->

[startup-formation-system-leaps-no-20-global](#)

Forbes News Story (November 2019):

<https://www.forbes.com/sites/scottcarpenter/2019/11/27/detection-of-methane-leak-from-space-could-herald-a-revolution/#64c23440667c>

WINNER: 2019 CO-LABS Governor's Awards for High Impact Research Dual Comb Spectroscopy Methane Detection Technology (October 2019):

<https://www.youtube.com/watch?v=F7DkKgtQvTM&feature=youtu.be>

CUBit Quantum Initiative Stories – Faculty Spotlight (October 2019):

<https://www.colorado.edu/initiative/cubit/2019/10/30/greg-rieker>

Yale Environment 360 Story (October 2019): <https://e360.yale.edu/features/methane-detectives-can-a-wave-of-new-technology-slash-natural-gas-leaks>

CU Boulder Today Story (October 2019): <https://www.colorado.edu/today/2019/10/31/cu-researchers-recognized-3-governors-awards-high-impact-research>

CGTNAmerica.com Methane Emissions Story (October 2019):

<https://www.youtube.com/watch?v=2q9STz1si5Y&feature=youtu.be>

Meetings with US Congressman Joe Neguse and NIST directors (2019)

NIST – A Standard Blog – Taking Measure (May 2019):

<https://www.nist.gov/blogs/taking-measure/long-road-nobelists-invention-longpath-technologies>

Colorado Public Radio live interview (2018): <https://www.cpr.org/news/story/detecting-methane-leaks-could-turn-into-big-business>

9news Colorado story (2018): <https://www.9news.com/video/news/scientists-working-to-find-invisible-methane-leaks/73-8134745>

CBS news Colorado story (2018): <https://denver.cbslocal.com/2018/05/02/colorado-researchers-team-up-on-gas-leak-detecting-technology/>

Colorado Public Radio story (2018): <http://www.kunc.org/post/how-scientists-are-using-lasers-hunt-leaky-oil-and-gas-equipment>

Boulder Weekly story (2018): <http://www.boulderweekly.com/boulderorganic/enter-boulder-born-laser-methane-comb/>

Grand Junction Sentinel story (2018):

https://www.gjsentinel.com/news/western_colorado/lasers-developed-at-cu-fight-methane-leaks/article_9d2971aa-4138-11e8-8d84-10604b9f6eda.html

University of Colorado press release (2018):

<https://www.colorado.edu/mechanical/2018/03/22/detecting-methane-miles-away>

Optical Society of America press release (2018): https://www.osa.org/en-us/about_osa/newsroom/news_releases/2018/laser-based_system_offers_continuous_monitoring_of/

Select sites carrying above press releases (2018):

1. Science Daily: <https://www.sciencedaily.com/releases/2018/03/180322103259.htm>
2. Patch.com (oil and gas industry news): <https://patch.com/colorado/boulder/cu-built-laser-based-sensor-detects-methane-leaks-miles-away>
3. Physics World: <https://physicsworld.com/a/infrared-frequency-combs-detect-gas-leaks/>
4. https://www.eurekalert.org/pub_releases/2018-03/nios-md031918.php
5. <https://www.rdmag.com/article/2018/03/laser-based-instrument-finds-gas-leaks-distance>
6. <https://eonline.com/articles/2018/03/26/new-method-shown-for-detecting-methane-leaks.aspx>
7. <https://www.pddnet.com/news/2018/03/laser-based-sensing-system-can-detect-methane-leaks-miles-away>

Reference in story on methane emissions in the US (2018):

<https://cen.acs.org/articles/96/i16/Overhaul-needed-methane-measurements-National.html>

“Regional Methane Leak Detection”, Senator Michael Bennet [meeting with U.S. Senator Michael Bennet to describe our work under the ARPA-E MONITOR program], March 14, 2018.

“Regional Methane Leak Detection”, Senator Cory Gardner [meeting with U.S. Senator Cory Gardner to describe our work under the ARPA-E MONITOR program], April 17, 2017.

“Dual-Comb Spectroscopy”, *Optics and Photonics News* [our work on mobile dual frequency comb spectroscopy highlighted in article by Takuro Ideguchi], January 1, 2017, https://www.osa-opn.org/home/articles/volume_28/january_2017/features/dual-comb_spectroscopy/.

“CU Boulder team to track methane leaks using lasers” *CU Mechanical Engineering* [press release], January 26, 2017, <http://www.colorado.edu/mechanical/2017/01/26/cu-boulder-team-track-methane-leaks-using-lasers>.

“CU Engineers Using Lasers to Track Gas Leaks”, *KUNC All Things Considered*, [article], and Radio Interview, February 6, 2017, <http://www.kunc.org/post/cu-engineers-using-lasers-track-gas-leaks>.

“CU Boulder Team Tracks Methane Leaks with Lasers”, *Photonics Spectra*, [article], January 31, 2017, <https://www.photonics.com/Article.aspx?PID=6&VID=146&IID=931&AID=61644>

“Engineers at CU Boulder to track gas leaks using lasers”, *BizWest* [article], January 27, 2017, <https://bizwest.com/2017/01/27/engineers-cu-boulder-track-gas-leaks-using-lasers/>

“New Methane Leak Detector Could Save Oil Industry \$30 Billion Per Year”, oilprice.com, [article], February 2, 2017, <http://oilprice.com/Energy/Energy-General/New-Methane-Leak-Detector-Could-Save-Oil-Industry-30-Billion-Per-Year.html>

“CU Boulder-led team lands grant to study gas storage emissions”, Daily Camera, [article], January 27, 2017, http://www.dailycamera.com/cu-news/ci_30754199/cu-boulder-led-team-lands-grant-study-gas

“NIST/CU Team Launches ‘Comb and Copter’ System to Map Atmospheric Gases”, NIST [press release], June 23, 2017, <https://www.nist.gov/news-events/news/2017/06/nistcu-team-launches-comb-and-copter-system-map-atmospheric-gases>

“IRISS Teams Up with NIST and DARPA to Test Nobel Prize-Winning Technology”, Grand Challenge Integrated Remote and In Situ Sensing [press release], June 27, 2017, <http://www.colorado.edu/iriss/2017/02/10/iriss-uas-reflects-frequency-combs>

CURRENT AND PAST RESEARCH GRANTS

Total as PI: \$ 33,350,361

Total as PI or Co-PI: \$ 77,078,361

Total Share to Rieker Laboratory: \$ 16,028,396

Carcinogenic Air Pollutant Monitoring with Dual-comb Spectroscopy

\$50,000 Greg Rieker (PI)

- Colorado OEDIT 2023-2024 Seed Grant
- 1/1/24 – 6/30/25
- 0 person-months/year

SAURON: Standoff Aerosol measurement Remote Optical Network

\$18,696,153 Greg Rieker (PI), (\$2,841,218 – Rieker share)

- Intelligence Advanced Research Projects Agency
- 1/8/24 – 5/31/27
- 2 person-months/year

Phase I SBIR, FLAME: Frequency comb Lasers for the Analysis of Methane Emissions from flares

\$250,000 Stefan Droste (PI), (\$79,618 – Rieker share)

- Department of Energy
- 7/1/23 – 6/30/24
- 0 person-months/year

A Low GHG Advanced SI Engine that can Operate on NG and NG/H2 Blends with Diesel-equivalent Performance for Off-Road Applications

\$2,540,848 Jeffrey Naber (PI) (\$151,500 – Rieker share)

- Department of Energy
- 6/1/23 – 8/31/26
- 0.5 person-months/year

Integrating measurements across platforms to feasibly assess emissions and mitigation of methane and VOCs from landfills

\$1,000,000 Mike Hannigan (PI), (\$214,000 – Rieker share)

- Environmental Protection Agency
- 9/1/23 – 8/31/26
- 0 person-months/year

High-speed frequency comb molecular identifier

\$125,000 Greg Rieker (PI) (\$62,500 – Rieker share)

- Colorado OEDIT Advanced Industries Accelerator Grant;
- 3/1/23 – 2/29/24
- 0 person-months/year

Accurate Multi Parameter Scramjet Diagnostics Using Frequency Comb Lasers

\$1,325,000 Greg Rieker (PI) (\$869,482 – Rieker share)

- Air Force Research Laboratories; Kristin Rice (Kristin.rice@us.af.mil)
- 08/12/2020-11/15/2024
- 0.5 person-months/year

Collaborative Research: NNA Track 1: Yukon River Watershed Communities: Global Impacts and Social Implications

\$2,998,503 Tyler Jones (PI), Greg Rieker (co-PI) (\$601,338 – Rieker share)

- National Science Foundation; Angela Turner, (aturner@nsf.gov)
- 09/15/2020– 08/31/2024
- 0.38 person-months/year

Advancing Frequency Comb Technology for Air Force-relevant Sensing Applications: Pathway to Routine High Accuracy (1%) Measurements in Propulsion and Hypersonic Systems

\$1,230,478 Greg Rieker (PI)

- Air Force Office of Scientific Research; Andy Stickrath
- 09/30/2020 – 09/29/2024
- 1.0 person-months/year

MRI: Development of a Mobile High-speed Dual Frequency

\$1,036,033 Greg Rieker (PI), (\$792,578 – Rieker share)

- National Science Foundation; John Daily (702.292.7937, jdaily@nsf.gov)
- 09/01/2020 – 08/31/2023
- 0.5 person-months/year

QLCI-CI: Enhanced Sensing and Distribution Using Correlated Quantum States

\$25,000,000 Jun Ye (PI), Greg Rieker (co-PI) (\$850,000 – Rieker share)

- National Science Foundation; NSF Quantum Leap Challenge Institutes Management Team (hwarchall@nsf.gov and ddagenai@nsf.gov)
- 07/01/2020 – 6/30/2025
- 0.5 person-months/year

Novel Sloping Wind Tunnel Experiments and Adaptive Mesh Simulations of Fine-Scale Combustion for Physics-Based Models of Wildland Fire

\$2,088,770 Peter Hamlington (PI), Greg Rieker (co-PI) (\$ 593,917 – Rieker share)

- SERDP; Kurt Preston (Kurt.T.Preston@usace.army.mil)
- 05/01/2020 - 1/31/2024
- 0.5 person-months/year

Phase 2 - STTR: Mid Infrared Laser Absorption Spectroscopy for Multi-Parameter Rotating Detonation Analysis

\$750,000 Jason Kriesel (PI), Greg Rieker (co-PI) (\$150,000 – Rieker share)

- Air Force Research Laboratories; William Hargus, Jr. (William.hargus@us.af.mil)
- 9/01/2020 – 11/30/2023
- 0.0 person-months/year

CAREER: Frequency Comb-based Diagnostics for Combustion Environments

\$ 510,000. Greg Rieker (PI) (\$ 510,000 – Rieker share)

- National Science Foundation; Song-Charng Kong (703.292.8695, skong@nsf.gov)
- 3/1/15 – 2/29/21
- 0.5 person-months/year

Frequency Comb-Based Remote Methane Observation Network

\$ 2,125,470. Greg Rieker (PI), (\$ 980,415 – Rieker share)

- DOE ARPA-E; Joseph King (202.287.1055, Joseph.king@hq.doe.gov)
- 5/1/15 – 5/5/17
- 2.5 person-months/year

(Plus-Up) Frequency Comb-Based Remote Methane Observation Network

\$ 2,692,143. Greg Rieker (PI), (\$ 1,186,117 – Rieker share)

- DOE ARPA-E; Joseph King (202.287.1055, Joseph.king@hq.doe.gov)
- 3/27/18 – 3/30/21
- 2.5 person-months/year

Emission Inventories from Natural Gas Storage Facilities using Regional Frequency Comb Laser Monitoring and Aircraft Flyovers

\$ 1,323,130. Greg Rieker (PI) (\$ 730,885 – Rieker share)

- Department of Energy; Sandra Borek (412.386.4533, Sandra.borek@netl.doe.gov)
- 10/1/16 – 9/30/20
- 0 person-months/year

Broadband Dual-Comb Spectrometry for Hazardous Material Detection

\$ 1,741,625. Greg Rieker (PI) (\$ 1,241,625 – Rieker share)

- DARPA, Anne Fischer (703.526.2831, anne.fischer@darpa.mil)
- 9/1/15 – 9/30/20
- 2.0 person-months/year

Exoplanets Research Program: Frequency Comb Measurement of Methane and Water to 1300 K

\$ 464,829. Greg Rieker (PI) (\$ 276,473 – Rieker share)

- NASA ROSES;
- 1/1/18 – 12/31/21
- 0.5 person-months/year

Phase and Angular Momentum Spectroscopy with Frequency Comb Lasers

\$ 583,000. Greg Rieker (PI) (\$ 583,000 – Rieker share)

- AFOSR; Chiping Li (703.696.8574, chiping.li@us.af.mil)
- 4/1/17 – 12/31/21
- 1.0 person-months/year

Collaborative Research: High Temperature and Pressure Char Kinetics – Diagnostic development, Gasifier experiments, and Modeling

\$ 310,000. Greg Rieker (PI) (\$ 155,000 – Rieker share)

- NSF; Dr. Ray Chen
- 9/1/13 – 8/30/16
- 0.5 person-months/year

Western Economic Development Atmospheric Methane Monitoring Project

\$ 250,000. Greg Rieker (PI) (\$ 108,683 – Rieker share)

- CMC Research Institutes, Inc.;
- 12/4/17 – 3/31/19

- 0 person-months/year

Regional Methane Leak Detection System

\$ 130,000. Greg Rieker (PI) (\$ 130,000 – Rieker share)

- Colorado OEDIT Advanced Industries Accelerator Grant;
- 6/1/18 – 5/31/19
- 0 person-months/year

Research and Development of Optimized Polymer Film Flame Treatments

\$ 480,000 to date (\$110k/year ongoing). Greg Rieker/Peter Hamlington (PI) (\$ 240,000 – Rieker share)

- 3M Corporation; Mark Strobel (mastrob11@mmm.com)
- 1/1/15 – present (ongoing)
- 0 person-months/year

Innovative Seed Grant: Single-beam laser diagnostic to measure fluid vorticity in real-world environments

\$ 50,000. Greg Rieker (PI) (\$ 25,000 – Rieker share)

- University of Colorado; Victor Bright
- 7/1/18 – 12/31/19
- 0 person-months/year

Innovative Seed Grant: Multi-species Trace Gas Analyzer for Atmospheric, Energy, and Medical Applications

\$ 50,000. Greg Rieker (PI) (\$ 50,000 – Rieker share)

- University of Colorado; Victor Bright
- 7/1/14 – 12/31/15
- 0 person-months/year

Wavelength Modulation Spectroscopy for Expanding NH₃ Gas Plume

\$ 42,500. Greg Rieker (PI) (\$ 42,500 – Rieker share)

- AFRL; Natalia MacDonald
- 6/1/15 – 6/1/16
- 0 person-months/year

Examination of Wildland Fire Spread at Small Scales Using Direct Numerical Simulations and Frequency Comb Laser Diagnostics

\$ 1,150,000. Peter Hamlington (PI), Greg Rieker (co-PI) (\$ 442,000 – Rieker share)

- SERDP; Kurt Preston (Kurt.T.Preston@usace.army.mil)
- 9/1/16 – 8/30/19
- 0.5 person-months/year

MURI: Stratospheric Turbulence/ Particle Measurements and Models for Air Force Hypersonics

\$ 7,500,000. Brian Argrow (PI), Greg Rieker (co-PI) (\$450,702 – Rieker share)

- AFOSR; TBA (TBA)
- 1/1/18 – 12/31/23
- 0.5 person-months/year

GRADUATE TEACHING

Faculty Course Questionnaires (FCQs) max score 6.0
Fall 2013 **MCEN 5065/5075: Graduate Design**
18 students, FCQs: 5.4 course overall, 5.2 instructor overall
Spring 2014 **MCEN 5055: Advanced Product Design**
26 students, FCQs: 5.3 course overall, 5.8 instructor overall
AY 14-15 **MCEN 5065/5075: Graduate Design Team Mentorship**
1 team of 3 students, no FCQ
AY 15-16 **MCEN 5065/5075: Graduate Design Team Mentorship**
2 teams of 3 students, no FCQ
AY 16-17 **MCEN 5065/5075: Graduate Design Team Mentorship**
2 teams of 3 students, no FCQ
Spring 2015 **MCEN 5055: Advanced Product Design**
25 students, FCQs: 5.2 course overall, 5.5 instructor overall
Spring 2016 **MCEN 5055: Advanced Product Design**
18 students, FCQs: 5.4 course overall, 5.8 instructor overall
Fall 2016 **MCEN 5055: Advanced Product Design**
27 students, FCQs: 4.7 course overall, 5.4 instructor overall

Change to Faculty Course Questionnaires (FCQs) max score 5.0
Spring 2022 **MCEN 5055: Advanced Product Design**
25 students, FCQs: >4.65 across all 16 categories, Average 4.81
Fall 2022 **MCEN 5055: Advanced Product Design**
33 students, FCQs: >4.4 across all 16 categories, Average 4.65
Spring 2023 **(New Course) MCEN 5228: Optical Sensing**
17 students, FCQs: Average (16 categories) 4.33

UNDERGRADUATE TEACHING

Faculty Course Questionnaires (FCQs) max score 6.0
AY 15-16 **MCEN 4045/4085: Undergraduate Design Team Mentorship**
1 team of 6 students, FCQs: 6.0 course overall, 6.0 instructor overall
Spring 2017 **MCEN 4228: Thermofluids Laboratory (new course)**
11 students, FCQs: 4.8 course overall, 5.8 instructor overall
Fall 2017 **MCEN 3012: Thermodynamics I**
114 students, FCQs: 5.2 course overall, 5.6 instructor overall
Spring 2018 **MCEN 4228: Thermofluids Laboratory**
6 students, FCQs: 6.0 course overall, 5.8 instructor overall
Fall 2018 **MCEN 3012: Thermodynamics I**
103 students (2 sections), FCQs: 5.2 course overall, 5.6 instructor overall

EDUCATION GRANTS

Total as PI: \$ 133,500

STEM Education Grant: University of Colorado Senior and Graduate Design Projects in Support of NIST Metrology Initiatives

\$ 90,000. Greg Rieker (PI)

- NIST; Paul Hale (303.497.5367, paul.hale@nist.gov)
- 9/1/14 – 8/30/18
- 0 person-months/year

New Hands-on Upper Level Energy Course: Experimental Thermal-Fluid Systems Capstone

\$ 33,500. Greg Rieker/Julie Steinbrenner (PI)

- CU; EEF Committee (Rotates)
- 6/1/16 – 5/30/19
- 0 person-months/year

Shell Education Grant for Experimental Thermal-Fluid Systems Capstone

\$ 10,000. Greg Rieker/Julie Steinbrenner (PI)

- CU; Michael Hannigan (michael.hannigan@colorado.edu)
- 6/1/16 – 5/30/17
- 0 person-months/year

RESEARCH ADVISING

Current

Senior Research Associates

Sean Coburn (2015 – present)
Garrett Mathews (2021 – present)

Postdoc

Graeme Gillespie (2023 – present)
Justin Earley (2023 – present)

PhD

Scott Egbert
Charles Callahan
Carl Mathurin
Augustine Frymire
Alyssa Lalko
Elijah Miller
Carly Rowe
Nicolas Harris
Erick Gatica

Undergrad

Gemma Gallaher (SPUR 2023)
Colton Huff (SPUR 2023)

Alumni

PhD

Paul Schroeder PhD 2017 (now with General Atomics)
Torrey Hayden PhD 2018 (now with OnPoint)
Jason Christopher PhD 2018 (co-advised with Hamlington; now with Air Force)
Amanda Makowiecki PhD 2019 (now with LongPath Technologies)
Nathan Malarich PhD 2020 (now with NIST)
Ryan Cole PhD 2021 (now with Bates College)
Elizabeth Strong PhD 2021 (now with Fathom Radiant)
Alex Rybchuk PhD 2021 (now with NREL)
David Yun 2023 (now with Boeing)

Research Associate / Postdoc

Nazanin Hoghooghi (2015 – 2023, now with NIST)

Caroline Alden (2015 – 2022, now with LongPath)

Research Engineers

Robert Wright (2015-2020, now with LongPath)

Griffith Wendland (2018-2019)

MS

Anthony Draper MS 2018 (now with Facebook Reality Labs)

Bennett Sodergren MS 2015 (now with Vescent Photonics, Inc.)

Jinyu Yang MS 2017 (now with Notre Dame)

Alan Sanchez MS 2018 (now with Tesla)

Justice Calderon MS 2021 (now with IBM)

Mehrassa Marizad MS 2023 (now with Double Helix)

Undergraduates & BS/MS

Jaylen Hinds (You're @ CU 2014)

Matthew Chamot (DLA 2016-2017)

Brendan Bitterlin (DLA 2017-2018)

Bill Andrew (summer intern 2015)

Bryan Watson (summer intern 2016)

Josh Biggio (summer intern 2017)

Sonya Schuppan (summer intern 2017)

Zak Armacost (summer intern 2018)

Nicolas Seitz (summer intern 2018)

Cesar Galan Gutierrez (part-time staff 2017-2018)

Alexandra Jaros (SPUR, intern 2018-2019)

Robert Giannella (summer intern 2018)

Christopher Kling (DLA 2019-2020)

Cameron Casby (DLA 2019-2020)

Abdul Dalwatzai (intern 2020-2021)

Timothy Breda (DLA 2020-2021)

Sean Bohling (SPUR 2021)

Walter Sabon (DLA 2021-2022)

Alison Kelly (SPUR 2022)

Liam Davis (DLA 2022 – 2023)

Colton Huff (SPUR 2023)

Gemma Gallaher (SPUR 2023)

Marcus Centeno (SPUR 2023)

Visiting Scholars

Marta Ruiz-Llata (University Carlos III Madrid, 2019-2020)

Other

Matt Francisco, MS Thesis Committee 2013

Ricardo Jiminez, PhD Committee (Physics) 2013

Ricardo Piedrahita, Preliminary exam 2014, PhD Committee 2015

Ben Yu, PhD Committee (Physics) 2015

Dan Maser, PhD Comprehensive Exam (Physics) 2015, PhD Committee 2017
 Fnu Shikhar, PhD Committee 2015
 Kim Urness, PhD Comprehensive Exam 2013, PhD Committee 2014
 Colin Towery, PhD Comprehensive Exam 2015, PhD Committee 2017
 Bill Tandy, PhD Comprehensive Exam (Aerospace) 2016, PhD Committee 2017
 Awad Alquaity, PhD Committee (KAUST) 2016
 Nick Wimer, PhD Comprehensive Exam 2017, PhD Committee 2019
 Yao Zhai, PhD Comprehensive Exam 2017, PhD Committee 2018
 Sid Nigam, MS Committee 2018
 Daniel Cole, PhD Committee (Physics) 2018
 Holly Leopardi, PhD Comprehensive Exam (Physics) 2018, PhD Committee 2019
 Samuel Whitman, PhD Preliminary Exam 2018
 Caelan LaPointe, PhD Preliminary Exam 2018, PhD Comprehensive Exam 2019,
 PhD Committee 2020
 Corey Rogers, PhD Preliminary Exam 2018
 Stephanie Schwartz, PhD Comprehensive Exam 2019, PhD Committee 2020
 Susana Toderó, PhD Committee (Physics) 2020
 Dan Lesko, PhD Comprehensive Exam (Chemistry) 2020
 Meghan Kelleher, PhD Comprehensive Exam 2021, PhD Committee 2023
 Yeweu Wu, PhD Committee (Physics) 2021
 Mike Meehan, PhD Preliminary Exam 2019, PhD Comprehensive Exam 2021
 Zach Decker, PhD Committee 2021
 M. Ali Abbas, PhD Committee (Radboud University, Netherlands) 2021
 Chaitanya Ghole, PhD Preliminary Exam 2022
 Alex Anderson, PhD Committee (Electrical) 2022
 Jeff Glusman, PhD Preliminary Exam 2020, PhD Comprehensive Exam 2021,
 PhD Committee 2022
 Alex Lind, PhD Comprehensive Exam (Physics) 2020, PhD Committee 2022
 Manoj Kalubovilage, PhD Committee (Physics) 2022
 Tin Nguyen, PhD Comprehensive Exam (Physics) 2022
 Daniel Herman, PhD Comprehensive Exam (Physics) 2020, PhD Committee 2022
 Tim Aiken, PhD Comprehensive Exam (Aerospace) 2022, PhD Committee 2023
 James Rundel, PhD Preliminary Exam 2021, PhD Committee 2023
 Jatinder Sampathkumar, PhD Preliminary Exam 2020, PhD Comprehensive Exam
 2021, PhD Committee 2023
 Emily Caldwell, PhD Comprehensive Exam (Electrical) 2022, PhD Committee
 2023
 Jas Shahanand, PhD Preliminary Exam 2023
 Sam Simons-Wellin, PhD Preliminary Exam 2023
 Neeraj Prakesh, PhD Comprehensive Exam 2023, PhD Committee 2024
 Jan Bartos, PhD Comprehensive Exam 2024

DEPARTMENT SERVICE

2013-2014	Graduate committee Graduate visit day (GEARRS) event co-lead Design track admissions lead
2014-2015	Graduate committee

	Graduate visit day (GEARRS) event co-lead
	Design track admissions lead
2015-2016	Graduate committee
	Graduate visit day (GEARRS) event lead
	Faculty search committee
2015-2018	Secured funding for 6 senior and graduate design teams
2016-2017	External relations committee
	Design track admissions lead
2017-2018	Graduate committee
2018-2019	External relations committee
	Department chair search committee
	Quantum Science search committee
2020-2021	Design Center Colorado Committee
2021-2022	Faculty Search Committee
2022-2023	Chair, Research & External Relations Committee
	Executive Committee
2023	Quantum Seed Grant Steering Committee
2023	Mechanical Engineering Mentor Program
2023	MCEN 5930 Internship for Credit: advising Murali Anumolu, Yugendran Subramani & Rahul Gondi

COLLEGE/CAMPUS SERVICE

2015-2018	BOLD Center Goldshirt Interviews
2015, 2016	BOLD Center Aspire Summer Bridge Presenter
2015, 2016	Innovative Seed Grant Review Panels
2017-2018	Water-energy Nexus Innovative Research Thrust Executive Committee
2017-2018	Quantum Integrated Sensor Systems Innovative Research Thrust Executive Committee
2017-2019	Organizer and Faculty Lead, Operational Renegade Gas (ORG) Working Group
2018	Faculty Innovation Ambassador
2018-2020	Quantum Sensing and Metrology Pillar Lead, CUBit Quantum Initiative
2019-2020	Development Committee, 3M Master Research Agreement
2019-2023	CEAS Quantum Engineering Initiative, Director
2022	CEAS Strategic Planning, Facilitator for Innovation & Entrepreneurship Workshop
2020-present	CUBit Quantum Initiative, Associate Director for Engineering
2023-present	CEAS Quantum Engineering Initiative, Member

NATIONAL/INTERNATIONAL SERVICE

2014	DOE Basic Energy Sciences Early Career Proposal Review Panel
2015	NSF Combustion and Fire Systems Proposal Review Panel
2016	Organizing Committee, OSA <i>Fourier Transform Spectroscopy</i> conference
2017	Local Organizing Committee, OSA <i>Light and Energy Congress</i> conference
2017	Participant, NSF Junior Faculty in Combustion Workshop

2017-2018 Organizing Committee, OSA *CLEO* conference, Applications and Technology subgroup
 2018 Organizing Committee, OSA *Optics for Energy and Environment* conference
 2018 Organizing Committee, OSA *Laser Applications in Chemical, Security, and Environmental Analysis* conference
 2019 Chair, OSA *CLEO* conference, Applications and Technology subgroup
 2015-2018 Presider/Chair, 9 conference sessions
 2018 European Research Council STG proposal review panel
 2018 EPSRC European proposal review panel
 2019 Participant, NSF Junior Faculty in Combustion Workshop
 2019 Nominee, NAE Frontiers in Engineering Symposium
 2019 Participant and section organizer, AFOSR Fundamental Spectroscopy Workshop
 2021 Organizing Committee, Master in Quantum Technology and Engineering, Universidad Carlos III de Madrid, Spain
 2021 US Sections of the Combustion Institute Early Career Research Award Selection Panel
 2022 Peter Werle Early Career Award Selection Panel, Lead Facilitator
 2022 NSF Combustion and Fire Systems CAREER Award Review Panel
 2023 QUADMARTS Annual Meeting, Host and Organizer
 2018-present NASA NExSS Steering Committee
 2020-present FLAIR Conference Advisory Board
 2022-present QUADMARTS International Collaborative Steering Committee

JOURNAL REVIEWER

Optica
 Optics Express
 Combustion and Flame
 Journal of Quantitative Spectroscopy and Radiative Transfer (JQSRT)
 Proceedings of the Combustion Institute
 Applied Optics
 Optics Letters
 Applied Physics B
 Journal of Molecular Spectroscopy
 AIAA Journal
 Journal of Applied Remote Sensing
 Measurement Science and Technology
 Applied Spectroscopy
 Optics and Laser Technology
 Journal of Physics D
 Journal of Energy & Fuels
 Nature Communications