

Samuel Jacobi Grauer

CONTACT INFORMATION	232–233 Research East Bldg 185 Scholarship Dr University Park, PA 16802	<i>Phone</i> 814-863-6289 <i>Email</i> sgrauer@psu.edu <i>Web</i> samgrauer.ca
EDUCATION	University of Waterloo PhD, Mechanical and Mechatronics Engineering • Thesis: Bayesian methods for gas-phase tomography hdl:10012/13774 • Advisor: Kyle J Daun University of Manitoba BSc, Mechanical Engineering • Thesis: Development of correlations for laminar film condensation in a non-condensing gas • Advisor: Scott J Ormiston	Waterloo, Canada 9/10/2018 Winnipeg, Canada 6/3/2014
APPOINTMENTS	Pennsylvania State University Kenneth Kuan-Yun Kuo Early Career Professor Assistant Professor, Department of Mechanical Engineering Affiliated Faculty, Rock Ethics Institute Faculty Fellow, Institute for Computational and Data Sciences Friedrich-Alexander-Universität Erlangen-Nürnberg Guest Professor, Erlangen Graduate School in Advanced Optical Technologies	University Park, PA 2024–Present 2021–Present 2024–Present 2021–Present Erlangen, Germany 2022–Present
RESEARCH EXPERIENCE	Georgia Institute of Technology <i>Postdoctoral Fellow</i> , Ben T. Zinn Combustion Laboratory University of Waterloo <i>Undergraduate Research Assistant</i> Atomic Energy of Canada Limited <i>Undergraduate Research Assistant</i> , Fuel & Fuel Channel Safety Branch	Atlanta, GA 2018–2020 Waterloo, Canada Summer 2013 Chalk River, Canada Summer 2012
AWARDS & SCHOLARSHIPS	Outstanding Paper Award 2023, Fluid Mechanics Editorial Board, Measurement Science and Technology, Institute of Physics (IOP) Emerging Leader in Measurement and Metrology Editorial Board, Measurement Science and Technology, Institute of Physics (IOP) SAOT Young Researcher Award (YRA) in Advanced Optical Technologies Erlangen Graduate School in Advanced Optical Technologies (SAOT) Postdoctoral Fellowship (PDF) Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarships–Doctoral Program (PGS D3) Natural Sciences and Engineering Research Council of Canada (NSERC) President’s Graduate Scholarship University of Waterloo	2/2024 3/2023 2022–2026 EUR 100k 2018–2020 CAD 90k 2016–2018 CAD 63k 2016–2018 CAD 30k

RESEARCH
FUNDING

STTR: Phase II Fast and Robust Algorithms and Software for Limited-Data Computed Tomography Sponsor: <i>Department of the Army</i> Prime: <i>Spectral Energies, LLC</i> (PI: KD Rein) Role: <i>Principal Investigator</i>	5/2024–4/2026 Award total: \$1,150k Allocation: \$400k
Algorithms and Design-of-Experiments Analysis for Optical Sensing of Detonation Cell Structures Sponsor: <i>Air Force Research Laboratory</i> Role: <i>Principal Investigator</i>	1/2024–12/2024 Award total: \$102k
Developing a Generalized Empirical Model for Flame Transfer Functions Using Multi-Fidelity Data from Experiments and Numerical Simulations Sponsor: <i>Solar Turbines Incorporated</i> Role: <i>Co-Principal Investigator</i> (PI: Y Xuan)	5/2023–4/2025 Award total: \$243k Allocation: –
Uncertainty Quantification Framework for Gas Turbine Digital Twins Sponsor: <i>Solar Turbines Incorporated</i> Role: <i>Principal Investigator</i>	1/2023–12/2023 Award total: \$100k
STTR: Phase I Fast and Robust Algorithms and Software for Limited-Data Computed Tomography Sponsor: <i>Department of the Army</i> Prime: <i>Spectral Energies, LLC</i> (PI: KD Rein) Role: <i>Principal Investigator</i>	8/2022–7/2023 Award total: \$175k Allocation: \$75k
Collaborative Research: Physics-Informed Background-Oriented Schlieren Tomography of Wildfire-Relevant Combustion Sponsor: <i>National Science Foundation</i> Role: <i>Principal Investigator</i> (Co-PIs: BE Schmidt, YTT Liao)	10/2022–9/2025 Award total: \$526k Allocation: \$284.5k
SBIR: Phase I Multiparameter Laser Absorption Tomography System for High-Speed Flows Sponsor: <i>National Aeronautics and Space Administration</i> Prime: <i>Innovative Scientific Solutions, Inc.</i> (PI: BA Ochs) Role: <i>Principal Investigator</i>	8/2022–7/2023 Award total: \$150k Allocation: \$44.5k
LDRD: Ultra-High-Speed X-Ray Tomography: Bridging the Gaps to See the Unknown Sponsor: <i>Sandia National Laboratories</i> (PI: BR Halls) Role: <i>Principal Investigator</i>	1/2022–12/2024 Award total: \$1,800k Allocation: \$300k
3D Signal Inversion and Optimization Framework for Multi-Beam LAS in a High-Speed Inlet Sponsor: <i>Air Force Research Laboratory</i> Prime: <i>Innovative Scientific Solutions, Inc.</i> (PI: BA Ochs) Role: <i>Principal Investigator</i>	9/2021–8/2022 Award total: \$43.5k

Design-of-Experiment Framework for Multi-Modal Measurements Applied to a High-Speed Inlet 9/2019–8/2020
 Award total: \$75.5k
 Sponsor: *Air Force Research Laboratory* Allocation: –
 Prime: *Innovative Scientific Solutions, Inc.* (PI: BA Ochs)
 Role: *Co-Principal Investigator* (PI: AM Steinberg)

SERVICE FUNDING **Conference: Keeping the Fire Alive: Fostering a Sustainable Community in the Combustion Sciences** 2/2023–2/2024
 Award total: \$31.6k
 Sponsor: *National Science Foundation* Allocation: –
 Role: *Co-Principal Investigator* (PI: DI Pineda)

TEACHING

Role	Course	Institution	Term
Inst	Ethics for Engineers (ME 497)	Penn State	Spring 2024
Inst	Computational Tools (ME 330)	Penn State	Spring 2024
Inst	Computational Tools (ME 330)	Penn State	Fall 2023
Inst	Computational Tools (ME 330)	Penn State	Spring 2023
Inst	Computational Tools (ME 330)	Penn State	Fall 2022
Inst	Computational Tools (ME 330)	Penn State	Spring 2022
Inst	Computational Tools (ME 330)	Penn State	Fall 2021
Inst	Computational Tools (ME 330)	Penn State	Spring 2021
TA	Ordinary Differential Equations (ME 203)	University of Waterloo	Spring 2017
TA	Ordinary Differential Equations (MTE 202)	University of Waterloo	Winter 2017
TA	Heat Transfer II (ME 456)	University of Waterloo	Fall 2016
TA	Heat Transfer I (ME 353)	University of Waterloo	Fall 2016
TA	Thermodynamics and Heat Transfer (ECE 309)	University of Waterloo	Spring 2016
TA	Technology, Society, and the Future (CIVL 4460)	University of Manitoba	Winter 2014

BOOK CHAPTERS

B3. **SJ Grauer**, TA Sipkens, PJ Hadwin, KJ Daun, “Statistical inversion, uncertainty quantification, and the optimal design of optical experiments,” in *Optical Diagnostics for Reacting and Non-Reacting Flows: Theory and Practice*, A Steinberg and S Roy, eds, 1st ed (AIAA, 2023), 1137–1202. [doi:10.2514/5.9781624106330.1137.1202](https://doi.org/10.2514/5.9781624106330.1137.1202)

B2. BR Halls, TR Meyer, **SJ Grauer**, L Ma, “Tutorial: Tomographic imaging in combustion-related flows,” in *Optical Diagnostics for Reacting and Non-Reacting Flows: Theory and Practice*, A Steinberg and S Roy, eds, 1st ed (AIAA, 2023), 1089–1136. [doi:10.2514/5.9781624106330.1089.1136](https://doi.org/10.2514/5.9781624106330.1089.1136)

B1. H McCann, P Wright, K Daun, **SJ Grauer**, C Liu, S Wagner, “Chemical species tomography,” in *Industrial Tomography: Systems and Applications*, M Wang, ed, 2nd ed (Woodhead Publishing, 2022), 155–206. [doi:10.1016/B978-0-12-823015-2.00004-2](https://doi.org/10.1016/B978-0-12-823015-2.00004-2)

INTELLECTUAL PROPERTY P1. **SJ Grauer**, K Zhou*, JP Molnar, and J Hong, “System and method for fluid flow assessment,” International Publication No. WO 2024/112677 (May 30, 2024).

JOURNAL PUBLICATIONS **Published**

J27. JL Suazo Betancourt, **SJ Grauer**, J Bak, AM Steinberg, and MLR Walker, “Bayesian plasma model selection for Thomson scattering,” *Rev Sci Instrum* **95**, 043004, 2024. [doi:10.1063/5.0158749](https://doi.org/10.1063/5.0158749)

*Underline indicates a student who was supervised by me.

- J26. Y Bin, X Hu, J Li, **SJ Grauer**, and XIA Yang, “Constrained re-calibration of two-equation Reynolds-averaged Navier–Stokes models,” *Theor Appl Mech Lett* **14**(2), 100503, 2024. doi:10.1016/j.taml.2024.100503
- J25. FJ Bauer[†], PAB Braeuer[†], MWR Wilke, S Will, and **SJ Grauer**, “2D *in situ* determination of soot optical band gaps in flames using hyperspectral absorption tomography,” *Combust Flame* **258**, 112730, 2023. doi:10.1016/j.combustflame.2023.112730
- J24. K Zhou, J Li, J Hong, and **SJ Grauer**, “Stochastic particle advection velocimetry (SPAV): theory, simulations, and proof-of-concept experiments,” *Meas Sci Technol* **34**, 065302, 2023. doi:10.1088/1361-6501/acc049
- J23. JP Molnar, L Venkatakrishnan, BE Schmidt, TA Sipkens, and **SJ Grauer**, “Estimating density, velocity, and pressure fields in supersonic flows using physics-informed BOS,” *Exp Fluids* **64**, 14, 2023. doi:10.1007/s00348-022-03554-y
- J22. TA Sipkens, JC Corbin, **SJ Grauer**, and GJ Smallwood, “Tutorial: Guide to error propagation for particle counting measurements,” *J Aerosol Sci* **167**, 106091, 2023. doi:10.1016/j.jaerosci.2022.106091
- J21. **SJ Grauer**[†], K Mohri[†], T Yu, H Liu, and W Cai, “Volumetric emission tomography for combustion processes,” *Prog Energy Combust Sci* **94**, 101024, 2023. doi:10.1016/j.pecs.2022.101024
- J20. **SJ Grauer**, KM Rice, JM Donbar, NJ Bisek, JJ France, BA Ochs, and AM Steinberg, “Optimization of tunable diode laser arrays for inlet mass capture measurement,” *AIAA J* **60**(10), 5854–5867, 2022. doi:10.2514/1.J061774.
- J19. JP Molnar and **SJ Grauer**, “Flow field tomography with uncertainty quantification using a Bayesian physics-informed neural network,” *Meas Sci Technol* **33**(6), 065305, 2022.[‡] doi:10.1088/1361-6501/ac5437
- J18. M Gomez, **SJ Grauer**, J Ludwigsen, AM Steinberg, SF Son, S Roy, and TR Meyer, “Megahertz-rate background-oriented schlieren tomography in post-detonation blasts,” *Appl Opt* **61**(10), 2444–2458, 2022. doi:10.1364/AO.449654
- J17. TA Sipkens, **SJ Grauer**, AM Steinberg, SN Rogak, and P Kirchen, “New transform to project axisymmetric deflection fields along arbitrary rays,” *Meas Sci Technol* **33**(3), 035201, 2022. doi:10.1088/1361-6501/ac3f83
- J16. NP Brown, **SJ Grauer**, JA Deibel, MLR Walker, and AM Steinberg, “Bayesian framework for THz-TDS plasma diagnostics,” *Opt Express* **29**(4), 4887–4901, 2021. doi:10.1364/OE.417396
- J15. **SJ Grauer** and AM Steinberg, “Linear absorption tomography with velocimetry (LATV) for multiparameter measurements in high-speed flows,” *Opt Express* **28**(22), 32676–32692, 2020. doi:10.1364/OE.408588
- J14. RB Miguel, J Emmert, **SJ Grauer**, J Thornock, and KJ Daun, “Optimal filter selection for quantitative gas mixture imaging,” *J Quant Spectrosc Radiat Transfer* **254**, 107208, 2020. doi:10.1016/j.jqsrt.2020.107208
- J13. **SJ Grauer** and AM Steinberg, “Fast and robust volumetric refractive index measurement by unified background-oriented schlieren tomography,” *Exp Fluids* **61**(3), 80, 2020. doi:10.1007/s00348-020-2912-1
- J12. J Emmert, **SJ Grauer**, S Wagner, and KJ Daun, “Efficient Bayesian inference of absorbance spectra from transmitted intensity spectra,” *Opt Express* **27**(19), 26893–26909, 2019. doi:10.1364/OE.27.026893
- J11. **SJ Grauer**[†], J Emmert[†], ST Sanders, S Wagner, and KJ Daun, “Multiparameter gas sensing with linear hyperspectral absorption tomography,” *Meas Sci Technol* **30**(10), 105401, 2019. doi:10.1088/1361-6501/ab274b

[†]Authors made an equal contribution.

[‡]Paper featured on the journal issue cover.

- J10. **SJ Grauer**, A Unterberger, A Rittler, KJ Daun, AM Kempf, and K Mohri, “Instantaneous 3D flame imaging by background-oriented schlieren tomography,” *Combust Flame* **196**, 284–299, 2018. doi:10.1016/j.combustflame.2018.06.022
- J9. TA Sipkens, PJ Hadwin, **SJ Grauer**, and KJ Daun, “Predicting the heat of vaporization of iron at high temperatures using time-resolved laser-induced incandescence and Bayesian model selection,” *J Appl Phys* **123**(9), 095103, 2018. doi:10.1063/1.5016341
- J8. **SJ Grauer**, BC Conrad, RB Miguel, and KJ Daun, “Gaussian model for emission rate measurement of a heated plume using hyperspectral data,” *J Quant Spectrosc Radiat Transfer* **206**, 125–134, 2018. doi:10.1016/j.jqsrt.2017.11.005
- J7. TA Sipkens, PJ Hadwin, **SJ Grauer**, and KJ Daun, “General error model for analysis of laser-induced incandescence signals,” *Appl Opt* **56**(30), 8436–8445, 2017. doi:10.1364/AO.56.008436
- J6. **SJ Grauer**, PJ Hadwin, TA Sipkens, KJ Daun, “Measurement-based meshing, basis selection, and prior assignment in chemical species tomography,” *Opt Express* **25**(21), 25135–2514, 2017. doi:10.1364/OE.25.025135
- J5. **SJ Grauer**, RW Tsang, and KJ Daun, “Broadband chemical species tomography: Measurement theory and a proof-of-concept emission detection experiment,” *J Quant Spectrosc Radiat Transfer* **198**, 145–154, 2017. doi:10.1016/j.jqsrt.2017.04.030
- J4. **SJ Grauer**, PJ Hadwin, and KJ Daun, “Improving chemical species tomography of turbulent flows using covariance estimation,” *Appl Opt* **56**(13), 3900–3912, 2017. doi:10.1364/AO.56.003900
- J3. **SJ Grauer**, PJ Hadwin, and KJ Daun, “Bayesian approach to the design of chemical species tomography experiments,” *Appl Opt* **55**(21), 5772–5782, 2016. doi:10.1364/AO.55.005772
- J2. KJ Daun, **SJ Grauer**, and PJ Hadwin, “Chemical species tomography of turbulent flows: Discrete ill-posed and rank deficient problems and the use of prior information,” *J Quant Spectrosc Radiat Transfer* **172**, 58–74, 2016. doi:10.1016/j.jqsrt.2015.09.011
- J1. **SJ Grauer**, EJFR Caron, NL Chester, MA Wells, and KJ Daun, “Investigation of melting in the Al–Si coating of a boron steel sheet by differential scanning calorimetry,” *J Mater Process Technol* **216**, 89–94, 2015.

Preprints

- A1. K Zhou and **SJ Grauer**, “Flow reconstruction and particle characterization from inertial Lagrangian tracks,” *arXiv preprint*, 2311.09076, 2023. doi:10.48550/arXiv.2311.09076

Submitted Manuscripts

- S2. Y Bin, XIA Yang, **SJ Grauer**, and RF Kunz, “Data-enabled reduction of the time complexity of iterative solvers,” *J Comput Physics* (Submitted).
- S1. JP Molnar, EJ LaLonde, CS Combs, O Léon, D Donjat, F Nicolas, and **SJ Grauer**, “Forward and inverse modeling of depth-of-field effects in background-oriented schlieren,” *AIAA J* (Submitted).

CONFERENCE CONTRIBUTIONS

Papers

- C41. K Zhou, **SJ Grauer**, D Schanz, P Godbersen, A Schröder, T Rockstroh, YJ Jeon, and B Wieneke, “Benchmarking data assimilation algorithms for 3D Lagrangian particle tracking,” *21st International Symposium on Applications of Laser and Imaging Techniques to Fluid Mechanics*, Lisbon, Portugal, Jul 8–11, 2024 (22 pp). doi:10.55037/lxaser.21st.229
- C40. R Tang, K Zhou, J Tan, and **SJ Grauer**, “Parallel physics-informed neural networks for inverse analysis of fluid–structure interactions,” *11th International Conference on Inverse Problems in Engineering*, Búzios, Rio de Janeiro, Brazil, Jun 8–12, 2024 (14 pp).

- C39. JP Molnar, EJ LaLonde, CS Combs, and **SJ Grauer**, “Reconstructing hypersonic flow over a bluff body from experimental background-oriented schlieren data,” *AIAA SciTech 2024 Forum*, Orlando, FL, Jun 23–28, 2024 (10 pp). doi:10.2514/6.2024-2493
- C38. FJ Bauer, PAB Braeuer, MWR Wilke, SR Faderl, **SJ Grauer**, and S Will, “Broadband extinction and Raman spectroscopy measurements to investigate optical properties of soot particles in premixed flames,” *11th European Combustion Meeting*, Rouen, France, Apr 26–28, 2023 (6 pp).
- C37. N Schmidt, PAB Braeuer, **SJ Grauer**, FJ Bauer, and S Will, “NIR-emission spectroscopy for local temperature measurements in premixed hydrogen/air flames,” *11th European Combustion Meeting*, Rouen, France, Apr 26–28, 2023 (6 pp).
- C36. JP Molnar, **SJ Grauer**, O Léon, D Donjat, and F Nicolas, “Physics-informed background-oriented schlieren of turbulent underexpanded jets,” *AIAA SciTech 2023 Forum*, National Harbor, MD & Online, Jan 23–27, 2023 (15 pp). doi:10.2514/6.2023-2441
- C35. **SJ Grauer**, AM Steinberg, KM Rice, JM Donbar, NJ Bisek, JJ France, and BA Ochs, “Bayesian optimization of a TDLAS array for mass capture measurement,” *AIAA SciTech 2021 Forum*, Virtual Event, Jan 11–15 & 19–21, 2021 (16 pp). doi:10.2514/6.2021-0721
- C34. **SJ Grauer**, J Emmert, AM Steinberg, S Wagner, and KJ Daun, “Hyperspectral absorption tomography with a lineshape prior,” *11th US National Combustion Meeting*, Pasadena, CA, Mar 24–27, 2019 (10 pp).
- C33. **SJ Grauer**, A Unterberger, KJ Daun, and K Mohri, “Demonstration of instantaneous 3D flame reconstruction by background-oriented schlieren tomography,” *Combustion Institute/Canadian Section Spring Technical Meeting*, Toronto, Canada, May 14–17, 2018 (6 pp).
- C32. RB Miguel, **SJ Grauer**, TA Sipkens, and KJ Daun, “Optical measurement of hydrocarbon gas mixtures using MWIR broadband cameras,” *Combustion Institute/Canadian Section Spring Technical Meeting*, Toronto, Canada, May 14–17, 2018 (6 pp).
- C31. TA Sipkens, PJ Hadwin, **SJ Grauer**, and KJ Daun, “Using Bayesian model selection and time-resolved laser-induced incandescence to probe the sublimation properties of soot,” *Combustion Institute/Canadian Section Spring Technical Meeting*, Toronto, Canada, May 14–17, 2018 (6 pp).
- C30. **SJ Grauer**, PJ Hadwin, and KJ Daun, “Chemical species tomography with self-similar covariance as hierarchical Bayesian inference,” *9th International Conference on Inverse Problems in Engineering*, Waterloo, Canada, May 23–26, 2017 (8 pp).
- C29. TA Sipkens, PJ Hadwin, **SJ Grauer**, and KJ Daun, “Applying model selection to laser-induced incandescence,” *9th International Conference on Inverse Problems in Engineering*, Waterloo, Canada, May 23–26, 2017 (16 pp).
- C28. **SJ Grauer**, BM Conrad, RB Miguel, and KJ Daun, “Assessment of a novel optical diagnostic to quantify emissions from a heated methane plume,” *Combustion Institute/Canadian Section Spring Technical Meeting*, Montreal, Canada, May 15–18, 2017 (6 pp).
- C27. RW Tsang, **SJ Grauer**, and KJ Daun, “Development, calibration, and testing of a tomographic open-path hydrocarbon detection system,” *Combustion Institute/Canadian Section Spring Technical Meeting*, Waterloo, Canada, May 10–12, 2016 (6 pp).
- C26. **SJ Grauer**, PJ Hadwin, and KJ Daun, “An analysis of prior information in Bayesian tomographic reconstruction,” *1st Thermal Fluids Engineering Summer Conference*, New York, NY, Aug 9–12, 2015 (11 pp). doi:10.1615/TFESC1.cmd.012901
- C25. RW Tsang, **SJ Grauer**, and KJ Daun, “Development of an open-path hydrocarbon detector for tomographic mass flux estimation,” *Combustion Institute/Canadian Section Spring Technical Meeting*, Saskatoon, Canada, May 11–14, 2015 (7 pp).

Abstracts

- C24. **SJ Grauer**, “Neural measurement operators for reconstructing complex flows,” *2024 IEEE International Instrumentation and Measurement Technology Conference*, Glasgow, UK, May 20–23, 2024.[§]
- C23. **JP Molnar**, **SJ Grauer**, JJ France, BA Ochs, JM Donbar “Time-resolved WMS tomography with velocimetry for high-enthalpy flows,” *76th Annual Meeting of the APS Division of Fluid Dynamics*, Washington, DC, Nov 19–21, 2023.
- C22. K Zhou and **SJ Grauer**, “Reconstructing complex flows from inertial Lagrangian particle tracks,” *76th Annual Meeting of the APS Division of Fluid Dynamics*, Washington, DC, Nov 19–21, 2023.
- C21. **AK Singh**, **JP Molnar**, **SJ Grauer**, and GS Sidharth, “Aggregate loss data assimilation (ALDA) for supersonic BOS,” *75th Annual Meeting of the APS Division of Fluid Dynamics*, Indianapolis, IN, Nov 20–22, 2022.
- C20. K Zhou, **SJ Grauer**, and J Hong, “4D DIH-PTV via stochastic particle advection velocimetry (SPAV),” *75th Annual Meeting of the APS Division of Fluid Dynamics*, Indianapolis, IN, Nov 20–22, 2022.
- C19. **JP Molnar** and **SJ Grauer**, “Reconstructing experimental measurements of supersonic flow via physics-informed BOS,” *75th Annual Meeting of the APS Division of Fluid Dynamics*, Indianapolis, IN, Nov 20–22, 2022.
- C18. **JP Molnar** and **SJ Grauer**, “Physics-informed flow field tomography with UQ using a B-PINN,” *74th Annual Meeting of the APS Division of Fluid Dynamics*, Phoenix, AZ, Nov 21–23, 2021.
- C17. **SJ Grauer** and AM Steinberg, “Direct background-oriented schlieren tomography,” *72nd Annual Meeting of the APS Division of Fluid Dynamics*, Seattle, WA, Nov 23–26, 2019.
- C16. KJ Daun, **SJ Grauer**, PJ Hadwin, and TA Sipkens, “Chemical species tomography in the Bayesian framework,” at 34th AIAA Aerodynamics Measurement Technology and Ground Testing Conference, Atlanta, GA, Jun 25–29, 2018.[§]
- C15. TA Sipkens, **SJ Grauer**, PJ Hadwin, and KJ Daun, “Predicting the heat of vaporization of iron at high temperatures using TiRe-LII and Bayesian model selection,” *8th International Workshop on Laser-Induced Incandescence*, Munich, Germany, Jun 10–13, 2018.
- C14. **SJ Grauer**, “Model error reduction in quantitative gas detection with hyperspectral imaging,” *Telops 13th Annual Workshop on Hyperspectral Imaging*, Munich, Germany, Oct 16 2017.
- C13. **SJ Grauer**, PJ Hadwin, and KJ Daun, “An a priori approach to assessing a Bayesian design-of-experiment procedure,” *29th Inverse Problems Symposium*, Lexington, VA, Jun 5–7, 2016 (3 pp).
- C12. **SJ Grauer**, PJ Hadwin, and KJ Daun, “Basis function selection for Karhunen–Loève laser absorption tomography,” *28th Inverse Problems Symposium*, East Lansing, MI, May 31–Jun 3, 2015 (3 pp).

Posters

- C11. K Zhou and **SJ Grauer**, “Implicit particle sizing and flow reconstruction from inertial particle tracks,” *ICDS Fall 2023 Symposium*, University Park, PA, Oct 18–19, 2023.
- C10. K Zhou and **SJ Grauer**, “Advection-based data assimilation for particle tracking velocimetry in complex flows,” *Gordon Research Conference 2023*, Newry, ME, Jul 8–14, 2023.

[§]Invited talk.

- C9. JP Molnar, L Venkatakrishnan, BE Schmidt, TA Sipkens, **SJ Grauer**, “Reconstructing supersonic flow from experimental data using scientific machine learning,” *ICDS Fall 2022 Symposium*, University Park, PA, Oct 12–14, 2022.
- C8. FJ Bauer, PAB Braeuer, MWR Wilke, **SJ Grauer**, S Will, “Mapping soot band gap fields via hyperspectral absorption tomography,” *39th International Symposium on Combustion*, Vancouver, Canada, Jul 24–29, 2022.
- C7. JP Molnar and **SJ Grauer**, “Bayesian scientific machine learning for flow field tomography with uncertainty quantification,” *ICDS Fall 2021 Symposium*, University Park, PA, Oct 6–7, 2021.
- C6. E Stanic, TA Sipkens, J Rochussen, **SJ Grauer**, SN Rogak, and P Kirchen, “Gas jet injection characterization using BOS imaging and Abel inversion for engine relevant pressure ratios,” *OSA Optical Sensors and Sensing Congress: Laser Applications to Chemical, Security and Environmental Analysis*, Vancouver, Canada, Jun 22–26, 2020. [doi:10.1364/3D.2020.JTu2A.14](https://doi.org/10.1364/3D.2020.JTu2A.14)
- C5. **SJ Grauer**, J Emmert, AM Steinberg, S Wagner, and KJ Daun, “High-speed inference of absorbance data for absorption spectroscopy,” *Gordon Research Conference on Laser Diagnostics in Energy and Combustion Science*, Les Diablerets, Switzerland, Jun 23–28, 2019.
- C4. **SJ Grauer**, A Unterberger, TA Sipkens, AM Kempf, KJ Daun, and K Mohri, “Background-oriented schlieren tomography for instantaneous 3D combustion imaging,” *37th International Symposium on Combustion*, Dublin, Ireland, Jul 29–Aug 3, 2018.
- C3. J Menser, **S Grauer**, A Unterberger, A Kempf, and K Mohri, “Volumetric imaging of the Cambridge Flame using tomography, background-oriented schlieren and high-speed imaging,” *CENIDE-Konferenz 2018*, Duisburg, Germany, Feb 19, 2018.
- C2. RB Miguel, **SJ Grauer**, and KJ Daun, “A survey of techniques for optical measurement of flare combustion efficiency,” *PTAC Forum Advancing the Low Carbon Economy Through Innovation & R&D*, Calgary, Canada, Oct 23, 2017.
- C1. TA Sipkens, PJ Hadwin, **SJ Grauer**, and KJ Daun, “Bayesian model selection for laser-induced incandescence,” *Gordon Research Conference on Laser Diagnostics in Combustion*, West Dover, VT, Aug 6–11, 2017.

INVITED TALKS

- T27. University of Cambridge, Cambridge, UK, May 29, 2024.
“Reconstructing disperse multi-phase flows with inertial transport and fluid–structure interactions”
- T26. Imperial College London, London, UK, May 28, 2024.
“Neural state estimation for complex multi-phase flows”
- T25. University of Edinburgh, Edinburgh, UK, May 24, 2024.
“Neural state estimation for complex multi-phase flows”
- T24. Experiments in Fluids Seminar Series, Online, Apr 9, 2024. [doi:10.52843/cassyni.cwts9z](https://doi.org/10.52843/cassyni.cwts9z)
“Reconstructing complex flows using neural data assimilation”
- T23. National Institute of Standards and Technology, Gaithersburg, MD, Feb 21, 2024.
“Neural data assimilation for turbulent multiphase multiphysics flows”
- T22. Office of Naval Research, Alexandria, VA, Dec 13, 2023.
“Measurement strategies and neural data assimilation for multiphysics flows”
- T21. Technische Universität München, Munich, Germany, June 1, 2023.
“BOS–Euler and BOS–RANS data assimilation for compressible flows”
- T20. École Polytechnique, Paris, France, May 4, 2023.
“Neural-implicit particle advection for PTV (with UQ) and beyond”
- T19. Office National d’Etudes et de Recherches Aérospatiales, Toulouse, France, May 3, 2023.
“Neural-implicit BOS–Euler and BOS–RANS data assimilation for compressible flows”

- T18. Mitsubishi Electric Research Laboratories, Cambridge, MA, Apr 5, 2023.
“Physics-informed background-oriented schlieren for turbulent compressible flow”
- T17. Johns Hopkins University, Baltimore, MD, Mar 10, 2023.
“Stochastic particle advection velocimetry (SPAV): reconstructing accurate Eulerian fields from noisy Lagrangian particle tracks”
- T16. University of Minnesota, Twin Cities, Minneapolis, MN, Jan 18, 2023.
“Reconstructing flow fields from particle tracks via physics-informed advection”
- T15. Shanghai Jiao Tong University, Shanghai, China, Dec 2, 2022.
“Physics-informed methods for fluid measurement: statistical particle tracking and background-oriented schlieren”
- T14. Case Western Reserve University, Cleveland, OH, Oct 7, 2022.
“Estimating steady density, velocity, and pressure fields in supersonic flow from two images”
- T13. Arizona State University, Phoenix, AZ, Sep 9, 2022.
“Estimating density, velocity, and pressure fields in supersonic flow from two images”
- T12. FAU Erlangen-Nürnberg (SAOT), Erlangen, Germany, Jul 11, 2022.
“Physics-informed 4D imaging of turbulent flows for propulsion, combustion, and biomedical applications”
- T11. FAU Erlangen-Nürnberg (LTT), Erlangen, Germany, Dec 7, 2021.
“Physics-informed imaging of fluid flow with Bayesian UQ”
- T10. Air Force Research Laboratory, Wright-Patterson Air Force Base, OH, Nov 9, 2021.
“Bayesian physics-informed machine learning for robust data assimilation and uncertainty quantification of spatio-temporally resolved flow fields”
- T9. Pennsylvania State University, University Park, PA, Apr 6, 2021.
“Bayesian methods for complex measurement: 2D hyperspectral imaging, 3D background-oriented schlieren, and future horizons”
- T8. Pennsylvania State University, University Park, PA, Feb 18, 2020.
“Bayesian methods for complex measurement: 2D hyperspectral imaging, 3D background-oriented schlieren, and future horizons”
- T7. Auburn University, Auburn, AL, Jan 15, 2020.
“Fast and robust volumetric refractive index measurement by unified background-oriented schlieren tomography”
- T6. University of Manitoba, Winnipeg, Canada, Jul 15, 2019.
“Statistical inversion in mechanical engineering: Bayesian tomography and other problems”
- T5. Georgia Institute of Technology, Atlanta, GA, Apr 2, 2019.
“Incorporating a priori lineshape data into Bayesian hyperspectral absorption tomography”
- T4. University of Alabama, Tuscaloosa, AL, Mar 6, 2019.
“Statistical inversion in mechanical engineering: Bayesian tomography and other problems”
- T3. University of Waterloo, Waterloo, Canada, Apr 19, 2018.
“Demonstration of 3D flame tomography by background-oriented schlieren imaging”
- T2. University of Edinburgh, Edinburgh, United Kingdom, Jan 23, 2018.
“Selecting a mesh for chemical species tomography with Bayesian model comparison”
- T1. University of Duisburg-Essen, Duisburg, Germany, Sep 27, 2017.
“Data-based meshing in chemical species tomography”

ACADEMIC
SERVICE

Supervisor (current: 7 PhD students, 1 BS, student; past: 3 BS students)

Joseph P Molnar	PhD	1/2021–Present	<i>passed QE, scheduled CE</i>
Ke Zhou	PhD	1/2022–Present	<i>passed QE, scheduled CE</i>
Ryan J Sirimanne	PhD	2/2022–Present	<i>passed QE</i>
Amit K Singh	PhD	3/2022–Present	<i>passed QE</i>
Rui Tang	PhD	8/2022–Present	<i>passed QE</i>
Reese Peck Cowles	PhD	7/2023–Present	
Ruixuan Tang [¶]	PhD	8/2023–Present	
Andrew I Masker	BS	1/2024–Present	
Sean S Adams	BS	8/2022–5/2023	
Natalie E King	BS	8/2021–5/2023	
Logan L Yoder	BS	8/2021–5/2022	

Thesis Committee Member (2 comprehensive exams, 3 MS theses, 1 MS paper)

Mitchell J Swann	PhD CE	Acoustics	5/1/2024	
Parvaneh Motiei	PhD CE	Mech Eng	12/19/2022	
Michael V Crognale	MS thesis	Mech Eng	3/14/2024	
Cossack C Rodrigues	MS thesis	SEMTE	11/13/2023	<i>Arizona State University</i>
Alexander S Hillstrom	MS thesis	Mech Eng	3/16/2023	
Parvaneh Motiei	MS paper	Mech Eng	12/10/2022	

Professional Service

Technical Committee Member, Aerodynamic Measurement Technology (AMT) 3/2023–Present
American Institute of Aeronautics and Astronautics (AIAA)

Co-Organizer, 2023 Combustion Early Career Investigator Workshop 9/2022–3/2023
The Combustion Institute (with funding from NSF)

University Service

Co-Director, Fluid Dynamics Research Consortium (FDRC) 8/2022–Present

Reviewer (108 papers reviewed for 39 outlets; 5 NSF panels)

Optics Express (17 papers); Combustion and Flame (7 papers); Proceedings of the Combustion Institute (7 papers); Applied Optics (6 papers); Experiments in Fluids (6 papers); Measurement Science and Technology (6 papers); Aerospace Science and Technology (5 papers); Applications in Energy and Combustion Science (5 papers); Optics Letters (5 papers); Journal of Quantitative Spectroscopy & Radiative Transfer (4 papers); Journal of Physics: Conference Series (3 papers); Journal of Verification, Validation and Uncertainty Quantification (3 papers); AIAA Journal (2 papers); Applied Physics B (2 papers); Applied Thermal Engineering (2 papers); Experimental Thermal and Fluid Science (2 papers); Flow, Turbulence and Combustion (2 papers); IEEE Transactions on Industrial Informatics (2 papers); Inverse Problems (2 papers); Journal of Fluid Mechanics (2 papers); Applied Sciences (1 paper); ASME Journal of Fluids Engineering (1 paper); Combustion Science and Technology (1 paper); Computer Methods in Applied Mechanics and Engineering (1 paper); Engineering with Computers (1 paper); Flow Measurement and Instrumentation (1 paper); IEEE Transactions on Instrumentation & Measurement (1 paper); Infrared Physics & Technology (1 paper); International Communications in Heat and Mass Transfer (1 paper); International Journal of Heat and Fluid Flow (1 paper); International Journal of Heat and Mass Transfer (1 paper); Journal of the Optical Society of America A (1 paper); Nature Computational Science (1 paper); Nature Machine Intelligence (1 paper); Optics Continuum (1 paper); Physica Scripta (1 paper); Proceedings of ASME Turbo Expo (1 paper); Review of Scientific Instruments (1 paper).

[¶]Co-supervised with Yuan Xuan