**curriculum vitae**

**PAUL BRADFORD SHEPSON**

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1. **General Information:**

**A. Education:**

**B.S.** 1978 S.U.N.Y. College at Cortland (Chemistry)

**Ph.D.** 1982 Pennsylvania State University (Analytical/Atmospheric Chemistry)

**B. Professional Career:**

2021- SUNY Distinguished Professor, Stony Brook University

2018- Dean, School of Marine and Atmospheric Sciences, Stony Brook University

2018- Jonathan Amy Distinguished Professor Emeritus, Purdue University

2014-2018 Division Director, Atmospheric and Geospace Sciences,

National Science Foundation, Alexandria, VA

2014-2018 Jonathan Amy Distinguished Professor, Depts. of Chemistry, and Earth, Atmospheric, and Planetary Sciences, Purdue University

2008-2013 Head, Department of Chemistry, Purdue University

2006-2008 Director, Purdue Climate Change Research Center

2004-2006 Founding and Interim Director of the Purdue Climate Change Research Center

2003-2006 Head, Analytical Chemistry Division, Dept. of Chem., Purdue University

2001; 2008 Visiting Professor, University of Innsbruck, Institute for Ion Physics, Austria

2000 Visiting Scientist, Pacific Northwest National Labs, Environmental Molecular Sciences Laboratory, Richland, WA

1994-2018 Professor, Departments of Chemistry, and Earth and Atmospheric Sciences, Purdue University, West Lafayette, IN

1994-2006 Adjunct Professor, Department of Chemistry, York University

1991-1994 Associate Professor (with tenure), York University, Toronto, Ontario.

1988-1993 Acting Director, Centre for Atmospheric Chemistry (CAC), York University

1987-1991 Assistant Professor, Department of Chemistry, York University, Toronto, Ontario.

1982-1987 Research Chemist, Northrop Services, Inc. (on-site Contractor U.S. EPA, Atmospheric Sciences Research Laboratory, Research Triangle Park, N.C.)

1982 Research Chemist, Mobil Research and Development Corp., Motor Gasoline Group, Paulsboro, N.J.

**C. Awards**

Ontario Ministry of Environment and Energy 1994 Excellence in Research and Technology Development Award

AGU 1999 Editor’s Citation for Excellence in Refereeing

AGU 2006 Editors' Citation for Excellence in Refereeing for JGR-Atmospheres

Fellow of the American Association for the Advancement of Science, elected 2010

Fellow of the American Geophysical Union, elected 2011

2012 Purdue College of Science Graduate Student Mentoring Award

Walter Orr Roberts Lecturer in Interdisciplinary Sciences Award (American Meteorological Society (2015))

2015 American Chemical Society Award for Creative Advances in Environmental Science & Technology

**D. Professional Associations:**

American Chemical Society

American Geophysical Union

European Geophysical Union

Air and Waste Management Association

American Society for Mass Spectrometry

American Association for the Advancement of Science

American Meteorological Society

American Association for Aerosol Research

**E. Areas of Expertise:**

* Climate and Earth System Science
* Funding and organizing large scale international collaborative environmental science research projects
* Atmospheric Chemistry
* Atmospheric Chemistry and Analytical Chemistry Education
* Atmospheric Photochemistry and Free Radical Reaction Kinetics and Mechanisms
* Analytical Methods Development
* Aviation, and Aircraft Instrumentation Development
* Smog Chamber Studies
* Computer Modeling of Atmospheric Processes
* Atmospheric Pollutant Measurements
* Gas, Liquid, and Ion Chromatographic Techniques
* Quadrupole and Ion Trap mass spectrometry
* Atmospheric Mutagenesis
* Use of in-vitro and in-vivo Bioassay Techniques for Identification of Atmospheric Mutagens
* Snow chemistry/Arctic Chemistry
* Climate Change and Atmospheric Chemistry
* Greenhouse Gas Source and Sink Flux Measurements, and GHG Emissions Accounting
* Commercial, Multi-Engine and Instrument-Rated Pilot (2300+ hrs)

**F. National and International Responsibilities/Activities:**

1988 - Member and Secretary (1988-1990), Canadian Institute for Research in Atmospheric Chemistry (CIRAC) Scientific Steering Committee

1990 Organizing Committee Chair for CIRAC Air Toxics Research Planning Workshop, held November 26-28, 1990, Toronto.

1991 - Associate Editor, Atmosphere-Ocean

1997 – 2002 Associate Editor, Journal of Geophysical Research, Atmospheres

1997 – Associate Director, Program for Research on Oxidants: PHotochemistry, Emissions, and Transport

1999 – 2002 Member, Scientific Steering Committee, Arctic System Science Ocean-Atmosphere-Ice Interactions (ARCSS-OAII)

2000 Organized the 2000 Telluride Worksop on Atmospheric Chemistry

2001 Co-organized (with K. Prather) the 2001 ASMS Asilomar Conference on Mass Spectrometry

2003 Air-Ice Chemical Interactions Co-Chair (IGAC project)

2003-2007 NSF OPP External Advisory Panel

2003 NCAR ACD External Advisory Panel

2003 Created the Ocean-Atmosphere-Sea Ice-Snowpack (OASIS) project

2004 Co-Chair, IGAC project Air-Ice Chemical Interactions

2008-2010 NSF Geosciences Directorate External Advisory Panel

2008-2009 Organized OASIS2009 international field campaign

2013 - Inaugural Associate Editor (Atmospheric Sciences) for the online Journal *Elementa*

2013 Vice Chair, Atmospheric Chemistry Gordon Research Conference, Mt. Snow, Vt.

2014-2018 Division Director, Atmospheric and Geospace Sciences,

National Science Foundation, Arlington, VA

(Managed over $1B in awards from AGS to the community)

2015 Chair, Atmospheric Chemistry Gordon Research Conference, Waterville Valley, N.H.

2020 Member of the New York State Climate Action Council (Responsible for developing the Scoping Plan for implementation of the Climate Leadership and Community Protection Act)

2020- New York Sea Grant Board of Governors

2021- Peconic Estuary Partnership Management Committee

Office of Science and Technology Policy (OSTP) service

2015 - Space Weather Operations, Research, and Mitigation Task Force

Published output - the National Space Weather Action Plan

https://www.whitehouse.gov/sites/default/files/microsites/ostp/ final\_nationalspaceweatheractionplan\_20151028.pdf

2016 - Greenhouse Gas Monotoring Working Group

2016 - Methane Monitoring and Characterization Working Group

**II. Discovery**

**A. Peer-Reviewed Publications:** (G= Shepson Grad. student, U= Undergrad.,

P= Postdoc)

244. Graham, K. A., C. D. Holmes, G. Friedrich, C. D. Rauschenberg, C. R. Williams, J. W. Bottenheim, F. P. Chavez, J. W. Halfacre, D. K. Perovich, P. B. Shepson, W. R. Simpson, P. P. Tans, and P. A. Matrai, Variability of Atmospheric CO2 Over the Arctic Ocean: Insights From the O-Buoy Chemical Observing Network, *J. Geophys. Res.,* submitted, 2022.

243. Wei, D., H. Alwe, D. Millet, B. Bottorff, M. Lew, P. Stevens, F. Keutch, Q. Shi, S. Kavassalis, J. Murphy, K. Vasquez, H. Allen, E. Praske, J. Crounse, P. Wennberg, P. B. Shepson, K. Pratt, F. Xiong, E. Wood, R. Griffin, and A. L. Steiner, FORest Canopy Atmosphere Transfer (FORCAsT) 2.0: model updates, *Geosci. Model Dev., 14*, 6309–6329, 2021.

242. Lopez-Coto, I., X. Ren, A. Karion, K. McKain, C. Sweeney, R. R. Dickerson, B.

McDonald, P. B. Shepson, and J. R. Whetstone, Carbon Monoxide emissions anomaly and trend detection over the Washington, D.C. and Baltimore metropolitan area, https://doi.org/10.1021/acs.est.1c06288, *ES&T,* 2022.

241. Pitt, J. R., I. Lopez-Coto, K. D. Hajny, J. Tomlin, R. Kaeser, T. Jayarathne, B. H. Stirm, C. R. Floerchinger, C. P. Loughner, R. Commane, C. K. Gately, L. R. Hutyra, K. R. Gurney, G.y S. Roest, J. Liang, A. Karion, J. R. Whetstone, and P. B. Shepson, New York City greenhouse gas emissions estimated with inverse modelling of aircraft measurements, 2022, *Elem. Sci. Anth*., 10: 1. DOI: https://doi.org/10.1525/elementa.2021.00082.

240. Jones, T. S., Franklin, J. E., Chen, J., Dietrich, F., Hajny, K. D., Paetzold, J. C., Wenzel, A., Gately, C., Gottlieb, E., Parker, H., Dubey, M., Hase, F., Shepson, P. B., Mielke, L. H., and Wofsy, S. C.: Assessing urban methane emissions using column-observing portable Fourier transform infrared (FTIR) spectrometers and a novel Bayesian inversion framework, Atmos. Chem. Phys., 21, 13131–13147, https://doi.org/10.5194/acp-21-13131-2021, 2021.

239. Chen, Q., R. M. Kirpes, S. Thanekar, N. Loeb, L. Upchurch, A. J. Barget, A. R. W. Raso, S. M. McNamara, S. China, P. K. Quinn, A. Kennedy, P. B. Shepson, J. D. Fuentes, and K. A. Pratt, Atmospheric particle abundance and chemical composition observations in the springtime Arctic: a focus on blowing snow and leads, *Atmos. Chem. Phys.,* submitted, 2020.

238. TomlinG, J. M., K. A. Jankowski, F. A. Rivera-Adorno, M. Fraund, S. China, B. H. Stirm, R. Kaeser, G. S. Eakins, R. C. Moffet, P. B. Shepson, and A. Laskin, Chemical Imaging of Fine Mode Atmospheric Particles Collected from a Research Aircraft over Agricultural Fields, ACS Earth and Space Chemistry, DOI: 10.1021/acsearthspacechem.0c00172, 2020.

237. HajnyG, K. D., T. N. LavoieG, O. E. SalmonG, J. M. TomlinG, T. JayarathneP, C. R. Floerchinger, R. Kaeser, A. A. Stuff, A. Armstrong, B. Wulle, B. H. Stirm, D. R. Lyon, J. Rudek, and P. B. Shepson, Assessing the Accuracy and Precision of the Airborne Mass Balance Technique for Point-Source Emissions Quantification, *Environ. Sci. Technol. Lett..,* submitted, 2020b.

236. HajnyG, K. D., C. Floerchinger, R. Kaeser, , J. TomlinG, J. PittP, B. H. Stirm, T. JayarathneP, C. Gately, M. Sargent, K. Gurney, P. B. Shepson, and S. Wofsy, Estimating Anthropogenic CO2 Emissions from New York City Using Aircraft Measurements and Dispersion Modelling, *Elementa.,* submitted, 2020a.

235. MoralesG, A. C., T. JayarathneP, J. H. SladeP, A. Laskin, and P. B. Shepson, The Production and Hydrolysis of Organic Nitrates from OH Radical Oxidation of β- Ocimene, *Atmos. Chem. Phys.,* Atmos. Chem. Phys., 21, 129–145, 2021

https://doi.org/10.5194/acp-21-1-2021.

234. Thomas, J. L., J. Stutz, M. M. Frey, T. Bartels-Rausch, K. Altieri, F. Baladima, J. Browse, M. Dall’Osto, L. Marelle, J. Mouginot, J. G. Murphy, D. Nomura, K. Pratt, M. Willis, P. Zieger, J. Abbatt, T. A. Douglas, M. C. Facchini, J. France, A. E. Jones, K. Kim, P. A. Matrai, V. F. McNeill, A. Saiz-Lopez, P. Shepson, N. Steiner, K. S. Law, S. R. Arnold, B. Delille, J. Schmale, J. Sonke, A. Dommergue, D. Voisin, M. L. Melamed, and J. Gier, Fostering multidisciplinary research on interactions between chemistry, biology, and physics within the coupled cryosphere-atmosphere system, *Elem. Sci. Anth., 7*: 58. DOI: https://doi.org/10.1525/elementa.396.

233. Swanson, W. F., Graham, K. A., Halfacre, J. W., Holmes, C. D., Shepson, P. B., and Simpson, W. R. (2020), Arctic reactive bromine events occur in two distinct sets of environmental conditions: A statistical analysis of 6 years of observations, *J. Geophys. Res., 125*, e2019JD032139, https://doi.org/ 10.1029/2019JD032139.

232. McNamara, S. M., N. M. Garner, S. Wang, A. R. W. RasoG, S. Thanekar, J. D. Fuentes, P. B. Shepson, K. A. Pratt, Bromine Chloride Observations in the Coastal Arctic: Diel Patterns and Production Mechanisms, *ACS Earth and Space Chemistry,* DOI 10.1021/acsearthspacechem.0c00021, 2020.

231. Ditto , J. C., T. Joo, J. H. SladeP, P. B. Shepson, N. L. Ng, D. R. Gentner, Non-targeted tandem mass spectrometry analysis reveals diversity and variability of aerosol

functional groups across multiple sites, seasons, and times of day, *Environ. Sci. Technol. Lett.,* https://doi.org/10.1021/acs.estlett.9b00702, 2020.

230. Floerchinger, C, Shepson, PB, HajnyG, K, Daube, BC, Stirm, BH, Sweeney, C,Wofsy, SC., 2021, Relative flux measurements of biogenic and natural gas-derived methane for seven U.S. cities. *Elementa Science of the Anthropocene, 9*, DOI: https://doi.org/10.1525/elementa.2021.000119.

229.Ahn, D., J. R. Hansford, S. Howe, X. R. Ren, R. J. Salawitch, N. Zeng, M. D. Cohen, B. Stunder, O. E. SalmonG, and P. B. Shepson, K. R. Gurney, T. Oda, A. Karion, I. Lopez-Coto, J. Whetstone, R. R. Dickerson, Fluxes of atmospheric greenhouse‐gases in Maryland(FLAGG‐MD): Emissions of carbon dioxide in the Baltimore, MD‐Washington, D.C. area.Journal ofGeophysical Research: Atmospheres,125, e2019JD032004. https://doi.org/10.1029/2019JD032004, 2020.

228.Lopez-Coto, I., X. Ren, O. E. SalmonG, A. Karion, P. B. Shepson, R. R. Dickerson, A.

Stein, K. Prasad, and J. Whetstone, Wintertime CO2, CH4 and CO emissions estimation in the Washington DC / Baltimore metro area using an inverse modeling technique, Environ. Sci. Technol., 54, 2606-2614, 2020.

227.Hajny, K. D.G, O. E. SalmonG, P. B. Shepson, J. Rudek, D. Lyon, A. A. Stuff, B. H. Stirm, R. Kaeser, C. R. Floerchinger, S. Conley, M. Smith, Observations of Methane Emissions from Natural Gas-Fired Power Plants, *Environ. Sci. Technol*., DOI: 10.1021/acs.est.9b01875, 2019.

226. Olson, N. E., N. W. May, R. M. Kirpes, J. H. SladeP, A. E. Watson, K. D. HajnyG, P. B. Shepson, K. A. Pratt, and A. P. Ault, Lake Spray Aerosol Incorporated in Great Lakes Clouds, *ACS Earth and Space Chemistry,* 3, 2765-2774, 2019.

225. Salmon, O. E.G, L. R. Welp, M. Baldwin, K. HajnyG, B. H. Stirm, and P. B. Shepson, Vertical profile observations of water vapor deuterium excess in the lower troposphere, *Atmos. Chem. Phys., 19*, 11525-11543, 2019.

224. Ren, X., D. L. Hall, T. Vinciguerra, S. E. Benish, P. R. Stratton, D. Ahn, J. R. Hansford, M. D. Cohen, S. Sahu, H. He, C. Grimes, J. D. Fuentes, P. B. Shepson, R. J. Salawitch, S. H. Ehrman, and R. R. Dickerson, Methane emissions from the Marcellus Shale in southwestern Pennsylvania and northern West Virginia Based on Airborne Measurements, *J. Geophys. Res. – Atmos.*, 124, 1862–1878, 2019, <https://doi.org/10.1029/2018JD029690>.

223. McNamara, S. M., A. R. W. RasoG, S. Wang, S. Thanekar, E. Boone, K. R. Kolesar, P. K. Peterson, W. R. Simpson, J. D. Fuentes, P. B. Shepson, and K. A. Pratt, Springtime Nitrogen Oxide-Influenced Chlorine Chemistry in the Coastal Arctic, *Environ. Sci. Technol.,* doi.org/10.1021/acs.est.9b01797, 2019.

222. Turnbull, J., A. Karion, K. J. Davis, T. Lauvaux, N. Miles, S. Richardson, C. Sweeney, K. McKain, S. Lehman, K. R. Gurney, R. Patarasuk, J. Liang, P. B. Shepson, A. Heimburger, R. Harvey, M. O. Cambaliza, J. Whetstone, Synthesis of urban CO2 emission estimates from multiple methods from the Indianapolis Flux Project (INFLUX), *Environ. Sci. Technol.,* DOI: 10.1021/acs.est.8b05552, 2018.

221. Wang, S., S. M. McNamara, C. W. Moore, D. Obrist, A. Steffen, A. R. W. RasoG, P. B. Shepson, R. M. Staebler, and K. A. Pratt, Direct Detection of Tropospheric Atomic Bromine Leading to Mercury and Ozone Depletion, *Proc. Nat. Acad. Sci., 116,* 14479-14484, 2019.

# 220. Slade, J. H.P, A. P. Ault, A. T. Bui, J. C. Ditto, Z. Lei, A. L. Bondy, N. E. Olson, R. D. Cook, S. J. Desrochers, R. M. HarveyP, M. H. Erickson, H. W. Wallace, S. L. Alvarez, J. H. Flynn, B. E. Boor, G. A. Petrucci, D. R. Gentner, R. J. Griffin, P. B. Shepson, Bouncier Particles at Night: Biogenic Secondary Organic Aerosol Chemistry and Sulfate Drive Diel Variations in the Aerosol Phase in a Mixed Forest, *Environ. Sci. Technol.,* 53, 4977-4987, 2019.

219. Peterson, P. K., D. Pöhler, J. Zielcke, S. General, U. Friess, U. Platt, W. R. Simpson, S. V. Nghiem, P. B. Shepson, B. H. Stirm, and K. A. Pratt, Springtime Bromine Activation Over Coastal and Inland Arctic Snowpacks, *ACS Earth and Space Chem., 2,* 1075-1086, 2018.

218. Ren, X., O. E. SalmonG, J. R. Hansford, D. Ahn, D. Hall, S. E. Benish, P. R. Stratton, H. He, S. Sahu, C. Grimes, A. M. F. HeimburgerP, W. T. Luke, P. Kelley, M. D. Cohen, B. Stunder, A. Karion, K. L. Mueller, J. R. Whetstone, R. J. Salawitch, S. H. Ehrman, P. B. Shepson, and R. R. Dickerson, Methane emissions from the Baltimore-Washington area based on airborne observations: Comparison to emissions inventories, J. Geophys. Res. Atmospheres, *123,* https://doi.org/10.1029/2018JD028851, 2018.

217.Alvarez, R. A., D. Zavala-Araiza, D. R. Lyon, D. T. Allen, Z. R. Barkley, A. R. Brandt, K. J. Davis, S. C. Herndon, D. J. Jacob, A. Karion, E. A. Kort, B. K. Lamb, T. Lauvaux, J. D. Maasakkers, A. J. Marchese, M. Omara, S. W. Pacala, J. Peischl, A. L. Robinson, P. B. Shepson, C. Sweeney, A. Townsend-Small, S. C. Wofsy, and S. P. Hamburg, Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain, *Science, 361*, 186-188, 2018.

216. Toma, S., S. Bertman, C. Groff, F. XiongG, P. B. Shepson, P. Romer, K. Duffey, P. Wooldridge, R. Cohen, K. Baumann, E. Edgerton, J. de Gouw, A. Goldstein, and J.-L. Jimenez, Importance of Biogenic Volatile Organic Compounds to Peroxyacyl Nitrates (PANs) Production in the Southeastern U.S. during SOAS 2013, *Atmos. Chem. Phys., 19*, 1867-1880, 2019.

215.Bonin, T. A., B. J. Carroll, R. M. Hardesty, W. A. Brewer, K. Hajny, O. E. SalmonG, and P. B. Shepson, Doppler lidar observations of the mixing height in Indianapolis using an

automated composite fuzzy logic approach, *J. Atmos. and Ocean. Technol., 35,* 473-490, 2018.

214. Salmon, O. E.G P. B. Shepson, X. Ren, R. R. Dickerson, B. H. Stirm, S. S. Brown, D. L. Fibiger, E. E. McDuffie, K. R. Gurney, J. A. Thornton, Top-down Estimates of NOx and CO Emissions from Washington, D.C.-Baltimore During WINTER, *J. Geophys. Res.,* https://doi.org/10.1029/2018JD028539, 2018.

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213. Slade, J. H.P, C. de Perre, L. Lee, and P. B. Shepson, Nitrate radical oxidation of

γ-terpinene: hydroxy nitrate, total organic nitrate, and secondary organic aerosol yields, *Atmos. Chem. Phys., 17*, 8635–8650, 2017.

212. Custard, K. D.G, A. R. W. RasoG, P. B. Shepson, R. M. Staebler, and K. A. Pratt, Production and Release of Molecular Bromine and Chlorine from the Arctic Coastal Snowpack, *Earth and Space Chemistry, 1,* 142-151, 2017.

211. Raso, A. R.G W., K. D. CustardG, N. W. May, D. J. Tanner, M. K. Newburn, L. Walker, R. Moore, L. G. Huey, M. L. Alexander, P. B. Shepson, and K. A. Pratt, Active Molecular Iodine Snowpack Photochemistry in the Arctic, *Proc. Nat. Acad. Sci., 114*, 10053-10058, 2017.

210. Artiglia, L., J. Edebeli, F. Orlando, S. Chen, P. C. Arroyo, A. Gilgen, T. Bartels-Rausch, A. Kleibert, M. Vazdar, M. A. Carignano, J. S. Francisco, P. B. Shepson, I. Gladich and M. Ammann, A surface-stabilized ozonide triggers bromide oxidation at the aqueous solution – vapor interface, *Nature Comms.,* DOI: 10.1038/s41467-017-00823, 2017.

209. Bondy, A. L. B. Wang, A. Laskin, R. L. Craig, V. M. NhliziyoU, S. B. Bertman, K. A. Pratt, P. B. Shepson, and A. P. Ault, Inland Sea Spray Aerosol Transport and Incomplete Chloride Displacement: Varying Heterogeneous Reactivity Observed during SOAS, *Environ. Sci. Technol.,* 10.1021/acs.est.7b02085, 2017.

208. Gurney, K.R., J. Liang, R. Patarasuk, D. O’Keeffe, J. Huang, M. Hutchins, T. Lauvaux, J. C. Turnbull, and P. B. Shepson, 2017, Reconciling the differences between a bottom- up and inverse-estimated FFCO2 emissions estimate in a large US urban area, *Elem. Sci. Anth., 5*: 44, DOI: <https://doi.org/10.1525/elementa.137>, 2017.

207. N. L. Miles, S. J. Richardson, T. Lauvaux, K. J. Davis, N. V. Balashov, A. Deng, J. C. Turnbull, C. Sweeney, K. R. Gurney, R. Patarasuk, I. Razlivanov, M. O. L. CambalizaP and P. B. Shepson, Quantification of urban atmospheric boundary layer greenhouse gas dry mole fraction enhancements in the dormant season: Results from the Indianapolis Flux Experiment (INFLUX), *Elem Sci Anth, 5: 27*, DOI: https://doi.org/10.1525/elementa.127.

206. Davis, K. J., A. Deng, T. Lauvaux, N. L. Miles, S. J. Richardson, D. Sarmiento, K. R. Gurney, R. M. Hardesty, A. Brewer, P. B. Shepson, R. M. Harvey, M. O. CambalizaP, C. Sweeney, J. Turnbull, J. Whetstone, and A. Karion, The Indianapolis Flux Experiment (INFLUX): A test-bed for developing anthropogenic greenhouse gas emission measurements, *Elem. Sci. Anth., 5*: 21, DOI: https://doi.org/10.1525/elementa.188, 2017.

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203. Peterson, P. K., H. Sihler, D. Pohler, J. Zielcke, S. General, U. Frieß, U. Platt, W. R. Simpson, S. V. Nghiem, P. B. Shepson, B. H. Stirm, D. R. CaultonG, S. Dhaniyala, J. D. Fuentes, and K. A. Pratt, Observations of Bromine Monoxide Transport Aloft Sustained on Aerosol Particles, *Atmos. Chem. Phys., 17*, 7567–7579, 2017.

202. RindelaubG, J. D., C. H. Borca, M. A. Hostetler, M. A. Lipton, L. V. Slipchenko, and P. B. Shepson, The Acid-Catalyzed Hydrolysis of an α-Pinene-Derived Organic Nitrate: Kinetics, Products, Reaction Mechansisms, and Atmospheric Impact, *Atmos. Chem. Phys., 16*, 15425–15432, 2016.

201. SalmonG, O. E., P. B. Shepson, X. Ren, A. G. Carlton, M. Miller, D. Sarmiento, B. H. Stirm, R. Grundman, R. R. Dickerson, J. D. Fuentes, J. Whetstone, Urban Emissions of Water Vapor and the Urban Heat Island, *J. Geophys. Res., 122*, doi:10.1002/

2016JD026074, 2017.

200. J. W. HalfacreG, P. B. Shepson, K. A. Pratt, Oxidative release of molecular chlorine, bromine, and iodine from frozen saline surfaces, *Atmos. Chem. Phys., 19*, 4917–4931, 2019.

199. LavoieG, T. N., P. B. Shepson, C. A. SusdorfU, B. H. Stirm, R. Kaeser, B. Wulle, D. Lyon, R. Alvarez, J. Rudek, Measurements of the Contribution of Natural Gas-Fired Power Plants and Oil Refineries to National Methane Emissions, *Environ. Sci. Technol.,* 10.1021/acs.est.6b05531, 2017.

198. Su, L., E. G. Patton, J. Vilà-Guerau de Arellano, A. B. Guenther, L. Kaser, B. Yuan, F. XiongG, P. B. Shepson, L. Zhang, D. O. Miller, W. H. Brune, K. Baumann, E. Edgerton, A. Weinheimer, and J. E. Mak, Understanding isoprene photo-oxidation using observations and modelling over a subtropical forest in the Southeast US, *Atmos. Chem. Phys., 16*, 7725-7741, doi:10.5194/acp-16-7725-2016, 2016.

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8. P.B. Shepson, E.O. Edney, T.E. Kleindienst, J.H. Pittman, G.R. Namie, and L.J. Cupitt. "The Production of Organic Nitrates from OH and NO3 Reaction with Propylene", Environ. Sci. Technol., 19, 849, (1985).

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3. P.B. Shepson and J.P. Heicklen. "The Wavelength and Pressure Dependence of the Photolysis of Propionaldehyde Vapor", J. Photochem., 19, 215, (1982).

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**B. Technical Reports:**

1. T.E. Kleindienst, P.B. Shepson and E.O. Edney, "Mutagenic Activities of Wood Smoke Photooxidation Products", EPA/600/S3-86/049 (1986).

2. P.B. Shepson, T.E. Kleindienst and E.O. Edney, "The Production of Mutagenic Compounds as a Result of Urban Photochemistry", EPA/600/S3-87/020, (1987).

3. L.T. Cupitt, L.D. Claxton, P.B. Shepson, and T.E. Kleindienst, "IACP (Integrated Air Cancer Project) Emissions: Transformations and Fate", EPA Report (1987).

**C. Book Chapters**

P. B. Shepson, Organic Nitrates, in “Volatile Organic Compounds In The Atmosphere”, Ralf Koppmann, Ed., Blackwell Publishing, Ltd., Oxford, UK, 2007.

P. B. Shepson and F. Domine, "Chemistry in the Cryosphere", 19 chapter volume on the subject, in press with World Scientific Publishing, 2021.

**D. Book Editing**

P. B. Shepson and F. Domine, "Chemistry in the Cryosphere", World Scientific, and wrote Chapter 1 - "Cryosphere-Atmosphere Interactions", https://doi.org/10.1142/12095, December 2021, 924 pages.

**E. Invited Presentations:**

1. "The Atmospheric Chemistry and Toxicology of Peroxyacetyl Nitrates (PAN)", York U. Chemistry Department Seminar, November 1989.

2. "Is the Chemistry and Composition of the Atmosphere Changing?" CHEMED '89. Queens University, Kingston, Ontario. August 16, 1989

3. "Measurements of Carbonyl Compounds During EMEFS", Atmospheric Environment Service, Downsview, Ontario, March 1989.

4. "Mechanisms for the Atmospheric Production of Peroxyacetyl Nitrate (PAN)", Atmospheric Environment Service, Downsview, Ontario, February 1988.

5. "Photochemical Smog and Air Pollution", Invited Lectures, Department of Chemistry, Queens University, Queen University, Kingston, Ontario, November 1987.

6. P.B. Shepson. "Are we Changing the Composition of the Atmosphere?" Science Teachers Association of Ontario Conference, Toronto, November 1-3, 1990.

7. "Atmospheric Chemistry at the Dorset Site", Ontario Ministry of the Environment - Technology Transfer Conference, Toronto, Ontario, November 25, 1991.

8. "PAN and Oxidant Chemistry", CIRAC/AWMA Joint International Conference on Atmospheric Chemistry - The Role of Models in Understanding Atmospheric Chemistry. Toronto, Ontario, Jan. 27, 1992.

9. "Mutagenicity of PAN *in vivo*", Workshop on the Genotoxicity and Dosimetry of Atmospheric Transformation Products, U.S. EPA, RTP, N.C., May 28, 29, 1992.

10. "Global Atmospheric Change" Science Teachers Association of Ontario Meeting, Toronto, November 5, 1992.

11. "Global Atmospheric Change and Odd-Nitrogen Chemistry", Purdue University, Dept. of Earth and Atmos. Sci., April 13, 1993.

12. "Uncovering a Hole in our Understanding of Arctic Ozone Chemistry", Clarkson University, Department of Chemistry, September 2, 1993

13. "Investigations of Arctic Tropospheric Ozone, and the Possible Role of Halogen Atom Chemistry", Purdue University, Dept. of Earth and Atmos. Sci., February 1994.

14. "The Impact of Natural Hydrocarbons on Ozone Production in an Urban Environment", Purdue University, Analytical Division Seminar, October 4, 1994.

15. "Surface Ozone Depletion in the Arctic, and the Possible Role of Halogen Atom Chemistry", University of Western Michigan, Department of Chemistry, November 24, 1994.

16. “Alkyl Nitrates, and Their Relationship to Halogen Atom Chemistry in the Arctic at Polar Sunrise”, American Chemical Society National Meeting, Chicago, IL, August 20, 1995.

17. “Evidence for the Importance of Halogen Atom Chemistry in the Troposphere”, Purdue University, Physical Chemistry Seminar, September 20, 1995.

18. “Trace Analysis in Atmospheric Chemistry”, Purdue University, Industrial Associates Meeting, October 12, 1996.

1. “Evidence for Halogen Atom Chemistry in the Arctic Troposphere”, U.C. - Irvine, Department of Chemistry, October 29, 1996.
2. “Evidence for Halogen Atom Chemistry in the Arctic Troposphere”, U.C. - Riverside, Department of Chemistry, October 30, 1996.
3. “PROPHET: Program for Research on Oxidants: Photochemistry, Emissions, and Transport”, U.S. Environmental Protection Agency, Research Triangle Park, N. C., Nov. 25, 1996.
4. “Studies of the Role of Biogenic Hydrocarbons in Production of Ozone in the Troposphere”, Oak Ridge National Labs, Oak Ridge, TN, Dec. 5, 1996.
5. “The Role of Biogenic Hydrocarbons in Tropospheric Ozone Production”, Indiana State University, Dept. of Chemistry, Feb. 11, 1997.
6. “Bromine Chemistry in the Arctic Troposphere”, Great Lakes Chemical Co., West Lafayette, IN, Feb. 13, 1997.
7. “Surface Ozone Depletion in the Arctic, and the Possible Role of Halogen Atom Chemistry”, Indiana University, Dept. of Geography, Bloomington, IN, Feb. 28, 1997.
8. “Field Intensive Preliminary Results as part of the Program for Research on Oxidants: Photochemistry, Emission, and Transport (PROPHET), 20th Annual Midwest Environmental Chemistry Workshop, Indiana University, November 9, 1997.
9. “Evidence for Halogen Atom Chemistry During Polar Sunrise”, U. C. Davis, Dept. of Earth and Atmospheric Sciences, November 10, 1997.

28. “The Role of Isoprene in Tropospheric Ozone Production and the Sequestration of NOx”, U. C. Davis, Dept. of Chemistry, November 11, 1997.

29. “The Role of Biogenic Hydrocarbons in the Production of Ground Level Ozone”, Northeastern Illinois University, Department of Chemistry, January 29, 1998.

1. “Development of a Fast Time Response Method for Isoprene Measurement Using Ion Trap MS/MS”, National Center for Atmospheric Research, March 2, 1998.
2. “Studies of the Role of Halogen Atom Chemistry in the Destruction of Marine Boundary Layer Ozone at Polar Sunrise”, Harvard University, Department of Earth, Atmospheric, and Space Science, March 30, 1998.
3. “Tropospheric Chemistry at the Air-Ice Interface”, Telluride Summer Workshop, “Recent Advances in Tropospheric Chemistry”, Telluride, CO, Aug. 6, 1998.
4. “Recent developments in the analytical chemistry of isoprene and its oxidation products”, York University, Department of Chemistry, Toronto, Ontario, Oct. 2, 1998.
5. “Studies of Multi-Phase Chemistry in the Arctic”, University of Michigan, Department of Chemistry, Ann arbor, MI, February 19, 1999.
6. “Sustainable Atmosphere”, panel presentation, University of Michigan, Business School, Ann Arbor, MI, February 22, 1999.
7. “Studies of Multi-Phase Chemistry in the Arctic”, University of Illinois, Atmospheric Science Department, Champaign-Urbana, Il, February 24, 1999.
8. “Studies of Multi-Phase Chemistry in the Arctic”, New York State Department of Health, Wadsworth Center, Albany, N. Y., March 4, 1999.
9. “Studies of Multi-Phase Chemistry in the Arctic”, Purdue University, Department of Earth and Atmospheric Sciences, March 8, 1999.

39. “Development of Quadrupole Ion trap Methods for Determination of Atmospheric Volatile Organic Compounds”, American Chemical Society Meeting, Symposium on Quadrupole Ion Trap Mass Spectrometric Analysis in the Environment, March 22, 1999, Anaheim, CA.

40. “Studies of Multi-Phase Chemistry in the Arctic”, West Chester University, Department of Chemistry, April 5, 1999.

41. “Air/Snow Interactions of Atmospheric Carbonyl Compounds”, 9th Annual Goldschmidt Conference, Harvard University, Aug. 23, 1999.

42. “Interactions of Carbonyl Compounds with the Snowpack”, Pacific Northwest National Laboratories, Richland, WA, Oct. 5, 1999.

43. “Arctic Tropospheric Chemistry: Evidence for Photochemistry in the Snowpack”, University of California, Berkeley, Oct. 26, 1999.

44. “Polar Tropospheric Chemistry: The Importance of Snow Phase Photochemistry”, Environment Canada, 10/28/99, presented remotely from Purdue’s Distance Learning Lab.

45. “Atmospheric Chemistry at the Air-Snow Interface”, Ohio Wesleyan University, Interdisciplinary Science Series, 11/4/99.

46. “Atmospheric Chemistry at the Air-Snow Interface”, Bradley University, Department of Chemistry, 11/10/99.

47. “Dry and Wet Deposition of Atmospheric Organic Nitrates”, presented at the Society of Environmental Toxicology and Chemistry Annual Meeting, Philadelphia, PA, Nov. 17, 1999.

48. “Polar Tropospheric Chemistry:Evidence for Photochemistry in the Snowpack”, McGill University, Dept. of Chemistry, Dec. 2, 1999.

49. Paul B. Shepson, Ann Louise Sumner, Amanda M. Grannas,

Christophe Guimbaud, Kevin Ford, Terra Dassau, Tara L. Couch, and Richard Honrath

“Studies of the Interaction of Carbonyl Compounds Between the Atmosphere and the Snowpack”, Pacific Northwest National Laboratories, June 23, 2000.

50. “PROPHET: the Forest and the Trees”, University of Michigan Biological Station, Pellston, MI, 7/12/00.

51. “Studies of Photochemistry in the Snowpack in the Arctic”, Washington Statue University, Pullman, WA, September 25, 2000.

52. “Studies of the Role of the Snowpack in Determining the Concentration of Carbonyl Compounds in the Arctic Boundary Layer”, at the “Reactivity on the surface of ice: Application to the Environment and Interstellar Space conference at Porquerrolles, France, Sept. 25 – 29, 2000.

53. “Air-Surface Interactions and New Challenges in Analytical  Atmospheric Chemistry”, Pacific Northwest National Laboratory, Richland, WA, October 17, 2000.

54. “Recent Developments in Measurements of Atmospheric Nitrogen Species, and the Search for the Missing NOy”, Eastern Analytical Symposium, Atlantic City, N.J., Oct. 31, 2000.

55. “Ice and Snow Chemistry: Unearthing the Secrets”, presented at the New Horizons in Science Briefing of the Council for the Advancement of Science Writing, Nov. 2, 2000, Houston, TX.

56. “The Role of Snowpack Processes in Determining Carbonyl Compound Concentrations in the Arctic”, NOAA-Aeronomy Laboratory, November 14, 2000, Boulder, CO.

57. “Freezing Salty Water – NMR Studies”, Pacific Northwest National Laboratory, Richland, WA, 12/13/00.

58. “Canadian Ice and NMR Spectroscopy”, Antioch University, Yellows Springs, OH, March 30, 2001.

59. “Evidence for Photochemistry in the Snowpack, and its Impact on the Composition of the Atmosphere”, University of Virginia, Dept. of Environmental Sciences, Charlottesville, VA, April 5, 2001.

60. “Evidence for Photochemistry in the Snowpack, and its Impact on the Composition of the Atmosphere”, University of Innsbruck, Institut für Ionenphysik, May 14, 2001.

61. “Studies of the Role of Biogenic Volatile Organic Compounds (VOCs) and Their Role in Atmospheric Nitrogen Cycling at the PROPHET Site”, Keynote presentation, Great Lakes Regional ACS meeting, Grand Rapids, MI, June 13, 2001.

62. “Studies of the Interaction of Carbonyl Compounds with Snow, and the Impact on Arctic Boundary Layer Photochemistry”, Atmospheric Chemistry Gordon Conference, Salve Regina U., Newport, RI, June 21, 2001.

63. “Chemistry on the Quasi-Liquid Layer on the Surface of Ice”, Analytical Chemistry Gordon Conference, Connecticut College, New London, CT, June 28, 2001.

64. “Studies Of Snowpack Processes And Their Role In Determining The Concentration Of Formaldehyde And Acetaldehyde In The Arctic Atmospheric Boundary Layer”, International Association of Meteorology and Atmospheric Sciences 11 July 2001 (session convenor).  
Innsbruck, Austria .

65. “Chemistry on the Surface of Ice and Snow”, Industrial Associates Meeting, Purdue University, Department of Chemistry, October 5, 2001.

66. “Challenges for the Quantitative Determination of Atmospheric Trace Level Pollutants Using Ion Trap Mass Spectrometry”, Federation of Analytical Chemistry and Spectroscopy Societies meeting, Detroit, MI, October 8, 2001.

67. “Flux Measurements of Atmospheric Pollutants, on the Fly”, Asilomar meeting of the American Society for Mass Spectrometry - Real World Challenges and New Developments in Environmental Mass Spectrometric Measurements, Pacific Grove, CA, October 19-23, 2001 (Conference co-Chair, with Kim Prather).

68. “Planning for a Future Ocean-Ice-Atmosphere Research Program in the Arctic”, NSF OAII All Hands Meeting, Salt Lake City, UT, Nov. 14, 2001.

69. “Chemistry on the Surface of Ice and Snow”, Eastern Illinois University, Dept. of Chemistry, 11/5/01.

70. “Chemistry on the Surface of Ice and Snow, and its Impact on Atmospheric Chemistry”, Ohio State University, Dept. of Chemistry, 11/20/01

71. “Snowpack Photochemistry and its Impact on the Arctic Boundary Layer Atmosphere”, Georgia Institute of Technology, Dept. of Earth and Atmospheric Science, 11/30/01.

72. “Atmospheric Chemistry at the Air-Snow Interface”, Indiana University-NW, Merrillville, IN, February 27, 2002.

73. “Studies of the production of organic nitrates for OH oxidation of biogenic VOCs”, ACS Award symposium for Roger Atkinson, ACS National Meeting, Orlando, FL, April 9, 2002.

74. “The Biosphere, Inverse Micelles, Carbonyl Compounds, Organic Nitrates, Particulate Matter, and the Biosphere”, Telluride Atmospheric Chemistry Workshop, Telluride, CO, Aug. 5, 2002.

75. “Studies of Biogeochemical Cycling of Carbon and Nitrogen in a Forest Environment as Part of PROPHET”, ACS National Meeting, Boston, MA, August 19, 2002.

76. “Studies of the Interactions of the Carbon and Nitrogen Cycles in Forest Environments”, Department of Agronomy, Purdue University, Oct. 14, 2002.

77. Atmosphere-Forest Exchange: Important Questions Regarding the Atmosphere's Role in the Delivery of Nutrient Nitrogen and Impacts on Nitrogen and Carbon Cycling, M. Carroll, P. B. Shepson, S. B. Bertman, J. P. Sparks, and E. Holland, American Geophysical Union Fall Meeting, Dec. 6, 2002.

78. “Biosphere-Atmosphere Interactions and Global Climate Change”, Biology Dept., Purdue University, Eco-Lunch Seminar, Sept. 3, 2003.

## 79. “What we Think We Might Possibly Know About VOC Structure and Organic Nitrate Yields, and Why we Should Care”, American Physical Society Meeting, March 22, 2004, Montreal, Canada.

80. “Missing Carbon, Missing Nitrates, and Biosphere-Atmosphere Interactions”, U.C. Irvine, Dept. of Earth Systems Science, April 28, 2004, Irvine, CA.

81. “New Developments in studies of photochemistry on the surface of ice and snow”, American Chemical Society National Meeting, Philadelphia, PA, August 25, 2004.

82. “Development of an Aircraft-Based Platform for Study of Coupling Between the Carbon and Nitrogen Cycles”, School of Public and Environmental Affairs, Indiana University, October 21, 2004.

83. “Climate Change and Air-Snow Interactions”, The Ukpeagvik Iñupiat Corporation (UIC) Science Center, Barrow, AK, Feb. 5, 2005.

84. “Atmospheric Chemistry and Climate Change in the Arctic”, Indiana University-Purdue University-Fort Wayne, Fort Wayne, IN, Sept. 30, 2005.

85. “Cloud and canopy processes in the processing of atmospheric nitrogen”, Berkeley Atmospheric Sciences Center Symposium, U.C. Berkeley, October 14, 2005.

86. “Studies of Halogen Atom Chemistry in the Arctic”, Georgia Institute of Technology, Departments of Earth and Atmospheric Sciences, and Chemistry, October 21, 2005.

87. “Atmospheric Chemistry and Climate Change in the Arctic”, Reed College, Department of Chemistry, Portland, OR, Dec. 1, 2005.

88. “The ALAR Program: Studies of Coupling Between the Carbon and Nitrogen Cycles”, NOAA GMD, Boulder, CO, Dec. 19, 2005.

89. “Atmospheric Radiation and Photochemistry”, European Research Course on Atmospheres, University Joseph Fourier of Grenoble, Grenoble, France, January 9, 2006.

90. “Chemical Kinetics and Atmospheric Lifetimes”, European Research Course on Atmospheres, University Joseph Fourier of Grenoble, Grenoble, France, January 10, 2006.

91. “Photochemistry of Organic Compounds in Ice”, Conference on The routes for organics oxidation in the atmosphere and its implications to the atmosphere, Alpe d’Huez, France, January 8, 2006.

92. “Climate Change, Feedbacks, and the Future in the Arctic”, The First Undergraduate Conference on Extreme Weather and Climate Change Impacts, Purdue University, April 21, 2006.

93. “State of the Fundamentals of Snowpack Photochemical Production of Important Stuff” Co-organizer (with Eric Wolff and Florent Domine) of the Air-Ice Chemical Interaction (AICI; an IGAC project) Workshop in Grenoble, Fr., May 29-Jun1, 2006.

94. “Coupling Between Forests, the Atmosphere, and Climate Change: the Big and Little Pictures”, Purdue Climate Change Research Center, Purdue University, West Lafayette, IN, August 24, 2006.

95. “Coupling Between Climate Change, Atmospheric Chemistry, and Human Impacts in the Arctic”, Michigan Technological University, Department of Civil and Environmental Engineering, October 9, 2006.

96. “Coupling Between Climate Change, Atmospheric Chemistry, and Human Impacts in the Arctic”, Kalamazoo College, Department of Chemistry, November 6, 2006.

97. “Climate change and air-snow interactions in the Arctic”, January 10, 2007, Grandes Conférences Des Sciences De L’univers Grenoble, Grenoble, France.

98. “Atmospheric Radiation and Photochemistry”, January 11, 2007, European Research Course on Atmospheres, Universite Joseph Fourier, Grenoble, France.

99. “Chemical kinetics, sources and sinks of atmospheric chemical species, and atmospheric lifetimes”, January 11, 2007, European Research Course on Atmospheres, Universite Joseph Fourier, Grenoble, France.

100. “Climate Change and Atmospheric Chemistry in the Arctic”, January 12, 2007, European Research Course on Atmospheres, Universite Joseph Fourier, Grenoble, France.

101. “A Case for NCAR involvement in OASIS”, National Center for Atmospheric Research, Atmospheric Chemistry Division, Jan. 26, 2007.

102. “Quantitative Determination of Isobaric Volatile Organic Compounds using Proton Transfer Reaction – Linear Ion Trap (PTR-LIT) mass spectrometry”, L. H. Mielke, P. B. Shepson, S. Mcluckey, D. Erickson, A. Hansel, and A. Wisthaler, Biogenic Hydrocarbons and the Atmosphere Gordon Conference, Ventura, CA, Feb. 28, 2007.

103. “Arctic Halogen Chemistry, Climate Change, and the Future”, NCAR ACD seminar, Boulder, CO, April 9, 2007.

104. “Atmospheric Chemistry and Climate Change in the Arctic”, Department of Chemistry, Juniata College, Huntingdon, PA, Sept. 18, 2007.

105. “Atmospheric Chemistry and Climate Change in the Arctic”, Department of Chemistry, Wabash College, Crawfordsville, IN, Sept. 27, 2007.

106. “Connections between biogenic volatile organic compound emissions and the fate of atmospheric NOx”, Texas A&M, Department of Atmospheric Sciences, College Station, TX, October 9, 2007.

107. “Connections between atmospheric nitrogen deposition and net ecosystem exchange of carbon”, University of Iowa, Department of Chemical and Biological Engineering, Iowa City, Iowa, Nov. 1, 2007.

108. “Climate Change, and Atmosphere-Surface Interactions in the Arctic”, the 17th Annual Harold I. Schiff Lecture, York University, Toronto, Ontario, Canada, Nov. 27, 2007.

109. “Snow and Ice Photochemistry in Polar Regions, and Interactions With a Changing Climate”, American Geophysical Union Fall Meeting, Dec. 13, 2007, San Francisco, CA.

110. “Introduction to Atmospheric Chemistry”, European Research Course on Atmospheres”, U. Josef Fourier, Grenoble, Fr., January 7, 2008.

111. “Tropospheric Ozone and the Future”, European Research Course on Atmospheres”, U. Josef Fourier, Grenoble, Fr., January 8, 2008.

112. “Atmospheric Chemistry and Climate Change in the Arctic”, European Research Course on Atmospheres”, U. Josef Fourier, Grenoble, Fr., January 9, 2008.

113. “Climate Change, and Atmosphere-Cryosphere Chemical Interactions in the Arctic”, University of Innsbruck, Institut fur Ionenphysik, Innsbruck, Austria, January 17, 2008.

114. “Atmospheric chemistry and climate change in the Arctic”, Circumpolar Flaw Lead Study, on board the Canadian Coast Guard Icebreaker, The Amundsen, Feb. 5, 2008.

115. “Atmospheric chemistry and climate change in the Arctic”, Department of Chemistry, Transylvania University, Lexington, KY, March 4, 2008.

116. “A connection between arctic haze and halogen chemistry?”, American Physical Society Meeting, March 12, 2008, New Orleans, LA.

117. “Climate Change, and Atmosphere-Cryosphere Interactions in the Arctic”, ACS National Meeting, April 10, 2008, New Orleans, LA.

118. “Climate Change: Realities, Impacts, and Opportunities”, Fort Wayne Rotary Club World Affairs Conference, Indiana U. Purdue U.-Fort Wayne Campus, March 11, 2008.

119. “Climate Change: Fundamentals, Impacts, and Opportunities”, Department of Physics Colloquium, Purdue University, West Lafayette, IN, March 27, 2008.

120. “Climate Change and Ecosystem Impacts”, University of Michigan Biological Station, All-Camp Lecture, July 2, 2008.

121. “Photochemistry in and above ice and snow, and the impact on the atmosphere”, International Global Atmospheric Chemistry Conference, Sept. 11, 2008, Annecy, France.

122. “Chemistry, Climate Change, Energy Management, and Politics: Why these things are exciting”, Eastern Illinois University, Charleston, IL, Oct. 1, 2008.

123. “New Insights on Halogen Chemistry and Air-Surface Interactions in the Arctic”, Harvard University, Dept. of Earth and Planetary Sciences, April 3, 2009.

124. “Determination of the Carbon Footprint of the City of Indianapolis Using an Aircraft-Based Mass-Balance Approach”, Loyola University (Chicago), May 4, 2009.

125. “Climate Change: A Global Scale Challenge with Regional Scale Impacts and Opportunities”, University of Notre Dame, Mendoza College of Business, June 25, 2009.

126. “Air-Snowpack-Sea Ice Chemical Interactions in the Arctic”, University of Toronto, Department of Chemistry, November 10, 2009.

127. “Halogen Atom Chemistry in the Arctic in the Context of Climate Change”

Howard University, Dept. of Chemistry, Feb. 26, 2010.

128. "Studies of Halogen Chemistry in the Arctic and Connections to Climate Change", Penn State University, Dept. of Meteorology, March 31, 2010.

129. "The INFLUX Project: Toward Improved Capabilities in Urban-Area Scale Greenhouse Gas Flux Measurements", NOAA, Boulder, CO, May 18, 2010.

130. "Climate Change and Atmospheric Chemistry in the Arctic", Plenary Lecture, 41st Central Regional Meeting of the American Chemical Society, June 18, 2010, Dayton, OH.

131. "Climate Change, Atmospheric Chemistry, and Arctic Sea Ice", Purdue University, Physical Chemistry Seminar, Oct. 20, 2010.

132. "Halogen Chemistry on the Surface of Ice", University of Alaska at Fairbanks,

department of Chemistry, February 22, 2011.

133. “Atmospheric Chemistry and Climate Change in the Arctic”, Villanova University, Dept. of Chemistry, April 12, 2011, Philadelphia, PA.

134. “Working Toward an Improved Ability to Quantitatively Determine Urban Area-Wide Fluxes of Greenhouse Gases, or, Going to the Dump”, Atmospheric Chemistry Gordon Conference, Mt. Snow, Vt., July 26, 2011.

135. “Arctic Haze and Air Pollution”, Arctic Climate Summer Course, U.of Stockholm research station at Abisko, Sweden, August 2, 2011.

136. “Tropospheric Ozone”, Arctic Climate Summer Course, U.of Stockholm research station at Abisko, Sweden, August 2, 2011.

137. “Arctic Climate Change Impacts, and Going to the Dump”, Purdue University, Earth and Atmospheric Sciences Departmental seminar, West Lafayette, IN, Sept. 8, 2011.

138. “Climate Change Impacts in the Arctic, and Going to the Dump”, Atmospheric Sciences Research Center, SUNY-Albany, Albany, NY, September 12, 2011.

139. “Measuring Greenhouse Gas Fluxes in Indianapolis: Going to the Dump”, Purdue University Dept. of Biology, Ecolunch Seminar Series, West Lafayette, IN, Sept. 21, 2011.

140. “Climate change and sea-ice-atmospheric chemistry-CCN-cloud cover feedbacks”, Purdue Climate Change Research Center Water and Climate Seminar Series, West Lafayette, IN, Sept. 23, 2011.

141. “Climate change impacts and chemistry in the Arctic, and, Going to the dump”, University of Illinois, Department of Chemistry, Urbana-Champagne, IL, October 21, 2011.

142. “Climate Change and Impacts on Atmospheric Chemical Composition in the Arctic”, American Geophysical Union Fall Meeting, San Francisco, CA, Dec. 7, 2011.

143. “Climate Change and the Future of Ice at the Poles”, Endurance Lecture Series, Indiana State Museum, Indianapolis, IN, January 19, 2012.

144. “INFLUX: Moving Toward the Ability to Conduct Regional and Global Scale Accounting of Greenhouse Gases”, University of Madison, WI, Weston Roundtable Series, [Nelson Institute Center for Sustainability and the Global Environment](http://www.sage.wisc.edu/), Madison, WI, February 9, 2012.

145. “Assessment of uncertainties of aircraft based measurement of urban greenhouse gas emissions. Preliminary results from the Indianapolis Flux Experiment (INFLUX)”, meeting of the Network of Airborne Environmental Research Scientists (NAERS), Garmisch-Partenkirchen, Germany, February 14, 2012.

146. “The latest on climate change and halogen chemistry in the Arctic troposphere”, U. C. Irvine, Dept. of Chemistry, Irvine, CA, May 22, 2012.

147. “Interactions between atmospheric nitrogen chemistry, air quality, and the health of the biosphere”, ACS National Meeting, Kinetics and Mechanism in the Atmosphere, August 21, 2012.

148. "Studies of the propagation of bromine chemistry in the Arctic: from the sea ice to open leads and across the tundra", IGAC, Beijing, China, September 18, 2012.

149. "Toward the Development of Integrated Approaches for the Measurement of Greenhouse Gas Emission Rates for Megacities", National Institute of Metrology, Beijing, China, September 20, 2012.

150. “Measurements of Urban Area-Wide CO2 and CH4 Fluxes as part of the Indianapolis Flux Experiment (INFLUX)”, American Geophysical Union Fall Meeting, Dec. 7, 2012, San Francisco, CA.

151. "Airborne Measurements of Surface Fluxes of Greenhouse Gases", Cornell University, Dept. of Ecology and Evolutionary Biology, Ithaca, N.Y., January 25, 2013.

152. "Aircraft-Based Studies of Atmosphere-Surface Chemical Interactions: from Sea Ice to Shale Gas”, University of Michigan, Dept. of Atmospheric, Oceanic and Space Sciences, Ann Arbor, MI, Feb. 21, 2013.

153. "Aircraft-based Studies of Methane Emission from Shale Gas Drilling Operations in the Bakken and Marcellus Formations”, Purdue University Center for the Environment, March 1, 2013.

154. "37 Years of Research About Organic Nitrates and Their Impact on Atmospheric Nitrogen, Ozone and Aerosols", 30th Informal Symposium on Kinetics and Photochemical Processes in the Atmosphere, Caltech, Pasadena, CA, March 8, 2013.

155. "Visions and Musings", Dept. of Meteorology, Penn State University, University Park, PA, Sept. 9, 2013.

156. "Climate Change, and Quantification of Sources and Sinks of Greenhouse Gases Using an Aircraft Platform", Bradley University Dept. of Chemistry, Peoria IL, Oct. 3, 2013.

157. "Understanding climate change, and its impacts, while emitting a lot of CO2 myself", University of Dubuque, Dubuque, IA, Oct. 4, 2013.

158. "Aircraft-based measurements of fluxes of greenhouse gases:  from forest uptake to urban area-wide and shale gas basin scale emissions", University of Maryland, Dept. of Atmospheric and Oceanic Sciences, College Park, MD, November 7, 2013.

159. "Aircraft-based measurements of methane emissions from shale gas operations in

the Bakken, the Barnett, and the Marcellus formations", Harvard University, Dept. of Earth and Planetary Sciences, Cambridge, MA, Feb. 28, 2014.

160. "Aircraft-based measurements of methane emissions from shale gas operations in

the Bakken, the Barnett, and the Marcellus formations”, Environment Canada, Toronto, ON, Canada, April 10, 2014.

161. "Aircraft-based measurements of methane emissions from shale gas operations in

the Bakken, the Barnett, and the Marcellus formations”, DePauw University, Dept. of Chemistry, Greencastle, IN, April 24, 2014.

162. "Climate Change and Halogen Chemistry in the Arctic", U. of Iowa, Dept. of Chemistry, Iowa City, IA, April 25, 2014.

163. “Dr. Tentativehope: or How I Learned to Stop Worrying About Climate Change and Embrace the Future”, Dynamics of Climate Conference, PCCRC, Keynote Lecture, West Lafayette, IN, June 19, 2014.

164. “Dr. Tentativehope: or How I Learned to Stop Worrying About Climate Change and Embrace the Future”, Telluride Town Talk, for the Telluride Science Research Center, Telluride, CO, July 29, 2014.

165. “Production and multi-phase processing of organic nitrates from BVOC oxidation”, Telluride Atmospheric Chemistry Workshop, Telluride, CO, July 30, 2014.

166. “New insights into the impact of organic nitrate production on ozone, aerosols, and the biosphere”, ACS National Meeting, Aug. 10, 2014, San Francisco, CA.

167. "Air-Ice Chemical Interactions, Their Impacts, and Connections to Climate Change", the 2015 Walter Orr Roberts Lecture of the Americam Meteorological Society, Phoenix, AZ, the American Meteorological Society National Meeting, January 5, 2015.

168. "Observing and Quantifying global sources and sinks of Greenhouse Gases", Council for Chemical Research national meeting, Alexandria, VA, May 5, 2015.

169. "Heterogeneous Photochemical Processes in a Changing Arctic", ACS Award Address for Creative Advances in Environmental Science and Technology, Aug. 17, 2015, Boston, MA.

170. "Studies of Halogen Chemistry and Climate Change in the Arctic", Kohn Distinguished Lecture in Chemistry, Penn State University, University Park, PA, Nov. 5, 2015.

171. "The Flow of Nitrogen into and Out of BVOCs", Keynote lecture, BVOC Gordon Research Conference, June 26, 2016, Girona, Spain.

172. “A National Science Foundation Programmatic Perspective”, U. C. Davis, Atmospheric Chemical Mechanisms 2016 Conference, Keynote Presentation, Dec. 7, 2016, Davis, CA.

173. "Assessing the Needs and Progress for Urban Scale Greenhouse Gas Emissions Quantification", National Institute of Standards and Technology, March 1, 2017, Gaithersburg, MD.

174. "Studies of Halogen Chemistry in the Arctic", ACS meeting, San Francisco, April 5, 2017, Symposium in honor of Barbara Finlayson-Pitts.

175. "Climate Change Impacts on Atmospheric Composition and Chemistry: The Facts Matter", U. C. Irvine, Dept. of Chemistry, April 19, 2017.

176. "NSF Perspectives on Space Weather Research to Operations", Space Weather Prediction Center Annual Meeting, Broomfield, CO, May 2, 2017.

177. "NSF and Space Weather Research", Embassy of Italy, Washington, D.C., May 18, 2017.

178. "Anatomy of Climate Change Misinformation", July 27, 2017, Wolf Park, Battle Ground, Indiana.

179. "Measurements of Greenhouse Gases from U.S. Cities", West Chester University, West Chester, PA, November 1, 2017

180. "Everything you always wanted to know about securing funding from NSF\*

\*but were afraid to ask", West Chester University, West Chester, PA, November 1, 2017

181. “Iodine Chemistry in the Arctic, and Connections to Ozone and Aerosols”, NETCARE Workshop, University of Toronto, Toronto, Ont., Canada, November 14, 2017.

182. “Halogen Chemistry in a Changing Arctic”, Department of Environmental Science, Policy, and Management, U. C. Berkeley, Berkeley, CA, Feb. 14, 2018.

183. “Aircraft-based Measurements of CO2 and CH4 Emissions from Urban Environments, as Part of the Indianapolis Flux Experiment (INFLUX)”, U. of Notre Dame, Dept.of Civil and Environmental Engineering, South Bend, IN, Feb. 20, 2018.

184. “Embrace the Change”, Keynote presentation at Earthstock, Stony Brook University, April 20, 2018, Stony Brook, N.Y.

185. "High-Precision Measurements of the Emission Rates of Greenhouse Gases from East Coast Urban Environments", September 7, 2018, SoMAS Southampton Lecture Series, Southampton, N.Y.

186. “Studies of Snowpack Photochemistry in the Arctic: A Tribute to Richard Honrath”, Richard Honrath Memorial Lecture, October 15, 2018, Michigan Tehnological University, Houghton, MI.

187. “Driving GHG Reductions and Verification Forward”, CO2-Urban Synthesis and Analysis Workshop, October 24, 2018, University of Utah, Salt Lake City, UT.

188. “Halogen Chemistry in the Arctic, and Connections to Climate Change”, November 15, 2018, Dept. of Chemistry, Stony Brook University, Stony Brook, N. Y.

189. “Quantitative Observations of Greenhouse Gas Emission Rates

for Megacities (like NYC) and Connections to Policy”, February 7, 2019, Dept. of Geosciences, Stony Brook University, Stony Brook, N. Y.

190. “City Sensing Networks for Greenhouse Gas Emission”, IEEE 5th World Forum on Internet of Things, 15-18 April 2019, Limerick, Ireland.

191 “Meeting the Challenge of Quantitative Measurement of Greenhouse Gas Emission Rates for Urban Environments”,University of Minnesota, Duluth, Department of Chemistry and Biochemistry, April 26, 2019, Duluth, MN.

192. “An Opportunity to Rebuild the World”, University of Minnesota, Duluth, Department of Chemistry and Biochemistry, Senior Awards Dinner Address, April 27, 2019, Duluth, MN.

193. “Atmospheric Organic Nitrates, Secondary Organic Aerosol, and Aqueous Phase Chemistry”, American Chemical Society Meeting, Symposium on From Oceans to Clouds: The Environmental Chemistry of Water, August 27, 2019, San Diego, CA.

194. “Studies of Atmospheric Halogen Chemistry in a Rapidly Changing Arctic”, SUNY College of Environmental Science and Forestry, October 24, 2019, Syracuse, NY.

195. “Quantitative Observations of Greenhouse Gas Emission Rates for Megacities (like NYC) and Connections to Policy”, College of Engineering and Applied Sciences, Stony Brook University, November 15, 2019, Stony Brook, NY.

196. "The Impact of SUNY Cortland on a Long Academic Career and a Gifted Life", Sixth Annual Michael J. Bond ’75, M.D. Alumni/ Undergraduate Science Symposium, SUNY College at Cortland, Cortland, NY, October 23, 2021

**F. Grants:**

November 1987 – NSERC Strategic Grant "Atmospheric Chemistry and Toxicology of October 1990 Peroxyacyl Nitrates" with H. Schiff, H. Niki, D.R. Hastie and J.A. Heddle $101,120/yr.

April 1988 AES Science Subvention "Development and Application of Techniques for Measurement of Atmospheric Carbonyl Compound Concentrations $7,000.

March 1989 AES Contract "Development of a Technique for Measurement of Atmospheric Nitrogen Dioxide" $7,000.

April 1989 AES Science Subvention "Development of Measurement Techniques for Peroxyacyl Nitrates and Organic Nitrates $10,000.

April 1988 - NSERC Operating Grant "Atmospheric Mutagenesis Involving Volatile

March 1990 Organo-Chlorine Compounds" $25,300/yr.

March 1990 AES Contract "Development of a Technique for Measurement of Atmospheric Nitrogen Dioxide" $10,000.

April 1990 NSERC Equipment Grant - High Performance Liquid Chromatograph (with D.R. Hastie) $34,772.

April 1990- AES/NSERC Science Subvention "Atmospheric Measurements of Organic Nitrates and PANs" $20,000.

March 1990

April 1990- NSERC Operating Grant "Atmospheric Photochemistry and Mutagenesis

March 1992 involving Volatile Organo-Chlorine Compounds" $26,000/yr.

Sep. 1990-Aug. 1991 OME Contract "PAN Measurement and Data Analysis for two Sites in Ontario" $23,100

October 1990 AES Contract "Measurements of PAN during the Intercomparison of NO2 Measurement Methods" $4,212

November 1990 AES Contract to Plan, Conduct and Report on a Workshop entitled, "Atmospheric Processes of Organic Toxic Pollutants and their Role in Current Environmental Problems" $25,000

April 1991 OME Grant, Environment Technologies Program "Development of a Nitrogen-Specific GC/Detector for Measurement of Atmospheric Nitrates" (with D.R. Hastie) $248,980 (3 years).

April 1991 OME Grant "Studies of Oxidant Formations in Rural Areas of Ontario" $346,825 (3 years).

April 1991 NSERC Major Equipment Grant, GC/MS, (with Leznoff, Aspinall, Lee-Ruff, Lever, Potvin, Niki) $252,619

May 1991 AES/NSERC Science Subvention "Atmospheric Measurements of Organic Nitrates" $19,760

February 1992 AES Contract - Construction of a Flow Mode Reaction Chamber. $36,668.90

April 1992 NSERC Operating Grant. "Studies of Oxidant Chemistry in Sensitive Canadian Environments" $92,000 (4 years).

May 1992 AES/NSERC Science Subvention "Development and Application of a Gas Chromatographic Technique for Measurement of Atmospheric Carbonyl Compounds" $21,000

May 1992 York University, President's NSERC Fund. "Computer Control and Data System for the CIRAC Air Toxics Research Project". $2,500

November 1992 AES Strategic Grant. "Development of an Automated Cryo-Concentration/GC/MSD method for Routine Measurements of Atmospheric Oxidation Products" $50,000

January 1993 OME Contract. "Measurement of Peroxyacetyl Nitrate at Urban and Rural Sites in Ontario" $36,500

April 1993 NSERC Equipment Grant. "Automated Sample Acquisition/Gas Chromatograph/Mass Selective Detector for Atmospheric Pollutant Measurements" $62,292

April 1993 York University, President's NSERC Fund. "Development of a Method for Measurement of Atmospheric Cl2" $1,000.

June 1993 AES/NSERC Science Subvention. "Measurements of Hydrocarbon Oxidation Products in Canadian Atmospheric Environments" $63,000 (three years).

June 1994 Ontario Ministry of Environment and Energy. "Studies of Oxidant Formation in Southern Ontario" $87,000

June 1994 AES/NSERC Strategic Grant. "Photochemical Reaction Chamber Hydrocarbon Oxidation Product Measurement System" $35,607

May 1995 EPA subcontract (GIT). “Carbonyl Compound Measurements During the Nashville 1995 Summer Intensive of the Southern Oxidants Study”, $31,700

July 1995 Showalter Foundation, Purdue University. Proposal for Purchase of Instrumentation for Measurement of Vertical Profiles of Atmospheric Ozone, $49,462.

January 1996 National Science Foundation, “Arctic Outflow Campaign: A Measurement Study to Characterize the Composition and Photochemistry of Arctic Air Transported Southward During Spring”, $7,802 (in collaboration with Michigan Technical University).

January 1996 National Science Foundation, “A Study of the Importance of Organic Nitrates as Sinks for Atmospheric Nitrogen Oxides”, $350,000 (3 years).

May 1996 NOAA contract, AEROCE Ozone Vertical Profile Measurements at Purdue, $5,525

October 1996 US EPA, Development, Evaluation, and Application of a Fast Time-Response Mass Spectrometric Method for Quantitative Monitoring Oxidant Precursors, $485,262 (3 years)

September 1996 BASF - Industrial Associates Program, $20,000

Feb. 1997 NSF, “nvestigations of the Importance of Halogen Atom Chemistry in the Arctic Troposphere”, $649,817 (three years; with co-PIs Sun, Francisco, and Margerum).

May 1997 PRF Research Grant. “Studies of the Contribution of Isoprene and its Oxidation Products to Ozone Formation in the Troposphere”, $11,666.

May 1997 Supplement to “A Study of the Importance of Organic Nitrates as Sinks for Atmospheric Nitrogen Oxides”, $21,336.

September 1997 BASF - Industrial Associates Program, $20,000

January 1998 – NSF – Air-Snow Exchange of Reactive Nitrogen Oxides at Summit, Greenland, co-PI with J. Dibb, U.-N.H., $255,692

Dec. 2000

January 1998 PRF Research Grant. “Studies of Formaldehyde Photochemistry in the Arctic at Polar Sunrise”, $11,666.

May 1998 Chemical Manufacturers Assoc., “Studies of Organic Nitrate Formation from Atmospheric Oxidation of Glycol Ethers”, $35,325.

February 1999 Albemarle Corp., “Studies of the Organic Nitrate Yield from OH Reaction with 1-Bromopropane”, $39,348.

March 1999 NSF, (Office of Polar Programs), “Studies of the Role of Sea Ice in Arctic Tropospheric Ozone Chemistry”, 3 years, 397,394.

March 1999 NSF (Atmospheric Chemistry), “A Study of the Role of Organic Nitrate Formation in the Removal of Tropospheric NOx”, 3 years, $360,000.

March 1999 NOAA, “Measurements of Biogenic VOCs During the Southern Oxidants Study 1999”, $56,000, 3/99-2/00.

Sept. 1999 NSF, OPP “Investigation of Photochemical Transformations within Snow and Their Effect on Snow and the Atmospheric Composition”.

Years 1&2 - $190,179

Sept. 2001 NSF, Biocomplexity Program, “Development of Instrumentation for Measurement of Biosphere-Atmosphere Fluxes of Carbon and Nitrogen”, 4 years, $588,474

(Collaborative grant with B. Lamb, H. Westberg (WSU), A. Guenther (NCAR), and P. Curtis (OSU); total award was $1.7M)

May 2002 NSF, (Office of Polar Programs), “Studies of the Role of Sea Ice in Arctic Tropospheric Ozone Chemistry”, Supplement, $22,865

July 2002 The Showalter Foundation, “Studies of the Impact of Atmospheric Nitrogen Deposition on the Sequestration of Carbon Dioxide by North American Forests, $100,000

April 2002 NSF (Atmospheric Chemistry), “A Study of the Role of Organic Nitrate Formation in the Removal of Tropospheric NOx”, supplement, $30,191.

August 2002 NSF (Office of Polar Programs), “Changing Environmental Controls on Coupled Chemical Exchange Between the Ocean, Ice, and Atmosphere in the Arctic – A Workshop Request”, $81,191

January 2003 NSF (Atmospheric Chemistry), “Studies of the Fluxes of Atmospheric Organic Nitrogen Compounds to a Forest Environment”, $360,000

June 2003 NSF (Polar Programs), “Studies of the Impact of Emission of Reactive Gases from Arctic Snowpacks and Sea Ice”, $399,959.

June 2003 NSF (Analytical Chemistry), “Development of a Proton Transfer Reaction Linear Ion Trap for Fast Atmospheric Pollutant Detection”, $535,000

April 2003 NSF-IGERT, via U. Mich., (BART), “The Development of a Light-Aircraft Flux Measurement System for Determinations of Fluxes of CO2 and Odd-Nitrogen Compounds”, $55,000.

July 2003 Purdue Research Foundation, “Studies Of The Impact Of Frost Flowers On Tropospheric Ozone”, 2 years, $13,263/yr.

December 2003 NSF, SBIR Phase I grant, with Aerodyne Corp. (Boston), “Innovative Aerosol Collector for On-line Analysis of Organics”, $15,000.

August 2004 21st Century Fund, $120,566.

September 2004 Budget for the 2004/2005 Academic Yr. for the Purdue Climate Change Research Center, $122,000

December 2004 Purdue Research Foundation, International Travel Grant, “OASIS Implementation Plan Workshop”, $1,000.

August 2005 Budget for the 2005/2006 Academic Yr. for the Purdue Climate Change Research Center, $212,275

July 2005 Supplement to "Studies of the Impact of Emission of Reactive Gases from Arctic Snowpacks and Sea Ice.", NSF, Office of Polar Programs, $43,320.

August 2005 Supplement to “Studies of the Fluxes of Atmospheric Organic Nitrogen Compounds to a Forest Environment”, $37,151

September 2005 Supplement to “Development of Instrumentation for Measurement of Biosphere-Atmosphere Fluxes of Carbon and Nitrogen”, $53,443

January 2006 A Multiphase Study of the Nature, Sources, and Fate of Atmospheric Organic Nitrogen, NSF-ATM, $689,869 (4 yrs).

February 2006 Purdue Research Foundation, “Halogen Atom Measurements as part of the International Polar Year”, $14,040, 1 Year Graduate Fellowship.

January 2006 Purdue Research Foundation International Travel Grant – AICI Workshop, $1,000

March 2007 The Collaborative O-Buoy Project: Deployment of a Network of Arctic Ocean Chemical Sensors for the IPY and Beyond, 3 years, $462,843

June 2007 Aircraft-Based Measurements of CO2 as Part of the Mid-Continent Intensive, NOAA, $19,825

July 2007 Showalter Trust (co-PI with lead PI Kevin Gurney), “The Hestia Project: Supporting Climate Science, Policy and Planning at Purdue”, $74,591

July 2007 Health Research, Inc., Aircraft-based HONO measurements, with PI Xianliang Zhou, $11,742

May 2007 U. Mich. IGERT, "Secondary organic aerosol formation from biogenic VOC's and feedbacks to the climate system" (BART), $31,500

Sept. 2007 IPY: Halogen Chemistry and Ocean-Atmosphere-Sea Ice-Snowpack (OASIS) Chemical Exchange During IPY, NSF-OPP, $469,513

Nov. 2007 Production of Secondary Organic Aerosol from Multiphase Terpene Photooxidation, U.S. EPA STAR Grant, $333,397

June 2008 Purdue Research Foundation Fellowship, $12,000

July 2009 “Collaborative Research: Program for Research on Oxidants – Photochemistry Emissions & Transport (PROPHET) 2009 – Community Atmosphere-Biosphere INteractions Experiment (CABINEX)”, 2 years, $116,836

January 2009 “Computational & Laboratory Studies of Arctic Sea Ice Halogen Chemistry”, The Camille and Henry Dreyfus Foundation Inc., two years, $120,000

July 2009 “The Canadian Obuoy Project”, Environment Canada/Bigelow Labs, 1 year, $42,128

August 2009 Supplement to: IPY: Halogen Chemistry and Ocean-Atmosphere-Sea Ice-Snowpack (OASIS) Chemical Exchange During IPY, NSF-OPP, $74,148

August 2009 Supplement to: The Collaborative O-Buoy Project: Deployment of a Network of Arctic Ocean Chemical Sensors for the IPY and Beyond, $44,676

August 2009 Supplement to: A Multiphase Study of the Nature, Sources, and Fate of Atmospheric Organic Nitrogen, NSF-ATM, $61,148.

January 2010 “Development, Improvement, & Assessment of the Accuracy of Aircraft-Based Mass Balance Measurements of Integrated Urban Emission Fluxes of Greenhouse Gases”, NIST, 3 years, $1,500,000

April 2010 "Implications of Arctic Sea Ice Reduction of Tropospheric Bromine, Ozone, and Mercury Chemical Processes, Transport, and Distribution" NASA, IDS, 3 years, $269,451

September 2010 "Collaborative Research: The O-Buoy Network of Chemical Sensors in the Arctic Ocean", NSF, OPP, 5 years, $1,041,211 (Purdue component)

December 2010 "Airborne Microwave Observatory of Subcanopy and Subsurface (AirMOSS)", 5 years, $586,958 (Purdue component of NASA Earth Venture-1 Project).

July 2011 “Studies of the Production of Molecular Halogens in Arctic Snowpacks

and on Sea Ice Surfaces”, NSF, OPP, 3 years, $526,971.

August 2011 “Collaborative Research: Biogenic Volatile Organic Compounds and their Impacts in a Changing Temperate Forest”, NSF, ATM, 2 years, $162,743.

May 2012 Gift in support of the Shepson Atmospheric Chemistry Research Group, Clean Air Task Force, $23,100.

August 2012 "Studies of the Impact of Organic Nitrates on Nitrogen Cycling and Aerosol Production", NSF-GEO, 3 years, $526,971

October 2012 "Aircraft-Based Assessment of the Individual Source Contributions to the Total Greenhouse Gas Emissions from an Urban Environment, National Institute of Standards and Technology, 1 year, $268,000.

May 2013 "The Role of Oxidation of BVOCs in SOA Production in the Southeastern U.S.", EPA, 1 year, $105,000.

September 2013         “Improvement and Application of Aircraft and Ground-Based Measurements of the Emission of Greenhouse Gases from the City of Indianapolis”, 1 year, $258,169.

October 2013 "Quantitative Aircraft Mass Balance Measurements of the Flux of Methane from Specific Sources Related to Shale Gas Operations in the Barnett Shale Formation Region", Environmental Defense Fund, $78,300.

September 2013 “Coordinated Research Campaign to Estimate and Attribute Methane Emissions in the Barnett Shale Region”, Environmental Defense Fund, $78,315, Sept. 1. 2013-Sept.30, 2015.

February 2014 "Gift in support of the Shepson Atmospheric Chemistry Research Group, Clean Air Task Force, $38,000.

May 2014 "Gift in support of the Shepson Atmospheric Chemistry Research Group, Clean Air Task Force, $25,000.

June 2014 "ALAR Measurements of Methane in the Eagle Ford Region", Environmental Defense Fund, $71,558.

September 1, 2014 Collaborative Research: Studies of Chlorine, Bromine and Iodine Chemistry in the Arctic, and its Impacts, NSF, $316,777, Sept. 1, 2014-Aug. 31, 2017.

September 2014 "Intergovernmental Personnel Act Assignment for Paul B. Shepson"

NSF; $268,495; Sept. 15, 2014-Sept. 14, 2015.

September 2014 “Refinement and Application of Aircraft-Based Methods for the Determination of Greenhouse Gas Emission Rates from Urban Environments”, National Institute of Standards and Technology, January 1, 2015 - Dec. 31, 2016, $629,707.

April 2015 "Gift in support of the Shepson Atmospheric Chemistry Research Group", Clean Air Task Force, $25,000.

September 2015 "Intergovernmental Personnel Act Assignment for Paul B. Shepson"

NSF; $277,417 ; Sept. 15, 2015-Sept. 14, 2016.

January 2016 "Multiphase Chemistry of Organic Nitrates from Monoterpene Oxidation

and Their Role in Aerosol Growth", April 1, 2016 - March 31, 2020, $480,858, Jonathan Slade, NSF substitute PI for the Shepson Group.

September 2016 "Measurements of Methane Emissions from Natural Gas Power Plants", Environmental Defense Fund, $96,906.

September 2016 “Intergovernmental Personnel Act Assignment for Paul B. Shepson”. NSF; $283,465; Sept. 15, 2016-Sept. 14, 2017.

October 2016 "Application of the Aircraft Mass Balance Method for Measurement of Greenhouse Gas Emission Rates for Eastern U.S. Cities", NIST,

October 2016 - September 2018, $754,565.

June 2017 "Measurements of Methane Emissions from Natural Gas Power Plants", Environmental Defense Fund, $20,000.

September 2017 “Intergovernmental Personnel Act Assignment for Paul B. Shepson”. NSF; $283,465; Sept. 15, 2017-Sept. 14, 2018.

June 2019 “Development of SUNY Expertise in Understanding and Minimizing Urban Air Quality Human Health Risks,” SUNY Empire Innovation Program, $750,000, July 1, 2019 – June 30, 2025.

September 2019 "Observations, Analysis, and Modeling Applied to Determination of

CO2 and CH4 Emission Rates Along the U.S. East Coast”, NIST, $1,185,941, Oct. 1, 2019 – Sept. 30, 2022.

July 2020 "Collaborative Research: CHemistry in the Arctic: Clouds, Halogens, and Aerosols (CHACHA)", NSF (recommended to Grants and Agreements), $2.3M, July 1, 2020 - June 30, 2024 (SBU funding for Shepson (Lead PI for 6 Universities), $398,226; Purdue funding for the ALAR aircraft operations, $278,937).

August 2020 "Collaborative Research: Greater NY Oxidant, Trace gas, Halogen, and Aerosol Airborne Mission (GOTHAAM)", $3,497,538, for four years ($665,000 total to SBU researchers Mak (lead PI; there are 6 other collaborating Universities), Knopf (co-PI), Shepson (co-PI) and Lindenfeld Sher

Submitted “Securing a Strong Future for the Peconic Estuary Partnership” (Award to Host the PEP), U. S. Environmental Protection Agency, $950,825, July 1, 2021 – Sept. 30, 2022. FY21 PEP budget is $1.91M.

March 2021 “Greenhouse Gas Emission Rates for Urban Environments Along the U.S. Northeast Coast”, NIST, $752,304, 3/1/21 - 2/29/24.

**III. Mentoring**

**A. Graduate Supervision:**

**Current students** Ana Morales (July '17 - ; Ph.D.)

Jay Tomlin (Oct. '17 -; Ph.D.)

**Former students** Ning Gao (September 1989 -1990; Ph.D.(transferred))

Kathleen Hedley (September 1989 - 1991; M.Sc.)

Pierrette Blanchard (September 1988 - 1993; Ph.D.)

Anna-Pearl Sirju (January 1992 - 1993 ; M.Sc.)

David Plummer (September 1992-1995 ; M.Sc.)

Meghan Jones (Oct. 95 - May ‘96)

T. Walker (Nov. 96 - May 97;transferred)

Tom Biesenthal (York U., September 1992-May 1997 ;Ph.D.)

Gary Impey (York U., September 1993- Dec. 1998;Ph.D.)

Orlando Herrera-Gomez (Nov. 96 – Dec. 98;M.S.)

Bradley Campbell (Nov. ’97 – Dec. 1999; M.S.)

Brian Michalowski (Sept. ’97 – June 1999; M.S.)

Bryan Splawn (June 1995 – August 1999; M.S.)

David Hulbert (Oct. 96 – Dec. ‘98; M.S.)

Jason O'Brien (York U., September 1992-1998 ;Ph.D.)

John Grossenbacher (Oct. 95 -; 2001, Ph.D.)

Ann Louise Sumner (Nov. 96 -;2001, Ph.D.)

Dennis Barket (Nov. 96 - 2001;Ph.D.)

Julia Hurst (Nov. 96 - 2001;Ph.D.)

Kevin Ford (Nov. ’98 - 2001 M.S.)

Amanda Grannas (Nov. ‘98- Dec. 2002; Ph.D.)

Cyntia Espada (Nov. ’97 - Dec. 2003; Ph.D.)

Pete Giacopelli (Nov. ’00 - Dec. 2003; M.S.)

Rose Ravelo (Nov. 2001 -2004; withdrew)

Terra Dassau (Nov. ‘98- 2005; Ph.D.)

Adam Keil (Nov. 2000 – Nov. 2005; Ph.D.)

Cory Moffatt (Nov. ’02 -; Aug. ’06; M.S.)

Kimberly Hill (Sept. ’02 – April 06; Ph.D.)

Amanda Lockwood (Nov. 2001 – Dec. 2008; Ph.D.)

Aubrey Cavender (Nov. 2001- June 2008; Ph.D.)

Phil Tackett (Nov. ’03 – Dec. 2008; Ph.D.)

Marc Fiddler (Jan. ’07 – Jan. ‘09; Ph.D.)

Karl Garman (Jan. 2002 - ; Dec. 2009; Ph. D.)

Doug Martins (Sept. ’02 -; May ‘09; Ph.D.)

Kelly Mays (Sept. ’07 – May ‘09; M.S.)

Jonathan Slade (Nov. ’07 – Dec. ‘09; M.S.)

Levi Mielke (Nov. ’04 – Dec. ‘09; Ph.D.)

Travis Knepp (Nov. '04 - Apr. '10; Ph.D.)

Jade Jones (Nov. ’08 - May 2011; M. S.)

Allyson Costa (Nov. ’04 - Aug. ’11; Ph.D.)

Nick Veselka (Nov. ’09 - Dec. ’11; M.S.)

Chelsea Stephens (Nov. ’07 - Dec. '12); Ph.D.)

Dana Caulton (Nov. '10 - Dec. '14; Ph.D.)

Kevin McAvey (Nov. ’09 - April '15; Ph.D.)

Joel Rindelaub (Jun. ’09 - April '15; Ph.D.)

Kyle Custard (Nov. '10 - April '15; Ph.D.)

Chris Groff (Nov '12 - April '15;- M.S.)

Fulizi Xiong (Nov. '10 - November '15; Ph.D.)

Wes Halfacre (Nov. '10 - July 2016; Ph.D.)

Tegan Lavoie (Nov. '13- July 2016; Ph.D.)

Olivia Salmon (June '13 - July 2018; Ph.D.)

Angela Raso (Nov '12-August '18; Ph.D.)

Kris Hajny (Nov. '15 – Dec. '20; Ph.D.)

**B. Post-Doctoral Fellows:**

York U.:

Kirk Gladstone (January - July 1989)

Kayambu Muthuramu (February 1991 - May 1994)

J. Zhang (May 1991 - December 1991)

Cunshing Hao (May 1992 - April 1994)

Quanji Wu (February 1993 - March 1994)

Purdue U.

Tim Starn (January 1995 - May 1996)

Xiaohui Chen (March 1996 - April 1997)

Orlando Colorado (January 1997 – Aug. 1998)

Tara Couch (August 1997 – July 1999)

Christophe Guimbaud (August 1999 - 2001)

Gavin Edwards (June 2003 – Oct. 2005)

Marjan Alaghmand (May 2007 – Oct. 2009)

Ivan Gladich (Jan. 2009 - Dec. 2010)

Shexia Ma (Sept. 2009 - August 2011)

Kerri Pratt (April 2010 - June 2013)

Maria Cambaliza (May 2010 - June 2014)

Alexie Heimburger (May 2014 - May 2016)

Ana Kerlo (September 2015 - September 2016)

Jonathan Slade (January 2015 - 2018)

Rebecca Harvey (June 2016 - 2017)

Karunarathna Jayarathne (June 2017 – June 2019)

Stony Brook U.

Joseph Pitt (September 2019 - )

Kris Hajny (January 2021 - )

Austin Hope (February 2021 - )

**IV. Summary of Courses Developed/Taught**

**Undergraduate (York U.)**

SC/CHEM 3110.08 Analytical Chemistry

SC/CHEM 4100.06 Research Project (Les Toth, Leslie Topham, Talbir Singh, Anna Sirju, Liz Frankford, Mary Boseovski, Kok Zhi Khoo, Craig Stroud)

SC/CHEM 3120.04 Instrumental Methods of Chemical Analyses

SC/CHEM 3160.03/ Introductory Atmospheric Chemistry

EATS 3130.03

SC/NATS 1770.06 Science and the Environment (non-majors General)

SC/NATS 1820.06 Chemistry in Modern Living (non-majors General)

SC/NATS 1770.06B Science and the Environment (non-majors general)

SC/CHEM 3130.04 Atmospheric Chemistry Measurements

**Undergraduate (Purdue)**

CHM490A Atmospheric Chemistry

CHM 499 Undergraduate Research (Kim Pollins, Charlie Snyder, Shonn Stanley, Kim Pollins, Jeff Hardy, Megan McMahon, Steve Yontz, Chris Bowman, Jamie Ursta, Stormy Ratajczak, Ralph Holler, Ben Nault, Megan Williams, Tennie Renkens; Arisa Iwasaki, Greg Hopkinson Cyrus Baker, Rachel Svetanov, Ye Xuan Gan, Hao Zong, Leigh Anderson)

CHM481 Environmental Chemistry

CHM115 General Chemistry

CHM599 Carbon Neutrality at Purdue (open to all students, all levels)

**Graduate (York U.)**

SC/CHEM 6010.03 Review Essay

SC/CHEM 5610.03 Special Topics in Atmospheric Chemistry

SC/ESS 5300.03 Introductory Atmospheric Chemistry

SC/CHEM 5710.03 Recent Advances in Atmospheric Chemistry

SC/CHEM 5170.03 Special Topics in Chemical Physics

**Graduate (Purdue)**

ATMS 591/CHM581 Atmospheric Chemistry

CHM 695A Seminar in Analytical Chemistry

CHM599C/EAS591C Atmosphere-Surface Chemical Interactions

**External**

Summer 1989/ CIRAC Summer Course - Lectures on Chemical Kinetics and Smog

Summer 1990 Chamber Studies

Summer 1991, 1992

1993, 1994 CIRAC Summer Course - Course Organizer

**V. Service and Outreach**

**A. Significant University Service:**

1988 - 1993 Acting Director, Centre for Atmospheric Chemistry, York U.

1989 Participated in the Development of a new Undergraduate Stream in Atmospheric Chemistry (York University)

1996 Created Undergraduate streams in atmospheric chemistry in the Departments of Chemistry and EAS, Purdue.

2003-2008 Created and Directed the Purdue Climate Change Research Center

2003-2007 Head, Analytical Chemistry Division, Dept. of Chem., Purdue U.

2008-2013 Head, Department of Chemistry, Purdue University

2013 - Executive Committee, Purdue Climate Change Research Center

2013 - Executive Committee, Purdue Center for the Environment

2018 - Dean, School of Marine and Atmospheric Sciences, Stony Brook University

**B. Presentations at Schools and/or outreach presentations**

1990 Unionville High School

1990 Milliken Mills High School

1991 Glen Forest Secondary School

1991 Bowmanville High School

1991 Markham Secondary School

1991 City School

1992 St. Andrews Collegiate

(All the above in the Toronto area)

2003 Cumberland Elementary School, “Climate Change”

2005 Barrow High School, Barrow, AK

2005 West Lafayette High School

2006 Happy Hollow Elementary School, West Lafayette, IN

2011 West Lafayette, IN High School Convocation, February 17, 2011, "Donuts, Fire, Ice, and Saving the World".

2011 Elderhostel Group, Purdue University, June 13, 2011, “Climate Change - Exciting??”

2016 Trumansburg, NY Middle School, April 22, "Climate change in the Arctic" (Career Day)

2018 Jefferson Ferry (retirement community), Dec. 6, 2018, “Exciting Things About Climate Change”, Port Jefferson Station, NY.

2019 Mt. Sinai Congregational Church, “Exciting Things About Climate Change”, April 3., 2019, Mt. Sinai, NY.

2019 Northport Public Library, “Exciting Things About Climate Change”, May 6, 2019, Northport, NY.

2019 Montauk Lighthouse, “Exciting Things About Climate Change”, July 25, 2019

2021 Montauk Lighthouse, “Exciting Developments in Climate Change Mitigation”, July 29, 2021.