JAMES NEVILLE GALLOWAY
Department of Environmental Sciences
Clark Hall, University of Virginia
Charlottesville, Virginia 22904
(434) 924-3103

EDUCATION

1966-1972 Ph.D. (Chemistry); University of California, San Diego; La Jolla, California, *Man's Alteration of the Natural Geochemical Cycles of Selected Trace Metals*
1962-1966 B.A. (Biology, Chemistry); Whittier College; Whittier, California

EMPLOYMENT

1976- University of Virginia
College and Graduate School of Arts and Sciences
2009-2012 Associate Dean for the Sciences
Department of Environmental Science
2023- Sidman P. Poole Professor, *Emeritus*
2008-2023 Sidman P. Poole Professor
1996-2001 Chair
1988-2008 Professor
1982-1988 Associate Professor
1976-1982 Assistant Professor
2001- Marine Biological Laboratory, Visiting Scientist
1974-1976 Postdoctoral Associate, Ecology and Systematics; Cornell University
1972-1974 Potter and Co-Owner, Shenandoah Crafts Inc, Lexington Virginia

COURSES TAUGHT

University of Virginia: Atmospheric Chemistry; Global Biogeochemical Cycles; Introduction to Air Quality; Chemistry of Natural Waters; Resources and the Environment; Environmental Chemistry; Nitrogen Seminar
University of California, San Diego: Man and the Environment

MAJOR AWARDS, HONORS

2020 Elected, US National Academy of Sciences
Inducted, Virginia Academy of Science, Engineering and Medicine
Awarded, 2020 Research Award, University of Virginia
2015 Awarded, Thomas Jefferson Award for Conservation, VA Museum of Natural History.
2012 Awarded, 2012 Whittier College Poet Award for Alumnae Achievement
2011 Elected, Board of Trustees, Marine Biological Laboratory, Woods Hole, MA.
2010 Elected, Member of Raven Society, University of Virginia
2008 Elected, Fellow of American Geophysical Union.
Awarded, Tyler Prize for Environmental Achievement (shared with Harold Mooney)
Awarded, Sidman P. Poole Professorship of Environmental Sciences.

2002 Elected, Fellow of the American Association for the Advancement of Science

OTHER AWARDS, HONORS

2018 Faculty Award from Student Council's Council on Sustainability
2017 Association for the Advancement of Sustainability in Higher Education, the 2017 Campus Sustainability Research Award for the establishment of the Nitrogen Footprint Tool Network for colleges and universities.
2015 Awarded, Thomas Jefferson Award for Conservation, Virginia Museum of Natural History.
2014 Named, Highly Cited Researcher in the area of Ecology & Environment; *The World's Most Influential Scientific Minds, 2014*
2013 Best Research Paper Award 2012 and Most Highly Cited Paper for the journal *Environmental Development* for the Leach et al., 2012 paper.
2012 Awarded, 2012 Whittier College Poet Award for Alumnae Achievement
Visiting Scholar, Whitter College, March 6-8
2011 Selected, Distinguished Guest Lecturer, Environmental Chemistry Group of the Royal Society of Chemistry, London.
Elected, Board of Trustees, Marine Biological Laboratory, Woods Hole, MA.
2010 Elected, Member of Raven Society, University of Virginia
2008 Elected, Fellow of American Geophysical Union.
Awarded, Tyler Prize for Environmental Achievement (shared with Harold Mooney)
Awarded, Sidman P. Poole Professorship of Environmental Sciences.
2007 Awarded, Sesquicentennial Associateship for 2008-2009.
2006 Galloway et al., 2004 *Biogeochemistry* paper is the third most cited paper in the field of ecology/environment that was published in the last two years.
Re-appointed to the executive committee of the EPA Science Advisory Board for a three-year period, October 2006 to September 2009
2005 University of Virginia, Environmental Sciences Organization Award
2003 Named as a "highly cited researcher" by the Institute of Scientific Information in three separate categories: Ecology/Environmental Science, Geosciences, and Engineering. According to ISI, in each area this represents the top 250 individuals who are the most highly cited for the period 1981 to 1999 and comprise less than one-half of one percent of all publishing researchers.
Invited to the 13th Annual Monticello Dinner Series hosted by the UVA Seven Society in recognition of devotion to teaching
Environmental Sciences Dept., Graduate Student Award for 2002/2003 academic year.
Appointed to the executive committee of the EPA Science Advisory Board for a three-year period, December 2003 to September 2006
2002 Elected, Fellow of the American Association for the Advancement of Science
Appointed, Guest Investigator, Woods Hole Oceanographic Inst., Woods Hole, MA
2001 Graduate Student Association Award, Department of Environmental Sciences, University of Virginia

Environmental Science Organization Award, Department of Environmental Sciences, University of Virginia
Sesquicentennial Associateship, Dept. of Environmental Sciences, University of Virginia
Steward of the Month Award, Virginia Center of Stewardship
Visiting Scientist, Woods Hole Oceanographic Institute, Woods Hole, MA

1995 Visiting Scholar, International Institute for Applied Systems Analysis, Vienna, Austria
Sesquicentennial Associateship and Visiting Professor, Marine Biological Laboratory, The Ecosystems Center and Woods Hole Oceanographic Institute, Woods Hole, MA

1990 Excellence in Service Award For Outstanding Service in Protecting Park Resources, National Park Service, Luray, VA

1989 Visiting Fellow, University of East Anglia, UK

1988 Sesquicentennial Associateship Visiting Fellow, United Kingdom Research in Atmospheric, Chemistry, Coordinating Committee, University of East Anglia, Norwich, UK

1986 President and Visitors Prize (shared with GM Hornberger, BJ Cosby, RF Wright and B Martin), Sigma Xi, University of Virginia

1982 Sesquicentennial Associateship Visiting Professor, University of Toronto

PUBLICATIONS

Peer-Reviewed Journal Articles

2024 Medinets, S, AM Leach, T Pavlik, V Medinets, **JN Galloway**. 2024. The nitrogen footprint of Ukraine: why personal consumption matters. *Environ. Res. Lett. 19*, 024023

2023 Dukes E, S Cheng, S Mogen, **JN Galloway**, AM Leach, AR Trimble, A Pettit, J Compton, M Pennino. 2023. Footprints in Action: How UVA Is Managing Its Sustainability Stewardship. *Sustainability and Climate Change* 16, *DOI: 10.1089/scc.2022.0067*

2022 Olff, H, R Aerts, R Bobbink, JHC Cornelissen, JW Erisman, **JN Galloway**, CJ Stevens, MA Sutton, FT de Vries, GWW Wamelink, DA Wardle. 2022. Explanations for nitrogen decline. *Science* 376, 1169-1170

Duce RA, RR Dickerson, IE Galbally, **JN Galloway**, R Jaenicke, WC Keene, J Lelieveld, H Levy, JM Prospero, L Schütz, F Slemr, P Winkler. 2022. Christian Junge–a pioneer in global atmospheric chemistry. *Journal of Atmospheric Chemistry*, 1-38

H Wu, GK MacDonald, **JN Galloway**, Y Geng, X Liu, L Zhang, S Jiang. 2022. A new dietary guideline balancing sustainability and nutrition for China's rural and urban residents. *Iscience* 25, 105048

2021 Dukes E, Castner E, Leach A, **Galloway JN**, Lloret, J, Messenger S, Zheng A, Baumgam S, Yoder J, Royal, Wiersma D. 2021. Introducing the Nitrogen Footprint in SIMAP: A Review of Improvements in Nitrogen Footprint Methodology for Institutions. *Sustainability and Climate Change* 14, DOI: 10.1089/scc.2021.0048

Galloway, JN and Cowling, EB. 2021. Reflections on 200 years of Nitrogen, 20 years later. AMBIO 50 (4) 745-749

Galloway, JN, Bleeker, A and Erisman, JW. 2021. The Human Creation and Use of

Reactive Nitrogen: A Global and Regional Perspective. ANNUAL REVIEW OF ENVIRONMENT AND RESOURCES, VOL 46, 2021 46, 255-288

Harmon, PA, Riscassi, AL, Scanlon, TM, **Galloway, JN**, Demarest, D, May, CL. 2021. The impacts of stream acidification on fish assemblages: Assessing three decades of recovery in Shenandoah National Park. GLOBAL ECOLOGY AND CONSERVATION 26, 1-13.

Kanter, DR, Wagner-Riddle, C, Groffman, PM, Davidson, EA, **Galloway, JN**, Gourevitch, JD, van Grinsven, HJM , Houlton, BZ , Keeler, BL, Ogle, SM, Pearen, H, Rennert, KJ, Saifuddin, M, Sobota, DJ , Wagner, G. 2021. Improving the social cost of nitrous oxide. NATURE CLIMATE CHANGE 11 (12), pp.1008-1010

Messenger, S, Lloret, J, Galloway, JN, Giblin, A. 2021. Identifying and assessing effectiveness of alternative low-effort nitrogen footprint reductions in small research institutions. ENVIRONMENTAL RESEARCH LETTERS 16 (3) https://doi.org/10.1088/1748-9326/abd9f6

Riscassi, AL, Scanlon, TM, Maben, SW, Galloway, JN. 2021. Shenandoah Watershed Study-Virginia Trout Stream Sensitivity Study (SWAS-VTSSS): Stream water quality and hydrologic monitoring data for mid-Appalachian headwater streams HYDROLOGICAL PROCESSES 35 (4)

Scanlon, TM; Riscassi, AL and Galloway, JN. 2021. Observed changes in chronic and episodic acidification in Virginia mountain streams in response to the Clean Air Act and amendments. ATMOSPHERIC ENVIRONMENT 252

Wu, HJ, MacDonald, GK, **Galloway, JN**, Zhang, L, Gao, LM, Yang, L, Yang, JX, Li, XL, Li, HR, Yang, T. 2021. T. The influence of crop and chemical fertilizer combinations on greenhouse gas emissions: A partial life-cycle assessment of fertilizer production and use in China. RESOURCES CONSERVATION AND RECYCLING 168

2020 Cattell Noll L, AM Leach, V Seufert, **JN Galloway**, B Atwell, JW Erisman and J Shade The nitrogen footprint of organic food in the United States. *Environmental Research Letters*, 15 (4), 045004

Dukes ESM, **JN Galloway**, LE Band, LR Cattaneo, PM Groffman, LM Leach, EA Castner A Community Nitrogen Footprint Analysis of Baltimore City, Maryland, *Environmental Research Letters*, 15, 10.1088/1748-9326/ab76dc

Kanter DR, S Del Grosso, C Scheer, DE Pelster, **JN Galloway**. 2020. Why future nitrogen research needs the social sciences. *Current Opinion in Environmental Sustainability*, 47, 54-60.

Metson G, G MacDonald, AM Leach, JE Compton, J Harrison, **JN Galloway**, James. Consumer-oriented phosphorus and nitrogen footprints for U.S. diets. *Environmental Research Letters*. 15, 10.1088/1748-9326/aba781

Piester HE, CM DeRieux, J Tucker, NR Buttrick, **JN Galloway**, TD Wilson. 2020. “I’ll

Try the Veggie Burger": Increasing purchases of sustainable foods with information about sustainability and taste. *Appetite* 155, 104842

Shade J, L Cattell Noll, V Seufert, JN Galloway, JW Erisman. 2020. Decreasing reactive nitrogen losses in organic agricultural systems. Organic Agriculture. https://doi.org/10.1007/s13165-020-00297-0

Uwizeye A, IJM de Boer, CI Opio1, RPO Schulte, A Falcucci, G Tempio, F Teillard, F Casu, M Rulli, **JN Galloway**, A Leip, JW Erisman, TP Robinson, H Steinfeld and PJ Gerber. Nitrogen emissions along global livestock supply chains. *Nature Food*, 1, 10.1038/s43016-020-0113-y.

2019 Gu, B, SK Lam, S Reis, H van Grinsven, X Ju, X Yan, F Zhou, H Liu, Z Cai, **JN Galloway**, C Howard, MA Sutton, D Chen. 2019. Towards a generic analytical framework for sustainable nitrogen management: application for China. *Environmental Science & Technology* 53 (3), 1109-1118

Houlton, B. Z., Almaraz, M., Aneja, V., Austin, A. T., Bai, E., Cassman, K. G., J Compton, E Davidson, JW Erisman, **JN Galloway**, B Gu, LA Martinelli, K Scow, WH Schlesinger, TP Tomich, C Wang, (2019). A world of co-benefits: Solving the global nitrogen challenge. *Earth's Future* 7. https://doi.org/ 10.1029/2019EF001222

Muth, M. K., C. Birney, A. Cuéllar, S. M. Finn, M. Freeman, **J. N. Galloway**, I. Gee, J. A. Gephart, K. Jones, L. Low, E. Meyer, Q. D. Read, T. Smith, K. A. Weitz, and S. Zoubek. 2019. A systems approach to assessing environmental and economic effects of food loss and waste interventions in the United States. *Science of the Total Environment* 685:1240-1254. DOI: 10.1016/j.scitotenv.2019.06.230.

Riscassi A, T Scanlon, **JN Galloway**. 2019. Stream geochemical response to reductions in acid deposition in headwater streams: Chronic versus episodic acidification recovery. *Hydrological Processes*. DOI: 10.1002/hyp.13349

2018 Davis, KF, C Dalin, R DeFries, **JN Galloway**, A Leach, N Mueller. 2018. Sustainable pathways for meeting future food demand. In *Encyclopedia of Food Security and Sustainability*. Elsevier

Erisman, JW, AM Leach, A Bleeker, B Atwell, L Cattaneo, **JN Galloway**. 2018. An integrated approach to a nitrogen use efficiency (NUE) indicator for the food production-consumption chain. *Sustainability* 10(4):925

Liang, X, S Lam, B Gu, **JN Galloway**, AM Leach, D Chen. Reactive nitrogen spatial intensity (NrSI): a new indicator for environmental sustainability. 2018. *Global Environment Change* 52, 101-107.

Liang, X, NE Ling, SK Lam, EA Castner, AM Leach, R gu, GP Healey, **JN Galloway**, D Chen. 2018. The nitrogen footprint for an Australian university: institutional change for corporate sustainability. *Journal of Cleaner Production* 197, 534-541.

Sullivan, TJ, CT Driscoll, CM Beier, D Burtraw, IJ Fernandez, **JN Galloway**, DA Gay, CL Goodale, GE Likens, GM Lovett, SA Watmough. 2018. Long-term monitoring is

essential to effective environmental policy. *Environmental Science & Policy* 84, 69-73

2017 Baker, AR., M Kanakidou, KE Altieri, N Daskalakis, GS Okin, S Myriokefalitakis, F Dentener, M Uematsu, MM Sarin, RA Duce, **JN Galloway**, WC Keene, A Singh, L Zamora, J-F Lamarque, S-C Hsu, SS Rohekar and JM Prospero. 2017. Observation- and model-based estimates of particulate dry nitrogen deposition to the oceans, *Atmos. Chem. Phys. Discuss*. doi:10.5194/acp-2016-1123 17, 8189-8210

Castner, EA, AM Leach, J Andrews, JE Compton, **JN Galloway**. 2017. Comparing the nitrogen footprints of institutions. *Sustainability: the Journal of Record 10, 105-113*

Castner, EA, AM Leach, N. Leary, JS. Baron, JE. Compton, MG Hastings, J Kimiecik, J Lantz-Trissel, E de la Reguera, R Ryals, **JN Galloway**. 2017. The Nitrogen Footprint Network: A multi-institution program to limit nitrogen pollution. *Sustainability: the Journal of Record 10, 79-88*

Compton, JE, AM Leach, EA Castner, **JN Galloway**. 2017. Assessing the social and environmental costs of institutional nitrogen footprints. *Sustainability: the Journal of Record 10, 114-122*

de la Reguera, E, EA Castner, **JN Galloway**, AM Leach, N Leary, J Tang. 2017. Defining system boundaries of an institution nitrogen footprint. *Sustainability: the Journal of Record ß 10, 123-130*

D'Odorico, D., JL Natyzak, EA Castner, KF Davis, KA Emery, JA Gephart, AM Leach, ML Pace, and **JN Galloway**. 2017. Ancient water supports today's energy needs. *Earth's Future* 5 doi.org/10.1002/2017EF000544

Galloway, JN, AM Leach, JW Erisman and A Bleeker. 2017. Nitrogen: The historical progression from ignorance to knowledge, with a view to future solutions. *Soil Research 55, 417-424*

Galloway, JN. 2017. Footprints Make an Impression: an editorial. *Sustainability: the Journal of Record 10, 7-8*

Guo, M., X Chen, Z Bai, R Jiang**, JN Galloway**, AM Leach, LR Cattaneo, O Oenema, L Ma and F Zhang. 2017. How China's nitrogen footprint of food has changed from 1961 to 2010**.** *Environmental Research Letters 12,* 104006

Hutton, M, AM Leach, A Leip, **JN Galloway**, M Bekunda, C Sullivan, JP Lesschen. 2017. Toward a nitrogen footprint calculator for Tanzania. *Environmental Research Letters* 12: 034016

Kanter, DR, JS Wentz, **JN Galloway**, WR Moomaw, W Winiwarter. 2017. Managing a forgotten greenhouse gas under existing US law: An interdisciplinary analysis. *Environmental Science & Policy* 67, 44-51

Leach, AM, **JN Galloway**, EA Castner, J Andrews. 2017. An integrated tool for calculating and reducing institution carbon and nitrogen footprints. *Sustainability: the Journal of Record 10*, 140-148

Natyzak, JL, EA Castner, P D'Odorico, **JN Galloway**. 2017, Virtual water as a metric for institutional sustainability. *Sustainability: The Journal of Record* 10, 237-245

2016 Davis, KF, J Gephart, KA Emery, AM Leach, **JN Galloway**, P D'Odorico. 2016 Meeting future crop demand with current agricultural resources: Required changes in dietary trends and production efficiencies. *Global Environmental Change* 39: 125-132

Galloway JN and AM Leach. 2016. Your feet's too big. *Nature Geosciences 9*, 97-98.

Gephart JA, KF Davis, KA Emery, AM Leach, **JN Galloway**, ML Pace. 2016. The environmental cost of subsistence: optimizing diets to mimize footprints. *Science of the Total Environment 553, 120-127.*

Ju, XT, BJ Gu, YY Wu, **JN Galloway**. 2016. Reducing China's fertilizer use by increasing farm size. *Global Environmental Change-Human and Policy Dimensions* 41, 26-32

Leach AM, KA Emery, J Gephart, K Davis, JW Erisman, A Leip, ML Pace, P D'Odorico, J Carr, L Cattell Noll, E Castner, **JN Galloway**. 2016. Environmental impact food labels combining carbon, nitrogen, and water footprints. *Food Policy.* 61: 213-223.

Liang, X, AM Leach, **JN Galloway**, B Gu, SK Lam, D Chen. 2016. Beef and coal are key drivers of Australia's high nitrogen footprint. *Scientific Reports* 6: 39644

Shibata, H, **JN Galloway**, AM Leach, LR**,** Cattaneo, L Cattell Noll, JW Erisman, B Gu, X Liang, K Hayashi, L Ma, T Dalgaard, M Graversgaard, D Chen, K Nansai, J Shindo, K Matsubae, A Oita, M-C Su, S-I Mishima, A Bleeker. 2017. Nitrogen footprints: Regional realities and global connections for reducing anthropogenic nitrogen losses to the environment. *Ambio* 46: 129-142.

2015 Chen, D, **JN Galloway**, S Greenwood, A Mosier. 2015. A tribute to John Freney. *Environmental Development 14*, 2-3.

Fowler, D, CE Steadman, D Stevenson, M Coyle, RM Rees, UM Skiba, MA Sutton, JN Cape, AJ Dore, M Vieno, D Simpson, S Zaehle, BD Stocker, M Rinaldi, MC Facchini, CR Flechard, E Nemitz, M Twigg, JW Erisman and **JN Galloway**. 2014.

Effects of global change during the 21st century on the nitrogen cycle. *Atmospheric Chemistry and Physics 15*, 1747–1868 .

Galloway JN, TL Theis, OC Doering. 2015. Managing nitrogen pollution in the United States. A success, a challenge and an action plan. *EM 65*, 6–11.

Keene WC, **JN Galloway**, GE Likens, FA Deviney, KN Mikkelsen, JL Moody, JR Maben. 2015. Atmospheric Wet Deposition in Remote Regions: Benchmarks for Environmental Change. *Journal of Atmospheric Sciences* 72, 2947-2978, doi:10.1175/JAS-D-14-0378.

2014 Davidson EA, **JN Galloway**, N Millar, and AM Leach. 2014, N-related greenhouse gases in North America: Innovations for a sustainable future. *Current Opinion in Environmental Sustainability* 9-10, 1-8

Du EZ, W de Vries, **JN Galloway**, XY Hu, JY Fang. 2014. Changes in wet nitrogen deposition in the United States between 1985 and 2012. *Environ. Res. Lett*. 9, 095004 -095012.

Galloway, JN, W Winiwarter, A Leip, AM Leach, A Bleeker4 and JW Erisman. 2014, Nitrogen footprints: past, present and future. *Environ. Res. Lett*. 9, 115003-11514.

Keene WC, JL Moody, **JN Galloway**, JM Prospero, OR Cooper, S Eckhardt, and JR Maben. 2014. Long-term Trends in Aerosol and Precipitation Composition over the Western North Atlantic Ocean at Bermuda. *Atmos. Chem. Phys.*, 14, 8119-8135.

Moody JM, WC Keene, OR Cooper, KJ Voss, R Aryal, S Eckhardt[4], B. Holben, JR Maben, MA Izaguirre, and **JN Galloway**. 2014. Flow climatology for physicochemical properties of dichotomous aerosol over the western North Atlantic Ocean at Bermuda. *Atmos. Chem. Phys.*, 14, 691-717.

Pierer M, W. Winiwarter, AM Leach and **JN Galloway**. 2014. The nitrogen footprint of food products and general consumption patterns in Austria. *Food Policy, 49, 128-136.*

Robison, A. L., T.M. Scanlon, B.J. Cosby, J.R. Webb, and **J.N. Galloway**. 2013. Roles of sulfate adsorption and base cation supply in acidification and recovery of streams of western Virginia, *Biogeochemistry*, Volume 116, Issue 1-3 , pp 119-130.

Shibata, H, LR Cattaneo, AM Leach, **JN Galloway**. 2014. First approach to the Japanese nitrogen footprint model to predict the loss of nitrogen to the environment. *Environ. Res. Lett*. 9, 115013-11521.

Stevens CJ, Leach AM, Dale S, **Galloway JN**. Personal nitrogen footprint tool for the United Kingdom. *Environmental Science: Processes & Impacts* 2014, DOI: 10.1039/c3em00690e.

2013 Erisman JW, **JN Galloway**, S Seitzinger, A Bleeker, NB Dise, R Petrescu, SM Leach, W. De Vries. 2013. Consequences of human modification of the global nitrogen cycle. *Philosophical Transactions B,* 368.1621.

Fowler D, M Coyle, U Skiba, M. Sutton, JN Cape, S. Reis, L Sheppard, A Jenkins, B. Grizetti, **JN Galloway**, P Vitousek, A Leach, L Bouwman, K Butterback-Bahl, F Dentener, D Stevenson, M Amann and M Voss. 2013. The global nitrogen cycle in the 21st century. *Philosophical Transactions B,* 368.1621

Galloway J. N., Leach, A. M., Bleeker, A., Erisman, J. W. A chronology of human understanding of the nitrogen cycle. *Philosophical Transactions B,* 368.1621.

Gu, B, AM Leach, L Ma, **JN Galloway**, SX Chang, Y Ge, J Chang. 2013. Nitrogen footprint in China: Food, energy, and nonfood goods. *Environmental Science & Technology* 47: 9217-9224.

Gu BJ, Chang, J, Min Y, Ge Y, Zhu Q, **Galloway JN**, Peng CH. 2013. The role of industrial nitrogen in the global nitrogen biogeochemical cycle. *Scientific Reports*, 3: 2579

Kanter, DR, DL Mauzerall, AR Ravishankara, JS Daniel, RW Portmann, P Brabiel, WR Moomaw, **JN Galloway**. A post-Kyoto partner: Considering the stratospheric ozone regime as a tool to manage nitrous oxide. *Proc. National Acad. Sci*. www.pnas.org/cgi/doi/10.1073/pnas.1222231110.

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Leach AM, AN Majidi, **JN Galloway**, AJ Greene. 2013. Towards institutional sustainability: A nitrogen footprint model for a university. *Sustainability: The Journal of Record, 6, 211 – 219.* DOI:10.1089/sus.2013.9852.

Previdi, M, BG Liepert, D Peteet, J Hansen, DJ Beerling, AJ Broccoli, S Frolking, **JN Galloway**, M Heimann, C Le Quéré, S Levitus, and V Ramaswamy. Climate Sensitivity in the Anthropocene. *Quarterly Journal of the Royal Meteorological Society,* 674, 1121-1131.

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2012 Davidson, EA, MB David, **JN Galloway**, CL Goodale, R. Haeuber, JA Harrison, RW Howarth, DB Jaynes, RR Lowrance, BT Nolan, JL Peel, RW Pinder, E Porter, CS Snyder, AR Townsend, and MH Ward. 2012. Excess nitrogen in the U.S. environment: trends, risks, and solutions. *Issues in Ecology* 15, 1-16

Erisman, JW, **J Galloway**, S Seitzinger, A. Bleeker, and D. Butterbach-Bahl. Reactive nitrogen in the environment and its effect on climate change. *Current Opinions in Environmental Sustainability,* 3, 281–290.

Leach, AM**, J. N. Galloway**, A. Bleeker, J. W. Erisman, R. Kohn, J. Kitzes. A nitrogen footprint model to help consumers understand their role in nitrogen losses to the

environment. *Environmental Development* 1, 40-66. (*Note: in January 2013, this paper was awarded Best Research Paper of 2012 by the journal's editorial board*).

2011 Bleeker, A, K Hicks, F Dentener, **J. Galloway**. N deposition as a threat to the World's protected areas under the Convention on Biological Diversity. Environmental Pollution. *Environmental Pollution* 159, 2280-2288.

Driscoll, CT, EB Cowling, P Grennfelt, **J Galloway**, R Dennis. 2011. Integrated Assessment of Ecosystem effects of atmospheric deposition. Environmental Manager Journal 22, 6 – 13.

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2010 Bobbink, R., K. Hicks, J. Galloway, T. Spranger, R. Alkemade, M. Ashmore, M. Bustamante, S. Cinderby, E. Davidson, F. Dentener, B. Emmett, J. W. Erisman, M. Fenn, F. Gilliam, A. Nordin, L. Pardo and W. de Vries. 2010. Global Assessment of Nitrogen Deposition Effects on Terrestrial Plant Diversity: a synthesis. *Ecological Applications* 20, 30-59.

Butchart, SHM and 45 others, 2010. Global Biodiversity: Indicators of Recent Declines. *Science* 328, 1164-1168.

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2009 Duce, RA, JN Galloway, PS Liss. The impacts of atmospheric deposition to the ocean on marine ecosystems and climate. *WMO Bulletin* 58, 61-66.

2008 Duce, RA, J. LaRoche, K. Altieri, KR Arrigo, AR Baker, DG Capone, S. Cornell, F. Dentener, **J. Galloway**, RS Ganeshram, RJ Geider, T. Jickells, MM Kuypers, R. Langlois, PS Liss, SM Liu, JJ Middelburg, CM Moore, S. Nickovic, A. Oschlies, T. Pedersen, J. Prospero, R. Schlitzer, S. Seitzinger, LL Sorensen, M. Uematsu, O. Ulloa, M. Voss, B. Ward, L. Zamora. Impacts of atmospheric nitrogen on the open ocean. *Science* 320, 893-897.

Erisman, J. W., M. S. Sutton, **J. N. Galloway,** Z. Klimont, W. Winiwarter. A century of ammonia synthesis. *Nature Geosciences*, 1, 1-4; doi:10.1038/ngeo325.

Galloway, J, N Raghuram and YP Abrol. A persective on reactive nitrogen in a global, Asian and Indian context. *Current Science* 94, 1-7.

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Galloway, JN, FJ Dentener, E. Marmer, Z. Cai, YP Abrol, VK Dadhwal, AV Murugan.The environmental reach of Asia. *Annual Reviews*, 33: 461-481.

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Books, Book Chapters, Book Reviews, Posters

2019 Read QD, JA Gephart, AD Cuellar, S Finn, E Meyer, KA Weitz, JN Galloway, L Marston, SBrown, MK Muth. How much do proposed interventions to reduce food loss and waste benefit the environment, climate, and biodiversity? Presentation by Q. Read at 2019 ESA Annual Meeting Louisville KY, August 11—16

Riscassi AL, TM Scanlon, JN Galloway. The Shenandoah Watershed Study-Virginia Trout Stream Sensitivity Study (SWAS-VTSSS): 40 years of stream monitoring and

research in mid-Appalachian headwater catchment. Presentation by A. Riscassi at AGU Fall Meeting, December 2019

2013 Ciais P, Sabine C, Bala G, Bopp L, Brovkin V, Canadell J, Chhabra A, DeFries R, **Galloway J**, Heimann M, *et al*.: 2013: Carbon and Other Biogeochemical Cycles. In*: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Edited by Stocker TF, Qin D, Plattner G-K, Tignor M, Allen SK, Boschung J, Nauels A, Xia Y, Bex V and Midgley PM. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA: 2013:465 - 570.

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2012 Bleeker, A, AM Leach, **JN Galloway**, JW Erisman. 2012. How changing consumption patterns can change the loss of reactive nitrogen to the environment. Poster, Planet Under Pressure Conference, London, UK, 26-29 March

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2011 Leach, AM, AN Majidi, **JN Galloway**, AJ Greene. 2011. University of Virginia nitrogen footprint model. Poster, Association for the Advancement of Sustainability in Higher Education) 2011 Conference, Pittsburgh, PA. 9-12 October.

2010 **Galloway, JN**, F Dentener, M Burke, E Dumont, AF Bouwman, RA Kohn, HA Money, S Seitzinger, C Kroeze. 2010. The impact of animal production systems on the nitrogen cycle. Chapter 6 in, *Livestock in a Changing Landscape.* Eds, H. Steinfeld, H Mooney, F Schneider, L Neville. Island Press.

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2007 **Galloway, J,** . Erisman, A Townsend, E Davidson, M Bekunda, Z Cai, J Freney, L Martinelli, S Seitzinger, and M Sutton. Human alteration of the nitrogen cycle: threats, benefits, and opportunities. UNESCO-SCOPE Policy Brief—No. 4, Paris

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2002 **Galloway, JN,** EB Cowling, JW Erisman, J Wisniewski, C Jordan. Optimizing nitrogen management in food and energy production and environmental protection. Contributed papers from the Second International Nitrogen Conference. 14 – 18 October, Potomac, MD, (Maryland USA)., Co-published by Balkema Publishers & The Scientific World.

2000 Cowling, EB, **JN Galloway**, JW Erisman, Optimizing nitrogen management in North America, Europe, and Asia. In: *Agriculture of the New Century: Managing Bio-Resources and Bio-Diversity* conference proceedings, National Taiwan University, Taipei, Taiwan.

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1998 **Galloway, JN**, and J Melillo, editors, *Asian Change in the Context of Global Climate Change.* New York, NY: Cambridge University Press.

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1993 Liss, PS, and **JN Galloway.** Air-sea exchange of sulphur and nitrogen and their interactions in the marine atmosphere. In: R Wollast, FT Mackenzie, L Chou, editors. *Interactions of C, N, P and S Biogeochemical Cycles and Global Change.*NATO ASI Series I, Vol. 4, New York, NY: Springer-Verlag. pp 259-281.

1992 Panel on Global Climate Change Sciences in China (**JN Galloway**, Chairman), *China and Global Change: Opportunities for Collaboration*, National Research Council.Washington, DC: National Academy Press.

1991 Cosby, BJ, PF Ryan, JR Webb, GM Hornberger, **JN Galloway.** Mountains of western virginia, In: DF Charles, editor. *Acid Deposition and Aquatic Ecosystems: Regional Case Studies*. New York, NY: , Spinger-Verlag. pp 297-318.

1990 **Galloway, JN.** The intercontinental transport of sulfur and nitrogen, Chapter 4. In: AH Knap and MS Kaiser, editors. *The Long-Range Atmospheric Transport of Natural and Contaminant Substances.*NATO ASI Series C, Vol. 297, Dordrecht, The Netherlands: Kluwer. pp 87-104.

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1988 Davis, RB, DS Anderson, DF Charles, **JN Galloway.** Two-hundred year pH history of Woods, Sagamore and Panther Lakes in the Adirondack Mountains, New York state.In: WJ Adams, GA Chapman, and WG Landis, editors. *Aquatic Toxicology and Hazard Assessment.*Vol. 10. ASTM STP 97. Philadelphia, PA: American Society for Testing and Materials. pp 89-111.

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Rodhe, H, E Cowling, I Galbally, **J Galloway,** R Herrera. Acidification and regional air pollution in the tropics, Chapter 1. In: H Rodhe and R Herrera, editors. *Acidification in Tropical Countries.* Scope 36. New York, NY: Wylie.

Weathers, KC, GE Likens, FH Bormann, JS Eaton, KD Kimball, **JN Galloway**, TG Siccama, D Smiley. Chemical concentrations in cloud water from four sites in the eastern United States. In: MH Unsworth and D Fowler. *Acid Deposition at High Elevation Sites.* , Dordrecht, The Netherlands: Kluwer. pp 345-357.

1986 **Galloway, JN**, TM Church, AH Knap, DM Whelpdale. The Western Atlantic Ocean Experiment (WATOX): The export, deposition, and fate of North American emissions to the Western Atlantic Ocean, Chapter 4. In: RW Johnson, GE Gordon, AZ Elzerman, W Calkins, editors. *Chemistry of Acid Rain.* edited by ACS Special Sympos.,Vol. 349. Washington, DC: American Chemical Society. pp. 39-55.

1985 **Galloway, JN.** The deposition of sulfur and nitrogen from the remote atmosphere: Background paper, Chapter 8. In: **JN Galloway**, RJ Charlson, MO Andreae, H Rodhe, editors.*Biogeochemical Cycling of Sulfur and Nitrogen in theRemote Atmosphere.* ,NATO ASI Series C, Vol.159. Dordrecht, Tthe Netherlands: Reidel. pp 143-175.

Galloway, JN, RJ Charlson, MO Andreae, H Rodhe, editors. *The Biogeochemical Cycling of Sulfur and Nitrogen in the Remote Atmosphere*. NATO ASI Series C, Vol.159. Dordrecht, The Netherlands: Reidel.

Prospero, JM, W C Keene, **J N Galloway**, R J Delmas, L Granat, G Gravenhorst, GE Likens. The deposition of sulfur and nitrogen from the remote troposphere: Working group report, Chapter 9. In: **JN Galloway**, RJ Charlson, MO Andreae, H Rodhe, editors.

*Biogeochemical Cycling of Sulfur and Nitrogen in the Remote Atmosphere.*NATO ASI Series C, Vol.159. Dordrecht, The Netherlands: Reidel. pp 176-200.

1980 **Galloway, JN.** Regional-scale studies of atmospheric deposition effects: Overview. In: DS Shriner, CR Richmond, SE Lindberg, editors. *Atmospheric Sulfur Deposition: Environmental Impact on Health Effects.*Ann Arbor, MI: Ann Arbor Science.

Galloway, JN, and GG Parker. Difficulties in measuring wet and dry deposition on forest canopies and soil surfaces, In: TC Hutchinson and M Havas, editors. *Effects of Acid Precipitation on Terrestrial Ecosystems.* , NATO ASI Series I, Vol. 4. New York, NY: Plenum.

CURRENT RESEARCH

- 1979-2022
  Shenandoah Watershed Study, National Park Service
- 1984-2022
  National Trends Network, U.S. Geological Survey (with W. Keene; T. Scanlon)
- 1992-2022
  Long-term drivers, state change, and disturbance on the Virginia Coast Reserve
  National Science Foundation, co-PI with numerous others

EXPERT TESTIMONY, OFFICIAL BRIEFINGS, INVITED LECTURES

2021 Invited Seminar. International Forum on Advanced Environmental Sciences and Technology (iFAST), *NitrogenOut of the Bottle: The Challenge of Managing the Genie,* January 27

Invited Presentation, National Academies of Science, Engineering and Medicine; *Addressing Reactive Nitrogen in Agriculture*. June 28

2020 Invited Seminar. *Human impacts on the global nitrogen cycle and nitrogen in the Coastal Zone: The Good, The Bad and The Ugly.* Environmental Issues and Challenges in the 21st Century. Marine Biological Laboratory (virtual) with J. Lloret and K. Foreman, December 1

2019 External Reviewer, Environmental Science and Policy Program, College of Willian and Mary, Jan 27 – 29.

Ran 6th Nitrogen Footprint Tool Workshop; University of New Hampshire. 35 attendees August 5-8.

Presented, *Nitrogen footprints, past, present and future;* Semester in Environmental Sciences, Marine Biological Laboratory, 23 October.

2018 Presented, *Nitrogen, the World and UVA*; Marine Society, University of Virginia. 19 February.

Organized 5th Nitrogen Footprint Tool Workshop; Open Grounds, University of Virginia. 35 attendees from four countries; June 18-20

Organized 2nd Integrated Nutrient Management Study – N-Print Workshop; Odum Room, University of Virginia. 8 attendees from 4 countries; June 14-16.

Presented, *Nitrogen Management Opportunities*, National Press Club, Purdue University/Mellon Foundation/USDA-NIFA event on the Long Run Sustainability of US Agriculture, September 16.

Presented, *The Challenge of Managing the Genie*; Westminster-Canterbury of the Blue Ridge; October 18.

Presented, *The Nitrogen Footprint Network*; UVA's Sustainability Summit, Rotunda, October 28.

Presented, Galloway JN, AM Leach, JW Erisman, A Bleeker. *Nitrogen: Cascading Through Time*, AGU Annual Meeting, Dec 10 – 13.

Presented, *The Nitrogen Footprint Concept Tools for Nitrogen Management*, at the Nitrogen Workshop, Lisbon Portugal, November 15 (via video link).

2017 Organizer, 4th Nitrogen Footprint Tool Workshop, University of Virginia. 35 attendees from four countries, June 6-8

Organizer, 1st Integrated Nutrient Management Study – N-Print Workshop; Odum Room, University of Virginia. 8 attendees from 4 countries, June 8-9

Presenter, SESYNC Workshop on Food Waste & the Environment. Annapolis MD. Presentation on the Environmental and Ecological Impacts of Food Waste, November 1-2

2016 Organizer, Symposium on Limiting our Planetary Nitrogen Footprint. AAAS Annual Meeting, Washington DC. February 13.

Invited seminar, *Nitrogen Out of the Bottle: The Challenge of Managing the Genie*. Natural Resource Ecology Laboratory, Colorado State University. March 4.

Keynote Lecture, *Virginia's Mountain Streams: Sentinels of Change*. Awards Ceremony Virginia Museum of Natural History, Waynesboro VA. March 24.

Invited Lecture, *Global and Local Importance of Macronutrients Cycles*. Macronutrient Cycles Symposium, Royal Society of London, London, UK. June 15.

Introductory Lecture, *Nitrogen Footprint Tool Overview.* NFT Network Workshop, University of New Hampshire, June 20.

Invited Panelist, *Stemming the Tide of Ocean Pollution.* Our Ocean Conference, US State Department, Washington DC, September 16.

Poster presentation, *Meeting a Nitrogen Footprint Reduction Goal: A Case Study at the University of Virginia*. Annual Meeting, Association for the Advancement of Sustainability in Higher Education, Baltimore MD, October 10

Panel Presentation, *Combining carbon and nitrogen footprints: A new tool for a more comprehensive approach to environmental management on campuses*. Annual Meeting, Association for the Advancement of Sustainability in Higher Education, Baltimore MD, October 11

Invited seminar, *Nitrogen Out of the Bottle: The Challenge of Managing the Genie*. EPA Atlantic Ecology Laboratory. Narragansett, RI. October 27

Workshop Presentation. *Overview of N footprint model development*. Workshop on Integrating N and P Footprint approaches. McGill University, Montreal, Canada, November 15.

Invited lecture, *The global nitrogen cycle and anthropogenic effects.* Symposium on Nitrogen, Nitrogen Footprints and their ManagementLeader, McGill University, Montreal, Canada, November 16.

Invited lecture, *N footprint history.* Workshop on Nitrogen Footprints, University of Melbourne, Australia, December 2.

Invited lecture, *N-Print and INMS Partnership.* Workshop on Integrated Nitrogen Management Strategy. Melbourne, Australia. December 3.

Keynote Address, *Nitrogen: the historical progression from ignorance to knowledge, with a view to future solutions.* 7th International Nitrogen Conference, Melbourne, Australia, December 4.

2015 Invited presentation, *Beyond Carbon: Creating and Tracking a Nitrogen Footprint (*with Lia Cattaneo), Greater Virginia Green Building Council, Charlottesville VA. February 10.

Invited seminar, *Creating and Tracking a Nitrogen Footprint.* Undergraduate Seminar, University of Virginia. February 17.

Invited plenary lecture (given remotely), *Overview of global N issues and the need for N-footprint tools*. International workshop of Nitrogen Footprint: Local Reality and Global Connection. Hokkaido University Japan. March 16.

Invited panelist, Sustainable Food for the 21st Century - Blue Ribbon Panel Meeting. World Wildlife Fund, Washington DC. May 11 – 13.

Leader, Annual Workshop of the Nitrogen Footprint Tool Network. Brown University, June 22 – 24

Moderator, Ecosystem Science Panel at Celebration of Discovery Symposium. Marine Biological Laboratory, July 11.

Invited seminar, *Nitrogen Out of the Bottle: The Challenge of Managing the Genie*. Civil and Environmental Engineering, University of Virginia. October 23.

Invited seminar, *Nitrogen Out of the Bottle: The Challenge of Managing the Genie*. School of Engineering and Applied Sciences, Earth Systems Science Department, Stanford University. November 11.

2014 Invited presentation, *AMoN Overview*, Ammonia Workshop, Brown University, March 7

Keynote Address, *Sustainability in a Global Environment: Have You Considered Your Nitrogen Footprint?*, at 2014 DEQ Environmental Excellence Conference, Richmond VA, March 11.

Invited seminar, *Nitrogen out of the Bottle: The Challenge of Managing the Genie*, Harvard University, April 4

Invited seminar, *Nitrogen Out of the Bottle: The Challenge of Managing the Genie*. School of Engineering and Applied Sciences, Harvard University. April 4.

Invited discussion. *Changing the Fertilizer Game*. Virtual Fertilizer Research Center. Cosmos Club, Washington DC, June 11.

Invited presentation, *The Future of Nr Formation and Use.* EPA-USDA-USGS Working meeting on Management Strategies for Reactive Nitrogen and Co-Pollutants. Washington DC. June 24.

Invited lecture, *Climate Change Assessments: National to Global.* Blue Ridge Chapter of United Nations Association, Charlottesville. September 21.

Invited lecture, *Nitrogen Footprints: Tools for People, Institutions and Decision-Makers.* Joint presentation with Allison Leach and Laura Cattell Noll. National Institute of Food and Agriculture, USDA. Washington DC. September 25.

Hosted workshop and gave presentation, *Implementing the Nitrogen Footprint Tool: A Workshop for Universities*, University of Virginia. November 12 – 14.

2013 Conference Attendee: Fourth Lead Author Meeting, Working Group 1, AR5, IPCC. Australia, January 13-17.

Invited Lecture: *A Chronology of Human Understanding of the Nitrogen Cycle.* Greencycles Training Workshop IV: Nitrogen in the Earth System. Via video link. Jena, Germany, February 25.

Invited Lecture: *The Anthropogenic Nitrogen Cascade*. Via video link. Greencycles Training Workshop IV: Nitrogen in the Earth System. Jena, Germany, February 26.

Workshop, Building a Better Bay Model, University of Maryland, May 22-23.

Invited lecture, *Nitrogen out of the Bottle: The Successes of Managing the Genie*, Workshop on Nitrogen, Why is so Little Happening? Saltsjöbaden, Sweden, by video-link, June 25

Invited sermon, St. Paul's Memorial Church, September 8

Briefing (with AM Leach), BOV Buildings and Grounds Committee concerning nitrogen footprint goal for UVA, September 19

Invited seminar, *Nitrogen out of the Bottle: The Challenge of Managing the Genie*. University of New Hampshire, October 21.

Plenary lecture, *Nitrogen Footprints: Past, Present and Future.* Sixth International Nitrogen Conference, Kampala Uganda, November 18 – 22.

2012 Invited Lecture (with Allison Leach): *What is Your Nitrogen Footprint?* Washington State University, March 5.

Invited Lecture: T*he Nitrogen Dilemma: Do We Feed the World or Protect the Environment?* Whittier College, March 7.

Session Organizer (with JW Erisman): "Nitrogen: Too Much of a Good Thing" held at the Planet Under Pressure Conference, London UK. March 26.

Invited Presentation (given by A. Leach): *Analysis of international trade of reactive nitrogen as food and fertilizer.* A. Leach, J. Galloway, J. Kitzes, JW Erisman, A Bleeker. Session on "Nitrogen: Too Much of a Good Thing" held at the Planet Under Pressure Conference, London UK. March 26.

Invited Lecture: T*he Nitrogen Dilemma: Do We Feed the World or Protect the Environment?* Whittier College, March 7.

Conference Attendee: Third Lead Author Meeting, Working Group 1, AR5, IPCC. Morocco 4/16-20.

Workshop, Coordinating Lead Authors: National Climate Assessment, Washington, DC, June 24-26.

Invited Paper: Nitrogen, Pushing the Limits. Gordon Research Conference on Environmental Sciences: Water. Holderness School, NH. June 24-28.

Invited Lecture: *The International Nitrogen Initiative*. Via video link. Workshop on Nitrogen-sustainable food systems in Uganda, Kampala, November 27.

Invited Paper: Nitrogen Out of the Bottle: the Challenge of Managing the Genie. Session on Reactive Nitrogen at the Intersection of Climate Change, Air Quality, Ecosystem Sustainability, and Policy, 2012 AGU Annual Meeting, San Francisco, December.

2011 Invited Lecture: The Nitrogen Dilemma of the United States. Special session, Global and Local Responses to the Nitrogen Challenge: Science, Practice and Policy at Annual

Meeting of American Association for the Advancement of Science, Washington DC, February 19.

Keynote Lecture: Nitrogen: A Story of Food, Feed and Fuel. Workshop on The Nitrogen Cycle, Environmental Chemistry Group Royal Society of Chemistry, London, March 9.

Keynote Lecture: Nitrogen, Feed the World or Protect the Environment. 68th Annual Meeting of the National Institute of Science & BKX, March 23.

Keynote Lecture: Human Alteration of the Nitrogen Cycle. Conference on Nitrogen and Global Change. Edinburgh Scotland, April 12.

Invited Lecture: The Nitrogen Footprint of the United States, (with Allison Leach), Chesapeake Bay Foundation, Annapolis MD, May 19.

Invited Lecture (with Allison Leach): *The Nitrogen Footprint of the United States*. World Resources Institute September 28

Invited Workshop*: IPCC workshop on Nitrogen and Climate***,** Amsterdam, October 28-November 1

Invited Briefing: *Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options.* EPA Office of Air and Radiation. November 15.

Invited Briefing: *Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options.* US Department of Agriculture November 15.

Invited Briefing: *Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options.* EPA Office of Water. November 16.

Invited Briefing: *Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options.* EPA Office of Policy. November 16.

Invited Briefing: *Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options.* EPA Office of Research and Development. November 17.

Invited Briefing: *Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options.* Environmental Defense Fund. November 17.

Workshop Organizer (with A. Leach and JW Erisman): *N-PRINT Workshop-Developing Nitrogen Calculators for Europe*. The Royal Institution of Great Britain, London UK. December 3-4.

Invited Lecture: *A chronology of human understanding of the nitrogen cycle 1700 – 2000*. The Global Nitrogen Cycle Conference. Royal Society, UK. London. December 5-6.

Invited Lecture: *International trade of nitrogen.* Policy Meeting on What would a global policy to regulate human use of fixed nitrogen look like? The Kavli Royal Society International Centre, Chicheley Hall, Buckinghamshire UK. December 7-8.

2010 Invited Seminar: Nitrogen, A Story of Food, Fuel and Fiber. Old Dominion University, February 18.

Invited Presentation: *Nitrogen, A Story of Food, Fuel and Carbon*. Workshop on Climate Sensitivity Extremes: Assessing the Risk. Lamont-Daughery Laboratory. Columbia University, April 27.

Invited Public Lecture: *The Nitrogen Dilemma: Feed the World or Protect the Environment*. Bermuda Institute of Ocean Sciences, April 22.

Invited Seminar: *Nitrogen, A Story of Food, Fuel and Carbon*. Workshop on Climate Sensitivity Extremes: Assessing the Risk. Lamont-Douerty Laboratory. Columbia University, April 27.

Invited Seminar: *Nitrogen, A Story of Food, Feed and Fuel*. Atmospheric and Ocean Sciences, University of Maryland, May 6.

Invited Seminar: *Nitrogen, A Story of Food, Feed and Fuel*. Environmental Geology and Geochemistry Seminar, Geosciences Department, Princeton University, May 20.

Invited Lecture: *Nitrogen Change and Climate Change*. Workshop to Discuss Interacting Effects of Climate and Nitrogen on Ecosystems and their Services Arlington VA, October 12.

Invited Lecture: *Nitrogen Change and Climate Change*. AMS Briefing on Nitrogen and Climate. Senate Office Building, Washington DC, November 19

2009. Keynote Speaker: *Nitrogen, A Story of Food, Fuel and Fiber*. Workshop on Managing Nitrogen sponsored by the Association of Environmental Engineering and Science Professors, University of Iowa, July 27.

Invited Public Lecture: *Nitrogen Dilemma—Cascading Through our Lives*. Stewardship of the Planet Series, West Falmouth Meeting of the Society of Friends, August 9.

Invited Presentation: *Nitrogen, A Story of Food, Fuel and Fiber*. Nitrogen Symposium. Agouron Institute, October 14-19.

Invited Seminar, *Nitrogen: a Story of Food, Fiber and Fuel.* Environmental Change Initiative, Brown University, February Invited, Harold S. Johnston Seminar, *Nitrogen: A Story of Food, Fuel and Fiber,* University of California at Berkeley, May

Invited, James R. Arnold Lecture, *Nitrogen: A Story of Food, Fuel and Fiber,* University of California at San Diego, May

2008. Invited Lecture, *Nitrogen, Cascading Through our Lives*. Tyler Prize Lecture, University of Southern California, April.

Invited Presentation, *The Nitrogen Cascade*. Fellows Symposium, AGU Spring Meeting, May.

Keynote Lecture, *From Black Flies to Global Change.* Centennial Celebration at University of Michigan's Biological Station, August.

Invited Lecture, *Nitrogen: a Story of Food, Fiber and Fuel.* Ocean Explorium at New Bedford Seaport, October.

Invited Seminar, *Nitrogen: a Story of Food, Fiber and Fuel.* The Ecosystems Center, Marine Biological Station, November.

Invited Seminar, *Human Alteration of the Nitrogen Cycle: Consequences and Responses.* Coastal Ocean Institute & Biology Department, Woods Hole Oceanographic Institution, December.

Invited Presentation, *Nitrogen Cascade: An Opportunity to Integrate Biogeochemisty and Policy*. Co-authors, W. Moomaw and T. Theis. AGU Annual Meeting, December.

Invited Presentation, *Food, Feed and Fuel: A Story about Nitrogen.* Co-authors, M. Burke, H. Mooney, H. Steinfeld. AGU Annual Meeting, December.

2007 Invited speaker, *Links between Atmospheric Deposition and Streamwater Chemisttry.* NPS Eastern Rivers Summit, Shepherdstown, WV, February

Invited seminar, *All About Nitrogen: Goldilocks and the Three Bears*. Horn Point Marine Laboratory, MD, April

2006 Keynote speaker, *World N Production: A Historical Perspective and Future Projections,* Airy Symposium "Visions for Animal Agriculture and the Environment." Kansas City, Missouri, January

Co-organizer and presenter, *Nitrogen and Society: Results of Preliminary Scientific Assessments.* Nitrogen Policy Workshop. UNEP, France, March

Invited speaker, *Nitrogen: An Essential Ingredient for Life and Food*. American Meteorological Society Environmental Science Seminar Series, Human Alteration of the Nitrogen Cycle: Implications for Plant Growth, Food Supply, Climate, Water Quality, and Human Health. Russell Senate Office Building, Washington, DC, March

Invited speaker, *Nitrogen Biogeochemistry in Intensive Animal Production Systems.* Workshop on Livestock in a Changing Landscape—Drivers, Consequences and Responses. UNFAO, Italy, March

Local organizer, International Air Pollution Workshop. Boar's Head Inn, Charlottesville, VA, April

Invited speaker, *Biogeochemical Perspective on Critical Loads – Linkages between Emissions, Deposition, and Biogeochemical cycles*. Multi-Agency Critical Loads Workshop on Sulfur & Nitrogen Deposition Effects on Freshwater and Terrestrial Ecosystems, University of Virginia, Charlottesville, May

Invited speaker, *Workshop on Anthropogenic Nitrogen Impacts on the Open Ocean*; The Global Nitrogen Cycle: History, Fluxes, Future, University of East Anglia, November

2005 Invited participant, XII SCOPE General Assembly. New Delhi, India, February

Chair, Case Studies, Consequences of Industrialized Animal Production Systems Workshop. Stanford University, March

Briefing, State Department. International Nitrogen Initiative, June

Invited speaker, *Nitrogen Mobilization in Asia: Magnitude and Consequences* Symposium on Ecological Impacts of Asia on Global Sustainability at MultipleScales, August

ESA/INTECOL Meeting. Montreal, Canada, August

Invited speaker, *Human Alteration of the Nitrogen Cycle: the Good and the Bad*, Symposium on Nitrogen and Human Health. ASA-CSSA-SSSA Annual Meeting, Salt Lake City, UT, November

Invited participant, AIMES/IGBP Science Committee Annual Meeting, Boulder, CO, November

2004 Working Group leader, Workshop on the Nitrogen Fertilizer Rapid Assessment Project. Kampala, Uganda, January

Invited seminar, *Human Alteration of the Global Nitrogen Cycle: Current Science and Future Policy.* Duke University, Durham, NC, March

Banquet speaker, Workshop on Advanced Approaches to Quantify Denitrification. Woods Hole, MA, May

Invited presentation, *Background, current status and the African context of the International Nitrogen Initiative*. Presentation at the Symposium on Improving Human Welfare and Environmental Conservation by Empowering Farmers to

Combat Soil Fertility Degradation. Yaoundé, Cameroon, May (presentation given by M. Bekunda)

Keynote speaker, Third International Nitrogen Conference. Nanjing, China, October

Co-Organizer and speaker, Virginia Mountain Streams Symposium. Charlottesville, VA, October

Invited participant, Consequences of Industrialized Animal Production Systems Workshop. Stanford University, November

Invited speaker, *Anthropogenic nitrogen mobilization: Drivers, consequences and opportunities for action.* Presented at the Symposium on Bio-atmospheric N Cycle, Fall American Geophysical Meeting, San Francisco, CA, December

2003 Invited presentation, *Global Nitrogen Cycle*, Collaborative Large-scale Engineering Assessment Network for Environmental Research Workshop. Duke University, February

Invited participant, *SCOPE Workshop on Nitrogen Fertilizer Use.* Paris, France, April

Hosted Workshop on *International Nitrogen Initiative*, The Hague, The Netherlands, May

Invited participant at SCOPE General Assembly. Granada, Spain, June

Moderator, *Tracking Nutrient Enrichment of Water Resources in the 21st Century: Challenges and Opportunities for Information Management at the National Level*. A Plenary Session of the Universities Council on Water Resources Annual Conference. Washington, DC, August

Invited participant, *SCOPE Workshop on Industrial Animal Production Systems.* Stanford University, September

Invited participant, *SCOPE/UNEP GEO-2003 Workshop,* Paris, October

Invited seminar, *Human Alteration of the Global Nitrogen Cycle: Past, Present and Future.* University of Maryland (Appalachian Environmental Laboratory), March

Invited seminar, *Human Alteration of the Global Nitrogen Cycle: Current Science and Future Policy*. Cornell University, March

Invited seminar, *Contributions of Coastal and Marine Ecosystems to the Global Atmospheric Nitrogen Budget.* Institute of Meteorology, University of Stockholm, Sweden, May.

Invited lecture, *Nitrogen and Society: Benefits and Problems.* Royal Swedish Academy of Sciences, Sweden, May

Invited lecture, *Overview of Nitrogen in the Environment*, Symposium on Impact of Animal Feeding Operations on the Environment. Annual Joint Meeting of the American Society of Animal Science and the American Dairy Science Association, Phoenix, June

Poster presentation, EW Boyer, RW Howarth, JN Galloway. *Riverine Nitrogen Export from the World's Watersheds*. Esturarine Research Federation Meeting, September

Invited presentation, *Nitrogen deposition: Effects of ammonia*. The Ammonia Workshop, Washington, DC, October

Poster presentation (by second author), J Galloway,M Bekunda, K Syers, A Mosier. *The International Nitrogen Initiative: Background, Current Status, and Likely Future Directions*. Sixth African Crop Science Conference in Nairobi, Kenya, October

Poster presentation, JN Galloway, and D Sahagian. *A coordinated approach to investigating human perturbations to the nitrogen cycle*. American Geophysical Union Annual Meeting, San Francisco, CA, December

2002 Invited Presentation, *Nitrogen and the World.* Fertilizer Marketing Annual Meeting, Orlando, Florida, February

Invited Seminar,*Human Alteration of the Global Nitrogen Cycle: Past, Present and Future*. Dept of Biological Sciences, University of Southern California, CA, March

Invited Seminar, *Human Alteration of the Global Nitrogen Cycle: Past, Present and Future*. Wrigley Institute of Marine Sciences, Catalina Island, University of Southern California, March

Poster Presentation, *The Shenandoah Watershed Study: 20 Years of Catchment Hydrogeochemistry.* American Geophysical Union (AGU) Spring Meeting, Washington, DC, May

Invited Seminar, The 2nd International Nitrogen Conference—*How human activities affect the nitrogen cycle.* Science and Technology Consortium Seminar, NRCS/USDA, May

Co-Organizer, Workshop on "*Nitrogen Management for Food Security and Ecosystem Security,*" Science Forum of the World Summit on Sustainable Development, Johannesburg, South Africa, August (did not attend)

Plenary Address, *Consequences of Nitrogen Mobilization and Redistribution.* Joint CACGP/IGAC2002 International Symposium, Crete, Greece, September.

Invited Workshop, *Inter-Element Interactions, a SCOPE Rapid Response Workshop.* Prague, Czech Republic, October

Invited Seminar, *Human Alteration of the Global Nitrogen Cycle: Past, Present and Future.* Institute for Ecosystem Studies, Millbrook, NY, October

Invited Seminar, *Human Alteration of the Global Nitrogen Cycle: Past, Present and Future.* University of New Hampshire, Durham, NH, October

2001 Invited Speaker, *The Global N Story*, Spring AGU Meeting, Boston,MA

Invited Speaker, *Acid Rain Linkages – Ozone, Mercury, Particulate Matter, and Climate Change*. "Acid Rain: Are the Problems Solved?" Conference, Washington, DC

Seminar, *The Global N Cycle: Past, Present, and Future.* Center for Marine Science, University of North Carolina, Wilmington

Seminar, *The Global N Cycle: Past, Present, and Future.* Geophysical Fluid Dynamics Laboratory, Princeton, NJ

2000 Invited Speaker, *The Global Nitrogen Cycle: Atmosphere-Ocean Exchange*. Ocean Sciences Meeting, AGU/ASLO, San Antonio, TX

Invited Speaker, *The Year 1000: What Life was Like at the Turn of the First Millennium.* Great Ideas Lecture Series, University of Virginia, Charlottesville

Invited Speaker, *Human Alteration of the Nitrogen Cycle*. Council of Visitors, Marine Biological Laboratory, Woods Hole, Massachusetts

Keynote Speaker, *Acid Rain, Past, Present, and Future*. National Atmospheric Deposition Program, Saratoga Springs, NY

Invited Speaker, *Effects of Ammonium on Terrestrial Ecosystems*. Shared Resources Workshop, Delaware

Plenary Speaker, *Acid Rain, Nature, and Humans*. Sixth International Acid Rain Conference, Tsukuba, Japan

Invited Speaker, *Sulfur and Nitrogen Cycling at the Regional Scale*. Sixth International Acid Rain Conference, Tsukuba, Japan

1999 Invited Plenary Lecture, *Historical Perspective on Research*. Workshop on Atmospheric Deposition: The Ecological Response, Washington, DC

Invited Speaker, *Symposium on Watershed and Landscape Ecology: Future Directions and Opportunities*. Frostburg, MD

Invited Speaker, *Biogeochemistry at the Watershed Scale*. Shenandoah Watershed Study Seminar, University of Virginia, Department of Environmental Sciences

Featured Speaker, *The Grand Experiment: The Alteration of an Environment by a Clever Animal.* University of Mary's Earth Day Convocation

Presenter, Congressional Staff Briefing on Air Quality, Washington, DC

Presenter, Congressional Staff Briefing on Acid Rain, Washington, DC

Invited Speaker, *The Global N Cycle: Past, Present, and Future*, paper presented at the workshop Critical Effects of Nitrogen Deposition and Ozone on Ecosystems. Institute Of Botany, University Of Basel, Basel, Switzerland

Invited Speaker, *The Global Nitrogen Cycle: Current Status and Future Needs*. Meeting of the Ecological Society of America, Spokane, WA

Invited Speaker, *Earth To Air To Water: The Changing Influence of Atmospheric Deposition on Aquatic Ecosystems*, invited paper presented at the American Society of Limnology and Oceanography, Santa Fe, NM

Invited Speaker, *People and Nitrogen: A Global Interaction*, invited paper presented at the America Society of Limnology and Oceanography, Santa Fe, NM

Seminar, *The Global Nitrogen Cycle*, Chemistry Department, University of Oslo, Norway

1998 Seminar, *Wet Deposition of S & N in Remote Regions of the World: Patterns and Processes*. Utrecht University, Amsterdam, The Netherlands

Invited Speaker, National Research Counsel Committee on Grand Challenges in Environmental Science, Maryland

1997 Staff Briefing on acid rain, acid deposition, Clean Air Act amendments, and Shenandoah National Park research. Southern Environmental Law Center, Charlottesville, VA

1994 National Forum on Environment and Natural Resource R&D, Office of Science and Technology Policy, Executive Office of the President, Washington, DC

1992 Joint Subcommittees of the U. S. House of Representatives, on the subject of Air Quality Issues Affecting our National Parks, Forests, and Public Lands, Washington, DC

Natural Parks and Public Lands Subcommittee, General Oversight and California Desert Lands Subcommittee, Internal and Insular Affairs Committee, US House of Representatives, Washington, DC

1990 Fourth Annual Congressional Scientific Forum on Global Change, Colorado Springs, CO

Joint Group of Experts on Scientific Aspects of Marine Pollution, University of Rhode Island, Narragansett

1988 National Parks and Recreation Subcommittee, US House of Representatives, Washington, DC

Natural Resources and Environmental Subcommittee, Science, Space, and Technology Committee, US House of Representatives, Washington, DC

Energy and Power Subcommittee of the US House of Representatives, Washington, DC

1986 Environmental and Public Works Committee, US Senate, Washington, DC

1985 Public Hearings, National Parks and Recreation Subcommittee, US House of Representatives, Washington, DC
Technical Advisory Committee, State Air Pollution Control Board, Richmond, VA
1984 Briefing: Sir John Mason, National Academy of Sciences, Washington, DC
1983 Roundtable Discussion, Scientific Understanding of Causes and Effects of Acid Deposition. National Academy of Sciences, Washington, DC
Briefing, Science Advisory Board Subcommittee's formation to review management of Federal Acid Rain Research Program: Secretary of Interior William Ruckelhaus
Briefing, President Reagan and Cabinet Council, Washington, DC
Briefing, Science Advisory Board, Washington, DC
1981 Health and the Environment Subcommittee, Energy and Commerce Committee, US House of Representatives, Washington, DC
1980 Environmental Pollution Subcommittee, Environment and Public Works Committee, US Senate, Washington, DC
1979 Acid Precipitation Briefing, Administrator, Environmental Agencies of the Eastern States. Environmental Protection Agency, Washington, DC
Air Quality Committee, National Academy of Sciences, Washington, DC
Natural Resources and Environmental Subcommittee, Science, Space, and Technology Committee, US House of Representatives, Washington, DC
1977 California Air Resources Board, Sacramento, CA
Energy and Power Subcommittee, Interstate and Foreign Commerce Committee, US House of Representatives, Washington, DC
Environmental Study Conference. US House of Representatives, Washington, DC
National Academy of Sciences, Washington, DC
1976 Briefing: Chairman, President's Council on Environmental Quality, Washington, DC
Hearing Examiner, State of Connecticut, Hartford
Hearing Examiner, State of New York, Albany

COMMITTEE MEMBERSHIPS – INTERNATIONAL AND NATIONAL

2020 - 2021
Member, Planning Committee, Environmental Health Matters Initiative of the National Academies, 5-workshop series on identifying ways to reduce the health impacts of reactive nitrogen in ground and surface water from agricultural sources, November 2020

2019 – present
AGU College of Fellows, Distinguished Traveling Lecture Series Committee

2015
World Wildlife Fund
Member, Blue Ribbon Panel on Sustainable Food for the 21st Century

2015-2018
EPA Office of Research and Development
Member, Board of Scientific Counselors, Executive Committee

2015-present
Environmental Development
Associate Editor

2015-2018
EPA Science Advisory Board

Member, Clean Air Scientific Advisory Committee NOx/SOx Panel

2010-2014

Lead Author, Working Group 1, Intergovernmental Panel on Climate Change

Coordinating Lead Author, US National Climate Assessment, Chapter 6, Biogeochemistry

2011-present

Marine Biological Laboratory, Woods Hole

- Trustee, *ermeritus* (2022-)
- Trustee (2011- 2022)
- Member, Nomination and Governance Committee
- Member, Academic and Campus Strategy Committee

1979-2014

Director, Shenandoah Watershed Study and Virginia Trout Stream Sensitivity Study

1983-present

Bermuda Institute of Ocean Sciences

Trustee, *emeritus* (2023-)
Trustee (1983-2023)
President (1988-1995)
Vice President (1987-1988)
Vice Chairman (2019-2022)

2002-2009

Member, Environmental Protection Agency (EPA) Science Advisory Board

2006-2011

Chair, Integrated Nitrogen Committee, EPA Science Advisory Board (2006-2009)

Member, Integrated Nitrogen Committee, EPA Science Advisory Board (2006-2011)

2003-2008

Chair, International Nitrogen Initiative, joint project of SCOPE and IGBP

2005-2007

Member, Organizing Committee, Fourth International Nitrogen Conference, Brazil

2004-2006

Associate Editor, Environmental Chemistry, The Scientific World

International Editorial Board, Journal of Environmental Sciences, Academia Sinica, Beijing

2004

Member, ad-hoc Committee, Air Quality and Ecosystem Change, Clean Air Markets Division, EPA

2003-2004

Member, Organizing Committee, Industrial Animal Production, a SCOPE Rapid Assessment Project.

2003

Member, EPA Science Advisory Committee, Environmental Engineering

Member, EPA Science Advisory Board, Executive Committee

Member, Organizing Committee, Nitrogen Fertilizer Use, a SCOPE Rapid Assessment Project

2002

Member, Organizing Committee, Third International Nitrogen Conference, Nanjing, China

2001

Co-Chair, Second International Nitrogen Conference

2000

Co-convener, Session on Biogeochemistry of Shenandoah National Park, Spring Meeting of American Geophysical Union, Washington, DC

1998

Member, External Review Committee, National Atmospheric Deposition Program, Champaign

Organizer, AAAS Symposium, The Changing Science of Environmental Science, Philadelphia, PA

Co-organizer and Speaker, Workshop on Organic Nitrogen, Maryland

1995

Chair, N Cycle of China Workshop, Beijing

Chair, Integrated Data Analysis Workshop, Shenandoah National Park

Chair, Natural and Anthropogenic Changes: Impacts on Global Biogeochemical Cycles, IGBP Science Symposium, Beijing, China

International Scientific Planning committee, ACID REIGN '95**?** Conference, Gothenburg, Sweden

Organizing Committee, SAC IV and the ICSU Forum on Earth System Research, Beijing

1990-1995

Board Member and Member, Scientific Advisory Committee, Center for a Sustainable Future (1990-1995)

1994

Chair, National Academy of Science Working Group on Integrated Nitrogen Cycle In China and the United States

Co-Chair, Aerosol and Cloud Chemistry Session, 8th International Symposium of the Commission on Atmospheric Chemistry and Global Pollution and Second Conference of the International Global Atmospheric Chemistry Program, Fuji-Yoshida, Japan

Scientific and Technical Advisory Committee, The Chesapeake Bay Program

International Advisory Group for the Scientific Committee, International Conference on Acidic Deposition

1992-1994

Co-Director and Organizing Committee, WMO/UNEP/SCOPE Workshop: Nitrogen Dynamics of the North Atlantic Basin

Steering Committee, Office of Interdisciplinary Earth Studies, University Corporation for Atmospheric Research, Boulder, CO

1992

Organizing Committee, Global Change Institute, Industrial Ecology and Global Change, Office for Interdisciplinary Earth Studies, Boulder, CO

Editorial Committee Guest, Annual Energy and Environment Reviews, Washington, DC

1987-1992

Editor, Environmental Chemistry Series, Cambridge University Press, Cambridge, MA

1991-1992

Chairman, Global Change Research in China, National Academy of Sciences, Washington, DC

1991

WMO Expert Group on Collection of Precipitation

Correspondent, Acidic Deposition: Its Nature and Impacts, Royal Society of Edinburgh, Glasgow, Scotland

Expert Group on Precipitation Collection, World Meteorological Organization, Geneva, Switzerland

1990

Science Review Board, Shenandoah National Park, Steering Committee, Office of Interdisciplinary Earth Sciences, University Corporation for Research, Boulder, CO

1989

Chairman, USA/China Joint Committee on Global Change, Washington, DC

Visiting Fellow, United Kingdom Research in Atmospheric Chemistry Coordinating Committee, Norwich, UK

Technical Program Committee, Second International Acid Rain Conference, Amsterdam, The Netherlands

1988

Invited Member, BAPMON Re-evaluation Committee, World Meteorological Organization

1987-1988

Organizing Committee, Special Program Panel, Global Transport Mechanisms in the Geo-Sciences, Lisbon, Portugal

1987

Technical Program Committee, International Acid Rain Conference, Lisbon, Portugal

1985

Board of Advisors, Acid Rain Abstracts, EIC Intelligence Inc., New York

1984-1985

Advisory Committee, National Park Service Watershed Project, Ft. Collins, CO

1983-1984

Atmospheric Chemistry and Radioactivity Committee, American Meteorological Society, Boston, MA

1979-1983

Joint U. S./Canadian Acid Precipitation Scientific Committee, National Academy of Sciences, Washington, DC

1977-1982

Executive Committee, Technical Committee, National Atmospheric Deposition Program, Washington, DC

1981

Chairman, Trace Metals Subcommittee, Joint U. S./Canadian Acid Precipitation Committee, National Academy of Sciences, Washington, DC (1981-1983)

1978-1981

Federal Interagency Health and Environmental Effects of Energy Technologies Committee, Washington, DC

1979

Secretary, Executive Committee, National Atmospheric Deposition Program, Washington, DC

Session Chairman, Regional Scale Studies of Atmospheric Deposition Effects, Program Committee, Life Sciences Symposium on Atmospheric Deposition, Gatlinburg, TN

Atmosphere-Biosphere Interactions Steering Committee, National Academy of Science,

Washington, DC

1978

Planning Committee, International Workshop, Limnological Aspects of Acid Precipitation, Environmental Protection Agency, Washington, DC

1977-1978

Sulfur Oxides Committee, National Academy of Sciences, Washington, DC

1976

US Delegation, Acid Precipitation Effects Meeting, Telemark, Norway