Curriculum Vitae

Jonathan Mark Gilligan
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Contents

1 Contact Information

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2 Degrees Earned

Ph.D.: 1991, Yale University (Physics). Dissertation, *Precise Multiphoton Spectroscopy of the H_2, HD, and D_2 Molecules and a New Determination of the Ionization Potential of HD.* Advisor: Edward E. Eyler.

B.A.: 1982, Swarthmore College (Physics & Philosophy), with Honors.

3 Employment History

2016–present Associate Professor, Dept. of Civil & Environmental Engineering (secondary), Vanderbilt University.

2009–present Associate Professor, Dept. of Earth & Environmental Sciences, Vanderbilt University.

2008–2009 Research Assistant Professor, Dept. of Earth & Environmental Sciences, Vanderbilt University.

2003–2009 Senior Lecturer, Dept. of Earth & Environmental Sciences, Vanderbilt University.

2000–2003 The Robert T. Lagemann Assistant Professor of Living State Physics, Dept. of Physics & Astronomy, Vanderbilt University.

1996–1998 Associate Director, Center for Molecular and Atomic Studies at Surfaces, Vanderbilt University.

1995–2000 Research Assistant Professor, Dept. of Physics & Astronomy, Vanderbilt University.

1994–1995 Lecturer, Dept. of Physics & Astronomy, Vanderbilt University.

1993–1994 Postdoctoral Research Associate, Cooperative Institute for Research in Environmental Science, National Oceanic & Atmospheric Administration and the University of Colorado. Mentors: James W. Elkins (NOAA) and David W. Fahey (NOAA).

1991–1993 National Research Council Postdoctoral Associate, National Institute of Standards & Technology. Mentor David W. Wineland.

1985–1991 Graduate Student/Teaching Assistant/Research Assistant, Yale University. Mentor Edward E. Eyler.

1983–1985 High school teacher, Commonwealth School, Boston MA.

4 Honors and Awards

2017 The Morrison Prize for the best paper published in 2015 on sustainability law and policy (shared with Michael Vandenbergh). Sandra Day O'Connor School of Law, Arizona State University ($10,000 divided equally between Prof. Vandenbergh and myself).

1998 Outstanding Scientific Paper Award, NOAA Environmental Research Labs.

1995 NASA Group Achievement Award for outstanding accomplishments and contributions to the Airborne Southern Hemisphere Ozone Experiment and Measurements to Assess the Effects of Stratospheric Aircraft.

1991–1993 National Research Council Postdoctoral Associate

1985–1986 J.W. Gibbs Fellow, Yale University

5 Research & Creative Expression

5a. Citations and H-Index

As of April 20, 2017, Google Scholar lists 3,661 citations (1,444 since 2012), an h-index of 24 (15 counting only citations since 2012), 10 papers with 100+ citations, including 4 papers with 300+.

5b. Book († denotes peer-reviewed book)

1. † M.P. Vandenbergh and **J.M. Gilligan**. (2017). *Beyond Politics: The Private Governance Response to Climate Change*. New York, NY: Cambridge University Press. In press. Anticipated release date Oct. 29, 2017. Manuscript: 287 pp.

5c. Articles (* denotes student author, † denotes peer-reviewed article)

1. † L. Benneyworth*, **J. Gilligan**, J.C. Ayers, S. Goodbred, G. George*, A. Carrico, M.R. Karim, F. Akter, D. Fry, K. Donato, and B. Piya*. (2016). "Drinking water insecurity: water quality and access in coastal south-western Bangladesh." *International Journal of Environmental Health Research*. **26**, 508–524. DOI: 10.1080/09603123.2016.1194383. **NOTE:** Featured by Taylor & Francis publishers as part of their observance of World Water Day 2017. T&F opened free access to the article and published an accompanying "Research Story" with background on the article: http://explore.tandfonline.com/page/gen/world-water-day-2017.

2. † E.K. Burchfield* and **J. Gilligan**. (2016). "Agricultural adaptation to drought in the Sri Lankan dry zone." *Applied Geography*. **77**, 92–100. DOI: 10.1016/j.apgeog.2016.10.003

3. † E. Burchfield*, J.J. Nay*, and **J. Gilligan**. (2016). "Application of Machine Learning to the Prediction of Vegetation Health." *ISPRS—International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*. **XLI-B2**, 465–469. DOI: 10.5194/isprs-archives-XLI-B2-465-2016

4. † T. Gunda*, G.M. Hornberger, and **J.M. Gilligan**. (2016). "Spatiotemporal Patterns of Agricultural Drought in Sri Lanka: 1881–2010." *International Journal of Climatology*. **36**, 563–575. DOI: 10.1002/joc.4365

5. † D.J. Hess, C.A. Wold*, E. Hunter*, J. Nay*, S. Worland*, **J. Gilligan**, and G.M. Hornberger. (2016). "Drought, Risk, and Institutional Politics in the American Southwest." *Sociological Forum*. **31**, 807–827. DOI: 10.1111/socf.12274

6. L.W. Auerbach*, S.L. Goodbred Jr, D.R. Mondal*, C.A. Wilson, K.R. Ahmed*, K. Roy, M.S. Steckler, C. Small, **J.M. Gilligan**, and B.A. Ackerly. (2015). "Reply to 'Tidal river management in Bangladesh'." *Nature Climate Change*. **5**, 492–493. DOI: 10.1038/nclimate2620

7. † L.W. Auerbach*, S.L. Goodbred Jr., D.R. Mondal*, C.A. Wilson, K.R. Ahmed*, K. Roy, M.S. Steckler, C. Small, **J.M. Gilligan**, and B.A. Ackerly. (2015). "Flood risk of natural and embanked landscapes on the Ganges-Brahmaputra tidal delta plain." *Nature Climate Change*. **5**, 152–157. DOI: 10.1038/nclimate2472

8. † G.M. Hornberger, D.J. Hess, and **J. Gilligan**. (2015). "Water Conservation and Hydrological Transitions in Cities in the United States." *Water Resources Research*. **51**, 4635–4649. DOI: 10.1002/2015WR016943

9. M.P. Vandenbergh and **J.M. Gilligan**. (2015). "Beyond Gridlock." *Columbia Journal of Environmental Law*. **40**, 217–303. DOI: 10.2139/ssrn.2533643

10. **J.M. Gilligan** and M.P. Vandenbergh. (2014). "Accounting for political feasibility in climate instrument choice." *Virginia Environmental Law Journal*. **32**, 1–26. DOI: 10.2139/ssrn.2220788

11. M.P. Vandenbergh, K.E. Toner, and **J.M. Gilligan**. (2014). "Energy and Climate Change: A Climate Prediction Market." *UCLA Law Review*. **61**, 1962–2017

12. † A.R. Carrico, M.P. Vandenbergh, P.C. Stern, G.T. Gardner, T. Dietz, and **J.M. Gilligan**. (2011). "Energy and climate change: Key lessons for implementing the behavioral wedge." *Journal of Energy & Environmental Law*. **2**, 61–67

13. M.P. Vandenbergh and **J.M. Gilligan**. (2011). "Macro-risks: The challenge for rational risk regulation." *Duke Environmental Law and Policy Forum*. **21**, 401–431

14. **J. Gilligan**, T. Dietz, G. Gardner, P. Stern, and M. Vandenbergh. (2010). "The Behavioral Wedge." *Significance*. **7**, 17–20. DOI: 10.1111/j.1740-9713.2010.00405.x. **NOTE:** *Invited paper, subsequently named one of the best papers of 2009 by Significance.*

15. † P.C. Stern, G.T. Gardner, M.P. Vandenbergh, T. Dietz, and **J.M. Gilligan**. (2010). "Design principles for carbon emissions reduction programs." *Environmental Science & Technology*. **44**, 4847–4848. DOI: 10.1021/es100896p

16. † M.P. Vandenbergh, P.C. Stern, G.T. Gardner, T. Dietz, and **J.M. Gilligan**. (2010). "Implementing the behavioral wedge: Designing and adopting effective carbon emissions reduction programs." *Environmental Law Reporter*. **40**, 547–554. **NOTE:** Selected by Environmental Law Institute to reprint as the featured cover story of the 2010 summer reading issue for policymakers of Environmental Forum.

17. † A.R. Carrico*, P. Padgett, M.P. Vandenbergh, **J. Gilligan**, and K.A. Wallston. (2009). "Costly myths: an analysis of idling beliefs and behavior in personal motor vehicles." *Energy Policy*. **37**, 2881–2888. DOI: 10.1016/j.enpol.2009.03.031

18. † T. Dietz, G. Gardner, **J. Gilligan**, P. Stern, and M. Vandenbergh. (2009). "Household actions can provide a behavioral wedge to rapidly reduce U.S. carbon emissions." *PNAS*. **106**, 18452–18456. DOI: 10.1073/pnas.0908738106

19. † M.R. Holcomb*, M.C. Woods*, I. Uzelac, J.P. Wikswo, **J.M. Gilligan**, and V.Y. Sidorov. (2009). "The Potential of Dual Camera Systems for Multimodal Imaging of Cardiac Electrophysiology and Metabolism." *Experimental Biology and Medicine*. **234**, 1355–1372. **NOTE:** *Selected by the editors as the feature article of the month.*

20. M.P. Vandenbergh, J. Barkenbus, and **J.M. Gilligan**. (2008). "Individual Carbon Emissions: The Low-Hanging Fruit." *UCLA Law Review*. **55**, 1701–1758

21. † D.N. Mashburn*, S. Hinkson*, M.C. Woods*, **J.M. Gilligan**, M.R. Holcomb*, and J.P. Wikswo. (2007). "A High-Voltage Cardiac Stimulator for Field Shocks of a Whole Heart in a Bath." *Review of Scientific Instruments*. **78**, 104302–104309

22. † **J.M. Gilligan**. (2006). "Flexibility, Clarity, and Legitimacy: Considerations for Managing Nanotechnolgy Risks." *Environmental Law Reporter*. **36**, 10924–10930

23. † E. Sobol, A. Sviridov, M. Kitai, **J.M. Gilligan**, G.S. Edwards, and N.H. Tolk. (2003). "Time-Resolved Light Scattering Measurements of Cartilage and Cornea Denaturation Due to Free-Electron Laser Radiation." *Journal of Biomedical Optics*. **8**, 216–222

24. † A. Cricenti, R. Generosi, M. Luce, P. Perfetti, G. Margaritondo, D. Talley, J. Sanghera, I. Aggarwal, **J.M. Gilligan**, and N.H. Tolk. (2002). "Surface Characterisation by Near-Field Microscopy and Atomic Force Microscopy." *Advances in Science and Technology*. **32**, 183–192

25. † G. Mensing*, **J. Gilligan**, P. Hari*, E. Hurt*, G. Lüpke, S. Pantelides, N. Tolk, and P. Taylor. (2002). "Defect transition energies and the density of electronic states in hydrogenated amorphous silicon." *Journal of Non-Crystalline Solids*. **299**, 621–625

26. † A. Cricenti, R. Generosi, M. Luce, P. Perfetti, G. Margaritondo, D. Talley, J. Sanghera, I. Aggarwal, **J.M. Gilligan**, and N.H. Tolk. (2001). "Spectroscopic scanning near-field optical microscopy with a free electron laser: CH_2 bond imaging in diamond films." *Journal of Microscopy*. **202**, 446–450

27. † G. Lupke, C.P. Cheney*, J. Sturman*, J.C. Keay*, **J.M. Gilligan**, L.C. Feldman, and N.H. Tolk. (2000). "Materials Science at the WM Keck Free Electron Laser: Infrared Wavelength Selective Materials Modification." *Condensed Matter Theories*. **14**, 349–364

28. † D.B. Talley, L. Shaw, J. Sanghera, I. Aggarwal, A. Cricenti, R. Generosi, M. Luce, G. Margaritondo, **J.M. Gilligan**, and N.H. Tolk. (2000). "Scanning near field infrared microscopy using chalcogenide fiber tips." *Materials Letters*. **42**, 339–344

29. † A. Cricenti, R. Generosi, P. Perfetti, G. Margaritondo, J. Almeida, **J.M. Gilligan**, N.H. Tolk, C. Coluzza, M. Spajer, D. Courjon, and I.D. Aggarwal. (1999). "Interface Applications of Scanning Near-Field Optical Microscopy with a Free Electron Laser." *Physica Status Solidi A: Applied Research*. **175**, 317–329

30. † A. Cricenti, R. Generosi, G. Herold, P. Chiaradia, P. Perfetti, G. Margaritondo, **J.M. Gilligan**, and N.H. Tolk. (1999). "Chemical Contrast Observed at a III-V Heterostructure by Scanning Near-Field Optical Microscopy." *Physica Status Solidi A: Applied Research*. **175**, 345–349

31. † Z. Marka*, C.P. Cheney*, W. Wang*, G. Lupke, **J. Gilligan**, Y. Yao, and N.H. Tolk. (1999). "Nonlinear Energy-Selective Nanoscale Modifications of Materials and Dynamics in Metals and Semiconductors." *Soviet Physics: Technical Physics*. **44**, 1069–1072

32. † D.T. Schaafsma, R. Mossadegh, J.S. Sanghera, I.D. Aggarwal, **J.M. Gilligan**, N.H. Tolk, M. Luce, R. Generosi, P. Perfetti, A. Cricenti, and G. Margaritondo. (1999). "Singlemode Chalcogenide Fiber Infrared SNOM Probes." *Ultramicroscopy*. **77**, 77–81

33. † D.T. Schaafsma, R. Mossadegh, J.S. Sanghera, I.D. Aggarwal, M. Luce, R. Generosi, P. Perfetti, A. Cricenti, **J.M. Gilligan**, and N.H. Tolk. (1999). "Fabrication of Single-Mode Chalcogenide Fiber Probes for Scanning Near-Field Infrared Optical Microscopy." *Optical Engineering*. **38**, 1381–1385

34. † A. Cricenti, R. Generosi, C. Barchesi, M. Luce, M. Rinaldi, C. Coluzza, P. Perfetti, G. Margaritondo, D.T. Schaafsma, I.D. Aggarwal, **J.M. Gilligan**, and N.H. Tolk. (1998). "First Experimental Results with the Free Electron Laser Coupled to a Scanning Near-Field Optical Microscope." *Physica Status Solidi A: Applied Research*. **170**, 241–247

35. † A. Cricenti, R. Generosi, P. Perfetti, **J.M. Gilligan**, N.H. Tolk, C. Coluzza, and G. Margaritondo. (1998). "Free-Electron-Laser Near-Field Nanospectroscopy." *Applied Physics Letters*. **73**, 151–153

36. † J. Sturmann*, R.G. Albridge, A.V. Barnes, J.L. Davidson, **J.M. Gilligan**, G. Lupke, A. Ueda*, and N.H. Tolk. (1998). "Infrared Wavelength-Selective Photodesorption on Diamond Surfaces." *Applied Surface Science*. **129**, 59–63

37. † N.H. Tolk, Z. Hargitai*, Y. Yao*, B. Pratt-Ferguson*, M.M. Albert*, R.G. Albridge, A.V. Barnes, **J.M. Gilligan**, V.D. Gordon*, G. Lupke, A. Puckett*, J. Tully, G. Betz, and W. Husinsky. (1998). "Molecular Effects in Measured Sputtering Yields on Gold at Near Threshold Energies." *Izvestiya Akademii Nauk: Seriya Fizicheskaya*. **62**, 676–679

38. † W. Wang*, G. Lupke, M. Di Ventra, S.T. Pantelides, **J.M. Gilligan**, N.H. Tolk, I.C. Kizilyalli, P.K. Roy, G. Margaritondo, and G. Lucovsky. (1998). "Coupled Electron-Hole Dynamics at the Si/SiO_2 Interface." *Physical Review Letters*. **81**, 4224–4227

39. † Y. Yao*, Z. Hargitai*, M. Albert*, R.G. Albridge, A.V. Barnes, **J.M. Gilligan**, B.P. Ferguson*, G. Lupke, V.D. Gordon*, N.H. Tolk, J.C. Tully, G. Betz, and W. Husinsky. (1998). "New Molecular Collisional Interaction Effect in Low-Energy Sputtering." *Physical Review Letters*. **81**, 550–553

40. † J. Sturmann*, R.G. Albridge, A.V. Barnes, **J. Gilligan**, M.T. Graham*, J.T. McKinley, W. Wang*, X. Yang*, N.H. Tolk, J.L. Davidson, and G. Margaritondo. (1997). "Photoexcitation Spectroscopy and Material Alteration with Free-Electron Laser." *Acta Physica Polonica A*. **91**, 689–696

41. † C.M. Volk*, J.W. Elkins, D.W. Fahey, G.S. Dutton, **J.M. Gilligan**, M. Loewenstein, J.R. Podolske, K.R. Chan, and M.R. Gunson. (1997). "Evaluation of Source Gas Lifetimes from Stratospheric Observations." *Journal of Geophysical Research: Atmospheres*. **102**, 25543–25564

42. † J.W. Elkins, D.W. Fahey, **J.M. Gilligan**, G.S. Dutton, T.J. Baring, C.M. Volk*, R.E. Dunn, R.C. Myers, S.A. Montzka, P.R. Wamsley, A.H. Hayden, J.H. Butler, T.M. Thompson, T.H. Swanson, E.J. Dlugokencky, P.C. Novelli, D.F. Hurst, J.M. Lobert, S.J. Ciciora, R.J. McLaughlin, T.L. Thompson, R.H. Winkler, P.J. Fraser, L.P. Steele, and M.P. Lucarelli. (1996). "Airborne Gas Chromatograph for *in situ* Measurements of Long-Lived Species in the Upper Troposphere and Lower Stratosphere." *Geophysical Research Letters*. **23**, 347–350

43. † C.M. Volk*, J.W. Elkins, D.W. Fahey, R.J. Salawitch, G.S. Dutton, **J.M. Gilligan**, M.H. Proffitt, M. Loewenstein, J.R. Podolske, K. Minschwaner, J.J. Margitan, and K.R. Chan. (1996). "Quantifying Transport Between the Tropical and Mid-Latitude Lower Stratosphere." *Science*. **272**, 1763–1768

44. † E.L. Woodbridge, J.W. Elkins, D.W. Fahey, L.E. Heidt, S. Solomon, T.J. Baring, T.J. Gilpin, W.H. Pollock, S.M. Schauffler, E.L. Atlas, M. Lowenstein, J.R. Podolske, C.R. Webster, R.D. May, **J.M. Gilligan**, S.A. Montzka, K.A. Boering, and R.J. Salawitch. (1995). "Estimates of Total Organic and Inorganic Chlorine in the Lower Stratosphere from *in situ* Measurements during AASE II." *Journal of Geophysical Research*. **100**, 3057–3064

45. † U. Eichmann, J.C. Bergquist, J.J. Bollinger, **J.M. Gilligan**, W.M. Itano, D.J. Wineland, and M.G. Raizen. (1993). "Young's Interference Experiment with Light Scattered from Two Atoms." *Physical Review Letters*. **70**, 2359–2362

46. † W.M. Itano, J.C. Bergquist, J.J. Bollinger, **J.M. Gilligan**, D.J. Heinzen, F.L. Moore, M.G. Raizen, and D.J. Wineland. (1993). "Quantum Measurements of Trapped Ions." *Vistas in Astronomy*. 169–183

47. † W.M. Itano, J.C. Bergquist, J.J. Bollinger, **J.M. Gilligan**, D.J. Heinzen, F.L. Moore, M.G. Raizen, and D.J. Wineland. (1993). "Ultra-High Precision Spectroscopy for Fundamental Physics." *Hyperfine Interactions*. **78**, 211–220

48. † W.M. Itano, J.C. Bergquist, J.J. Bollinger, **J.M. Gilligan**, F.L. Moore, and M.G. Raizen. (1993). "Quantum Projection Noise: Population Fluctuations in Two-Level Systems." *Physical Review A*. **47**, 3554–3570

49. † D. Shiner, **J.M. Gilligan**, B.M. Cook*, and W. Lichten. (1993). "H_2, D_2, and HD Ionization Potentials by Accurate Calibration of Several Iodine Lines." *Physical Review A*. **47**, 4042–4045

50. † **J.M. Gilligan** and E.E. Eyler. (1992). "Precise Determinations of Ionization Potentials and *EF* State Energy Levels of H_2, HD, and D_2." *Physical Review A*. **46**, 3676–3690

51. † M.G. Raizen, **J.M. Gilligan**, J.C. Bergquist, W.M. Itano, and D.J. Wineland. (1992). "Ionic Crystals in a Linear Paul Trap." *Physical Review A*. **45**, 6493–6501

52. † M.G. Raizen, **J.M. Gilligan**, J.C. Bergquist, W.M. Itano, and D.J. Wineland. (1992). "Linear Trap for High-Accuracy Spectroscopy of Stored Ions." *Journal of Modern Optics*. **39**, 233–242

53. † **J.M. Gilligan** and E.E. Eyler. (1991). "High-Resolution Three-Photon Spectroscopy and Multiphoton Interference in Molecular Hydrogen." *Physical Review A*. **43**, 6406–6409

54. † E. McCormack, **J.M. Gilligan**, C. Cornaggia, and E.E. Eyler. (1989). "Measurement of High Rydberg States and the Ionization Potential of H_2." *Physical Review A*. **39**, 2260–2263

55. † E.E. Eyler, **J.M. Gilligan**, E. McCormack*, A. Nussenzweig*, and E. Pollack. (1987). "Precise Two-Photon Spectroscopy of $E \leftarrow X^*$ Intervals in H_2." *Physical Review A*. **36**, 3486–3489

5d. Book Chapters

1. B.A. Ackerly, M. Anam*, **J. Gilligan**, and S. Goodbred. (2017). "Climate and Community: The Human Rights, Livelihood, and Migration Impacts of Climate Change." In: *Climate Change, Migration, and Human Rights*. D. Manou, A. Baldwin, D. Cubie, A. Mijr, and T. Thorp, eds. In press

2. B.A. Ackerly, M. Anam*, and **J. Gilligan**. (2015). "Environment, Political Economies, and Livelihood Change." In: *Environment, Migration and Adaptation: Evidence and Politics of Climate Change in Bangladesh*. B. Mallick and B. Etzold, eds. Dhaka: AHDPH, pp. 27–39

3. **J. Gilligan**. (2010). "People Should Behave Ethically for the Sake of Future Generations." In: *Opposing Viewpoints: Ethics*. R. Espejo, ed. Vol. 2. Gale, pp. 20–32

5e. Articles in Conference Proceedings (* denotes student author, † denotes peer-reviewed article)

1. † E.K. Burchfield* and **J.M. Gilligan**. (2016). "Dynamics of Individual and Collective Agricultural Adaptation to Water Scarcity." In: *Proceedings of the 2016 Winter Simulation Conference*. T. Roeder, P. Frazier, R. Szechtman, E. Zhou, T. Huschka, and S. Chick, eds. WSC'16. Piscataway, NJ, USA: IEEE Press, pp. 1678–1689. DOI: 10.1109/WSC.2016.7822216

2. † J.J. Nay*, M. Van der Linden*, and **J.M. Gilligan**. (2016). "Betting and Belief: Prediction Markets and Attribution of Climate Change." In: *Proceedings of the 2016 Winter Simulation Conference*. T. Roeder, P. Frazier, R. Szechtman, E. Zhou, T. Huschka, and S. Chick, eds. WSC'16. Piscataway, NJ, USA: IEEE Press, pp. 1666–1677. DOI: 10.1109/WSC.2016.7822215

3. † **J.M. Gilligan**, C. Brady, J.V. Camp, J.J. Nay*, and P. Sengupta. (2015). "Participatory Simulations of Urban Flooding for Learning and Decision Support." In: *Proceedings of the 2015 Winter Simulation Conference*. L. Yilmaz, W. Chan, I. Moon, T. Roeder, C. Macal, and M. Rossetti, eds. WSC '15. Piscataway, NJ, USA: IEEE Press, pp. 3174–3175. ISBN: 978-1-4673-9741-4. DOI: 10.1109/WSC.2015.7408456. 00000

4. † J.J. Nay* and **J.M. Gilligan**. (2015). "Data-driven Dynamic Decision Models." In: *Proceedings of the 2015 Winter Simulation Conference*. L. Yilmaz, W. Chan, I. Moon, T. Roeder, C. Macal, and M. Rossetti, eds. WSC '15. Piscataway, NJ, USA: IEEE Press, pp. 2752–2763. ISBN: 978-1-4673-9741-4. DOI: 10.1109/WSC.2015.7408381. 00000

5. **J.M. Gilligan**, B.A. Ackerly, and S.L. Goodbred. (2013). "Building Resilience to Environmental Stress in Coastal Bangladesh: An Integrated Social, Environmental, and Engineering Perspective." In: *Bridging the Policy-Action Divide: Challenges and Prospects for Bangladesh*. Bangladesh Development Initiative. Berkeley, CA

6. † K.G. Rogers, J.P. Syvitski, I. Overeem, S. Higgins*, and **J.M. Gilligan**. (2013). "Farming Practices and Anthropogenic Delta Dynamics." In: *Deltas: Landforms, Ecosystems and Human Activities*. Vol. 358. IAHS Publ. Int'l. Assoc. Hydrolog. Sci. Gothenberg SE, pp. 133–142

7. J. Sturmann*, Z. Marka*, M. Albert*, R.G. Albridge, **J.M. Gilligan**, G. Luepke, S. Singh, J.L. Davidson, W. Husinsky, and N.H. Tolk. (2001). "Infrared free-electron laser photoablation of diamond films." In: *Nonresonant Laser-Matter Interaction (NLMI-10)*. International Society for Optics and Photonics, pp. 206–211

8. E. Sobol, A. Sviridov, M. Kitai, **J.M. Gilligan**, and G.S. Edwards. (2000). "Alteration of Absorption Coefficients of Tissue Water as a Result of Heating under IR FEL Radiation with Different Wavelengths." In: *International Biomedical Optics Symposium*. Vol. 3925. SPIE, p. 78

9. E. Sobol, A. Sviridov, M. Kitai, **G.S. Edwards**, J.M. Gilligan, and N.H. Tolk. (1999). "Effect of Wavelength on Threshold and Kinetics of Tissue Denaturation under Laser Radiation." In: *International Biomedical Optics Symposium*. Vol. 3601. SPIE, pp. 122–129

10. **J.M. Gilligan**, J.W. Elkins, D.W. Fahey, G.S. Dutton, C.M. Volk, T.J. Baring, R.E. Dunn, and R.C. Myers. (1994). "Refinement of the Total Organic and Inorganic Chlorine Budgets in the Atmosphere with a New *in situ* Instrument, Airborne Chromatograph for Atmospheric Trace Species (ACATS-IV)." In: *Atmospheric Effects of Aviation Project Workshop*

11. U. Eichmann, J.C. Bergquist, J.J. Bollinger, **J.M. Gilligan**, W.M. Itano, J.G. Raizen, and D.J. Wineland. (1993). "Interference in the Resonance Fluorescence of Two Trapped Atoms." In: *Proceedings of the 11th International Conference on Laser Science*, pp. 43–48

12. W.M. Itano, U. Eichmann, J.C. Bergquist, J.J. Bollinger, **J.M. Gilligan**, M.G. Raizen, and D.J. Wineland. (1993). "Light Scattered from Two Atoms." In: *Proceedings of the 11th International Conference on Laser Science*, pp. 410–419

13. D.J. Wineland, J.C. Bergquist, J.J. Bollinger, W.M. Itano, F.L. Moore, **J.M. Gilligan**, M.G. Raizen, D.J. Heinzen, C.S. Weimer, and C.H. Manney. (1991). "High-Resolution Spectroscopy of Laser-Cooled Ions." In: *Proceedings of the Enrico Fermi Summer School on Laser Manipulation of Atoms and Ions, July 1991, Varenna, Italy*, pp. 539–551

14. D.J. Wineland, J.C. Bergquist, J.J. Bollinger, W.M. Itano, F.L. Moore, **J.M. Gilligan**, M.G. Raizen, D.J. Heinzen, C.S. Weimer, and C.H. Manney. (1991). "Recent Experiments on Trapped Ions at the National Institute of Standards and Technology." In: *Proceedings of the Enrico Fermi Summer School on Laser Manipulation of Atoms and Ions, July 1991, Varenna, Italy*, pp. 553–567

15. E.E. Eyler, **J.M. Gilligan**, and E. McCormack. (1988). "Precise Multiphoton Spectroscopy of H_2." In: *Advances in Laser Spectroscopy III*. Vol. 172. AIP Conference Proceedings, pp. 331–333

16. E.E. Eyler and **J.M. Gilligan**. (1987). "Precise Multiphoton Spectroscopy of Excited States of H_2." In: *Advances in Laser Spectroscopy II*. Vol. 160. AIP Conference Proceedings, pp. 388–390

17. E. McCormack, E.E. Eyler, and **J.M. Gilligan**. (1987). "Precise Photodissociation and Multiphoton Spectroscopy of H_2." In: *Proceedings of the XV International Conference on Quantum Electronics*. Vol. 21. Technical Digest Series. Optical Society of America, pp. 58–60

5f. Patents

1. F.J. Baudenbacher, J.P. Wikswo, R.R. Balcarcel, D. Cliffel, S. Eklund, **J.M. Gilligan**, O. McGuinness, T. Monroe, A. Prokop, M. Stremler, and A. Werdich. (2010). "Apparatus and Methods for Monitoring the Status of a Metabolically Active Cell." 7,704,745 B2. (Apr. 27, 2010)

2. D. Cliffel, F.J. Baudenbacher, J.P. Wikswo, S. Eklund, R.R. Balcarcel, and **J.M. Gilligan**. (2010). "Device and Methods for Detecting the Response of a Plurality of Cells to at Least One Analyte of Interest." 7,713,733 B2. (May 11, 2010)

5g. Software and other products

1. datafsm: Estimating Finite State Machine Models from Data by *John J. Nay, and **J.M. Gilligan**, Comprehensive R Archive Network, `https://cran.r-project.org/web/packages/datafsm/` (2015).

This software package was largely Nay's work. He had the original idea and did most of the programming. I contributed significatly to the design by suggesting that finite state machines and genetic algorithms would be the best way to implement Nay's concept. We shared equally in writing the "Introduction to datafsm" manual.

2. forecastVeg: Forecasting Vegetation Health at High Spatial Resolution, by *John J. Nay, *Emily K. Burchfield, and **J.M. Gilligan**, github: `https://github.com/JohnNay/forecastVeg` (2016).

   I suggested the line of research that led to this software. The code is entirely Nay's and Burchfield's work. This open-source package automates downoading high-resolution MODIS spectral data, applying machine learning (gradient-boosted machines) to identifying patterns in the data, generating a forecasting model, and assessing the out-of-sample predictive skill using cross-validation. This tool is designed to facilitate the use of machine learning and satellite remote sensing data for decision-support around the world, including in developing nations that do not have large research budgets.

5h. Invited Presentations

1. "Connecting Human and Natural Systems: The Role of Agent-Based Simulations," invited keynote talk, CSDMS 2017 Annual Meeting on Modeling Coupled Earth and Human Systems. Boulder, CO. May 23–25 2017.
2. "Dynamics of Individual and Collective Agricultural Adaptaiton to Water Security," invited talk, Winter Simulation Conference 2016, Arlington, VA, Dec. 12, 2016.
3. "Understanding Drought and Decision-Making," Workshop on Agricultural Drought and Policy, American Institute for Sri Lankan Studies, Colombo, Sri Lanka, March 10, 2015.
4. "Land Use, Livelihoods, Vulnerabilities, and Resilience in Coastal Bangladesh," in Session PA010: Livelihoods and Ecosystem Services in Vulnerable Delta Regions: Implications for Policy and Practice, American Geophysical Union Fall Meeting, San Francisco CA, December 2014.
5. "In the Tide Country: Live on an Active Delta in Bangladesh," Department of Geography, University of Georgia, October 20, 2014 (Host covered travel & lodging).
6. "Integrating Natural and Social Science to Inform Adaptation to Extreme Weather in Bangladesh and Sri Lanka," Symposium on Extreme Weather, Disasters and Indigenous Practices in South Asia, Annual Conference on South Asia, Madison WI October 16, 2014 (American Institute of Sri Lanka Studies covered conference registration and 50% of travel & lodging).
7. "Integrating Social and Natural Science to Understand Vulnerability and Resilience in Coastal Environments," Symposium on Climate Change, Drought, and Agricultural Adaptation, Colombo, Sri Lanka, June 7, 2013.
8. "Climate Change and Disaster Management," Ministry of Disaster Management, Colombo, Sri Lanka, June 5, 2013.
9. "From the Laboratory to the Legislature: Transdisciplinary Perspectives on Global Climate Change" Nashville State Community College, Nashville TN, Mar. 30, 2012.
10. "Don't Raise the Bridge, Lower the River: Geoengineering Technology and Governance" Environmental Governance at the Leading Edge of Technology Conference, George Washington U., Washington DC, Mar. 23, 2011 (Host covered travel, lodging & conference registration).
11. "The Behavioral Wedge: Reducing Greenhouse Gas Emissions by Individuals and Households," Joint Statistical Meetings (American Statistical Association, Statistical Society of Canada, etc.), Vancover BC, Aug. 1, 2010. **NOTE:** Part of a special session to highlight the best papers published in the journal *Significance* during the previous year. (Host covered travel, lodging, & conference registration).

12. Panelist, Pew Charitable Trusts Forum on the Law of the Sea Treaty, Belmont University, Nashville TN, Nov. 18, 2009.

13. "Global Climate Change: Earth Science, Behavioral Science, and Public Policy," Middle Tennessee State University, Murfreesboro TN, Oct. 16, 2009.

14. "From the Laboratory to the Legislature: Why Climate Change is Fundamentally a Transdisciplinary Issue," Belmont University, Nashville TN, Feb. 6, 2009 (Host paid honorarium)

15. "Individual Behavior and Climate Change: The Low-Hanging Fruit," Keynote Address, Summit for a Sustainable Tennessee, David Lipscomb University, Nashville TN, Nov. 13, 2008.

16. "From the Laboratory to the Legislature: Transdisciplinary Perspectives on Environmental Science and Policy," Distinguished Panel Speaker, 10th Beckman Scholars Symposium, Irvine CA, Jul. 26, 2008. (Host covered travel & lodging and paid an honorarium).

17. "Spirituality, Ethics, and the Environment," The Kenan Writers' Encounters: Writers and Artists Engage the Environment, Thomas S. Kenan Institute for the Arts & North Carolina School of the Arts, Winston-Salem NC, Apr. 12, 2008. (Host covered travel, lodging, and paid an honorarium).

18. "Ethics in Geological Time: Should We Care about Distant Future Generations?," The Berry Lecture, Dept. of Philosophy, Vanderbilt University, Nashville TN, Mar. 24, 2008 (honorarium).

19. "Individual Behavior and Greenhouse Gas Emissions," Behavior, Energy, and Climate Change conference, American Council for an Energy Efficient Economy, Sacramento CA, Nov. 7–9, 2007

20. "Flexibility, Clarity, and Legitimacy: Considerations for Managing Nanotechnology Risks," Nanotechnology Governance: Environmental Management from a Global Perspective, Environmental Law Institute and Vanderbilt Center for Environmental Management Studies, Nashville TN, May 19, 2006.

21. "*Et in Arcadia Ego*: Reflections on the Future of Tenure," Symposium on Promoting Scientific Freedom and Responsibility, AAAS Annual Meeting, Philadelphia PA (1998).

22. "Smart Modification of Surfaces with Free-Electron Lasers," ASM Materials Week '97, Indianapolis IN (1997).

23. "Modification of Diamond Films using Free-Electron Lasers," ASM Materials Week '96, Cincinnatti OH (1996).

24. "Quantum Mechanical Measurements with Single Atoms," April Meeting of the American Physical Society, Washington DC (1992).

5i. Published Abstracts

1. *E.K. Burchfield and **J.M. Gilligan**, "Dynamics of Individual and Collective Agricultural Adaptation to Water Scarcity", Amer. Geophys. Union Fall Meeting 2016

2. *C. Tasich, **J.M. Gilligan**, S.L. Goodbred, R.P. Hale, and C. Wilson, "Modeling Elevation Equilibrium in the Face of Sea Level Rise ", Amer. Geophys. Union Fall Meeting 2016

3. A. Carrico, **J.M. Gilligan**, and H.B. Truelove, "Actual vs. Perceived Climate Variability among Smallholding Rice Farmers", Amer. Geophys. Union Fall Meeting 2016

4. **J.M. Gilligan**, *J.J. Nay, and *M. Van der Linden, "Prediction Markets and Beliefs about Climate: Results from Agent-Based Simulations", Amer. Geophy. Union Fall Meeting 2015

5. **J.M. Gilligan**, C. Brady, J.V. Camp, *J.J. Nay, and P. Sengupta, "Emotional Engagement with Participatory Simulations as a Tool for Learning and Decision-Support for Coupled Human-Natural Systems: Flood Hazards and Urban Development", Amer. Geophy. Union Fall Meeting 2015

6. *M.G. Patrick, S.L. Goodbred, **J.M. Gilligan**, C.M. Tasich, S. Hossain, and K.M. Ahmed "Stratigraphic Evolution of the Ganges-Brahmaputra Lower Delta Plain and its Relation to Groundwater Arsenic Distributions", Amer. Geophy. Union Fall Meeting 2015

7. C.M. Tasich, **J.M. Gilligan**, S.L. Goodbred, C. Wilson, R.P. Hale, and L.W. Auerbach "Rejuvenating Poldered Landscapes: A Numerical Model of Elevation Equilibrium in Coastal Bangladesh", Amer. Geophy. Union Fall Meeting 2015

8. *T. Gunda, **J.M. Gilligan**, and G.M. Hornberger "Forecasts of Agricultural Drought in Sri Lanka", Amer. Geophy. Union Fall Meeting 2015

9. **J. Gilligan**, B. Ackerly, S. Goodbred, and C. Wilson "Land Use, Livelihoods, Vulnerabilities, and Resilience in Coastal Bangladesh," Amer. Geophy. Union Fall Meeting 2014

10. **J. Gilligan** and M. Vandenbergh, "Between Too Little and Too Late: Political Opportunity Costs in Climate Policy Analysis," Amer. Geophy. Union Fall Meeting 2014

11. G.M. Hornberger, **J. Gilligan**, and D. Hess "Water Conservation and Hydrological Transitions in Cities," Amer. Geophy. Union Fall Meeting 2014

12. S. Goodbred, M. Steckler, **J. Gilligan**, B. Ackerly, J. Ayers, C. Wilson, C. Small, and L. Seeber "Dynamic Asia: Coupling of climate, tectonics, rivers, and people defines risk and opportunity for the worldâĂŹs largest human populations," Amer. Geophy. Union Fall Meeting 2014

13. C. Tasich, S. Goodbred, **J. Gilligan**, and C. Wilson, "Rejuvenating Poldered Landscapes in a Tidally-Dominated, Sediment-Rich Delta: A Numerical Model and Analysis of the Effectiveness of Tidal River Management in Coastal Bangladesh," Amer. Geophy. Union Fall Meeting 2014

14. M. Steckler, S. Goodbred, S. Lowes, **J. Gilligan**, B. Ackerly, K.M. Ahmed, S. Akhter, D. Sousa, C. Wilson, D. Datta, K. Roy, and D. Mondal, "Enhancing University Courses and Field Schools through Cross-cultural Exchange: Joint US-Bangladeshi Trips to the Ganges-Brahmaputra and Mississippi Deltas," Amer. Geophy. Union Fall Meeting 2014

15. **J. Gilligan**, B. Ackerly, and S. Goodbred, "Integrating social science, environmental science, and engineering to understand vulnerability and resilience to environmental hazards in Bangladesh," Amer. Geophys. Union Fall Meeting 2013.

16. **J. Gilligan**, B. Ackerly, K. Ahmed, L. Auerbach, L. Benneyworth, S. Goodbred, J. Jacobi, D. Mondal, J. Pickering, K. Rogers, and K. Roy, "Water and social justice in Bangladesh: A transdisciplinary and intercultural approach," Amer. Geophys. Union Fall Meeting 2013.

17. *L. Auerbach, S. Goodbred, *D. Mondal, C. Wilson, K. Ahmed, K. Roy, M. Steckler, **J. Gilligan**, and S. Nooner "In the Balance: Natural v. Embanked Landscapes in the Ganges-Brahmaputra Tidal Delta Plain", Amer. Geophys. Union Fall Meeting 2013.

18. S. Goodbred, *L. Auerbach, C. Wilson, **J. Gilligan**, K. Roy, K. Ahmed, M. Steckler, L. Seeber, S. Akhter, and *S. Hossain, "A Tale of Two Deltas: Contrasting Perspectives on the Status of Natural and Human-modified Regions of the Ganges-Brahmaputra River Delta," Amer. Geophys. Union Fall Meeting 2013.

19. **J. Gilligan**, "Integrating social and natural science to understand vulnerability and resilience in coastal environments," Coastal Processes and Environments Under Sea-Level Rise and Changing Climate: Science to Inform Management, Joint Penrose/Chapman Conference, Geol. Soc. Amer. & Amer. Geophys. Soc., Galveston TX, 14-19 Apr. 2013.

20. **J. Gilligan**, B. Ackerly, and S. Goodbred, "Building resilience to environmental stress in coastal Bangladesh: An integrated social, environmental, and engineering perspective," Bridging the Policy-Action Divide: Challenges and Prospects for Bangladesh, Bangladesh Development Initiative, Berkeley CA, 22–24 Feb., 2013.

21. *J.H. Jacobi, **J.M. Gilligan**, A.R. Carrico, H.B. Truelove, and G. Hornberger, "Diffusion of a Sustainable Farming Technique in Sri Lanka: An Agent-Based Modeling Approach," Amer. Geophys. Union Fall Meeting 2012, abstract #1479443.

22. *L. Wallace Auerbach, S.L. Goodbred, *D. Mondal, K. Roy, *K.R. Ahmed, **J.M. Gilligan**, and B. Ackerly, "Contrasting Pristine and Human-Modified Deltaic Environments: Severe Consequences from Long-Term Coastal Embankments in Southwest Bangladesh," Amer. Geophys. Union Fall Meeting 2012, abstract #1496486.

23. **J.M. Gilligan**, N.H. Tolk, A. Cricenti, R. Generosi, P. Perfetti, C. Coluzza, and G. Margaritondo, "Infrared near-field spectromicroscopy of buried interfaces using free-electron lasers", by Bull. Amer. Phys. Soc. Mar. 1998, p. 2607.

24. "Infrared Wavelength Selective Modification of Doped Hydrogenated Silicon", by *C. Parks Cheney, G. Lüpke, *J.C. Keay, **J.M. Gilligan**, L.C. Feldman, N.H. Tolk, S. Chen, P.C. Taylor, Y. Tung, and D.O. Henderson, Bull. Amer. Phys. Soc. Mar. 1998, p. 2302.

25. *G. Mensing, J.M. Gilligan, *E. Hurt, N. Tolk, and P.C. Taylor, "Photoluminescenc Excitation Spectroscopy of a-Si: H using a Free-Electron Laser", Bull. Amer. Phys. Soc. Mar. 1998, p. 2704.

26. *Z. Hargitai, *Y. Yao, **J.M. Gilligan**, *B. Pratt-Ferguson, *V.D. Gordon, VD, *A. Puckett, N.H. Tolk, J. Tully, G. Betz, and W. Husinsky, "Observation of Enhanced Sputtering by Molecular Ions at Near-Threshold Energies", Bull. Amer. Phys. Soc. Mar. 1998, p. 2813.

27. *W. Wang, G. Lüpke, **J.M. Gilligan**, L.C. Feldman, N.H. Tolk, G. Lucovsky, and I.C. Kiziyalli, "Wavelength-Selective Alteration of the Si (001)/SiO2 Interface by Intense Tunable Infrared Radiation", Bull. Amer. Phys. Soc. Mar. 1998, p. 1510.

28. *C. Parks Cheney, G. Lüpke, *J.C. Keay, **J.M. Gilligan**, L.C. Feldman, N.H. Tolk, S. Chen, P.C. Taylor, Y. Tung, and D.O. Henderson, "Infrared Wavelength Selective Modification of Doped Hydrogenated Silicon", Bull. Amer. Phys. Soc. Mar. 1998, p. 2302.

29. **J.M. Gilligan**, N.H. Tolk, A. Cricenti, R. Generosi, P. Perfetti, C. Coluzza, and G. Margaritondo, "Infrared Near-Field Spectromicroscopy of Buried Interfaces using Free-Electron Lasers", Bull. Amer. Phys. Soc. Mar. 1998, p. 2607.

30. *Z. Hartigai, *Y. Yao, **J.M. Gilligan**, *B. Pratt-Ferguson, *V.D. Gordon, *A. Puckett, N.H. Tolk, J. Tully, G. Betz, and W. Husinsky, "Observation of Enhanced Sputtering by Molecular Ions at Near-Threshold Energies", Bull. Amer. Phys. Soc. Mar. 1998, p. 2813.

31. *Z. Hargitai, *Y. Yao, *M.M. Albert, A.V. Barnes, **J.M. Gilligan**, *V.D. Gordon, G. Lüpke, *B. Pratt-Ferguson, *A. Puckett, and N.H. Tolk, "Enhancement of Sputtering Yields by Low-Energy Molecular Ions", APS Southeastern Section Meeting Abstracts (1997), p. 9.

32. *J. Sturmann, R.G. Albridge, **J.M. Gilligan**, G. Lüpke, N.H. Tolk, and J.L. Davidson, "Infrared Wavelength-Selective Photodesorption from Diamond Films", APS Southeastern Section Meeting (1997), p. 8.

33. *G. Mensing, **J. Gilligan**, *E. Hurt, N.H. Tolk, and P.C. Taylor, "Photoluminescence Excitation Spectroscopy of a-si: H Using a Free Electron Laser", Bull. Amer. Phys. Soc. March 1997, p. 1202.

34. *G.S. Herold, *M.S. Salib, A. Petrou, B.D. McCombe, *G. Mensing, **J. Gilligan**, N. Tolk, M. Dutta, J. Pamulapati, and P.G. Newman, "Optically Detected Resonance Spectroscopy of Intersubband Transitions in GaAs/AlAs Multiple Quantum Wells", APS Southeastern Section Meeting (1997), p. 4.

35. **J. Gilligan**, *G. Mensing, N. Tolk, *M.S. Salib, A. Petrou, B.D. McCombe, M. Dutta, J. Pamulapati, and P.G. Newman, "Free Electron Laser Optically Detected Resonance Spectroscopy of Intersubband Transitions in GaAs/AlAs Quantum Wells", Bull. Amer. Phys. Soc. Mar. 1997, p. 1209.

36. *G.A. Mensing, *E. Hurt, **J. Gilligan**, N. Tolk, and P.C. Taylor, "Photoluminescence of a-Si: H using a Free Electron Laser", APS Southeastern Section Meeting (1996), p. 12.

37. *M.T. Graham, R.G. Albridge, A. Barnes, *B. Barnes, A. Beth, J. Davidson, **J. Gilligan**, J. McKinley, S. Pantelides, and N. Tolk, Bull. Amer. Phys. Soc. Mar. 1996, p. 2702. "Nonthermal Diffusion of Impurities in Silicon and Diamond",

38. U. Eichmann, J.C. Bergquist, J.J. Bollinger, and **J.M. Gilligan**, "Young's interference experiment with light scattered from two atoms", Bull. Amer. Phys. Soc. **38**, May 1993, p. 1140 (1993).

39. **J.M. Gilligan**, C. Monroe, and D. Wineland, "A miniature linear RF ion trap", Bull. Amer. Phys. Soc., **38**, May 1993.

5j. Research Grants

5j.i. Current Grants

1. Vanderbilt TIP grant: "VISOR: Vanderbilt Initiative on Smart-city Operations Research" $199,948 over 2 years (direct costs: $199,948, indirect costs: $0). Principal Investigator Gautam Biswas. I am a co-principal investigator and my role is leading a research project studying the impact of gentrification on access to mass-transit in Nashville.

2. "Multiscale Modeling and Observations of Landscape Dynamics, Mass-Balance, and Network Connectivity for a Sustainable Gange-Brahmaputra Delta," NSF Coastal SEES. Direct costs: $532,163. Indirect costs: $278,048. *Under review*. Principal Investigator Steven Goodbred. I am co-principal investigator and my role is computational modeling, statistical data analysis, and risk analysis.

3. Vanderbilt TIP grant: "Private Governance Approaches to Climate Change" $190,000 over 2 years (direct costs: $190,000; indirect costs: $0). Principal Investigator Michael Vandenbergh. I am a co-principal investigator and my role is project design, statistical analysis, and coordinating undergraduate immersive experiences.

4. National Science Foundation: NSF-EAR 1416964, "Water Conservation and Hydrological Transitions in American Cities" Aug. 2014–Jul. 2017. Total funds: $717,000 (direct costs: $496,000, indirect costs: $221,000). Principal Investigator George Hornberger. I am a co-principal investigator and my role in the project is integration of physical and social science with emphasis on statistical analysis and computer modeling of political and policy responses to water stress.

5. National Science Foundation: NSF-EAR 1204685, "Climate, Drought, and Agricultural Adaptations: An Investigation of Vulnerabilities and Responses to Water Stress Among Paddy Farmers in Sri Lanka" Sept. 2012–Aug. 2017. Total funds: $3.7 million (direct costs: $2.4 million, indirect costs: $1.3 million). Principal Investigator George Hornberger. I am a co-principal investigator and my role in the project is integration of physical and social science through statistical analysis, analysis of satellite remote sensing imagery, and computer modeling of social networks and interaction between behavior and environmental stress as communities of farmers in Sri Lanka adapt to drought and other climatic change.

6. Office of Naval Research ONR-MURI-N00014-11-1-0683 "Environmental stress and human migration in a low-lying developing nation: A comparison of co-evolving natural and human landscapes in the physically and culturally diverse context of Bangladesh," June 2011–May 2016; no-cost extention through May 2017. Total funds $7.50 million (direct costs$5.55 million, indirect costs $1.95 million). Principal Investigator Steven Goodbred (VU EES). I am one of three co-principal investigators (with Prof. Goodbred and Prof. Brooke Ackerly, Political Science) who share leadership of the project. From June–December 2011 I served as acting project leader while Prof. Goodbred was on leave. The project has three major components: physical science, social science, and integrative science. I am the leader of the integrative science team.

5j.ii. Previous Grants

1. "Climate Adaptation, Water-Energy Impacts, Perceptions and Behavior," Vanderbilt University Discovery Grant. Direct costs: $99,532. No indirect costs. Period of Award: Mar. 2011–Feb. 2013. Principal Investigator George Hornberger. I was co-principal investigator and my role was computer modeling of behavioral responses to water scarcity by farmers. I supervised Prof. Hornberger's Ph.D. student John Jacobi for part of his dissertation project which used agent-based modeling of farmer behavior.

5j.iii. Under Review

1. "NRT: Sustainability Transitions in Coupled Human-Natural Systems - A New Approach for Research and Education on Complex Environmental Systems," NSF NRT, Steven Goodbred (Vanderbilt) Principal Investigator. Total funds: $2,998,911 (direct costs: $2,560,039; indirect costs: $438,872). *Under review*.

2. "GENSTEM-S: GENeration Z STEM Education through Sustainability," NSF SBIR, Bill Giles (Yonder Systems, Inc.), Principal Investigator. Vanderbilt Portion: $100,218. *Under review*.

3. "Coupled Human-Natural Systems: Dynamics of Interacting Land-Use, Landscape Evolution, and Population Movement in Bangladesh," NSF CNH, Kimberly Rogers (U. Colorado), Principal Investigator. Vanderbilt Portion: $197,606 (direct costs: $131,956; indirect Costs: $65,650). *Under Review*. I am the Principal Investigator for the Vanderbilt part of this grant.

4. "Midwest Energy, Climate, Water Resources, Energy, and Transportation Consortium," NOAA RISA. *Under review*. Principal Investigator, Rezaul Mahmood. Vanderbilt lead, Janey Camp.

5k. Creative Expression

The idea of adapting Hawthorne's *Scarlet Letter* to the stage originated with Carol Gilligan. The idea of adapting the play into an opera originated jointly with Sara Jobin, Carol Gilligan, and myself equally.

Writing the script for the play *Scarlet Letter* and the libretto for the opera *Pearl* were joint projects equal contributions from each of us.

Amy Scurria wrote all of the music for *Pearl*. Sara Jobin served as producer both for assembling the librettists and composer and also for casting and organizing the public performances of *Pearl*.

2013 *Pearl*, Concert performance of the opera. Music by Amy Scurria, libretto by Carol Gilligan and Jonathan Gilligan. Maureen O'Flynn, soprano; John Bellemer, Tenor; Marnie Breckenridge, soprano; John Cheek, Bass-Baritone; Michael Corvino, Bass; Olivia Marchione, Child Soprano. Sara Jobin, Conductor, Piano, and Producer. At Shakespeare & Company, Lenox MA, Aug. 5.

2013 *Pearl*, Excerpts from opera performed at University of Shanghai for Science and Technology as part of a cultural exchange program sponsored by U.S. Department of State. John Bellemer, Tenor; Li Xin, Soprano; Wang Yang, Bass-Baritone; Lin Shu, Soprano; Charmaine, Child Soprano. March 21.

2012 *Pearl*, Concert performance of the opera. Music by Amy Scurria, libretto by Carol Gilligan and Jonathan Gilligan. Maureen O'Flynn, soprano; Marnie Breckenridge, soprano; John Bellemer, Tenor; John Cheek, Bass-Baritone; Olivia Marchione, Child Soprano; John Demler, Baritone; Jack Brown, Baritone; Sara Jobin, Piano, Conductor, and Producer. At Shakespeare & Company, Lenox MA, Aug. 13.

2011 The Prime Stage (Pittsburgh, PA) produces *The Scarlet Letter*, by Carol Gilligan and Jonathan Gilligan. Katie Mueller, director. 9 performances.

2011 South-Central Graduate Music Consortium Composer's Concert, Univ. N. Carolina Chapel Hill. *Pearl*, performance of opera as work-in-progress (Amy Scurria, music; Carol Gilligan and Jonathan Gilligan, libretto). Emily Siar, Soprano; Noelle Harb, Soprano; Ping Fu, Soprano; Tim Hambourger, Piano.

2010–2011 The National Players produce *The Scarlet Letter* as part of its 61st season. 31 performances.

2009 "Prima le Parole:" staged reading of work in progress, libretto excerpt from *Pearl*, an opera inspired by Hawthorne's *The Scarlet Letter*, by Carol Gilligan and Jonathan Gilligan. Center for Contemporary Opera and New York Society Library, Nov. 9.

2007 *The Scarlet Letter* by Carol Gilligan and Jonathan Gilligan staged reading starring Marisa Tomei, Ron Cephas Jones, Bobby Cannavale, and Marin Ireland, directed by Leigh Silverman. Produced by The Culture Project as part of the "Women Center Stage" festival, New York City July 10–11.

2006 *The Scarlet Letter* by Carol Gilligan and Jonathan Gilligan workshop performance by The Little Theater of Winston-Salem, as part of New Horizons Performance Series, sponsored by the Thomas S. Kenan Institute for the Arts, North Carolina School of the Arts, Oct. 21–22.

2005 Stage adaptation of *The Scarlet Letter* by Carol Gilligan and Jonathan Gilligan, staged reading starring Marisa Tomei, directed by Weir Harman. Produced by The Culture Project, as part of the "Women Center Stage" festival, New York City Aug. 7–8.

5l. Working Papers & Creative Expression in Progress

1. **J.M. Gilligan**, Review of P. Bélanger and A. Arroyo, *Ecologies of Power* (MIT Press, 2016, 448 pp.) for *CAA Reviews* (College Art Association). In review.
2. **J.M. Gilligan**, M.P. Vandenbergh, M.A. Cohen, and A.E. Wiseman, "Accounting for Policy Plasticity in Energy and Climate Policy Analysis," draft manuscript in preparation.

   I developed the main ideas with Vandenbergh. Wiseman contributed material on the legislative process and Cohen provided input on economic and institutional aspects. I did the bulk of the writing.
3. *J.J. Nay, *E.K. Burchfield, and **J.M. Gilligan**, "Forecasting Vegetation Health at High Spatial Resolution," draft manuscript in preparation.

   I came up with the idea and provided guidance and supervision. Nay did almost all of the machine learning analysis. Burchfield did most of the processing and analysis of the satellite remote sensing data. All three of us wrote the paper.

6 Teaching-Related Activities

6a. New courses introduced

1. "Data Science Methods for Smart Cities Applications," A new University Course to begin in Spring 2018. With Abhishek Dubey (Computer Science), Gautam Biswas (Computer Science), Mark Ellingham (Math), David Kosson (Civil and Environmental Engineering), and Claire Smrekar (Public Policy and Education).
2. "Global Climate Change," EES 3310/5310. To begin in Fall 2017. Expand my course EES 2110/5110 to cover material at a higher level and add a laboratory (increasing from 3 to 4 credit hours).
3. "Agent- and Individual-Based Computational Modeling" EES 4760/5760, Introduced Spring 2016. Agent-based computational modeling with emphasis on emergent phenomena and applications in environmental science, ecology, economics, public health, and urban planning.
4. "Water and Social Justice in Bangladesh" EES 390. Introduced Spring 2010. Developed team-taught transdisciplinary graduate capstone seminar (with Steven Goodbred and Brooke Ackerly) combining perspectives from natural sciences, engineering, social sciences, and humanities to study water resources and hazards in Bangladesh with focus on rivers, ground water, and coastal environments. The seminar includes interactions with students and faculty at Bangladeshi universities and field-work in Bangladesh.

5. "Global Climate Change" EES 2110/5110. Introduced Fall 2008. New interdisciplinary course on climate change in earth's with a focus on integrating the science, economics, politics, and ethics of anthropogenic climate change so students leave with a broad perspective on the big picture of the ways different scholarly disciplines contributed to understanding climate change and possible responses to it.

6. "Science, Risk, and Policy," EES2150 (formerly EES 205, GEOL 205). Introduced Spring 2004. Created interdisciplinary course on how society manages deadly risks.

7. "Science and Democracy," EES1111 (formerly EES115F). Introduced Fall 2004. First-year writing seminar on what constitutes science, separating good science from junk science, and how questions of what constitutes good science play into contemporary political and legal disputes.

8. "Deep Geological Disposal of High-Level Radioactive Waste" CE 299. Introduced Spring 2007. Developed team-taught transdisciplinary graduate capstone seminar (with Jim Clarke and Calvin Miller) on disposal of nuclear waste, with a focus on the proposed repository at Yucca Mountain. The seminar combined sociological, ethical, psychological, political, engineering, and geological perspectives on the proposed respository and featured fieldwork in Nevada both to examine the geology and hydrology of the region and to interact with politicians, public officials, and community activists.

9. "New Global Crisis: Energy and Water Resources in the 21st Century" HUM161 (with David Furbish). Co-taught a multidisciplinary undergraduate course on the science, politics, and ethics of energy and water resources.

10. "Earth and the Atmosphere," EES108. Introduced Spring 2004. The atmosphere from the perspective of weather and climate and also as a component of the earth system. Special topics on how weather, pollution, and global change affect human society and how science, economics, and politics interact to manage these impacts.

11. "Nonlinear Dynamics and Chaos," PHYS361. Introduced Fall 2000. Developed a graduate seminar on nonlinear dynamics and chaos with emphasis on drawing connections between the formal mathematical foundations and applications to laboratory science and students' research.

12. "Science in a Democracy," HONS189.02 (team-taught with Lewis Branscomb), Spring, 2000. Developed and co-taught an honors seminar on the interactions of science with public policy, examining issues of fraud and integrity in research, intellectual property, science as an engine of economic growth, technocracy vs. democracy, and environmental regulation. Featured guest lectures and class discussions with Senators Lamar Alexander and William Frist.

13. "Atmospheric Physics," PHYS108. Introduced Spring 1995. Introduced atmospheric physics course with focus on the science, economics, and politics of global environmental change.

6b. Current Graduate Students

6b.i. Advisor:

1. Christopher Tasich (Ph.D. student, Earth & Environmental Sciences, Advisor).

2. Rachel Shumaker (M.S. student, Earth & Environmental Sciences, Advisor).

3. Pamela Hoover (Ph.D. student, Civil and Environmental Engineering, co-Advisor: Jim Clarke is Hoover's primary advisor; I am supervising her research on the environmental impact of printed versus electronic documents.).

6b.ii. Member of Dissertation/Thesis Committee:

1. Moyo Ajayi (Ph.D. Student, Earth & Environmental Sciences).
2. Jennifer Bradham (Ph.D. Student, Earth & Environmental Sciences).
3. George Duffy (Ph.D. Student, Earth & Environmental Sciences).
4. Christian Hung (Ph.D. Student, Economics).
5. Kate Nelson (Ph.D. Student, Environmental Engineering).
6. Brooke Patton (M.S. Student, Earth & Environmental Sciences).
7. Scott C. Worland (Ph.D. Student, Environmental Engineering).

6c. Former Graduate Students

6c.i. Advisor:

1. Emily Burchfield (Ph.D. 2017, Environmental Engineering, Advisor. Current position: Tenure-track Assistant Professor, Utah State University, Dep't. of Environment and Society).
2. John Nay (Ph.D. 2017, Integrated Computational Decision Science, Advisor. Current position: Information Law Institute Fellow, School of Law and Center for Data Science, New York University, and CEO, Skopos Labs, Inc.).
3. Kevona Belcher (M.S. Student, Environmental Engineering and Vanderbilt-Fisk Bridge Program, Advisor. Currently on extended medical leave).
4. Laura Benneyworth (Ph.D. 2016, Environmental Management and Policy, Advisor. Current position: Tennesee Dep't. of Transportation).
5. John Jacobi (Ph.D. 2014, Environmental Engineering. Current position: Natural Catastrophe Modeling Manager, SCOR Reinsurance). George Hornberger was Jacobi's primary advisor. I supervised research using agent-based modeling of farmer decision-making that formed one third of his dissertation.

6c.ii. Member of Dissertation/Thesis Committee:

1. Leslie Duncan (Ph.D. 2017, Environmental Engineering, Dissertation Committee).
2. Thushara Gunda (Ph.D. 2017, Environmental Engineering, Dissertation Committee).
3. Jennifer Pickering (Ph.D. 2016, Earth & Environmental Science, Dissertation Committee).
4. Elena Wilmot (former Ph.D. student, Earth & Environmental Sciences, Dissertation Committee).
5. Kendra Abkowitz (Ph.D. 2015, Environmental Engineering, Dissertation Committee).
6. Elizabeth Stone (M.S. 2015, Earth & Environmental Science, Committee).
7. Gregory George (M.S. 2014, Earth & Environmental Science, Committee).
8. Shelley Donohue (M.S. 2013, Earth & Environmental Science, Committee).
9. Courte Voorhees (Ph.D. 2012, Community Research & Action, Dissertation Committee).
10. Ryan Haupt (M.S. 2012, Earth & Environmental Science, Committee).
11. Patricia Conway (former Ph.D. student, Community Research & Action, Dissertation Committee).
12. Luis Fong (Ph.D. 2005, Physics, Dissertation Committee).
13. Andrew Rose (Ph.D. 2001, Physics, Dissertation Committee).
14. Christine Cheney (Ph.D. 2001, Physics, Dissertation Committee).

6d. Undergraduate Advisees

1. Kelsey Kaline (Class of 2014, Independent major in Environmental Policy).
2. Courtney van Stolk (2013, Independent major in Environmental Policy).
3. Jeremy Doochin (2010, Indepdendent major in Environmental Policy).

6e. Undergraduate Research Projects Supervised

1. Austin Channell (2015–present, Civil Engineering major): Supervising multi-year immersive undergraduate research project on reducing individual and household greenhouse gas emissions. Austin won a Vanderbilt Undergraduate Summer Research fellowship and won a prize for his presentation of research results at the 2016 Vanderbilt Undergraduate Research Fair.
2. Marc Chen (2016–2017, Economics major): Co-supervised senior honors thesis research on poverty, access to public-transit, and employment in Nashville, and served as second reader of honors thesis. Mr. Chen's thesis was awarded highest honors.
3. Heebong Kim (2016, EES major): Supervised honors enrichment project on science policy.
4. Joshua Timm (2015–2016, Political Science major): Supervised independent research on media bias in reporting on climate and weather and immersive research on corporate energy conservation as part of a TIPs project. Second reader on senior honors thesis.
5. Michael Diamond (2014, EES major): Supervised field research in Bangladesh.
6. Michael Diamond (2012, EES major): Supervised independent honors research project on the feasibility of terraforming Mars.
7. Michael Kofsky (2010–11, Political Science major): Supervised independent research on the environmental footprints of delivering movies for home viewing by mailing DVD's versus streaming broadband.
8. Kelley Coffman (2002–03, Medicine, Health, & Society major): Supervised senior honors thesis on citizen response to environmental contamination by Oak Ridge National Laboratory. Ms. Coffman received high honors for her thesis.
9. Megan O'Grady (2002–03, Physics major): Co-supervised senior research project and honors thesis together with Prof. John Wikswo. Ms. O'Grady subsequently won an NSF Graduate Fellowship.

7 Service

7a. Service to Department

2017–2018 Speaker and Seminar Coordinator.

2015–2016 Chair, Subcommittee on Earth Sciences Curriculum.

2006–2014 Coordinator, Transdisciplinary Initiative on Environmental Systems and Doctoral Capstone Seminar.

7b. Service to College

2014–2015 Worked with Prof. Tiffiny Tung (Anthropology) on addressing problems of sexual harassment and hostile work environments for students conducting field research. Sought guidance from EEO and developed recommendations that Prof. Tung presented to Faculty Council.

2003–present Communication of Science, Engineering, and Technology Committee.

2004–2009 Writing Advisory Board.

7c. Service to University

2017 Co-chair (with Gail Carr-Williams), Public Transit Working Group, Transportation Planning, Vanderbilt FutureVU land-use planning initiative.

2017 "Climate Science Myth Busters" Public lecture on myths and facts about climate science and global warming. School of Engineering (Apr. 12).

2017 Led the inaugural Digital Salon at the Wond'ry, discussing cross-disciplinary applications of data science and computational modeling from engineering and the natural sciences to digital humanities (Feb. 21).

2017–present Management Committee, The Erdős Institute for Collaborative Research, Innovation, and Entrepreneurship (A joint venture of The Ohio State University and Vanderbilt University).

2015–2017 Worked with the Curb Center and the Wond'ry to build multi-university consortium to foster interdisciplinary faculty collaboration. This work led to the creation of the Erdős Institute.

2016 Panelist, "After Paris, What Next?" Roundtable discussion of climate policy after the Paris accord. Vanderbilt Law School, hosted by Chancellor Zeppos.

2015 Panelist, "Grand Challenge: Energy and the Future," (Vanderbilt Board of Trust Meeting, 13 Feb.)

2013 Panelist, "Starting the Conversation: Inspiring Your Students to Write" (Aug. 29, Center for Teaching, Writing Studio, & Heard Library).

2013 Speaker, "Dinner and a draft: Talking about writing and revising" (Mar. 28, Dean of Commons & Writing Studio).

2013 Graduate honor fellowships evaluation committee.

2010–2013 Traffic & Parking Committee.

2008 Co-chair (with Michael Bess), Faculty Seminar on the Future of Humanity, Center for Ethics.

1999–2000 Co-chair (with Lewis Branscomb) Faculty Seminar on Science and Technology Policy.

1996–1997 Chair, Faculty Seminar on Economics of Scientific Research (Vanderbilt Institute for Public Policy Studies).

Ongoing Frequent guest lectures about climate change and science policy in Nursing, Global Public Health, Law, Management, Engineering, and Arts & Science; speaking to student groups, such as WilSkills, McGill Hour, and Commons.

7d. Service to Profession

2017 Participant, NSF workshop on Interdisciplinary Disaster Research. Developing resources on best practices for interdisciplinary disaster research.

2016–present External Advisory Committee, Urban Water Innovation Network, an NSF-sponsored sustainability research network ($12.5 million funding).

2016–present Organizing committee, Annual Conference on Artificial Intelligence and the Law, Vanderbilt Law School.

2015 Organizing Committee: Food, Energy, Water Systems Nexus Challenges Workshop: Technology and Information Fusion (sponsored by NSF, Nov. 5–6, 2015).

2007 Represented Vanderbilt University at Oak Ridge National Laboratory University Liaisons Meeting: Opportunities for Collaborative Research on Climate Change, Sept 26.

2008 Session organizer and chair, "Quantifying Individual Emissions," Consumption, Law, & Environment Conference, Vanderbilt Law School (Apr. 17–19, 2008).

2006 Chair, "Intra- and Inter-Generational Equity" session, Consumption, Law, & Environment Workshop, Vanderbilt Law School (Oct. 19–20, 2006).

1997 Chair, Program Session on Laser and Ion-Beam Processing, ASM Materials Week '97, Indianapolis, IN.

1996 Co-Chair, Program Session on Laser and Ion-Beam Processing, ASM Materials Week '96, Cincinnati, OH.

1996 Organizing Committee, 5th Annual Workshop of the Consortium for Nanostructured Materials, Nashville TN.

Ongoing Review grant proposals for National Science Foundation, U.S. Department of Energy, UK National Environmental Research Council, and Indo-US Science & Technology Forum.

Ongoing Review journal manuscripts for ACM Transactions on Autonomous and Adaptive Systems, Climatic Change, Energy Policy, Royal Society of Chemistry, Environmental Science & Technology, Sustainability Science, International Journal of Biometeorology, Proceedings of the National Academy of Sciences of India, and International Journal of Sustainable Transportation.

Ongoing Review book proposals and manuscripts for Cambridge University Press, Oxford University Press, and Columbia University Press.

7e. Service to Community

2017 Working with Dr. Sanmi Areola (Metro Public Health), Kimberly Jackson (Meharry Medical College and Health Impacts of Degraded Environments), and Carol Ziegler (Vanderbilt School of Nursing) to establish a research network for monitoring air quality in public housing units and provide research opportunities for Vanderbilt undergraduate and graduate students.

2017 "Beyond Gridlock: The Private Governance Response to Climate Change." Public lecture (with Michael Vandenbergh) at Nashville Public Library as part of the "Thinking out of the Lunch Box" series. (Apr. 5).

2015–2017 Collaboration with University School of Nashville physics teacher Wilson Hubbell to incorporate scientific literacy about mathematical and computational modeling into high-school science curricula (Funding for USN from an Edwin E. Ford Leadership Challenge Grant).

2011–2012 Co-author, *Sustainable Tennessee*, a report to state and local decision makers on the impacts of climate change on Tennessee and possible adaptations. Oak Ridge National Laboratory and Sustainable Tennessee.

2009 Briefed representatives of Senators Corker and Alexander on environmental aspects of the Convention on the Law of the Sea Treaty (organized by the Pew Charitable Trusts), Nov. 18.

2009 Invited panelist, "Health in Tennessee: The Impact of Climate Change," Public Policy Forum with Tennessee State Legislature (organized by Papasan Institute for Government Relations, U. Memphis), June 3.

2007–2009 Advisory Board on Environment, The Tennessean Newspaper.

2008 Testimony about climate change before Tennessee House Committee on Conservation and Environment, Feb. 28.

2006 Co-Organizer, Nashville Forum on Christianity and the Environment, Scarritt-Bennett Center, Sept. 30.

2006 Panelist, Belcourt Theatre discussion of genetically modified food. Apr. 7.

2005 "Democracy in the Age of Science" Public lecture at Nashville Public Library as part of the "Thinking out of the Lunch Box" series. (Sept. 7).