

# Curriculum Vitae

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## 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

**2022–2023** The Alexander Heard Distinguished Service Professor, Vanderbilt University

**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 J. 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

**2023–2024** Fulbright Scholar Award, supporting a sabbatical leave as Fulbright Canada Research Chair in Digital Technologies and Sustainability at the University of Calgary.

**2022** The Alexander Heard Distinguished Service Professor Award, Vanderbilt University, recognizing distinctive contributions to the understanding of problems of contemporary society. (\$5000 cash prize)

- 2021** Outstanding Reviewer Award, Winter Simulation Conference, recognizing the top 2 percent of reviewers, who go above and beyond to provide exceptionally thorough, rigorous, and insightful reviews of invited and submitted conference papers.
- 2018** The Chancellor's Award for Research, Vanderbilt University, recognizing "excellence on the part of faculty for published research, scholarship or creative expression" published in the previous three years. (\$2000 cash prize)
- 2017** The Morrison Prize for the highest impact paper published in 2015–2016 on sustainability law and policy (shared with Michael Vandenberg). Sandra Day O'Connor School of Law, Arizona State University. (\$10,000 cash prize divided equally between Vandenberg 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 17, 2023, Google Scholar lists 7,117 citations (2,740 since 2018 and 603 new citations in 2022), an h-index of 36 (23 counting only citations since 2018), and 13 papers with 100+ citations, including 5 papers with 300+.

### 5b. Book (✓ denotes peer-reviewed book)

1. ✓ M.P. Vandenberg and **J.M. Gilligan**. (2017). *Beyond Politics: The Private Governance Response to Climate Change*. New York, NY: Cambridge University Press. ISBN: 978-1107181229. 494 pp.

*This book synthesizes and extends ten years of collaborative work by Vandenberg and me. We developed the ideas on policy plasticity, political opportunity cost, second-best solutions, and behavioral approaches to greenhouse gas emissions reduction together. Vandenberg developed the legal analyses and I did most of the quantitative analysis.*

### 5c. Articles (\* denotes student author, ✓ denotes peer-reviewed article)

1. ✓ J. Raff\*, J. Goodbred Steven, J. Pickering, R. Sincavage, J. Ayers, S. Hossain, C. Wilson, C. Paola, M. Steckler, D. Mondal, J.-L. Grimaud, C.J. Grail, K. Rogers, K. Ahmed, S.H. Akhter, B. Carlson, E. Chamberlain, M. Dejter, **J. Gilligan**, R. Hale, M. Khan, G. Muktedir, M. Rahman, and L. Williams. (2023). "Sediment delivery to sustain the Ganges-Brahmaputra delta under climate change and anthropogenic impacts," *Nature Communications*. In press.

2. ✓ M.D. Sweitzer, T. Gunda, and **J.M. Gilligan**. (2023). "Water narratives in local newspapers within the United States," *Frontiers in Environmental Science*, **11**. DOI: 10.3389/fenvs.2023.1038904.

3. ✓ K. Best\*, **J. Gilligan**, H. Baroud, A. Carrico, K. Donato, and B. Mallick. (2022). "Applying machine learning to social datasets: A study of migration in southwestern Bangladesh using random forests," *Regional Environmental Change*, **22**, 52. DOI: 10.1007/s10113-022-01915-1.

*Best (my graduate student) took the lead on this paper. I suggested the original idea, of applying survival analysis to the results of her machine-learning analysis and comparing the two methods. After I got her started, Best did all of the data analysis and wrote most of the paper, with input and guidance from me.*

4. ✓ F. Schenuit\*, **J. Gilligan**, and A. Viswamohan. (2021). "A scenario of solar geoengineering governance: Vulnerable states demand, and act," *Futures*, **132**, 102809. DOI: 10.1016/j.futures.2021.102809.

*This paper describes a "war gaming" exercise conducted by two groups at the 2019 Summer School on Governance of Geoengineering at Banff. Schenuit, Viswamohan, and I participated (along with many others) in the exercise. Schenuit took the lead in writing the paper, with distinct sections assigned to Viswamohan and myself. I took the lead on the introduction and the section on each group's critique of the other's policy actions and each group's response to the critique. All three of us then worked closely to integrate the sections into a coherent paper and to revise it after the initial peer review.*

5. ✓ **J.M. Gilligan**. (2021). "Expertise across disciplines: Establishing common ground in interdisciplinary disaster research teams," *Risk Analysis*, **41**, 1171–1177. DOI: 10.1111/risa.13407.

6. ✓ K.J. Ding\*, **J.M. Gilligan**, Y.E. Yang, P. Wolski, and G.M. Hornberger. (2021). "Assessing food-energy-water resources management strategies at city scale: An agent-based modeling approach for Cape Town, South Africa," *Resources, Conservation and Recycling*, **170**, 105573. DOI: 10.1016/j.resconrec.2021.105573.

*The idea for this paper came from Ding. I made many suggestions, especially for considering the role of economic inequality among urban water consumers. I worked closely with Ding and supervised his development of the agent-based model and his work coupling the agent-based model to the hydrological model. I suggested the approach to interpreting the time-series data from climate models in terms of stress as a function of realized warming. I was active in writing the paper with Ding, and provided a lot of suggestions about how to describe the model, present the data, and design visual displays of the data.*

7. ✓ K.B. Best\*, **J.M. Gilligan**, H. Baroud, A.R. Carrico, K.M. Donato, B.A. Ackerly, and B. Mallick. (2021). "Random forest analysis of two household surveys can identify important predictors of migration in Bangladesh," *Journal of Computational Social Science*, **14**, 77–100. DOI: 10.1007/s42001-020-00066-9.

*Best (my graduate student) took the lead on this paper, which grew out of a class project in Baroud's class. Carrico, Donato, and Ackerly shared their data for the analysis. I worked closely with Best to interpret and present the results of her analysis in the paper and to design data visualizations for the paper, but she did most of the actual writing and all of the data analysis.*

8. M.P. Vandenbergh and **J.M. Gilligan**. (2020). "Climate law and policy: Forks in the road," *Duke Environmental Law and Policy Forum*, **31**, 163–173. DOI: 10.2139/ssrn.3543639.

*Vandenbergh developed the original idea. He and I worked closely together to develop the idea and write the paper. I also provided analysis of the quantitative implications for climate policy.*

9. **J.M. Gilligan** and M.P. Vandenbergh. (2020). "Beyond wickedness: Managing complex systems and climate change," *Vanderbilt Law Review*, **73**, 1177–1810.

*This paper was mostly my work. It draws on a large body of collaborative work by Vandenbergh and me, but the analysis of the wicked problems paradigm was almost entirely mine and I wrote the paper, with input from Vandenbergh.*

10. ✓ A.R. Carrico, K.M. Donato, K. Best\*, and **J. Gilligan**. (2020). "Extreme weather and marriage among girls and women in Bangladesh," *Global Environmental Change*, **65**, 102160. DOI: 10.1016/j.gloenvcha.2020.102160.

*Carrico and Donato analyzed the survey data on marriage. Best (my graduate student) and I analyzed meteorological data and applied statistical interpolation methods to estimating the incidence of extreme weather events at the exact sites where the surveys were conducted. Carrico and Donato did most of the writing, with input from Best and myself.*

11. ✓ K.S. Nielsen\*, P.C. Stern, T. Dietz, **J.M. Gilligan**, D.P. van Vuuren, M.J. Figueroa, C. Folke, W. Gwozdz, D. Ivanova, L.A. Reisch, M.P. Vandenbergh, K.S. Wolske, and R. Wood. (2020). "Improving climate change mitigation analysis: A framework for examining feasibility," *One Earth*, **3**, 325–336. DOI: 10.1016/j.oneear.2020.08.007.

*This paper came out of a workshop Nielsen (a Ph.D. student) organized at Copenhagen Business School. The main ideas were developed during the workshop, and Nielsen, Stern, Dietz, and I took the lead in developing it into a paper. I played a major role in connecting the social and behavioral science approaches to the challenges of integrated assessment modeling, where van Vuuren has considerable expertise and I took the lead in writing the parts of the paper that described applying social, behavioral, and political analyses of feasibility to integrated assessment models.*

12. M.P. Vandenbergh, **J.M. Gilligan**, and H. Feuerman\*. (2020). "The new revolving door," *Case Western Reserve Law Review*, **70**, 1121–1149. DOI: 10.2139/ssrn.3570889.

*Vandenbergh took the lead on this. He came up with the idea and directed Feurman, who did the research. I helped to write it and develop the ideas, but I only played a minor role.*

13. ✓ S. Elsworth, T. Filatova, A.J. Jakeman, A.J. Kettner, M.L. Zellner, I.N. Athanasiadis, S.H. Hamilton, R.L. Axtell, D.G. Brown, **J.M. Gilligan**, M.A. Janssen, D.T. Robinson, J. Rozenberg, I.I.T. Ullah, and S.J. Lade. (2020). "Eight grand challenges in socio-environmental systems modeling," *Socio-Environmental Systems Modeling*, 2, 16226. DOI: 10.18174/sesmo.2020a16226.

*This was a group paper that came out of a working group at the National Socio-Environmental Synthesis Center. I was a lead author on grand challenges 3 and 8: "Combining qualitative and quantitative methods and data sources" and "Leveraging new data types and sources."*

14. ✓ **J.M. Gilligan** and M.P. Vandenbergh. (2020). "A framework for assessing the impact of private climate governance," *Energy Research & Social Science*, 60, 101400. DOI: 10.1016/j.erss.2019.101400.

*I wrote most of this paper; developed the structure, created the figures, and performed the quantitative analysis. Vandenbergh contributed to drawing connections between the methods of analysis and the political realities of initiative feasibility.*

15. **J.M. Gilligan**. (2019). "Modelling diet choices," *Nature Sustainability*, 2, 661–662. DOI: 10.1038/s41893-019-0354-7. Invited "News and Views" commentary.

16. **J.M. Gilligan**. (2018). "Carrots and sticks in private climate governance," *Texas A&M Law Review*, 6, 179–198.

17. J.B. Ruhl, J. Nay\*, and **J.M. Gilligan**. (2018). "Topic modeling the president: Conventional and computational methods," *George Washington Law Review*, 86, 1243–1315.

*I originated the concept, identified the source of data, and provided guidance in conducting the research. Nay performed the computational text analysis. All three authors contributed equally to interpreting the results of the computational textual analysis. Ruhl conducted literature review and wrote the paper.*

18. ✓ A. Maki, E. McKinney\*, M.P. Vandenbergh, M.A. Cohen, and **J.M. Gilligan**. (2018). "Employee energy benefits: what are they and what effects do they have on employees?" *Energy Efficiency*, 12, 1065–1083. DOI: 10.1007/s12053-018-9721-x.

*I contributed equally with the other authors on developing the idea for the research. I contributed to designing the study and the survey instrument, interpreting the results, and writing the paper. Maki (a postdoc) did most of the work of designing the study, conducting the study, and analyzing the results.*

19. ✓ **J.M. Gilligan**, C.A. Wold\*, S.C. Worland\*, J.J. Nay\*, D.J. Hess, and G.M. Hornberger. (2018). "Urban water conservation policies in the United States," *Earth's Future*, 6, 955–967. DOI: 10.1029/2017EF000797.

*I designed and conducted the statistical analysis, interpreted the results of the analysis, and wrote the paper. Wold and Hess collected the data on water conservation policies. Worland and Nay collected the climatic, demographic, and economic data. Hess, Hornberger, and I developed the theoretical basis for the statistical model.*

20. **J.M. Gilligan**. (2018). "Climate modeling: accounting for the human factor," *Nature Climate Change*, 8, 14–15. DOI: 10.1038/s41558-017-0038-0. Invited "News and Views" commentary.

21. ✓ J.J. Nay\*, E.K. Burchfield\*, and **J.M. Gilligan**. (2018). "A Machine-Learning Approach to Forecasting Remotely Sensed Vegetation Health," *International Journal of Remote Sensing*, 39, 1800–1816. DOI: 10.1080/01431161.2017.1410296.

*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.*

22. C. Phillips, **J.M. Gilligan**, S. Harper, J. Roberts, and M.P. Vandenberg. (2018). "Dialogue: Beyond politics: The private governance response to climate change," *Environmental Law Reporter*, **48**, 11049–11062.

*This is a transcript of a panel discussion. Each author's contributions are identified in the text.*

23. ✓ C. Wilson, S. Goodbred, C. Small, **J. Gilligan**, S. Sams\*, B. Mallick, and R. Hale. (2017). "Widespread infilling of tidal channels and navigable waterways in the human-modified tidal delta plain of southwest Bangladesh," *Elementa*, **5**, 78. DOI: 10.1525/elementa.263.

*Wilson led this paper, especially the analysis of remote-sensing imagery and the calculation of sediment budgets. I contributed to the research design, analyzing the social and environmental impact of infilling channels, and to writing the section on sustaining the Ganges-Brahmaputra tidal delta plain.*

24. **J.M. Gilligan**. (2017). "Are cops on the science beat?" *Issues in Science and Technology*, **34**, 6–8. Commentary invited by the editor.

25. ✓ 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.

*Gunda did the bulk of the data analysis for this paper and wrote most of the text. I provided guidance and suggestions to help with the data analysis and interpretation.*

26. ✓ 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: <https://web.archive.org/web/20170915110349/http://authorservices.taylorandfrancis.com/world-water-day-2017-2/>.

*Laura Benneyworth, my graduate student, did the vast majority of the work in this paper under my guidance. I provided guidance in conducting and interpreting statistical analyses, integrating and synthesizing the chemical and sociological data, and interpreting the results. Benneyworth wrote the text with my input, editing, and supervision.*

27. ✓ 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.

*I proposed the idea for the research that led to this paper. My students, Burchfield and Nay, did all the work of putting the idea into practice and wrote all the computer code and performed all the analysis. The three of us wrote the paper together.*

28. ✓ 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.

*This paper is a collaboration with my graduate student Burchfield. We worked closely together applying principal component analysis to satellite remote-sensing data to identify land-use and drought severity. Burchfield conducted the field research, analyzed the field data, and wrote most of the paper, with input and guidance from me.*

29. ✓ 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.

*Hess, Hornberger, and I came up with the idea for this research. Wold, supervised by Hess, collected the data. My student Nay and I made large contributions to the quantitative data analysis.*

30. 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.

*This is a short reply to a comment on our paper on flood risk in Bangladesh. I contributed material on the history and politics of Tidal River Management.*

31. ✓ 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.

*The project was conceived jointly by myself, Ackerly, and Goodbred. The bulk of this paper focused on geological measurements and analysis designed and conducted by Auerbach, Goodbred, Mondal, and Wilson. I contributed synthesis between the geological and social sciences, made with land-use in other parts of the delta, and did historical research on the evolution of scientific thinking about sediment dynamics and flood control in Bengal since the 19th century.*

32. ✓ 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.

*This project was conceived and designed equally by Hornberger, Hess, and myself. Hornberger and Hess did the bulk of research, analysis, and writing on this paper. I participated in writing and contributed a small amount of research and statistical analysis.*

33. M.P. Vandenbergh and **J.M. Gilligan**. (2015). "Beyond gridlock," *Columbia Journal of Environmental Law*, **40**, 217–303. DOI: 10.2139/ssrn.2533643. **NOTE:** This paper won the 2017 Morrison Prize for the highest-impact paper on sustainability law and policy in 2015.

*This paper was roughly equally written by Vandenbergh and myself. Vandenbergh contributed expertise on legislative history and policymaking. I contributed quantitative analysis of greenhouse gas emissions, risk analysis, and risk management. We contributed equally to material on the role of individual behavior.*

34. **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.

*Vandenbergh and I made equal contributions to this paper. I analyzed the consequences of delay on preventing catastrophic risk and developed the idea of political opportunity cost. Vandenbergh built on this to apply the political opportunity cost framework to analyzing policy options currently under discussion in the U.S. federal government.*

35. 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.



*Vandenbergh and Toner developed the idea of using prediction markets to influence beliefs. Vandenbergh researched the legal issues around prediction markets the legal status of actual prediction markets, such as IEM and InTrade. Toner researched the psychological issues around trust. I researched past proposals for climate prediction markets, bets on climate change between climate scientists and skeptics, and contributed economic analysis of possible sources of market failure in a prediction market. Vandenbergh and Toner did most of the writing, with myself contributing between 10% and 25% of the final text. In the course of writing, all three authors conducted extensive discussions of the entirety of the paper.*

36. 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.

*Dietz, Gardner, Stern, Vandenbergh, and I contributed equally to developing the concept of the behavioral wedge. I performed calculations and research on assessing the environmental impacts of individual actions. Carrico did most of the writing and psychological research.*

37. 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.

*Vandenbergh and I made equal contributions to this paper. I analyzed the potential for catastrophic risk and the problems this posed for cost-benefit analysis. Vandenbergh built on this to explore the implications for policy analysis.*

38. **J. Gilligan**, T. Dietz, G. Gardner, P. Stern, and M. Vandenbergh. (2010). "The behavioural 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*.

*I wrote this paper, with input from my co-authors. All of the authors made equal contributions to the underlying research.*

39. ✓ 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.

*Stern did most of the writing drawing on calculations and other research that I performed for assessing the environmental impacts of the measures he proposed.*

40. 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.

*I performed research and calculations on to assess the environmental impacts of individual actions to reduce energy consumption. Vandenbergh did most of the writing and policy analysis.*

41. ✓ 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.

*I conducted a literature review of motor vehicle idling, calculated the emissions resulting from idling, and the potential cost-savings and emissions reduction from reduced idling. I contributed to the statistical analysis of the survey data and to the writing of the paper. Carrico conducted the psychological research and wrote the paper.*

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

*I developed the quantitative framework for this analysis, performed all the calculations, did about half the assessments of the emissions reduction potential for different actions and the penetration of those actions in the contemporary population. I contributed substantially to writing the paper and wrote most of the "supporting information" document.*

43. ✓ 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. DOI: 10.3181/0902-RM-47. **NOTE:** Selected by the editors as the feature article of the month.

*I performed the original optical design and fabrication of the dual-camera system, wrote the high-speed image-acquisition software, and helped supervise Holcomb as he took over the project and brought it to fruition as his doctoral dissertation.*

44. M.P. Vandenberg, J. Barkenbus, and **J.M. Gilligan**. (2008). "Individual carbon emissions: The low-hanging fruit," *UCLA Law Review*, **55**, 1701–1758.

*I performed roughly half of the quantitative analysis. All three authors contributed equally to writing the paper.*

45. ✓ D.N. Mashburn\*, S.J. 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. DOI: 10.1063/1.2796832.

*I supervised Mashburn, who designed and built the stimulator as an undergraduate research project. I contributed substantially to writing the paper.*

46. **J.M. Gilligan**. (2006). "Flexibility, clarity, and legitimacy: Considerations for managing nanotechnology risks," *Environmental Law Reporter*, **36**, 10924–10930.

*This paper was entirely my work.*

47. ✓ 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.

*I contributed substantially to designing and conducting the experiments and measurements and to writing the paper. Sobol, Sviridov, Kitai, and I contributed equally to the experimental work. Sobol did most of the writing, with significant contributions from me. Edwards and Tolk made minor contributions.*

48. ✓ A. Cricenti, R. Generosi, M. Luce, P. Perfetti, G. Margaritondo, D. Talley, J.S. Sanghera, I.D. 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.

*I contributed substantially to designing and conducting the experimental work. Cricenti, Generosi, Luce, Talley, and I contributed roughly equally to conducting the experiments. Cricenti and I performed data analysis. Cricenti, Talley, and I did most of the writing. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

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

*I supervised Mensing, a graduate student, in designing and conducting the experiments. I conducted extensive theoretical analysis and developed computational models of defect states and contributed to analyzing the data. Mensing and I did most of the writing.*

50. ✓ A. Cricenti, R. Generosi, M. Luce, P. Perfetti, G. Margaritondo, D. Talley, J.S. Sanghera, I.D. Aggarwal, **J.M. Gilligan**, and N.H. Tolk. (2001). "Spectroscopic scanning near-field optical microscopy with a free electron laser: CH<sub>2</sub> bond imaging in diamond films," *Journal of Microscopy*, **202**, 446–450.

*Cricenti, Generosi, Luce, Talley, and I made equal contributions to designing and conducting the experiments. Cricenti and I analyzed data. Cricenti, Talley, and I wrote the paper. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

51. ✓ 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.

*A review of work by the research group on selectively modifying materials using a tunable mid-infrared free-electron laser. I designed and performed many of the experiments described here and conducted a substantial amount of the data analysis and interpretation. Lüpke did most of the writing.*

52. ✓ D.B. Talley, L.B. Shaw, J.S. Sanghera, I.D. 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.

*Talley, Shaw, Sanghera, and Aggarwal fabricated the chalcogenide fiber tips. Cricenti, Generosi, and Luce build the scanning near-field microscope. Talley, Cricenti, Generosi, Luce, and I made equal contributions to conducting the experiments. Talley did most of the writing. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

53. ✓ 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.

*Cricenti, Generosi, and I made equal contributions to designing and conducting the experiments. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

54. ✓ 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.

*Cricenti, Generosi, Herold, and I made equal contributions to designing and conducting the experiments. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

55. ✓ Z. Marka\*, C.P. Cheney\*, W. Wang\*, G. Lupke, **J. Gilligan**, Y. Yao\*, and N.H. Tolk. (1999). "Non-linear energy-selective nanoscale modifications of materials and dynamics in metals and semiconductors," *Soviet Physics: Technical Physics*, **44**, 1069–1072.

*Lüpke and I supervised Marka, Cheney, Wank, and Yao, all graduate students, in designing and conducting these experiments. Marka wrote most of this paper, with contributions from Lüpke, Tolk, and myself.*

56. ✓ 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.

*Schaafsma, Cricenti, Generosi, and I made equal contributions to designing and conducting the experiments. Schaafsma, Cricenti, and I wrote the paper. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

57. ✓ 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.

*Schaafsma, Cricenti, Generosi, and I made equal contributions to designing and conducting the experiments. Schaafsma, Cricenti, and I wrote the paper. I played a large role, together with Tolk, in recruiting the team and initiating the collaboration.*

58. ✓ 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.

*Schaafsma, Cricenti, Generosi, and I made equal contributions to designing and conducting the experiments. Schaafsma, Cricenti, and I wrote the paper. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

59. ✓ 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.

*Cricenti, Generosi, and I made equal contributions to designing and conducting the experiments. Cricenti and I wrote the paper. I played a large role, together with Margaritondo and Tolk, in recruiting the team and initiating the collaboration.*

60. ✓ J. Sturm<sup>\*</sup>, R.G. Albridge, A.V. Barnes, J.L. Davidson, **J.M. Gilligan**, G. Lupke, A. Ueda<sup>\*</sup>, and N.H. Tolk. (1998). "Infrared wavelength-selective photodesorption on diamond surfaces," *Applied Surface Science*, **129**, 59–63.

*This work was mostly Sturm's. I assisted in performing the experiments.*

61. ✓ N.H. Tolk, Z. Hargitai<sup>\*</sup>, Y. Yao<sup>\*</sup>, B. Pratt-Ferguson<sup>\*</sup>, M.M. Albert<sup>\*</sup>, R.G. Albridge, A.V. Barnes, **J.M. Gilligan**, V.D. Gordon<sup>\*</sup>, G. Lupke, A. Puckett<sup>\*</sup>, 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.

*This work was mostly performed by Yao and Hargitai, both graduate students. I supervised the students in performing the experiments, made significant contributions to analyzing the data, and helped write the paper.*

62. ✓ W. Wang<sup>\*</sup>, 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<sub>2</sub> interface," *Physical Review Letters*, **81**, 4224–4227.

*This work was mostly by Wang, a graduate student. Lupke supervised Wang in performing the experiments. I helped with experimental design, data analysis and interpretation, and writing.*

63. ✓ Y. Yao<sup>\*</sup>, Z. Hargitai<sup>\*</sup>, M. Albert<sup>\*</sup>, R.G. Albridge, A.V. Barnes, **J.M. Gilligan**, B.P. Ferguson<sup>\*</sup>, G. Lupke, V.D. Gordon<sup>\*</sup>, 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.

*This work was mostly performed by Yao and Hargitai, both graduate students. I supervised the students in performing the experiments, made significant contributions to analyzing the data, and helped write the paper.*

64. ✓ 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.

*This work was mostly by Sturmann and Graham, both graduate students. Barnes, McKinley, and I supervised the design and execution of the experiments, and contributed to data analysis. Sturmann did most of the writing.*

65. ✓ 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.

*This work was mostly performed by Volk, a graduate student. I supervised the design, fabrication, and operation of the main instrument. Volk, Elkins, and Fahey analyzed the data. Volk did most of the writing, with contributions from all the authors.*

66. ✓ 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.

*I was team-leader for designing, building, and operating one of the instruments described in this paper. Elkins, Fahey, and I did most of the writing.*

67. ✓ 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.

*This work was largely by Volk, a graduate student. I led the team designing, building, and operating the main instrument in the field. Volk and Salawitch did most of the theoretical analysis. Volk, Elkins, and Fahey did most of the data analysis and the writing.*

68. ✓ 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. Loewenstein, 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.

*I led the team that designed, build, and operated one of the main instruments used in this work. Solomon and Salawitch did theoretical analysis. Elkins, Fahey, Woodbridge, Baring, Montzka, and I did most of the data analysis. Woodbridge, Elkins, and Fahey did most of the writing, with contributions from the rest of the authors.*

69. ✓ 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.

*I developed the technique of using a Brewster plate to discriminate between measurements that could detect welcher-weg information and those that could not. Eichmann led the experiments, with substantial contributions from Bergquist, Bollinger, Itano, and myself. Eichmann did most of the writing, with contributions from the rest of the authors.*

70. ✓ 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.

*This paper is a review of a large number of experiments. I conducted some of the experiments. Itano did most of the writing.*

71. ✓ 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.

*This paper is a review of a large number of experiments. I conducted some of the experiments. Itano did most of the writing.*

72. ✓ 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.

*Itano designed the experiments. I made major contributions to performing the experiments. Itano, Bergquist, Bollinger, and I analyzed the data. Itano did most of the writing.*

73. ✓ D. Shiner, **J.M. Gilligan**, B.M. Cook\*, and W. Lichten. (1993). “H<sub>2</sub>, D<sub>2</sub>, and HD ionization potentials by accurate calibration of several iodine lines,” *Physical Review A*, **47**, 4042–4045.

*I designed the experiments. Shiner conducted them with substantial help from Cook and myself. Shiner and I made equal contributions to analyzing the data and writing the paper.*

74. ✓ **J.M. Gilligan** and E.E. Eyler. (1992). “Precise determinations of ionization potentials and EF state energy levels of H<sub>2</sub>, HD, and D<sub>2</sub>,” *Physical Review A*, **46**, 3676–3690.

*I designed and performed the experiments, analyzed the data, and wrote the paper, under the supervision of Eyler, my dissertation adviser.*

75. ✓ 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.

*Raizen designed the experiments and fabricated the ion trap. I analyzed the data and developed models of the crystal structures. Raizen and I made equal contributions to performing the experiments and writing the paper.*

76. ✓ 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.

*Raizen designed the experiments and fabricated the ion trap. Raizen and I made equal contributions to performing the experiments. I analyzed the data. Raizen and I made equal contributions to writing the paper.*

77. ✓ **J.M. Gilligan** and E.E. Eyler. (1991). “High-resolution three-photon spectroscopy and multi-photon interference in molecular hydrogen,” *Physical Review A*, **43**, 6406–6409.

*Eyler proposed this work. I performed the experiments and analyzed the data. Eyler and I interpreted the results. I wrote the paper, with contributions by Eyler.*

78. ✓ E. McCormack, **J.M. Gilligan**, C. Cornaggia, and E.E. Eyler. (1989). “Measurement of high Rydberg states and the ionization potential of H<sub>2</sub>,” *Physical Review A*, **39**, 2260–2263.

*McCormack, Cornaggia, and I made equal contributions to performing these experiments and analyzing the data. Cornaggia and I did the data analysis. All the authors made equal contributions to writing the paper.*

79. ✓ 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.

*Eyler, McCormack, and I performed most of the experiments and data analysis, with equal effort from each of us. All the authors contributed to writing the paper.*

5d. Book Chapters (\* denotes student author, ✓ denotes peer-reviewed chapter)

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. New York: Routledge, pp. 189–202. ISBN: 9780367136161.

*The concept was developed equally by the four authors as an integrated interdisciplinary research project. Ackerly, Anam, and Goodbred collected data. All four authors contributed to data analysis. All four authors interpreted the results. Ackerly wrote most of the chapter.*

2. **J. Gilligan**. (2017). "Nature of Collaboration across Disciplines." In: *Pathways to Collaboration*. R. Holowsinsky, A. Channell, O.J. Crocomo, J.P. Kreier, and W.R. Sharp, eds. Vol. 1. CreateSpace Independent Publishing, pp. 433–457. ISBN: 9781973944379.

3. 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, Bangladesh: AH Development Publishing House, pp. 27–39. ISBN: 9789849103790.

*The concept was developed equally by Ackerly and myself. I developed technological and software tools used to collect and organize the data. Ackerly designed the research. Ackerly and Anam conducted the research and data analysis. Ackerly did most of the writing. Ackerly, Anam, and I interpreted the results.*

4. **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.

*This is entirely my work.*

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

1. ✓ K.B. Best\*, A. Qu\*, and **J.M. Gilligan**. (2021). "Modeling multi-level patterns of environmental migration in Bangladesh: An agent-based approach." In: *Proceedings of the 2021 Winter Simulation Conference*. S. Kim, B. Feng, K. Smith, S. Masoud, Z. Zhang, C. Czabo, and M. Lopez, eds. Piscataway, NJ, USA: IEEE Press. DOI: 10.1109/WSC52266.2021.9715380.

*Best (my graduate student) took the lead on this paper. She designed the model with my input and supervision. Based on my suggestion, Qu and Best developed and implemented the machine-learning approach to analyzing the model parameters. I contributed significantly to interpreting the results of model experiments for the paper.*

2. ✓ J. Martinez\*, A. Mukhopadhyay, A. Ayman, M. Wilbur, P. Pugliese, D. Freudberg, **J. Gilligan**, A. Laszka, and A. Dubey. (2021). "Predicting public transportation load to estimate the probability of social distancing violations." In: *Proceedings of the Workshop on AI for Urban Mobility at the 35th AAAI Conference on Artificial Intelligence*. In press.

*Martinez is my graduate student and I supervised him doing the statistical analysis. Martinez and Mukhopadhyay did most of the writing, and I only had a minimal role in writing this paper.*

3. ✓ K. Ding\*, **J.M. Gilligan**, and G.M. Hornberger. (2019). “Avoiding “day-zero”: A testbed for evaluating integrated food-energy-water management in Cape Town, South Africa.” In: *Proceedings of the 2019 Winter Simulation Conference*. N. Mustafee, K.-H.G. Bae, S. Lazarova-Molnar, M. Rabe, C. Szabo, P. Haas, and Y.-J. Son, eds. Piscataway, NJ, USA: IEEE Press, pp. 866–877. DOI: 10.1109/WSC40007.2019.9004889.

*Ding is Hornberger’s graduate student. I closely supervised Ding in designing and developing the computational model, using the model to conduct computational experiments, and in writing up the work for presentation and publication. Ding wrote the first draft of the paper and I contributed extensive editing and writing in subsequent drafts.*

4. ✓ 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.M.K. Roeder, P.I. Frazier, R. Szechtman, E. Zhou, T. Huschka, and S.E. Chick, eds. Piscataway, NJ, USA: IEEE Press, pp. 1678–1689. DOI: 10.1109/WSC.2016.7822216.

*I proposed the idea of this paper. My student, Burchfield, collected and analyzed field data. I designed the model and Burchfield and I coded it together. I wrote the paper with help from Burchfield.*

5. ✓ 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.M.K. Roeder, P.I. Frazier, R. Szechtman, E. Zhou, T. Huschka, and S.E. Chick, eds. Piscataway, NJ, USA: IEEE Press, pp. 1666–1677. DOI: 10.1109/WSC.2016.7822215.

*I introduced the idea that participating in prediction markets could change people’s beliefs about the cause of climate change. Nay and Van der Linden developed the agent based model of a prediction market. I wrote the climate model used in the prediction-market simulation, designed the model experiments, worked with Nay to analyze the model output, and wrote large parts of the paper.*

6. ✓ **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.K.V. Chan, I. Moon, T.M.K. Roeder, C. Macal, and M.D. Rossetti, eds. Piscataway, NJ, USA: IEEE Press, pp. 3174–3175. ISBN: 978-1-4673-9741-4. DOI: 10.1109/WSC.2015.7408456. 00000.

*The concept and design originated in equal parts from myself, Camp, and Sengupta. Brady and Nay did the programming. Brady and Sengupta conducted the human-subject experiments. I wrote the paper.*

7. ✓ J.J. Nay\* and **J.M. Gilligan**. (2015). “Data-driven dynamic decision models.” In: *Proceedings of the 2015 Winter Simulation Conference*. L. Yilmaz, W.K.V. Chan, I. Moon, T.M.K. Roeder, C. Macal, and M.D. Rossetti, eds. Piscataway, NJ, USA: IEEE Press, pp. 2752–2763. ISBN: 978-1-4673-9741-4. DOI: 10.1109/WSC.2015.7408381. 00000.

*My student, Nay, came up with the idea, gathered the data, and did most of the programming. I introduced the idea of representing strategies as finite-state machines and using genetic algorithms to find the optimal strategy in order to implement his idea. We both contributed equally to writing the paper.*

8. **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.

*The three authors contributed equally to the major ideas and I wrote the entire paper.*



9. ✓ K.G. Rogers, J.P.M. 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.

*I contributed the analysis of strong coupling between human and natural systems and historical perspective of management and mismanagement of sediment transport and flooding in Bangladesh since the 1920s.*

10. J. Sturmman\*, Z. Marka\*, M.M. Albert\*, R.G. Albridge, **J.M. Gilligan**, G. Luepke, S.K. 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.

*This was principally Sturmman's work. I contributed to designing and performing the experiments.*

11. 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.

*Sobol, Sviridov, Kitai, and I made equal contributions to the experimental work. Sviridov and Sobol analyzed the data. Sobol and Sviridov did most of the writing.*

12. 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.

*Sobol, Sviridov, Kitai, and I made equal contributions to designing and conducting the experiments. Sobol and Sviridov analyzed the data and wrote the paper.*

13. **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*.

*I led the team that designed, built, and operated this instrument. I wrote the paper, with contributions from Elkins.*

14. ✓ 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 11<sup>th</sup> International Conference on Laser Science*, pp. 43–48.

*I developed the technique of using a Brewster plate to discriminate between measurements that could detect welcher-weg information and those that could not. Eichmann led the experiments, with substantial contributions from Bergquist, Bollinger, Itano, and myself. Eichmann did most of the writing, with contributions from the rest of the authors.*

15. 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 11<sup>th</sup> International Conference on Laser Science*, pp. 410–419.

*I developed the technique of using a Brewster plate to discriminate between measurements that could detect welcher-weg information and those that could not. Eichmann led the experiments, with substantial contributions from Bergquist, Bollinger, Itano, and myself. Itano did most of the writing, with contributions from the rest of the authors.*

16. 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.

*This was a review of many experiments. I performed some of the experiments. Wineland wrote the paper.*

17. 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.

*This was a review of many experiments. I performed some of the experiments. Wineland wrote the paper.*

18. E.E. Eyler, J.M. Gilligan, and E. McCormack. (1988). "Precise multiphoton spectroscopy of H<sub>2</sub>." In: *Advances in Laser Spectroscopy III*.
19. E.E. Eyler and **J.M. Gilligan**. (1987). "Precise multiphoton spectroscopy of excited states of H<sub>2</sub>." In: *Advances in Laser Spectroscopy II*. Vol. 160. AIP Conference Proceedings, pp. 388–390.

*Eyler proposed this work and I performed the experiments. Both of us contributed equally to analyzing and interpreting the data and writing the paper.*

20. E. McCormack, E.E. Eyler, and **J.M. Gilligan**. (1987). "Precise photodissociation and multiphoton spectroscopy of H<sub>2</sub>." In: *Proceedings of the XV International Conference on Quantum Electronics*. Vol. 21. Technical Digest Series. Optical Society of America, pp. 58–60.

*This work was mostly McCormack's. I assisted with performing the experiments.*

## 5f. Patents

1. D. Cliffler, 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).

*A patent for techniques to use multichannel screening to detect and identify environmental toxins, chemical or biological warfare agents. I contributed Bayesian statistical analysis for identifying significant patterns in a plurality of signals.*

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

*A patent for techniques to use multichannel screening to detect and identify environmental toxins, chemical or biological warfare agents. I developed optical techniques for monitoring metabolic activity and contributed Bayesian statistical analysis for analyzing metabolic activity.*

## 5g. Software and other products

1. kayadata: Kaya Identity Data for Nations and Regions by **J.M. Gilligan**, Comprehensive R Archive Network (2019): <https://cran.r-project.org/web/packages/kayadata/>
2. kayatool: Interactive Energy and Emissions Policy Analysis Tool by **J.M. Gilligan**, GitHub (2019): <https://github.com/jonathan-g/kayatool>
3. analyzeBehaviorspace: Interactive Analysis of Output from NetLogo Behaviorspace Experiments by **J.M. Gilligan** GitHub (2018): <https://github.com/jonathan-g/analyzeBehaviorspace>
4. forecastVeg: Forecasting Vegetation Health at High Spatial Resolution, by J.J. Nay\*, E.K. Burchfield\*, and **J.M. Gilligan**, GitHub (2016): <https://github.com/JohnNay/forecastVeg>

*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 downloading 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.*

5. predMarket: Agent-based model of trader behavior in a climate prediction market. by J.J. Nay\*, M. Van der Linden\*, and **J.M. Gilligan**, GitHub (2016): <https://github.com/jonathan-g/predMarket>

*This software model was originated by Nay and Van der Linden based on a paper by Vandenberg, Raimi, and myself. Van der Linden wrote code for implementing a simultaneous double-auction trading scheme. I wrote the climate prediction code and the code for initializing the social network of the traders. Nay and I wrote the code to run and analyze experiments with the model.*

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

*This software package was largely Nay's work. He had the original idea and did most of the programming. I contributed significantly 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.*

7. Floodpartsim: A Participatory Agent-Based Simulation of Urban Flood Risk Management by **J.M. Gilligan**, C.E. Brady, J.V. Camp, J.J. Nay\*, and P. Sengupta, GitHub (2015): <https://github.com/jonathan-g/Floodpartsim>

*Sengupta and I developed the conceptual design and specifications of the model. Camp contributed expertise on hydrological modeling. Brady and Nay wrote most of the code.*

## 5h. Invited Presentations

1. "The Race Towards Climate Justice." Invited panel presentation, Clinton Global Initiative University Annual Meeting 2023. Mar. 4, 2023.
2. "Modeling Behavior Change in Socio-Environmental Systems." Invited talk, Second Coastlines and People Workshop on Identifying Interoperability and Data Needs of Interdisciplinary Models for Understanding Vulnerability of Coastal Systems. Florida International University (Sponsored by National Science Foundation). Oct. 4, 2022.
3. "Incorporating Human Behavior into Coupled Socio-Environmental Systems Models." Keynote talk, National Socioenvironmental Synthesis Center webinar on Methods in Socio-Environmental Systems Modeling. June 20, 2022. A professionally produced video of my talk, together with a recording of the panel discussion that followed, has been posted to the SESYNC YouTube channel at <https://www.youtube.com/watch?v=rI994KY7ftE>
4. "Climate Change in Bangladesh: A Coupled Natural-Human Systems Approach," Invited talk, Howard H. Baker, Jr. Center for Public Policy, University of Tennessee Knoxville. October 14, 2021.
5. "Integrating Machine Learning with Agent-Based Modeling to Understand Human Impacts of Climate Change." Invited seminar, Florida International University. May 25, 2021.
6. "Beyond Politics: The Private Governance Response to Climate Change," Grand Rounds lecture in Radiology, Vanderbilt Medical Center. March 29, 2021.

7. “New Directions for Climate Policy in an Age of Political Gridlock,” Invited colloquium, co-delivered with Michael P. Vandenberg. Lehigh University Department of Environmental Science. October 30, 2020.
8. “Accounting for Human Behavior in Models of Coupled Natural & Human Systems,” Invited presentation at Workshop on Coastal Observation and Modeling Systems, sponsored by NSF Coastlines and People program. Virtual conference hosted by Florida International University, Miami, FL, September 8, 2020. (98 attendees).
9. “Managing Sediment for Sustainability,” Invited virtual seminar, International Centre for Climate Change and Development, Dhaka, Bangladesh, July 20, 2020.
10. “Beyond Wickedness: Managing Complex Systems and Climate Change,” Invited presentation, co-delivered with Michael P. Vandenberg. Vanderbilt University Law Review Symposium on Governing Wicked Problems. Nashville, TN, October 25, 2019.
11. “The New Revolving Door,” Invited presentation, co-delivered with Michael P. Vandenberg. Case-Western Reserve Law School Symposium on Fifty Years of the Environmental Protection Agency. Cleveland, OH, October 18, 2019.
12. “Agent-Based Modeling of Community Resilience and Environmental Non-Migration,” Invited presentation, First International Conference on Environmental Non-Migration: Framework, Methods, and Cases, Technical University of Dresden, June 19-21 2019.
13. “Sediment Management and Sea-Level Rise,” invited presentation, Fifth Annual Gobeshona International Conference on Climate Knowledge, International Centre for Climate Change and Development, Dhaka, Bangladesh, January 9, 2019.
14. Invited panelist, “What Can an Individual Do to Help Limit Climate Change,” public panel discussion at Copenhagen Business School, Aug. 29, 2018.
15. Invited participant, Workshop on Household Actions to Reduce Greenhouse Gas Emissions, Copenhagen Business School, Copenhagen Denmark, August 27–28 2018
16. Invited panelist, “Re-envisioning ‘Sustainable’ Deltas through Critical Geography,” American Association of Geographers Annual Conference, April 2018.
17. “Carrot and Sticks in Private Climate Governance,” invited presentation, Joint Conference on Environmental Regulation. The Hagler Institute for Advanced Study at the Texas A&M University School of Law and the Classical Liberal Institute at the New York University School of Law. March 9–10, 2018.
18. “Private Governance Approaches to Climate Policy: Pragmatic Responses to Government Inaction,” Department colloquium, Department of Environmental Studies, University of Colorado, Boulder, February 7, 2018.
19. “Energy and the Economy of Sri Lanka,” invited presentation, Workshop on Assessing Stakeholder Preferences in Planning of Energy Sector in Sri Lanka, Colombo, Sri Lanka, August 11, 2017.
20. “Understanding and Adapting to Water Scarcity at the Community Level,” invited keynote presentation, Conference on Recognizing Climate Change Risk of Dry Zone Farmers, Ministry of Disaster Management, Colombo, Sri Lanka, August 10, 2017.
21. “Planning for Environmental Stress and Disasters: The Importance of Interdisciplinary Approaches,” invited presentation to the Institute of Town Planners of Sri Lanka and the Organization of Professional Associations of Sri Lanka. Colombo, Sri Lanka, August 9, 2017.

22. “Quantifying the Potential for Greenhouse Gas Emissions Reductions through Private Governance,” invited presentation to National Academies Board on Environmental Change and Society. National Academies, Washington, DC, July 11, 2017.
23. “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. My talk is online at [https://www.youtube.com/watch?v=v6i5\\_P\\_00cU](https://www.youtube.com/watch?v=v6i5_P_00cU).
24. “Dynamics of Individual and Collective Agricultural Adaptation to Water Security,” invited talk, Winter Simulation Conference 2016, Arlington, VA, December 12, 2016.
25. “Understanding Drought and Decision-Making,” Workshop on Agricultural Drought and Policy, American Institute for Sri Lankan Studies, Colombo, Sri Lanka, March 10, 2015.
26. “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.
27. “In the Tide Country: Live on an Active Delta in Bangladesh,” Department of Geography, University of Georgia, October 20, 2014
28. “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
29. “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.
30. “Climate Change and Disaster Management,” Ministry of Disaster Management, Colombo, Sri Lanka, June 5, 2013.
31. “From the Laboratory to the Legislature: Transdisciplinary Perspectives on Global Climate Change” Nashville State Community College, Nashville TN, March 30, 2012.
32. “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, March 23, 2011 (Host covered travel, lodging & conference registration).
33. “The Behavioral Wedge: Reducing Greenhouse Gas Emissions by Individuals and Households,” Joint Statistical Meetings (American Statistical Association, Statistical Society of Canada, etc.), Vancouver BC, August 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).
34. Panelist, Pew Charitable Trusts Forum on the Law of the Sea Treaty, Belmont University, Nashville TN, November 18, 2009.
35. “Global Climate Change: Earth Science, Behavioral Science, and Public Policy,” Middle Tennessee State University, Murfreesboro TN, October 16, 2009.
36. “From the Laboratory to the Legislature: Why Climate Change is Fundamentally a Transdisciplinary Issue,” Belmont University, Nashville TN, February 6, 2009 (Host paid honorarium)
37. “Individual Behavior and Climate Change: The Low-Hanging Fruit,” Keynote Address, Summit for a Sustainable Tennessee, David Lipscomb University, Nashville TN, November 13, 2008.
38. “From the Laboratory to the Legislature: Transdisciplinary Perspectives on Environmental Science and Policy,” Distinguished Panel Speaker, 10<sup>th</sup> Beckman Scholars Symposium, Irvine CA, July 26, 2008. (Host covered travel & lodging and paid an honorarium).

39. "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, April 12, 2008. (Host covered travel, lodging, and paid an honorarium).
40. "Ethics in Geological Time: Should We Care about Distant Future Generations?," The Berry Lecture, Dept. of Philosophy, Vanderbilt University, Nashville TN, March 24, 2008 (honorarium).
41. "Individual Behavior and Greenhouse Gas Emissions," Behavior, Energy, and Climate Change conference, American Council for an Energy Efficient Economy, Sacramento CA, November 7–9, 2007
42. "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.
43. "*Et in Arcadia Ego*: Reflections on the Future of Tenure," Symposium on Promoting Scientific Freedom and Responsibility, AAAS Annual Meeting, Philadelphia PA (1998).
44. "Smart Modification of Surfaces with Free-Electron Lasers," ASM Materials Week '97, Indianapolis IN (1997).
45. "Modification of Diamond Films using Free-Electron Lasers," ASM Materials Week '96, Cincinnati OH (1996).
46. "Quantum Mechanical Measurements with Single Atoms," April Meeting of the American Physical Society, Washington DC (1992).

#### 5i. Published Abstracts

1. K.G. Rogers, A. Carrico, K. Donato, **J.M. Gilligan**, C. Wilson, and L.A. Valentine\*, "Positive and Negative Feedbacks Related to Infrastructure Building in Coastal Bangladesh", Amer. Geophys. Union Fall Meeting 2021
2. A. Carrico, K.G. Rogers, C. Wilson, K. Donato, and **J.M. Gilligan**, "Livelihoods, Mobility, and Flood Infrastructure in the Ganges-Brahmaputra Delta", Amer. Geophys. Union Fall Meeting 2020
3. K. Ding\*, **J.M. Gilligan**, Y-C.E. Yang, P. Wolski, and G.M. Hornberger, "Policy exploration for Food-Energy-Water security at a city-regional level: an example in Cape Town, South Africa", Amer. Geophys. Union Fall Meeting 2020
4. C.M. Tasich\*, **J.M. Gilligan**, and S.L. Goodbred, Jr., "Coupled Modeling of Landscape Evolution and Human Adaptation in the Ganges-Brahmaputra Delta", Amer. Geophys. Union Fall Meeting 2019
5. K. Ding\*, **J.M. Gilligan**, Y-C.E. Yang, and G.M. Hornberger, "Exploring FEW security at city scale: An Agent-Based Modeling approach for the City of Cape Town", Amer. Geophys. Union Fall Meeting 2019
6. K. Ding\*, **J.M. Gilligan**, Y-C.E. Yang, and G.M. Hornberger, "Agent-based modeling platform to inform regional decision-making for food, energy, and water resources management and services provision: A test case for Cape Town, South Africa", Amer. Geophys. Union Fall Meeting 2019
7. K. Best\*, **J.M. Gilligan**, K.G. Rogers, A. Carrico, K. Donato, B. Ackerly, and B. Mallick, "A Machine Learning Analysis of Multiple Social Surveys to Understand Environmental Migration in Coastal Bangladesh", Amer. Geophys. Union Fall Meeting 2018
8. A. Witte\*, G.M. Hornberger, T. Gunda, and **J.M. Gilligan**, "A Study of the Geographic Variances in Water Salience using Local Newspapers", Amer. Geophys. Union Fall Meeting 2018

9. C.M. Tasich\*, **J.M. Gilligan**, and S.L. Goodbred, Jr., “Agent-based Modeling of Human Adaptation in the Sinking Landscapes of the Ganges-Brahmaputra Delta”, Amer. Geophys. Union Fall Meeting 2018
10. L.A. Valentine\*, C. Wilson, K.G. Rogers, A. Carrico, K. Donato, and **J.M. Gilligan**, “Sediment Accretion and Erosion in Poldered and Non-Poldered Regions within the Ganges-Brahmaputra-Meghna Delta, Bangladesh: Implications for River Channel Migration and Flood Risk”, Amer. Geophys. Union Fall Meeting 2018
11. K. Best\*, **J.M. Gilligan**, H. Baroud, B. Ackerly, and B. Mallick, “Machine Learning to Identify Drivers of Internal Migration in Coastal Bangladesh”, Community Surface Dynamics Modeling System Annual Meeting, 2018.
12. C.M. Tasich\*, **J.M. Gilligan**, S.L. Goodbred Jr, R.P. Hale, and C. Wilson, “Modeling Elevation Equilibrium and Human Adaptation in the Ganges-Brahmaputra Delta”, Amer. Geophys. Union Fall Meeting 2017
13. C. Tasich\*, **J.M. Gilligan**, S. Goodbred, R. Hale, and C. Wilson, “Modeling Elevation Equilibrium and Human Adaptation in Southwest Bangladesh”, Community Surface Dynamics Modeling System Annual Meeting, 2017.
14. E.K. Burchfield\* and **J.M. Gilligan**, “Dynamics of Individual and Collective Agricultural Adaptation to Water Scarcity”, Amer. Geophys. Union Fall Meeting 2016
15. 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
16. A. Carrico, **J.M. Gilligan**, and H.B. Truelove, “Actual vs. Perceived Climate Variability among Smallholding Rice Farmers”, Amer. Geophys. Union Fall Meeting 2016
17. **J.M. Gilligan**, J.J. Nay\*, and M. Van der Linden\*, “Prediction Markets and Beliefs about Climate: Results from Agent-Based Simulations”, Amer. Geophys. Union Fall Meeting 2015
18. **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. Geophys. Union Fall Meeting 2015
19. 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. Geophys. Union Fall Meeting 2015
20. 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. Geophys. Union Fall Meeting 2015
21. T. Gunda\*, **J.M. Gilligan**, and G.M. Hornberger “Forecasts of Agricultural Drought in Sri Lanka”, Amer. Geophys. Union Fall Meeting 2015
22. **J. Gilligan**, B. Ackerly, S. Goodbred, and C. Wilson “Land Use, Livelihoods, Vulnerabilities, and Resilience in Coastal Bangladesh,” Amer. Geophys. Union Fall Meeting 2014
23. **J. Gilligan** and M. Vandenberg, “Between Too Little and Too Late: Political Opportunity Costs in Climate Policy Analysis,” Amer. Geophys. Union Fall Meeting 2014
24. G.M. Hornberger, **J. Gilligan**, and D. Hess “Water Conservation and Hydrological Transitions in Cities,” Amer. Geophys. Union Fall Meeting 2014

25. 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 world’s largest human populations,” Amer. Geophys. Union Fall Meeting 2014
26. 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. Geophys. Union Fall Meeting 2014
27. 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. Geophys. Union Fall Meeting 2014
28. **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.
29. **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 trans-disciplinary and intercultural approach,” Amer. Geophys. Union Fall Meeting 2013.
30. 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.
31. 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.
32. **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.
33. **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.
34. 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.
35. L. 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.
36. **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.
37. “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.
38. G. Mensing\*, J.M. Gilligan, E. Hurt\*, N. Tolk, and P.C. Taylor, “Photoluminescence Excitation Spectroscopy of a-Si: H using a Free-Electron Laser”, Bull. Amer. Phys. Soc. Mar. 1998, p. 2704.



39. Z. Hargitai\*, 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.
40. 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)/SiO<sub>2</sub> Interface by Intense Tunable Infrared Radiation", *Bull. Amer. Phys. Soc. Mar.* 1998, p. 1510.
41. 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.
42. **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.
43. 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.
44. 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.
45. 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.
46. 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.
47. 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.
48. **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.
49. 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.
50. 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",
51. 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).
52. **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. National Science Foundation: NSF SRS-RN 2115392, "SRS RN: Connecting Rural and Urban Environments for Equitable Access to Transportation, Telecommunications and Energy (CREEATTE)." Nov. 1, 2021–Oct. 31, 2022 Total funds: \$149,573 over one year. Direct costs: \$110,215. Indirect costs: \$39,358. Principal Investigator Jonathan Gilligan.

*I am the principal investigator.*

2. National Science Foundation: NSF FW-HTF 2129083, “FW-HTF-P: Integrating Practitioner Knowledge and Technology for the Future of Water Treatment” Sept. 15, 2021–Aug. 31, 2022. Total funds: \$150,000 over one year. Direct costs: \$105,890. Indirect costs: \$44,110. Principal Investigator Janey Camp.

*I am co-principal investigator. My role is developing expert systems to identify and automate decision strategies for water treatment, based on the tacit knowledge of experienced water-treatment operators.*

3. National Science Foundation: NSF CNH 1716909, “Socioecological System Dynamics Related to Livelihood, Human Migration, and Landscape Evolution.” Sept. 1, 2017–Feb. 28, 2023. Total funds: \$1,498,721 over four and one half years. Vanderbilt portion: Direct costs: \$100,067. Indirect costs: \$57,083. Total funds: \$157,105. Principal Investigator Amanda Carrico (University of Colorado).

*I am the principal investigator for the Vanderbilt portion of this project and my role is the lead in computational modeling and geospatial statistical analysis.*

4. Vanderbilt College of Arts & Science, “Climate and Society Grand Challenge Initiative.” 18-month grant to develop interdisciplinary connections between Humanities, Social Sciences, and Natural Sciences around climate change and society. Jul. 1, 2020–June 30, 2023. Total funds: \$100,000 over three years (direct costs: \$100,000, indirect costs: \$0). Principal Investigator Jonathan Gilligan

*I am principal investigator and director of the project.*

5. Vanderbilt College of Arts & Science, “Global Ecology and Health Grand Challenge Initiative.” Jul. 1, 2020–June 30, 2023. Total funds: \$75,000 over 3 years (direct costs: \$75,000, indirect costs: \$0). Principal Investigator John McLean.

*18-month grant to develop interdisciplinary connections between biological sciences, environmental sciences, and social sciences around climate change and emergent infectious diseases. I am co-investigator.*

## **5j.ii. Previous Grants**

1. Vanderbilt Trans-Institutional Project Grant, “Vanderbilt Climate Prediction Market,” Jul. 1, 2020–Jun. 30, 2022. Total funds: \$200,000 over 2 years (direct costs: \$200,000, indirect costs: \$0). Principal Investigator Mark Cohen.
2. Vanderbilt Trans-Institutional Project Grant, “Computational Thinking and Learning Initiative,” Jul. 1, 2019–Jun. 30, 2021. Total funds: \$200,000 over 2 years (direct costs: \$200,000, indirect costs: \$0). Principal Investigator Akos Ledeczki.
3. NSF Coastal SEES 1600319, “Multiscale Modeling and Observations of Landscape Dynamics, Mass-Balance, and Network Connectivity for a Sustainable Gange-Brahmaputra Delta,” Aug. 1, 2016–Jul. 31, 2020. Total funds: \$810,211. Direct costs: \$532,163. Indirect costs: \$278,048. Principal Investigator Steven Goodbred.

*I was co-principal investigator and my role is computational modeling, statistical data analysis, and risk analysis.*

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 was 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. Vanderbilt TIPS 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 was a co-principal investigator and my role is leading a research project studying the impact of gentrification on access to mass-transit in Nashville.*

6. Vanderbilt TIPS grant: "Private Governance Approaches to Climate Change" \$190,000 over 2 years (direct costs: \$190,000; indirect costs: \$0). Principal Investigator Michael Vandenberg.

*I was a co-principal investigator and my role is project design, statistical analysis, and coordinating undergraduate immersive experiences.*

7. "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.*

8. 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 extension 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 was 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.*

9. 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 was 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 Teaching-Related Activities

### 6a. New courses introduced

1. “Bayesian Statistical Methods,” EES 5891-03. Introduced Fall 2022. A graduate course on Bayesian statistical methods, to fill a need for more training in advanced statistical methods for graduate students in Earth & Environmental Sciences. The course begins with an introduction to Bayesian methods, and progresses to more sophisticated analysis, including multilevel regression and methods for spatiotemporal analysis.
2. “Climate and Society: Drowning Cities,” EES/HART 3333. Introduced Fall 2020. A new interdisciplinary course looking at cities that have grown along coastlines, rivers, and other bodies of water around the world from antiquity to the present. The course studies changing hazards, resources, and opportunities associated with proximity of water and how urban design reflects these resources and hazards. A large focus of the course is a semester-long project developing an interactive GIS-based presentation about a city of the student’s choice. With Betsey Robinson (History of Art and Architecture) and Steven Goodbred (Earth & Environmental Sciences).
3. “Data Science Methods for Smart Cities Applications,” UNIV 3360/5360. Introduced Spring 2018. A new interdisciplinary University Course with an emphasis on developing applications to make practical use of new data sources associated with smart-city operations. 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).
4. “Global Climate Change,” EES 3310/5310. Introduced Fall 2017. Expanded my course EES 2110/5110 to cover material at a higher level and add a laboratory (increasing from 3 to 4 credit hours). The laboratory is largely computational and introduces students to principles and practices of reproducible research using R and RMarkdown. Laboratory exercises include downloading and analyzing climate data from major online archives; conducting computational experiments using simple models of radiative transfer, geochemical carbon cycle, etc., and analyzing the model output; and analyzing energy demand and CO<sub>2</sub> emissions to assess different emission-mitigation policies. Course and laboratory materials are available at <https://ees3310.jgilligan.org>.
5. “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. Course materials are available at <https://ees4760.jgilligan.org/>
6. “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.
7. “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.
8. “Science, Risk, and Policy,” EES2150 (formerly EES 205, GEOL 205). Introduced Spring 2004. Created interdisciplinary course on how society manages deadly risks.
9. “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.

10. “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 repository 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.
11. “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.
12. “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.
13. “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.
14. “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.

## 6b. Current Graduate Students

### 6b.i. Advisor:

1. Fernanda “Ferna” Alvarez-Carrascal (Ph.D. Student, Earth & Environmental Sciences).
2. Wenwen “Bowen” He (Ph.D. student, Civil & Environmental Engineering, Co-Advisor with Prof. Janey Camp).
3. Juan Martínez (M.S. student, Civil & Environmental Engineering).
4. Christopher Tasich (Ph.D. student, Earth & Environmental Sciences, Advisor).

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

1. Moyo Ajayi (Ph.D. Student, Earth & Environmental Sciences).
2. Madeline Allen (Ph.D. Student, Civil & Environmental Engineering).
3. Bryce Belanger (Ph.D. Student, Earth & Environmental Sciences).
4. Vinay Dhanvada (Ph.D. Student, Civil & Environmental Engineering).
5. Pamela Hoover (Ph.D. student, Civil & Environmental Engineering).
6. Joshua McDuffie (Ph.D. Student, Civil & Environmental Engineering).
7. Michaela Peterson (Ph.D. Student, Earth & Environmental Sciences).
8. Erica Scarpitti (Ph.D. Student, Earth & Environmental Sciences).
9. Hannah Wolf (Ph.D. Student, Earth & Environmental Sciences).

## 6c. Former Graduate Students

### 6c.i. Advisor:

1. Kelsea Best (Ph.D. 2022, Earth & Environmental Sciences, Advisor). Current position: Assistant Professor, Department of Civil, Environmental, & Geodetic Engineering and Department of City & Regional Planning, The Ohio State University.
2. David Knorr (M.S. 2019, Earth & Environmental Sciences, Advisor. Current position: Staff Scientist, NewFields Inc., Atlanta GA.)
3. Emily Burchfield (Ph.D. 2017, Environmental Engineering, Advisor. Current position: Tenure-track Assistant Professor, Emory University, Department of Environmental Sciences).
4. John Nay (Ph.D. 2017, Integrated Computational Decision Science, Advisor. Current position: Founder and CEO, Brooklyn Artificial Intelligence Research and Brooklyn Investment Group, LLC.).
5. Rachel Shumaker (M.S. 2017, Earth & Environmental Sciences, Advisor. Current position: Environmental Scientist, Dewberry Engineers, Blanch, NC).
6. Laura Benneyworth (Ph.D. 2016, Environmental Management and Policy, Advisor. Current position: Retired).
7. John Jacobi (Ph.D. 2014, Environmental Engineering. Current position: Managing Director, Reinsurance Solutions, Aon, PLC). 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. Ishita Dash (Ph.D. 2022, Civil & Environmental Engineering).
2. Charles Doktycz (Ph.D. 2022, Civil & Environmental Engineering).
3. Paul Johnson (Ph.D. 2021, Student, Civil & Environmental Engineering).
4. Matthew Dietrich (Ph.D. 2021, Earth & Environmental Sciences).
5. Thomas Rechtman (M.S. 2021, Earth & Environmental Sciences).
6. Ke "Jack" Ding (Ph.D. 2020, Environmental Engineering).
7. George Duffy (Ph.D. 2020, Earth & Environmental Sciences).
8. Rachel McKane (Ph.D. 2020, Sociology).
9. Jennifer Bradham (Ph.D. 2019, Earth & Environmental Sciences).
10. Leslie Gillespie-Marthaler (Ph.D. 2019, Environmental Engineering).
11. Kate Nelson (Ph.D. 2018, Environmental Engineering, Dissertation Committee).
12. Scott C. Worland (Ph.D. 2018, Environmental Engineering, Dissertation Committee).
13. Christian Hung (former Ph.D. Student, Economics, Dissertation Committee).
14. Brooke Patton (M.S. 2017, Earth & Environmental Sciences, Committee).
15. Leslie Duncan (Ph.D. 2017, Environmental Engineering, Dissertation Committee).
16. Thushara Gunda (Ph.D. 2017, Environmental Engineering, Dissertation Committee).
17. Jennifer Pickering (Ph.D. 2016, Earth & Environmental Science, Dissertation Committee).

18. Elena Wilmot (former Ph.D. student, Earth & Environmental Sciences, Dissertation Committee).
19. Kendra Abkowitz (Ph.D. 2015, Environmental Engineering, Dissertation Committee).
20. Elizabeth Stone (M.S. 2015, Earth & Environmental Science, Committee).
21. Gregory George (M.S. 2014, Earth & Environmental Science, Committee).
22. Shelley Donohue (M.S. 2013, Earth & Environmental Science, Committee).
23. Courte Voorhees (Ph.D. 2012, Community Research & Action, Dissertation Committee).
24. Ryan Haupt (M.S. 2012, Earth & Environmental Science, Committee).
25. Patricia Conway (former Ph.D. student, Community Research & Action, Dissertation Committee).
26. Luis Fong (Ph.D. 2005, Physics, Dissertation Committee).
27. Andrew Rose (Ph.D. 2001, Physics, Dissertation Committee).
28. 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, Independent major in Environmental Policy).

#### 6e. Undergraduate Research Projects Supervised

1. Julia Tilton (2021–2022, EES major): Supervised research on developing a composite index of climate change.
2. Robin Young (2021–22, EES major): Supervised research on extreme heat and humidity in historical records and climate model simulations, which are part of his immersion project.
3. Ao Qu (2020–21, Computer science major): Supervised research on applying machine learning to analyzing agent-based model simulations. Mr. Qu co-authored a peer-reviewed paper based on his research.
4. Ellie Miller (2021, EES major): Supervised research on extreme heat and humidity in climate model simulations.
5. Margaret Dorhout (2018–2020, EES major): Supervised research on extreme weather patterns in Bangladesh.
6. Asaf Roth (2019, computer science major): Supervised research on time-series analysis of electricity consumption by buildings on Vanderbilt campus.
7. Madeline Allen (2018–2019, EES major): Supervised senior honors thesis research on flood modeling (in collaboration with Professors Mark Abkowitz and Janey Camp in Civil & Environmental Engineering).
8. Emma Rimmer (2018–2019, Environmental Sociology major, EES minor): Supervised research on household energy efficiency in the United States.
9. Umang Chaudhry (2017–2019, EES and Science Communications double-major): Supervised independent research project during academic year, summer research project, and senior honors thesis research on impacts of gentrification on activities of daily life for public-transit users in the Nashville Metropolitan Statistical Area.

10. Miguel Moravec (2017–2018, EES and CSET double-major): Supervised summer research and supervising senior honors thesis research on the impacts of gentrification on mobility among low-income residents of the Nashville Metropolitan Statistical Area.
11. 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.
12. Austin Channell (2015–2017, Civil Engineering major): Supervised immersive undergraduate research project on reducing individual and household greenhouse gas emissions. Mr. Channell won a Vanderbilt Undergraduate Summer Research fellowship to support this work and won a prize for his presentation of this work at the 2016 Vanderbilt Undergraduate Research Fair.
13. Heebong Kim (2016, EES major): Supervised honors enrichment project on science policy.
14. 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.
15. Michael Diamond (2014, EES major): Supervised field research in Bangladesh.
16. Michael Diamond (2012, EES major): Supervised independent honors research project on the feasibility of terraforming Mars.
17. 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.
18. Jeremy Doochin (2008–09, Independent major in Environmental Policy): Supervised independent research project on corporate greenhouse gas emissions reduction.
19. Kelley Coffman (2004–05, 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.
20. 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

**2021–2022** Member, Faculty Search Committee (climate modeling position).

**2017–2018** Chair, Seminar and Speaker Committee.

**2017–2018** Member, Faculty Search Committee (climate modeling position).

**2015–2016** Chair, Subcommittee on Earth Sciences Curriculum.

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

### 7b. Service to College

**2021–present** Co-chair, Climate Studies Program Committee. Developed a proposal for a new interdisciplinary major in Climate Studies.

**2020–present** Director, Vanderbilt Climate and Society Grand Challenge Initiative. Lead an interdisciplinary project to build strong ties among Humanities, Social Sciences, and Natural Sciences in research and teaching on the nexus of climate change and society.

**2022–2023** College Working Group on the Undergraduate Curriculum, developing new curriculum structure for College of Arts & Science.

**2020–2022** Junior Advisory Review Committee (JARC). Conduct third-year reviews for tenure-track faculty.

**2022** Presentation to Arts & Science Board of Advisors about the new Climate Studies major and the Climate & Society Grand Challenge Initiative. Mar. 25.

**2022** Keynote talk for Communication of Science, Engineering, and Technology Symposium (sponsored by National Endowment for Humanities grant). Mar. 18.

**2021–2022** Faculty Search Committee, Environmental Religious Studies.

**2019–2020** Arts & Science Grand Challenges Committee. Evaluated proposals to the college's Grand Challenges Initiative for interdisciplinary projects to address the most pressing problems facing society.

**2019–2020** Faculty Search Committee: Environmental Asian Studies, Asian Studies program.

**2003–2018** Communication of Science, Engineering, and Technology Committee.

**2014–2015** Worked with Prof. Tiffany 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.

**2004–2009** Writing Advisory Board.

### 7c. Service to University

**2021–2022** Member, University Working Group on Climate, Environment, and Energy Futures. Appointed by Chancellor Diermeier to evaluate Vanderbilt's strengths in climate, environment, and energy research and recommend future actions to enhance the university's prominence in these areas.

**2018–2019** Worked with Blue Sky sustainability initiative as part of FutureVU planning process.

- 2017–2019** Management Committee, The Erdős Institute for Collaborative Research, Innovation, and Entrepreneurship (A joint venture of The Ohio State University and Vanderbilt University).
- 2018** Organized panel on ethics in data science for Data Science Visions symposium.
- 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).
- 2016** Panelist, “After Paris, What Next?” Roundtable discussion of climate policy after the Paris accord. Vanderbilt Law School, hosted by Chancellor Zeppos.
- 2015–2017** Working with the Curb Center and the Wond’ry to build multi-university consortium to foster interdisciplinary faculty collaboration (Vanderbilt and Ohio State, founding members). Worked with Prof. Roman Holowsky at Ohio State to launch the Erdős Institute at Ohio State and develop university-industry connections to help doctoral students prepare for successful non-academic careers in the private sector.
- 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 Students Promoting Environmental Awareness and Responsibility, Wilderness Skills, McGill Hour, and Commons.

#### 7d. Service to Profession

- 2023–2025** Advisory Board/Technical Advisory Group, Southwest Urban Corridor Integrated Field Laboratory (SW-IFL), a collaboration between Arizona State University, University of Arizona, Northern Arizona University, Oak Ridge National Laboratory, Brookhaven National Laboratory, and IBM.
- 2021–present** Associate Editor for Climate Law and Policy, *Frontiers in Climate*.
- 2016–present** Organizing committee, Annual Conference on Artificial Intelligence and the Law, Vanderbilt Law School.

- 2016–present** Program Committee, Environmental and Sustainability Applications track, Winter Simulation Conference, IEEE and INFORMS.
- 2023** Panel and *ad-hoc* grant proposal review for National Science Foundation.
- 2016–2021** External Advisory Committee, Urban Water Innovation Network, an NSF-sponsored sustainability research network (\$12.5 million funding).
- 2022** Candidate for President of the Global Environmental Change section of the American Geophysical Union. Nominated by President-elect Andrew Dessler. I was not elected.
- 2022** Grant proposal review panel, National Science Foundation.
- 2022** Presubmission “red-team” review and feedback on grant proposals, by University of Texas, Austin and Colorado State University.
- 2021** External tenure review for Northeastern University
- 2021** Grant proposal review for Nederlandse Organisatie voor Wetenschappelijk (Dutch Research Council).
- 2019–2021** Member, External Advisory Committee, “Water Unaffordability in the United States,” an NSF-sponsored research project. Laura Senier, PI.
- 2019** Member, scientific committee, First International Conference on Environmental Non-Migration, Dresden Germany, June 19–21, 2019.
- 2019** With Michael Vandenbergh, I co-organized a conference on “The Tenth Anniversary of the Behavioral Wedge” at Vanderbilt Law School, Feb. 29–Mar. 1, 2019.
- 2018** NSF grant review panel.
- 2018** Member, Working Group on the Use of Socio-Environmental Systems Modeling in Actionable Science, National Socio-Environmental Synthesis Center (National Science Foundation and University of Maryland).
- 2018** Co-Chair, Environmental and Sustainability Applications Track, Winter Simulation Conference (Gothenburg, Sweden), Dec. 9–12 2018. Responsible for working with a European counterpart to develop the ESA track, including inviting speakers and session proposals, coordinating peer-review of submitted papers, appointing session chairs, and scheduling session.
- 2017–2018** Participant, NSF workshop on Interdisciplinary Disaster Research. Developing resources on best practices for interdisciplinary disaster research.
- 2017–2018** Member, Human Dimensions Working Group, Community Surface Dynamics Modeling System (University of Colorado, Boulder).
- 2017** Invited reviewer of National Academies report, *The Human Element: Integrating Social and Behavioral Sciences in the Weather Enterprise*
- 2017** Founding member and member of launch team, The Erdős Institute for Collaborative Research, Innovation, and Entrepreneurship, Columbus, OH. The Erdős Institute is an offshoot of a joint effort by Vanderbilt and Ohio State to foster innovative collaborative interdisciplinary research by faculty, and to stimulate the commercialization of research products through partnerships with private industry and sources of early investment funds.
- 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, 5<sup>th</sup> Annual Workshop of the Consortium for Nanostructured Materials, Nashville TN.
- Ongoing** Review grant proposals for National Science Foundation, U.S. Department of Energy, Dutch Research Council, UK National Environmental Research Council, and Indo-US Science & Technology Forum.
- Ongoing** Review journal manuscripts for Proceedings of the National Academy of Sciences of the United States, Nature Climate Change, Nature Sustainability, Nature Ecology & Evolution, Nature Communications, ACM Transactions on Autonomous and Adaptive Systems, Computers, Environment, and Urban Systems Climatic Change, Ecological Economics, Energy Policy, Energy Economics, Energy Research & Social Science, Environmental Modeling & Software, Environmental Science & Technology, Land Use Policy, PLOS ONE, Royal Society of Chemistry, Sociological Forum, 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, Columbia University Press, Oxford University Press, and Princeton University Press.

## 7e. Service to Community

- 2020–present** Advising Nashville Mayor’s Sustainability Advisory Committee on quantitative analysis of climate actions plans for the City of Nashville.
- 2023** Featured speaker, “An Opening Goodbye,” a chamber-music concert by the ensemble Chatterbird, co-sponsored by Vanderbilt’s Curb Center for Art, Enterprise, and Public Policy. The concert featured four new pieces by Vanderbilt faculty, each addressing an issue of contemporary social and political concern and paired with remarks from writers, political activists, and scholars. I commented on Professor Molly Herron’s piece, “An Opening Goodbye,” which engaged musically with climate change. April 12.
- 2022** Organized two-day workshop on using sustainable infrastructure to address urban-rural disparities in the Southeast. 50 participants represented government, universities, and private sector, including City of Nashville, Tennessee Valley Authority, AT&T, Greater Nashville Regional Council, and Atlanta Regional Commission, Electric Power Research Institute, University of Tennessee Knoxville, Tennessee Tech, and Georgia Tech. Mar. 24–25.
- 2020–2022** Keynote presentations on climate science for the Nashville Youth Climate Summit. Feb. 8, 2020, Feb. 20, 2021, Mar. 5, 2022.
- 2021** Panelist, 2021 Nashville Climate Summit, a webinar organized by AllianceBernstein to inform the Nashville business community about challenges and opportunities associated with climate change. April 21, 2021.
- 2019** Presented tutorial on “What Science Can and Cannot Say about Climate Change” as part of a training workshop for journalists from the Southeastern U.S., organized by Inside Climate News at the Freedom Forum First Amendment Center, Nashville TN, Sept. 16.

- 2019** Michael Vandenberg and I briefed a team of 13 representatives of the Office of the Inspector General for the U.S. Environmental Protection Agency about private environmental governance relating to toxic substances. Nashville, TN, July 10.
- 2019** Presented tutorial on “What Science Can and Cannot Say about Climate Change” as part of a training workshop for journalists from the Midwestern U.S., organized by Inside Climate News at the Freedom Forum First Amendment Center, Nashville TN, Mar. 7.
- 2018** Addressed Rotary Club of McMinnville TN on the impacts of climate change in middle Tennessee. McMinnville TN, Dec. 6.
- 2018** Interviewed by WCPI, McMinnville TN Public Radio station on the impacts of climate change in middle Tennessee. McMinnville TN, Dec. 6.
- 2018** Addressed Breakfast Club of Nashville (businesswomen’s group) on private-sector responses to climate change. Nashville TN, Nov. 29.
- 2018** Presented tutorial on “What Science Can and Cannot Say about Climate Change” as part of a training workshop for journalists from the Southeastern U.S., organized by Inside Climate News at the Freedom Forum First Amendment Center, Nashville TN, Sept. 24.
- 2018** Organized day-long workshop on “Data-Methods for Equitable Development in Nashville,” with participants from Metro Nashville government, Metropolitan Planning Organization, and many community groups.
- 2017–2019** Member, Environmental Public Health Community Advisory Group, Metro Nashville Department of Public Health. Worked with Dr. Sanmi Areola (Deputy Director, Metro Department of Public Health) 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 Vandenberg) 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).