Shade T. Shutters, PhD, CMA

Research Scientist

Arizona State University
School of Complex Adaptive Systems
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PROFESSIONAL APPOINTMENTS

Academic Appointments

2025 –	Research Associate, Max Planck Institute of Geoanthropology, Jena, Germany
2019 –	External Research Faculty, The Global Climate Forum, Berlin, Germany
2014 –	Research Scientist, School of Complex Adaptive Systems, Arizona State University
2012 – 2014	Postdoctoral Research Scholar, Center for Social Dynamics & Complexity, Arizona State University
2010 – 2019	Adjunct Professor, School of Sustainability, Arizona State University
2009 – 2010	Postdoctoral Research Scientist, Faculty of Applied Economics, University of Vigo (Spain)

Administrative Appointments

2024 –	Senior Advisor, National Laboratory for Education Transformation, Carmel, California, USA
2023 –	Director of Economic Transformations, Decision Theater, Arizona State University
2020 –	Founding Director, Laboratory for Regional Dynamics and Development
2019 –	Founding Co-Director, Complexity Economics Lab
2018 – 2021	Science Officer, National Laboratory for Education Transformation, Carmel, California, USA

Other Research Affiliations

2013 –	Faculty Affiliate, Center on Technology, Data and Society, Arizona State University
2011 –	Senior Global Futures Scientist, Global Futures Laboratory, Arizona State University
2010 –	Core Faculty, Center for Social Dynamics & Complexity, Arizona State University
2019 – 2022	Fellow, Knowledge Exchange for Resilience, Arizona State University
2017 – 2022	Faculty Affiliate, Center for Smart Cities and Regions, Arizona State University
2015 – 2019	Faculty Affiliate, Center on the Future of War, Arizona State University

EDUCATION

2009	Doctor of Philosophy, Biology (Systems Ecology) Arizona State University, Tempe, Arizona, USA
1990	Bachelor of Science (with Honors), Business Administration (Finance, Accounting) Indiana University, Bloomington, Indiana, USA

EDITORIAL APPOINTMENTS

2023 –	*PLOS Complex Systems*, Editorial Board and Associate Editor
2016 –	*Urban Science*, Editorial Board and Associate Editor
2015 –	*Humanities & Social Sciences Communications*, Editorial Board and Associate Editor

INDUSTRY POSITIONS (ABRIDGED)

Apollo Insights LLC, Tempe, Arizona, USA
2024 – Owner and principal consultant

- Providing decision support consulting services to regional economic developers

Shutters Consulting LLC, Tempe, Arizona, USA
2001 – Owner and principal consultant

- Delivering data-driven decision support and management consulting services

Rockford Europe GmbH, Achim, Germany
1999 – 2001 CEO (Geschäftsführer)

- Managed all aspects of a 25-person, $20 million European distribution/marketing HQ

Rockford Corporation, Tempe, Arizona, USA
1998 – 1999 Director of International Finance
1995 – 1998 Manager of Financial Planning and Analysis
1993 – 1995 Operations Analyst / New Product Development

- Developed sophisticated global forecasting and financial analytic algorithms, managing global finances and offices in 5 countries

AWARDS, HONORS, AND SCHOLARSHIPS

2023	Visiting Scholar, Jönköping University (Sweden)	
2022	Fellow, Institute for Advanced Sustainability Studies (Potsdam, Germany)	
2020	Visiting Faculty Award, University of Lausanne (Switzerland)	$5,000
2018	University Leadership Academy, Arizona State University	
2014	Visiting Scholar, Santa Fe Institute	
2011	Young Scholar Elect, Resilience Alliance, Stockholm Resilience Center	
2008	Graduate Travel Grant, School of Life Sciences, Arizona State University	$750
•	Student Author Travel Award, Air Force Office of Scientific Research	$110
•	AAAS Annual Conference, Student Research Projects in Social Sciences, 2nd place	
2007	Conference Attendance Grant, Global Institute of Sustainability, Arizona State University	$1,800
2006	International Travel Grant, Arizona State University	$1,500
•	International Conference Attendance Grant, University of Bologna (Italy)	$350
2005	Graduate Travel Grant, School of Life Sciences, Arizona State University	$500
•	Summer Institute Fellowship, Indiana University	$1,200
2004	Graduate Research Fellowship, US National Science Foundation	$120,000
•	Conference Attendance Grant, University of Washington	$2,500
2003	NSF IGERT Fellowship in Urban Ecology, Arizona State University	$120,000
2002	Outstanding chemistry student 2001-2002, Scottsdale Community College	
1995	Beyer Silver Medal, 2nd highest score in USA, 1995 Uniform CMA Exam	

JOURNAL PUBLICATIONS

First author – 37 Sole author – 14 Unique co-authors – 129

75. Artificial intelligence and the distribution of human capacity
ST Shutters (2026) *In review*

74. Economic Coercion through Asymmetric Trade Dependence: Why the Real Battery Chokepoint Is Elemental Phosphorus, Not Phosphate Rock
M Bertau, IA Aubel, **ST Shutters**, K Waters, G Steiner (2026) *In review*

73. Work-activity composition distinguishes urban labor markets by city size
ST Shutters, J Lobo, LMA Bettencourt (2026) *In review*

72. Sulfur, Not Phosphorus: The Hidden Bottleneck in Phosphoric Acid Production and its Implication for Food Security
M Bertau, **ST Shutters**, G Steiner (2026) *In review*

71. Occupational composition, concentration, and the urban wage premium
ST Shutters, J Lobo (2026) *In review*

70. Persistent Weights, Shifting Partners: Spatial Reallocation in the Global Coal Trade Network, 1988–2021
K Waters, **ST Shutters**, M Bertau, G Steiner (2026) *In review*

69. Comparing AI and Non-AI Inventions: Empirical Insights on Knowledge Recombination, Novelty, and Impact
J Wang, J Lobo, **ST Shutters**, D Strumsky (2026) *In review.* Preprint available at doi:10.2139/ssrn.7072891

68. From Emergence to Institutionalization: Mapping the Formation of Long COVID Science
TL Bils, F Wei, SS Kandala, B Gajera, S Mulagala, R Li, R Gorantla, J Loughman, **ST Shutters**, D Lienhard, M Simeone, X Jin, M Aspinall, MD Laubichler, K Steele (2026) *In review*

67. Resonance of Political Messaging on TikTok in the 2024 U.S. Presidential Election
D Lienhard, V Verma, M Simeone, A Walker, E Meyer, J Wang, M Bertau, B Birman, E Han, F Risopoulos-Pichler, M Schlosser, ES Schernhammer, **ST Shutters**, G Steiner, J Weitzer, L Zenk, M Kittilson, MD Laubichler (2025) *In review*

66. Correlates of non-voting among democracy supporters in the swing state Arizona
L Zenk, K Dvorkina, J Weitzer, E Han, D Lienhard, M Schlosser, M Bertau, MD Laubichler, F Risopoulos-Pichler, ES Schernhammer, **ST Shutters**, G Steiner (2026) *In review*

65. Mapping Perception Gaps: Measuring Objective-Subjective Divergence in Local Conditions Across German Districts
ST Shutters, B Alm, MD Laubichler (2026) *In revision*. Preprint available at doi:10.2139/ssrn.6777438

64. Beyond degree: residual motif-role specialization in directed ant communication networks
ST Shutters (2026) *In revision*

63. Empathy and Forgiveness in the Wake of a Pandemic: A Comparative Study between Austria and Arizona
G Steiner, K Dvorkina, J Weitzer, E Han, D Lienhard, M Schlosser, L Zenk, S Strohmaier, M Bertau, F Risopoulos-Pichler, MD Laubichler, **ST Shutters**, ES Schernhammer (2026) *In revision*

62. Economic Succession: An Ecology-Informed Diagnostic Framework for Sustainable Urban Transformation
ST Shutters, JM Applegate (2026) *In revision*

61. Explaining the "Harmonic" Signature in a Tag-based Model of the Evolution of Altruism
ST Shutters (2026) *In revision*

60. Evolution of indirect vulnerabilities in interdependent economic networks
S Pourshahabi, **ST Shutters**, R Muneepeerakul (2026) *Humanities and Social Sciences Communications* 13:1193, doi:10.1057/s41599-026-08218-4

59. Transdisciplinary Science–Practice Knowledge Integration and Generation as a Policy Instrument in Times of Crisis: Insights from Public Opinion in the D-A-CH Region
G Steiner, F Risopoulos-Pichler, M Bertau, **ST Shutters,** S Strohmaier, P Harold, D Ziganshina Lienhard, M Pfirman Schlosser, MD Laubichler, ES Schernhammer (2026) *Systems* 14(6):634, doi:10.3390/systems14060634

58. Complex Systems vs. Complex Adaptive Systems: Why the Difference Matters
ST Shutters, K Dhein (2026) *Frontiers in Complex Systems* 4:1808634*,* doi:10.3389/fcpxs.2026.1808634

57. Cooperation Collapse in the Harmony Game: Revisiting Scodel and Minas through Evolutionary Game Theory
ST Shutters (2026) *Games* 17(2):14, doi:10.3390/g17020014

56. Industrial structure and heterogeneity in regional development across China
J Zhou, K Waters, **ST Shutters**, T Clower (2025) *Evolutionary and Institutional Economics Review,* doi:10.1007/s40844-025-00317-2

55. Contradictions of democracy – structural paradoxes and the erosion of collective agency
F Risopoulos-Pichler, MD Laubichler, D Ziganshina Leinhard, M Schlosser, E Han, L Zenk, S Strohmaier, **ST Shutters**, M Bertau, ES Schernhammer, G Steiner (2025) *GAIA-Ecological Perspectives for Science and Society* 34(3):177-179, doi:10.14512/gaia.34.3.104

54. Transitioning to a Green Economy: Radical Transformation or Building Upon Existing Skills?
ST Shutters, J Lobo (2025) *Sustainability Analytics and Modeling* 5(2025):100044, doi:10.1016/j.samod.2025.100044

53. Cornering the Market with Foreign Direct Investments: China's Cobalt Politics
SO Altiparmak, K Waters, CG Thies, **ST Shutters** (2025) *Renewable and Sustainable Energy Transition* 7:100113, doi:10.1016/j.rset.2025.100113

52. Potential vulnerability of US green hydrogen in a world of interdependent networks
S Pourshahabi, **ST Shutters**, R Muneepeerakul, SO Altiparmak (2025) *iScience* 28(9):113284, doi:10.1016/j.isci.2025.113284

51. The geoeconomics of renewable energy: China's involvement in the European Union market
SO Altiparmak, CG Thies, **ST Shutters** (2025) *Sustainability* 17(3):5998, doi:10.3390/su17135998

50. Quantifying economic vulnerabilities induced by interdependent networks
S Pourshahabi, **ST Shutters**, R Muneepeerakul (2024) *Plos ONE* 19(7):e0306893, doi:10.1371/journal.pone.0306893

49. Pattern Detection in Bipartite Networks: A Review of Terminology, Applications and Methods
Z Neal, A Cadieux, D Garlaschelli, NJ Gotelli, F Saracco, T Squartini, **ST Shutters**, W Ulrich, G Wang, G Strona (2024) *Plos Complex Systems* 1(2):e0000010, doi:10.1371/journal.pcsy.0000010

48. Fueling a net-zero future: The influence of government-funded research on climate change mitigation inventions
J Wang, J Lobo, **ST Shutters**, D Strumsky (2024) *Environmental Innovations and Societal Transitions* 51:100836, doi:10.1016/j.eist.2024.100836

47. Urban economic structures as multidimensional networks: A complex systems framework for analyzing economic development trajectories
ST Shutters (2024) *Complexity* 2024:5521625, doi:10.1155/2024/5521625

46. The Green Mirage: The EU's Complex Relationship with Palm Oil Biodiesel in the Context of Environmental Narratives and Global Trade Dynamics
K Waters, SO Altiparmak, **ST Shutters**, CG Thies (2024) *Energies* 17(2):343, doi:10.3390/en17020343

45. Understanding and Preparing for the Labor Impacts of Decarbonizing the U.S. Economy: A Proposed Research Agenda
ST Shutters, J Lobo (2024) The National Academies of Sciences, Engineering and Medicine, Division of Behavioral and Social Sciences and Education, Board of Environmental Change and Society. *SSRN Electronic Journal*, doi:10.2139/ssrn.5009119

44. The Role of Occupational Socialness on the Productivity of Metropolitan Economies
ST Shutters, J Lobo, J Wang (2023) *SSRN Electronic Journal*, doi:10.2139/ssrn.4659919

43. A U.S. clean energy transition can enhance national security but it's not the bulletproof strategy you might think
ST Shutters, SO Altiparmak (2023) *Modern Diplomacy*, 07-Dec-2023

42. Inducing New Bilateral Oil Interdependencies: The unintended impact of 2014 US-led sanctions on Russia
SO Altiparmak, CG Thies, **ST Shutters**, K Waters (2023) *Journal of Indo-Pacific Affairs* 6(3):154-165

41. Employment and land use in the United States: cross-sectional and short-term trends reveal the importance of the 96th Meridian
D Rybski, DP Helmers, P Pradhan, **ST Shutters**, V Radeloff, V Butsic (2024) *arXiv*:2212.01148 [physics.soc-ph], doi:10.48550/arXiv.2212.01148

40. Industrial structure and a tradeoff between productivity and resilience
ST Shutters, K Waters (2022) *Studies in Business and Economics* 17(3):224-240, doi:10.2478/sbe-2022-0057

39. Evaluating multi-level resilience of Russian urban economies 2010-2019
M Rogov, C Rozenblat, M Bida, **ST Shutters** (2022) *Ecology and Society* 27(4):37, doi:10.5751/ES-13691-270437

38. Regional Economic Tightness from Rural to Urban Regions
K Waters, **ST Shutters** (2022) *Urban Transformations* 4:15, doi:10.1186/s42854-022-00044-6

37. Skills-Approximate Occupations: Using Networks to Guide Jobs Retraining
K Waters, **ST Shutters** (2022) *Applied Network Science* 7(1):1-13, doi:10.1007/s41109-022-00487-7

36. Triad analysis of global energy trade networks and implications for energy trade stability
ST Shutters, K Waters, R Muneepeerakul (2022) *Energies* 15(10):3673, doi:10.3390/en15103673

35. The Urban Wage Premium is Disappearing in U.S. Micropolitan Areas
ST Shutters, JM Applegate (2022) *Plos One* 17(4):e0267210, doi:10.1371/journal.pone.0267210

34. Impacts of Skills Centrality on Regional Economic Productivity and Occupational Income
K Waters, **ST Shutters** (2022) *Complexity* 2022:5820050, doi:10.1155/2022/5820050

33. Urbanization favors high wage earners
ST Shutters, JM Applegate, E Wentz, M Batty (2022) *npj Urban Sustainability* 2:6, doi:10.1038/s42949-022-00049-x

32. Modelling long-term COVID-19 impacts on the U.S. workforce of 2029
ST Shutters (2021) *Plos One* 16(12):e0260797, doi:10.1371/journal.pone.0260797

31. Industry interconnectedness and regional economic growth in Germany
ST Shutters, H Seibert, B Alm, K Waters (2021) *Urban Science* 6(1):1, doi:10.3390/urbansci6010001

30. Characterizing the sectoral development of cities
D Rybski, P Pradhan, **ST Shutters**, V Butsic, JP Kropp (2021) *Plos One* 16(7):e0254601, doi:10.1371/journal.pone.0254601

29. A Convergence Research Perspective on Graduate Education for Sustainable Urban Systems Science
J Lobo, M Alberti, M Allen-Dumas, LMA Bettencourt, A Beukes, LA Bojórquez Tapia, W-Q Chen, A Dodge, Z Neal, A Perreira, D Pfeiffer, A Revi, D Roberts, C Rozenblat, **ST Shutters**, ME Smith, E Stokes, D Strumsky, J Wu (2021) *npj Urban Sustainability* 1:39, doi:10.1038/s42949-021-00044-8

28. Resilience of Urban Economic Structures Following the Great Recession
ST Shutters, S Kandala, F Wei, AP Kinzig (2021) *Sustainability* 13(4):2374, doi:10.3390/su13042374

27. Innovations and Economic Output Scale with Social Interactions in the Workforce
DT Painter, **ST Shutters**, E Wentz (2021) *Urban Science* 5(1):21, doi:10.3390/urbansci5010021

26. Urban Science: Integrated Theory from the First Cities to Sustainable Metropolises
J Lobo, M Alberti, M Allen-Dumas, E Arcaute, M Barthelemy, LA Bojorquez Tapia, S Brail, LMA Bettencourt, A Beukes, W-Q Chen, R Florida, M Gonzalez, N Grimm, M Hamilton, C Kempes, CE Kontokosta, C Mellander, ZP Neal, S Ortman, D Pfeiffer, M Price, A Revi, C Rozenblat, D Rybski, M Siemiatycki, **ST Shutters**, ME Smith, EC Stokes, D Strumsky, G West, D White, J Wu, VC Yang, A York, H Youn (2020) *SSRN Electronic Journal,* doi:10.2139/ssrn.3526940

25. Inferring networks of interdependent labor skills to illuminate urban economic structure
ST Shutters, K Waters (2020) *Entropy* 22(10):1078, doi:10.3390/e22101078

24. Graduate Education for a New Sustainable Urban Systems Science: Designing a New PhD Curriculum Integrating Sustainability Science and Urban Science
J Lobo, Z Neal, M Alberti, M Allen-Dumas, LMA Bettencourt, A Beukes, D Pfeiffer, **ST Shutters**, ME Smith, E Stokes, D Strumsky, J Wu (2019) *SSRN Electronic Journal*, doi:10.2139/ssrn.3466322

23. A visual analytics framework for spatiotemporal trade network analysis
    H Wang, Y Lu, **ST Shutters**, M Steptoe, F Wang, S Landis, R Maciejewski (2019) *IEEE Transactions on Visualization and Computer Graphics* 25(1):331-341, doi:10.1109/TVCG.2018.2864844

22. Urban Science: Putting the "Smart" in Smart Cities
    ST Shutters (2018) *Urban Science* 2(4):94, doi:10.3390/urbansci2040094

21. Urban occupational structures as information networks: The effect on network density of increasing number of occupations
    ST Shutters, J Lobo, R Muneepeerakul, D Strumsky, C Mellander, M Brachert, T Farinha-Fernandes, LMA Bettencourt (2018) *Plos One* 13(5):e0196915, doi:10.1371/journal.pone.0196915

20. A Flexible Data-Centric Approach for Modeling and Analyzing Hyper Connected Megacities
    S Candan, **ST Shutters**, C Fortunato (2017) *Small Wars Journal* 13(7):14-Jul-2017

19. Interdependent Preferences and Prospects for Global Sustainability
    ST Shutters (2016) *International Journal of Sustainability Policy and Practice* 12(3):25-39, doi:10.18848/2325-1166/CGP/v12i03/25-39

18. Constrained pathways to a creative urban economy
    ST Shutters, R Muneepeerakul, J Lobo (2016) *Urban Studies* 53(16):3439-3454, doi:10.1177/0042098015616892

17. How hard is it for urban economies to become "green"?
    ST Shutters, R Muneepeerakul, J Lobo (2016) *Environment and Planning B: Urban Analytics and City Science* 43(1):198-209, doi:10.1177/0265813515600108

16. Anticipating Megacity Responses to Shocks: Using Urban Integration and Connectedness to Assess Resilience
    ST Shutters, W Herche, E King (2016) *Small Wars Journal* 12(2):26-Feb-2016

15. The New Global Urban Realm: Complex, Connected, Diffuse, and Diverse Social-Ecological Systems
    MR McHale, STA Pickett, O Barbosa, DN Bunn, ML Cadenasso, DL Childers, M Gartin, G Hess, DM Iwaniec, T McPhearson, MN Peterson, AK Poole, L Rivers III, **ST Shutters**, W Zhou (2015) *Sustainability* 7(5):5211-5240, doi:10.3390/su7055211

14. Quantifying urban economic resilience through labour force interdependence
    ST Shutters, R Muneepeerakul, J Lobo (2015) *Humanities and Social Sciences Communications* 1(201510):1-7, doi:10.1057/palcomms.2015.10

13. Altruism displays a harmonic signature in structured societies
    ST Shutters, D Hales (2015) *Journal of Artificial Societies and Social Simulation* 18(3):2, doi:10.18564/jasss.2780

12. Public Representation in Water Management – A Network Analysis of Organization and Public Perceptions in Phoenix, Arizona
    BB Cutts, T Muñoz-Erickson, **ST Shutters** (2015) *Society and Natural Resources* 28(12):1340-1357, doi:10.1080/08941920.2015.1020581

11. Living in a network of scaling cities and finite resources
    M Qubbaj, **ST Shutters**, R Muneepeerakul (2014) *Bulletin of Mathematical Biology* 77(2):390-407, doi:10.1007/s11538-014-9949-3

10. Urban Economies and Occupation Space: Can They Get "There" from "Here"?
    R Muneepeerakul, J Lobo, **ST Shutters,** A Goméz-Liévano, M Qubbaj (2013) *Plos One* 8(9):e73676, doi:10.1371/journal.pone.0073676

9. Collective action and the detrimental side of punishment
    ST Shutters (2013) *Evolutionary Psychology* 11(2):327-346, doi:10.1177/147470491301100204

8. Cultural polarization and the role of extremist agents: a simple simulation model
    ST Shutters (2013) *Lecture Notes in Computer Science* 7812:93-101, doi:10.1007/978-3-642-37210-0_11

7. Towards a rigorous framework for studying continuous 2-player games
    ST Shutters (2013) *Journal of Theoretical Biology* 321:40-43, doi:10.1016/j.jtbi.2012.12.026

6. Tag-mediated altruism is contingent on how cheaters are defined
    ST Shutters, D Hales (2013) *Journal of Artificial Societies and Social Simulation* 16(1):4, doi:10.18564/jasss.2090

5. Cooperation through the endogenous evolution of social structure
    D Hales, **ST Shutters** (2013) *Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering* 126:111-126, doi:10.1007/978-3-319-03473-7_10

4. Agricultural trade networks and patterns of economic development
    ST Shutters, R Muneepeerakul (2012) *Plos One* 7(7):e39756, doi:10.1371/journal.pone.0039756

3. Punishment leads to cooperative behavior in structured societies
    ST Shutters (2012) *Evolutionary Computation* 20(2):301-319, doi:10.1162/EVCO_a_00062

2. Strong reciprocity, social structure, and the evolution of fair allocations in a simulated ultimatum game
   ST Shutters (2009) *Computational and Mathematical Organization Theory* 15(2):64-77, doi:10.1007/s10588-008-9053-z

1. Weekly cycling of environmental variables in Phoenix, Arizona
   ST Shutters, RC Balling, Jr. (2006) *Atmospheric Environment* 40(2):304-310, doi:10.1016/J.ATMOSENV.2005.09.037

OTHER PUBLICATIONS

27. Interdependence and Its Discontents
    ST Shutters, L Mazur (2025) In *Resilience Matters: Ten Years of Transformative Thinking* 23-27. L Mazur, ed. Island Press. Washington, DC. eISBN: 978-1-64283-437-6

26. Coal Trade Networks and Trading Communities: The case of Australia
    K Waters, **ST Shutters**, T Clower (2022) *Western Regional Science Association, 2022 Conference*. Scottsdale, Arizona. Feb. 27, 2022

25. Augmenting regional clusters with intellectual property and labor force skills specializations
    T Slaper, R Zipper, **ST Shutters** (2021) *European Regional Science Association, 2021 Conference*. Bolzano, Italy. Aug. 25, 2021. https://az659834.vo.msecnd.net/eventsairwesteuprod/production-ersa-public/9446f38e9f904e6ca9ed358dcf2a9e29

24. Impacts of Skills Centrality on Regional Economic Productivity: A Complex Systems Approach
    K Waters, **ST Shutters** (2021) *Mid-Continent Regional Science Association, 2021 Conference*. Online. Jun. 11, 2021

23. A tale of two states: The Impact of #RedForEd on Arizona and Oklahoma
    ST Shutters (2021) *LinkedIn Pulse*. https://www.linkedin.com/pulse/tale-two-states-impact-redfored-arizona-oklahoma-shade-t-shutters

22. Coronavirus and the Public Good
    AP Kinzig, **ST Shutters** (2021) In *Resilience Matters: Reimagining the Future in a Tumultuous Year* 147-148. L Mazur, ed. Island Press. Washington, DC

21. A Knowledge Exchange Playbook to Build Resilience
    M Hinrichs, P Solis, JM Applegate, S BurnSilver, E Goldman, EW Johnston, TR Miller, D Morrison, M Nation, CN Ngo, **ST Shutters**, E Wentz, M Wyman (2021) https://hdl.handle.net/2286/R.2.N.160839. M Hinrichs, P Solis, eds. Global Council for Science and the Environment. Washington, DC

20. Who Gets Their Lights Back First if a Cyberattack Brings Down the Grid?
    J Miller, SM Ravich, **ST Shutters,** B Ruddell, A Fixler (2021) *Slate Magazine*. 19-Jan-2021. https://slate.com/technology/2021/01/us-government-continuity-economy-plan-cyberattack.html

19. Coronavirus and the Public Good
    AP Kinzig, **ST Shutters** (2020) *The Progressive*. 18-Mar-2020. https://progressive.org/op-eds/coronavirus-public-good-kinzig-shutters-200318/

18. Multi-level approach to urban resilience: conceptual and operational model
    M Rogov, C Rozenblat, **ST Shutters** (2019) *American Association of Geographers, 2019 Conference*, Session on Cities and Networks. Washington, DC. Apr. 6, 2019

17. Interdependence and Its Discontents
    ST Shutters, L Mazur (2018) In *Resilience Matters: Transformative Thinking in a Year of Crisis* 12-16. L Mazur, ed. Island Press. Washington, DC

16. What's so smart about "smart" cities?
    ST Shutters (2018) *LinkedIn Pulse*. https://www.linkedin.com/pulse/whats-so-smart-cities-shade-t-shutters/

15. Workforce Automation and the Mix of College Degrees
    ST Shutters (2018) *LinkedIn Pulse*. https://www.linkedin.com/pulse/workforce-automation-mix-college-degrees-shade-t-shutters/

14. Human society is totally interdependent—that's a huge advantage, but also a huge survival risk
    ST Shutters, L Mazur (2017) *Quartz Ideas,* 02-May-2017. https://tinyurl.com/knw78ne

13. Report on Sociocultural Modeling for Dense Urban Areas
    ST Shutters, DD White, R Halden, A Venkatesan (2016) Arizona State University Technical Report to U.S. Army Training and Doctrine Command

12. Pathways to Ontario's Knowledge Economy: A system for identifying existing regional strengths and future prospects
    R Florida, **ST Shutters**, G Spencer (2016) Martin Prosperity Research Working Paper Series, 2016-MPIWP-001. Martin Prosperity Institute, Rotman School of Management, University of Toronto. https://tinyurl.com/wvnt422d

11. United we fall, divided we stand: Resilience and the role of interdependence
    ST Shutters (2016) *International Urban Resilience Research Network, Viewpoints*. https://t.co/49BhQzfgyK

10. Cities which plan to transform into a creative engine of innovation may face a long and difficult journey
    ST Shutters (2015) *London School of Economics, US Centre, Daily Blog on US Politics and Policy*. http://bit.ly/1lUgMQ7

9. Emergence: Religion as a Superorganism
    ST Shutters (2013) *Conference on Emergent Approaches to Human Sociality and Religion*. Tempe, Arizona. Oct. 6, 2013, doi:10.2139/ssrn.4332962

8. Conflict, Collapse, Networks, and Governance: 20,000,000 Humans in a Virtual Petri Dish
    ST Shutters (2012) ASU working paper series, doi:10.13140/2.1.3922.0803

7. From cells to states: A unifying framework of social relativity
    ST Shutters, M Halás (2011) *European Consortium for Political Research, 2011 General Conference*, University of Iceland, Reykjavik, Iceland. Aug. 27, 2011. doi:10.13140/2.1.1990.9126

6. From terrorism to environmental management: A novel assessment of network robustness using triad analysis
    ST Shutters (2010) ASU working paper series, doi:10.13140/2.1.4647.0088

5. Strong Reciprocity, Social Structure, and the Evolution of Cooperative Behavior
    ST Shutters (2009) *Doctoral Dissertation, School of Life Sciences, Arizona State University.* doi:10.13140/2.1.5185.7920

4. Punishment, rational expectations, and relative payoffs in a networked prisoners dilemma
    ST Shutters (2009) *Social Computing and Behavioral Modeling* 201-208. H Liu, JJ Salerno, M J Young, eds. Springer. New York, New York. doi:10.1007/978-1-4419-0056-2_25

3. A simulation model of cultural consensus and persistent conflict
    ST Shutters, BB Cutts (2008) In *Proceedings of the Second International Conference on Computational Cultural Dynamics* 71-78. VS Subrahamanian, A Kruglanski, eds. AAAI Press. Menlo Park, California. https://www.aaai.org/Papers/ICCCD/2008/ICCCD08-011.pdf

2. Maximizing order entry efficiency using standard value rule sets
    ST Shutters, A Gitch (1998) In *Oracle Applications User Group Fall 1998 USA Conference Proceedings.* OAUG. San Diego, California

1. Facing the challenges of changing fiscal year
    ST Shutters, D Richards (1997) In *Oracle Applications Users Group Fall 1997 USA Conference Proceedings*. OAUG. Orlando, Florida

SOFTWARE, DATASETS, SPECIMEN COLLECTIONS, etc.

8. Replication Data for: Fueling a Net-Zero Future: The Influence of Government-Funded Research on Climate Change Mitigation Inventions
    J Wang, J Lobo, **ST Shutters**, D Strumsky (2024) *Harvard Dataverse*, V1, doi:10.7910/DVN/NMCLAR

7. Replication Data for: Urban economic structures as multidimensional networks: A complex systems framework for analyzing economic development trajectories
    ST Shutters (2024) *Harvard Dataverse*, V1, doi:10.7910/DVN/AY2HJM

6. Natural history specimens collected and/or identified and deposited: Lichen specimens of Northwest Mexico and Southwest United States
    ST Shutters (2023) *Zenodo*, doi:10.5281/zenodo.10247189

5. Author Classifications of O*NET Individual Work Activities (IWA) used in “Innovations and Economic Output Scale with Social Interactions in the Workforce”
    DT Painter, **ST Shutters**, E Wentz (2021). *Zenodo*, version 1, doi:10.5281/zenodo.4434706

4. Replication Data for: Modelling long-term COVID-19 impacts on the U.S. workforce of 2029
    ST Shutters (2021) *Harvard Dataverse*, V1, doi:10.7910/DVN/DVHBZT

3. Replication Data for: Urban Occupational Structures as Information Networks
    ST Shutters, J Lobo, R Muneepeerakul, D Strumsky, C Mellander, M Brachert, T Farinha-Fernandes, LMA Bettencourt (2018). *Harvard Dataverse*, V1, doi:10.7910/DVN/APJZC8

2. The emergence of tag-mediated altruism in structured societies (Version 1.2.0)
    ST Shutters, D Hales (2015) *CoMSES Computational Model Library*. doi:10.25937/503k-7517

1. Replication Data for: Quantifying urban economic resilience through labour force interdependence
    ST Shutters, R Muneepeerakul, J Lobo (2015) *Harvard Dataverse*, V1, doi:10.7910/DVN/HEWGDD

PUBLICITY AND PRESS COVERAGE

12. AI Forecasting the Future Workforce
    Upfront Planning Podcast, episode 123 (2025) https://podcasts.apple.com/es/podcast/ep-123-ai-forcasting-the-future-workforce/id1693283152?i=1000733311063&l=en-GB

11. New study shows teacher pay in Arizona is 'abysmal'
    The Arizona Republic (2018) https://www.azcentral.com/story/opinion/op-ed/laurieroberts/2018/03/07/new-study-shows-teacher-pay-arizona-abysmal/403695002/

10. Will our cities survive the 21st century?
    Slate Magazine (2018) https://slate.com/technology/2018/01/will-our-cities-survive-the-21st-century-a-future-tense-event-recap.html

9. The U.S. metros most at risk from automation
    The Atlantic: CityLab (2017) https://www.citylab.com/life/2017/10/metros-most-at-risk-from-automation/542454/

8. Big Data, Big Decisions
    KED Research (2017) https://research.asu.edu/stories/20170928-big-data-big-decisions

7. How data helps cities withstand shock
    Christian Science Monitor. (2017) http://www.csmonitor.com/Science/Complexity/2017/0110/Resilient-Cities

6. NSF Funds Regional Approach to Big Data Challenges in the West
    UC San Diego News (2016)
    http://ucsdnews.ucsd.edu/pressrelease/big_data_hub_gets_a_spoke_nsf_funds_regional_approach_to_big_data_challenge

5. The future of the knowledge economy is local
    The Toronto (Canada) Star (2016) https://www.thestar.com/opinion/commentary/2016/09/13/the-future-of-the-knowledge-economy-is-local.html

4. Western US: How the West Was One
    Site Selection Magazine.(2015) https://siteselection.com/how-the-west-was-one/

3. Tired of playing the field? Data may help your city or company find the best match
    Site Selection Magazine (2015) http://siteselection.com/onlineInsider/high-wage-tinder.cfm

2. The man with the power to predict economic success
    ASU News (2015) https://asunews.asu.edu/20150811-shade-shutters-predicting-economic-success

1. One Reason It's So Hard to Become a 'Creative Superstar City'
    The Atlantic: CityLab (2015) http://www.citylab.com/work/2015/05/one-reason-its-so-hard-to-become-a-creative-superstar-city/394256/

GRANTS AND FUNDING (* PI)

Sum of proposals (awarded and pending only): PI - $4.2M | co-PI - $21.6M | co-Author or other - $7.7M

21. GCR: Planning for Future HEAT - Convergence and Cooperation Along the I-10 Corridor for Hazards, Exposure, Adaptation, and Transformation
    R Rushforth***, ST Shutters (co-PI)**, M Hennrich (2026) $3,299,981. US National Science Foundation. Duration 60 months.

20. Zimin Institute Phase 2 Commercialization and Visibility
    G Raupp*, **ST Shutters (co-PI)**, C Hoover, D Salon, S Yang (2024) $275,000. Zimin Foundation. Duration 20 months.

19. Decision Support Tools for Cities Transitioning to Clean Energy
    ST Shutters*, M Simeone (2022) $133,000. Zimin Institute for Smart & Sustainable Cities. Duration 24 months.

18. Growing Chinese Economic Power and the Exacerbating Effects of US Economic Interdependence
    ST Shutters*, R Muneepeerakul, C Thies (2021) $1,266,800. US Department of Defense, Minerva Research Initiative. Duration 48 months.

17. RAPID: Tacit Knowledge Transfer and COVID-19 Impacts on US Invention
    ST Shutters*, D Strumsky (2020) $123,000. US National Science Foundation. Duration 24 months. (Assigned as PI after departure of original PI).

16. ASU: Knowledge Exchange for Resilience
    E Wentz*, P Solis, **ST Shutters (co-PI)**, E Johnston, M Guardaro, M Gall, JM Applegate, M Hinrichs, M Simeone (2019) $11,050,463. Virginia G. Piper Charitable Trust. Duration 66 months.

15. A complexity approach to resilience of urban economies
    ST Shutters* (2019) $47,500. Virginia G. Piper Charitable Trust. Duration 18 months.

14. Building Critical Mass at the Complexity Science Hub Vienna—Establishing and Expanding Complexity Science in Austria
    Several PIs, **ST Shutters (co-author)** (2019) €4,600,000 ($5,200,000). FTF Austrian Science Fund. Duration 72 months.

13. Expanding the Boundaries of Regional Economic Development: Integrating Complex Adaptive Systems
ST Shutters* (2019) $29,500. US Dept. of Commerce, Economic Development Administration. (Subaward through Indiana University). Duration 18 months.

12. Achieve60AZ decision modeling platform
J Miller*, E Johnston, **ST Shutters (co-PI)** (2017) $550,000. Arizona Board of Regents. Duration 12 months.

11. Center for Educational Excellence powered by Helios
J Miller*, E. Johnston, **ST Shutters (co-PI)** (2017) $2,350,000. Helios Foundation. Duration 36 months.

10. Economic System Security in the 21st Century
ST Shutters*, S Burke, C Thies (2017) $1,700,000. US Department of Defense, Minerva Research Initiative. Duration 36 months. Selected for funding but canceled due to failure of U.S. congress to approve a federal budget.

9. ASU Decision Theater – US Army TRADOC Partnership/Megacities
J Miller*, **ST Shutters (co-PI)**, R Salla, K Candan, D Boscovic (2017) $624,999. US Department of Defense, US Army Training and Doctrine Command. Duration 12 months.

8. Metroinsight: Knowledge discovery and real-time interventions from sensory data flows in urban spaces
ST Shutters* (2016) $179,100. US National Science Foundation. Duration 24 months.

7. Mesoscale Data Fusion to Map and Model the US FEW system (INFEWSion)
B Ruddell*, **ST Shutters (co-PI)**, J Sabo, K Gurney, WM Hanemann (2016) $3,000,000. US National Science Foundation. Duration 48 months.

6. Exacerbation and export of localized climate change impacts through agricultural trade networks
ST Shutters*, R Maciejewski (2016) $93,200. Skoll Global Threats Fund (unsolicited). Duration 12 months.

5. US Army and Megacities: Planning for 2040
R Halden*, DD White, **ST Shutters (co-PI),** M Dalrymple, P Shakarian (2015) $491,000. US Department of Defense (unsolicited). Duration 12 months.

4. Decision support for regional transboundary issues: Towards a new science of intercity relations
ST Shutters*, R Muneepeerakul (2013) $500,000. Walton Sustainable Solutions Initiative. Duration 36 months.

3. Phase transitions and allometry in social systems
ST Shutters*, M Barton, M Laubichler (2012) $43,467. Arizona State University, College of Liberal Arts & Sciences Seed Funding. Duration 12 months.

2. Socio-economic Factors in Designing Control Strategies for Forest Pathogens
J Touza*, **ST Shutters (co-author)** (2010) Convocatoria de ayudas de Proyectos de Investigación Fundamental no orientada. €900,000. Duration 36 months.

1. Assessing robustness and evolutionary trajectories of complex social-ecological networks through triad motif analysis
ST Shutters* (2009). National Institute for Mathematical and Biological Synthesis. $130,000. Duration 24 months. (Subsequently declined to pursue postdoc at the University of Vigo).

INVITED TALKS

44. A complexity view of economic "structures" and how they respond to shocks
US Department of Defense, Basic Research Forum. Washington, DC. Oct. 24, 2024.

43. Quantifying the impact of shocks using complex networks
Leibniz Institute of Ecological Urban and Regional Development. Dresden, Germany. Sep. 20, 2024.

42. Digital images of regional Innovation ecosystems: an instrument to support transformation regions?
2024 Annual Conference on Shaping Regional Transformations (with F Dornbusch and B Klement). German Ministry of Economic Affairs and Climate Impacts. Essen, Germany. Sep. 16, 2024.

41. Understanding and Preparing for the Labor Impacts of Decarbonizing the U.S. Economy: A Proposed Research Agenda
Developing and Assessing Ideas for Social and Behavioral Research to Speed Efficient and Equitable Industrial Decarbonization: A Workshop. U.S. National Academy of Sciences. Washington, DC. Feb. 26, 2024.

40. Using complex networks to operationalize the vague notion of urban economic structure
Workshop on Data Analytics and Computational Modeling for Social Challenges. Phoenix, Arizona. Jan. 24, 2024.

39. Linking networks to uncover cryptic risks and vulnerabilities
2023 U.S. Air Force Trust & Influence Program Review. US Air Force Academy, Colorado Springs, Colorado. Aug. 15, 2023.

38. How Complexity Science Can Guide Urban Transformations
Consortium for Science, Policy & Outcomes (with B Alm). Washington, DC. March 23, 2023.

37. Using Networks to Assess Resilience and Vulnerabilities of Global Trade
    2022 U.S. Air Force Trust & Influence Program Review. Arlington, Virginia. Sep. 13, 2022.

36. A complexity approach to understanding structural change of regional economies
    United Nations University. Maastricht, Netherlands. Apr. 21, 2022.

35. Decarbonize with Big Data: Why should I give you my data, and what do I get?
    The Sustainability and Security Forum. (Panelist). Washington, DC. Oct. 21, 2021.

34. Security implications of U.S. Economic Interdependence
    2021 U.S. Air Force Trust & Influence Program Review. Washington, DC. Aug. 16, 2021.

33. From Panarchy to practice: A complexity approach to understanding urban resilience
    Complexity Science Hub-Vienna. Vienna, Austria. Feb. 19, 2021.

32. Urban Resilience Tools for Economic Development Planning
    U.S. Economic Development Administration, National Research & Technical Assistance Network. (with K Waters) Washington, DC. Oct. 29, 2020.

31. Biological Rationality and Policy Making
    Winter School on Cooperation and Conflict. Tempe, Arizona. Jan. 9, 2020.

30. Urban Science Curriculum: Perspectives from the Security Community
    NSF Workshop: Graduate Education for a New Sustainable Urban Systems Science. Tempe, Arizona. Sep. 20, 2019.

29. Complexity methods for comparing urban economies
    Potsdam Institute for Climate Impacts Research. Potsdam, Germany. June 7, 2019.

28. Computational Approaches to Comparative Urban Analysis
    Oak Ridge National Laboratory. Oak Ridge, Tennessee. Apr. 29, 2019.

27. Resilience and job growth strategies
    Workshop: A New Framework for Regional Economic Development. U.S. Economic Development Agency. Arlington, Virginia. Apr. 3, 2019.

26. Data-driven decision tools for economic development
    NSF Program 2018 Meeting: BIGDATA and Big Data Hubs & Spokes. (with U Soni) Alexandria, Virginia. June 21, 2018.

25. The Future of Work: Intelligent Machines, Automation, & Societal Impacts
    NSF South Big Data Hub, Data Science Roundtable (Panelist). Washington, DC. Apr. 12, 2018.

24. A Dynamic Economy Is a Spectrum of Jobs
    International Economic Development Council. Las Vegas, Nevada. Jan. 29, 2018.

23. Will our cities survive the 21st century?
    COMEXI Future Tense Event (Panelist). Mexico City, Mexico. Jan. 23, 2018.

22. Labor Analytics for Targeted Job Growth
    Data2work Program. University of Chicago, Chicago, Illinois. Dec. 6, 2017.

21. Understanding the Labor Composition of Cities
    Workshop on Innovation, Cities, and the Future of Work. MIT, Cambridge, Massachusetts. Nov. 15, 2017.

20. How to Transition to a Green Economy Within a City
    Sustainable Cities Network (with K Feige, D Korz) Tempe, Arizona. Sep. 18, 2017.

19. MetroInsight: Real-time Tools for Urban Decision-making
    NSF West Big Data Innovation Hub Conference. Boulder, Colorado. Jun. 5, 2017

18. Industry growth decision tools for Greater Phoenix
    WESTMARC Summit on Economic Development. Glendale, Arizona. May 11, 2017

17. Big Data Tools for Workforce Development: Obstacles and Future Directions
    University of California-San Diego. Lo Jolla, California. Mar. 21, 2017.

16. MetroInsight: Workforce Analytics for Economic Development
    NSF Program 2017 Meeting: BIGDATA and Big Data Hubs & Spokes. (with U Soni) Washington, DC. Mar. 16, 2017.

15. Trade networks and climate change: Local effects – Global impact
    Workshop on Human Activity at Scale in Earth System Modeling. Oak Ridge National Laboratory. Oak Ridge, Tennessee. Sep. 19, 2016.

14. State of the Art: Modeling Socio-cultural factors of Dense Urban Areas
    Workshop on Human Socio-Cultural Modeling for Dense Urban Areas. Scottsdale, Arizona. Aug. 2, 2016.

13. A network approach to understanding and guiding urban economies
    Network Science Institute, Indiana University. Bloomington, Indiana. Feb. 24, 2016.

12. Understanding and facilitating transitions to sustainable cities
    KTH Royal Institute of Technology. Stockholm, Sweden. Dec. 14, 2015.

11. Constrained Pathways to a Creative Urban Economy
    IMT Institute for Advanced Studies. Lucca, Italy. Oct. 9, 2015.

10. Assessing urban economic resilience: lessons from the USA and possibilities for developing regions
    US National Geospatial Intelligence Agency. Springfield, Virginia. Sep. 10, 2015.

9. Novel methods for understanding and facilitating urban transformations
    The Martin Prosperity Institute. Rotman School of Management. University of Toronto. Toronto, Canada. Jul. 20, 2015.

8. Labor Sector Interdependencies and Urban Resilience
    Center for Urban Resilience. Loyola Marymount University. Los Angeles, California. Nov. 12, 2014.

7. Keynote: Emergence: Religion as a superorganism
    Conference on Emergent Approaches to Human Sociality and Religion. Tempe, Arizona. Oct. 6, 2013.

6. Complexity tools for targeted job growth
    The Greater Phoenix Economic Council. Phoenix, Arizona. June 17, 2013.

5. Modelling rational agents: Implications for successful environmental governance
    University of Vermont, Burlington, Vermont. Feb. 21, 2012.

4. Tackling sustainability in the face of competitive forces
    Simpson College, Indianola, Iowa. Mar. 31, 2011.

3. Punishment, rational expectations, and relative payoffs
    Aptima, Inc., Woburn, Massachusetts. June 12, 2009.

2. Social structure and the evolution of cooperation
    Social Science Agent-based Modelling Group. University of Arizona. Tucson, Arizona. Apr. 17, 2008.

1. The role of altruistic punishment in the evolution of cooperation
    Workshop in Political Theory. Indiana University. Bloomington, Indiana. May 21, 2005.

PRESENTATIONS – CONFERENCES, WORKSHOPS, etc.

31. Scaling Properties of Carbon Emissions in US Cities: Bigger is Better
    European Geosciences Union 2025 General Assembly. (with K Gurney, P Dass, J Lobo) Vienna, Austria. May 1, 2025.

30. Temporal patterns of indirect vulnerabilities in economic interdependent networks
    American Geophysical Union 2024 Annual Meeting. (with S Pourshahabi, R Muneepeerakul) Washington, DC. Dec. 11, 2024.

29. Using LLMs to Find Sustainability Capacities in Occupations
    National Sustainability Society 2024 Conference. (with J Wang, J Lobo) Seattle, Washington. Sep. 10, 2024.

28. Occupational tasks and the role of worker socialness on rates of urban invention
    7th CEnSE Urban and Regional Economics Workshop. Jönköping International Business School. Gothenburg, Sweden. Oct. 26, 2023.

27. A framework for viewing urban economic structures as multidimensional networks
    2023 Conference on Complex Systems, satellite UrbanSys2023. Salvador (Bahai), Brazil. Oct. 18, 2023.

26. Using Trade Networks to Identify Risks and Vulnerabilities
    2022 Department of Defense Minerva program review. Arlington, Virginia. May 3, 2023.

25. Diversity in International Energy Trade Markets
    American Association of Geographers Annual Meeting. (with K Waters, R Muneepeerakul). Denver, Colorado. Mar. 25, 2023

24. Using multidimensional networks to better understand constraints and possibilities of urban development
    Western Regional Science Association 2023 meeting. Waikoloa, Hawaii. Feb. 16, 2023

23. Global Palm-Oil Trade: A Network Analysis Approach
    Southeastern Division, American Association of Geographers, 77th Annual Meeting. (with K Waters) Atlanta, Georgia. Nov. 21, 2022

22. Co-agglomeration Networks
    American Association of Geographers 2022 Conference. (with K Waters) New York, New York. Feb. 25, 2022

21. Coal Trade Networks and Trading Communities: The case of Australia
    Western Regional Science Association, 61st Annual Meeting. (with K Waters, T Clower) Scottsdale, Arizona. Feb. 19, 2022

20. Augmenting regional clusters with intellectual property and labor force skills specializations
    European Regional Science Association Annual Meeting. (with T Slaper, R Zipper) Bolzano, Italy. Aug. 25, 2021.

19. Evaluating multilevel urban resilience: The case of Russian urban economies 2010-2019.
    Annual Conference of the International Geophysical Union Commission on Urban Geography. (with C Rozenblat, M Rogov). Beirut, Lebanon. Aug. 23, 2021.

18. Impacts of Skills Centrality on Regional Economic Productivity: A Complex Systems Approach
    Mid-Continent Regional Science Association, 51st Annual Meeting. (with K Waters) Online. Jun. 11, 2021.

17. Regional Economic Tightness from Rural to Populous Regions
    Southern Regional Science Association, 60th Annual Meeting. (with K Waters) Online. Apr. 6, 2021.

16. Skills-Approximate Occupations: Using Networks to Guide Jobs Retraining
    Western Regional Science Association, 60th Annual Meeting. (with K Waters) Online. Feb. 22, 2021.

15. The effect of industry interconnectedness on German economic growth and resilience during the 2007-09 global financial crisis
    Workshop: Urban Europe: Precarious Futures? (with H Seibert, B Alm) Coventry University, Coventry, England. Dec. 2, 2020.

14. Assessing urban adaptive capacity using economic networks
    American Association of Geographers 2020 Conference, session on Urban and Spatial Networks. (with F Wei, D Weber, S Kandala, V Bajej) Denver, Colorado. Apr. 7, 2020.

13. A complexity approach to labor dynamics and economic development tools
    Community Indicators Consortium Fall 2017 Conference. St. Petersburg, Florida. Nov. 16, 2017.

12. Smart targets: Labor structure constraints on regional specialisation
    International Conference of the Royal Geographical Society. London, England. Sep. 1, 2016.

11. Pathways to Ontario's Knowledge Economy: A system for identifying existing regional strengths and future prospects
    Regional Studies Association 2nd North American Conference. (with R Florida, G Spencer) Atlanta, Georgia. Jun. 15, 2016.

10. Analyzing and guiding megacities: Data challenges and possibilities
    Convening on Urban Data Science. University of Chicago, Chicago, Illinois. Apr. 28, 2016.

9. Cultural polarization and the role of extremist agents: a simple simulation model
    International Conference on Social Computing, Behavioral-Cultural Modeling, & Prediction. Washington, DC. Apr. 3, 2013.

8. Cooperation through the endogenous evolution of social structure
    2nd International Conference on Complex Systems. (with D Hales) Santa Fe, New Mexico. Dec. 6, 2012.

7. From cells to states: A unifying framework of social relativity
    European Consortium for Political Research 2011 General Conference (with M Halás) University of Iceland, Reykjavik, Iceland. Aug. 27, 2011.

6. Organizational attributes and the emergence of cooperative behavior in networked populations
    Computational Social Science Society of the Americas 2010 Conference. (with JT Murphy) Tempe, Arizona. Nov. 6, 2010.

5. Punishment, rational expectations, and relative payoffs
    2nd International Workshop on Social Computing, Behavioral Modeling, and Prediction. Phoenix, Arizona. Mar. 31, 2009.

4. A simulation model of cultural consensus and persistent conflict
    2nd International Conference on Computational Cultural Dynamics. (with BB Cutts) University of Maryland. College Park, Maryland. Sep. 16, 2008.

3. International agreements and their effects on globalization
    American Association for the Advancement of Science Annual Meeting. (with A Glorioso) Boston, Massachusetts. Feb. 16, 2008.

2. Social structure: The key to cooperative behavior?
    Conference for Sustainability IGERTs. University of Alaska. Fairbanks, Alaska. Oct. 12, 2007.

1. Simulating the effects of strong reciprocity on fair allocations
    International Workshop on Cooperation in Selfish Systems. University of Bologna. Bertinoro, Italy. May 28, 2006.

PRESENTATIONS – INTRA-CAMPUS

22. Using data science to understand urban systems
    The Unit for Data Science. Oct. 19, 2022.

21. Why study social insects - Panel
    Social Insect Research Group. Sep. 9, 2022.
20. Interdependence networks: A complexity approach to understanding urban resilience
    School of Complex Adaptive Systems Faculty Seminar Series. Feb. 18, 2022.
19. Resilience in Complex Systems: The Case of Urban Economies
    School of Sustainability Research Seminar. Oct. 28, 2020.
18. Panelist: Resilience as a Design Principle for Smart Cities and Regions
    ASU Smart Cities and Regions Research Workshop. Nov. 12, 2019.
17. Analytics of Complex Adaptive Systems (and the Networks that Structure Them)
    Analytics@ASU Cyber Monday Talks, W.P. Carey School of Business. Nov. 30, 2015.
16. Managing the hive: what social insect colonies tell us about organizational function
    Launch ceremony of the ASU Biomimicry Center. (with J. Fewell) Mar. 3, 2015.
15. Measuring "connectedness": A key to quantifying urban resilience
    ecoSERVICES Group. Feb. 2, 2015.
14. Evolutionary Psychology meets Behavioral Economics
    Consortium for Biosocial Complexity (with D Kenrick) Feb. 27, 2014.
13. Urban Reinvention: Complexity tools for targeted job growth
    School of Public Affairs. Nov. 1, 2013.
12. Using complexity tools to go green: a novel approach to urban growth
    ecoSERVICES Group. Aug. 30, 2013.
11. Social networks and the evolution of cooperation
    Symposium on Interdisciplinary Research in Science & Engineering. Oct. 17, 2008.
10. Social structure allows 3rd party punishment to flourish
    Graduates in Earth, Life, and Social Sciences Research Symposium. Feb. 1, 2008.
9. Social structure: A key to strong reciprocity?
    Student Organization for Computational Social Science. Oct. 2, 2007.
8. Self-enforcing attributes and success of international environmental treaties
    Community of Undergraduate Research Scholars Symposium. (with A Glorioso) May 2, 2007.
7. Effects of the costs of strong reciprocity on fair allocations in a simulated ultimatum game
    Student Organization for Computational Social Science. May 12, 2006.
6. An agent-based model of altruistic punishment
    Urban Ecology Reading Group. 26, 2005.
5. Weekly cycling of environmental variables in Phoenix, Arizona
    Graduates in Earth, Life, and Social Sciences Research Symposium. Feb. 11, 2005.
    6
4. The role of automobiles in weekly NO_X gas cycles in Phoenix, Arizona
    Current Topics in Life Sciences Seminar. Feb. 4, 2005.
3. Indirect reciprocity in the evolution of cooperation
    Math and Cognition Colloquium. Sep. 28, 2004.
2. A carbon budget for an urban man-made lake
    Graduates in Earth, Life, and Social Sciences Research Symposium (with E Larson, T Windman, T Boheni, R Davies, J Havig, D Gonzales, K McFadden, M Thomas) Feb. 24, 2004.
1. A carbon budget for an urban man-made lake
    Central Arizona-Phoenix Long Term Ecological Research (CAP LTER) symposium. (with E Larson, T Windman, T Boheni, R Davies, J Havig, D Gonzales, K McFadden, M Thomas) Feb. 23, 2004.

MENTORING AND ADVISING

Postdoctoral Scholars

2025	Suleyman Altiparmak	Currently faculty at Michigan State University
2022	Keith Waters	Currently faculty at George Mason University

Doctoral Committees (* chair)

Current Markkus Schlosser School of Complex Adaptive Systems
The crisis of democratic backsliding while framing democracy globally as a complex adaptive system

Current Joshua Abbott * School of Complex Adaptive Systems
Complexity and public policy

2025 Shokoufeh Pourshahabi School of Agricultural and Biological Engineering (University of Florida)
Networks measures of trade induced vulnerabilities

2022 Jacob Douma School of Geographical Sciences and Urban Planning
Labor dynamics of urban economies

2022 Mehdi Bidi School of Geography (University of Lausanne, Switzerland)
A micro-level approach of geographical transitions – The case of the evolution of the US system of cities economy over the last two centuries

2021 Mikhail Rogov School of Geography (University of Lausanne, Switzerland)
Urban resilience: toward a multi-level approach to Russian metropolitan areas facing the economic crisis of 2014-2016

2019 Claudia ElDib School of Historical, Philosophical, and Religious Studies
Dense Urban Environments

2018 Joffa Applegate School of Human Evolution and Social Change
Complexity Economics Studies of Firm Dynamics

2017 Shirley-Ann Behravesh School of Sustainability
The influence of organizational culture on the relationship between sustainable business practice bundles and corporate performance

Masters Committees

2017 Travis Seville School of Computing, Informatics & Decision Systems Engineering
A visual analytics process for exploring risk and vulnerability in international trade networks

Masters Capstone Projects (* chair)

2026 Jeremy Roy School of Complex Adaptive Systems
European Union Liquid Natural Gas Temporal Network Analysis (2015-2025)

Undergraduate Honors Thesis Committees (* chair)

2022 Eliana Valenzuela * School of Life Sciences
Sweet Lemonade from Sour Lemons: Improvements to STEM Education Quality Amid the Covid-19 Pandemic

2022 Joseph Olakkengil College of Education
Sweet Lemonade from Sour Lemons: Improvements to STEM Education Quality Amid the Covid-19 Pandemic

2020 Jairo Ramirez-Torres School of Electrical Engineering
Assessing the Economic Risks of Counties in the United States to a Loss of Fossil Fuel Dependence for Energy Production

2018 Jason Li School of Business
Exploratory Analysis of My Google Takeout *Search History*

2017 Sagarika Kadambi School of Computing, Informatics & Decision Systems Engineering
Visual analytics and the impact of inter-Country trade on violence

2014 Jacob McAuliffe School of Life Sciences
The genesis mechanism: An explorative undertaking across academic disciplines in the effort to synthesize a more comprehensive understanding of complexity and the role it has served in the genesis of life.

Research Experience for Undergraduates (REU) Supervision

2024 – 2025 phú Nguyễn Thiên School of Complex Adaptive Systems
Can Vietnam be the solution to US Semiconductor supply chains

2023 – 2024 Anushka Singh School of Complex Adaptive Systems
Impact of trade interdependence on global stock markets

2021 – 2023 Miles McAnulty School of Politics and Global Studies
Energy Alignments for Space-Based Solar Power

2021 – 2022 Erwann Guettouche School of Mathematical and Statistical Sciences
Forecast of Clean Energy Consumption in China Using an Optimized Grey Dynamic Model

2021 – 2022 Gabriel White School of Computing, Informatics & Decision Systems Engineering
A Brief Overview of World Trade 2008-2020

2021 – 2022 Kayleigh Steele School of Politics and Global Studies
The effect of a global energy transition on the workforce in the traditional energy industry

2017 – 2018 Nadira Khan School of Politics and Global Studies
Accumulation of coercive economic power by China in Africa

2008 – 2009 Alexandra Glorioso Department of Economics
Self-enforcing attributes and success of international environmental treaties

TEACHING – AT ARIZONA STATE UNIVERSITY UNLESS NOTED

= graduate level, (F) = fall semester, (S) = spring semester, (SS) = summer session

Courses Designed

2021 # Complexity: Cities as Complex Adaptive Systems
2010 Honors: Social Dilemmas

Courses Taught or Co-taught

2026 (S) # CAS: Applied Projects
2022 (S) Biology: Individual Research & Readings
2021 (S) # Sustainability: Fundamentals of Urban Sustainability Science
2019 (S) Honors: Army TRADOC e-intern program
2018 (F) Honors: Army TRADOC e-intern program
2018 (F) Honors: Individual Research
2018 (S) Honors: Individual Research
2017 (F) Honors: Individual Research
2014 (F) # Complexity: Fundamentals of Complex Adaptive Systems Science
2014 (S) Complexity: Are Sustainable Cities a Contradiction in Terms? (module on Megacities)
1991 (SS) Accounting: Financial Accounting 2 (Indiana Business College)
1991 (SS) Accounting: Financial Accounting 1 (Indiana Business College)

Guest Lectures

2026 (S) # Complexity: Fundamentals of Complex Adaptive Systems Science
2025 (S) # Complexity: Fundamentals of Complex Adaptive Systems Science
2024 (S) # Complexity: Fundamentals of Complex Adaptive Systems Science
2022 (F) # Complexity: Fundamentals of Complex Adaptive Systems Science
2021 (F) # Complexity: Fundamentals of Complex Adaptive Systems Science
2020 (S) Sustainability: Sustainable Urban Dynamics
2019 (F) Sustainability: Systems Thinking
2017 (F) # Sustainability: Sustainable Urban Dynamics
2015 (F) # Sustainability: Sustainable Urban Dynamics
2014 (F) # Sustainability: Sustainable Urban Dynamics
2013 (F) Biology: Intro to Applied Mathematics for Life and Social Sciences
2013 (F) Game Theory and Global Issues (Westwood High School)
2013 (F) # Complexity: Fundamentals of Complex Adaptive Systems Science
2013 (S) Game Theory and Global Issues (Westwood High School)
2013 (S) Biology: Intro to Applied Mathematics for Life and Social Sciences
2013 (S) History: The Origins of Religion
2012 (S) Game Theory and Global Issues (Westwood High School)
2009 (F) # Biology: Humans and Nature: Ecosystem Services

Corporate Training, Designed and Taught

1997 – 1999 International banking, accounting, and economics for non-finance personnel (Rockford Corporation)
1997 – 1999 Transnational transfer pricing and tax strategy for non-finance personnel (Rockford Corporation)
1997 – 1999 The basics of financial hedging (Rockford Corporation)

WORKSHOPS AND CONFERENCES – INVITED PARTICIPATION ONLY

38. Shaping Regional Transformations II
German Federal Ministry of Economic Affairs and Climate Impacts. Essen, Germany. Sep. 15-17, 2024.

37. Shaping Regional Transformations
German Federal Ministry of Economic Affairs and Climate Impacts. Rostock, Germany. Sep. 13-14, 2023.

36. "A Data Analyst, a Sociologist, and a Planner Walk into a…": New Collaborations in Urban Research.
Berlin, Germany. May 12-14, 2022.

35. Graduate Education for a New Sustainable Urban Systems Science: Designing a New PhD Curriculum Integrating Sustainability Science and Urban Science
National Science Foundation. Tempe, Arizona. Sep. 19-20, 2019.

34. Evolution of the Global Economy in the 21st Century
Global Climate Forum. Berlin, Germany. June 3-14, 2019.

33. Regional Economic Development – Future Directions and Goals
    U.S Dept. of Commerce, Economic Development Administration. Arlington, Virginia. Apr. 2-3, 2019.

32. Dense Urban Environment Advisory Board Meeting
    US Army Asymmetric Warfare Group (AWG). Ft. Hamilton, New York. Jan 31, 2019.

31. Multi-domain Battle in Megacities: Challenges at the Operational and Strategic Levels of War
    US Army USARPAC & TRADOC G2, US Army. Ft. Hamilton, New York. Apr. 3-4, 2018.
30. Workshop to Develop a Graduate Curriculum on Dense Urban Areas
    ASU Research Enterprise. Tempe, Arizona. Feb. 28 – Mar. 1, 2018.

29. Opportunity data for modeling the future of work
    National Laboratory for Educational Transformation. San Diego, California. Feb. 27, 2018.

28. Developing Arizona's Human Capital
    Arizona Commission for Postsecondary Education. Scottsdale, Arizona. Dec. 7-8, 2017.

27. Innovation, Cities, and the Future of Work
    MIT. Cambridge, Massachusetts. Nov. 14-15, 2017.

26. The Future of Urban Network Research
    Ghent University. Ghent, Belgium. Sep. 17-20, 2017.

25. Economics Research Boot Camp
    Jönköping University. Jönköping, Sweden. Aug. 23-24, 2017.

24. B2B Data Sharing for Smart Cities and the Internet of Things
    Orange Silicon Valley. San Francisco, California. Oct. 24, 2016.

23. Workshop on Human Activity at Scale in Earth System Models: Understanding the links between neighborhood level human activity and global climate change using data analytics, agent-based modeling and earth system modeling
    Oak Ridge National Laboratory. Oak Ridge, Tennessee. Sep. 19-20, 2016.

22. Human Socio-Cultural Modeling for Dense Urban Areas
    US Army Intelligence Center of Excellence. Scottsdale, Arizona. Aug. 2-3, 2016.

21. Physical Factors of Megacities/Dense Urban Areas
    US Army Intelligence Center of Excellence. Scottsdale, Arizona. July 7, 2016.

20. US Army TRADOC Mad Scientist workshop on Megacities
    Scottsdale, Arizona. Apr. 21-22, 2016.

19. Megacities Workshop: Geospatial Analytics Applied to Urban Environments
    US National Geospatial Intelligence Agency. Springfield, Virginia. Sep. 9-10, 2015.

18. Collective Behavior: From Cells to Societies
    US National Academies, Keck Futures Initiative. Huntington Beach, California. Nov. 12-15, 2014.

17. Sustainable Cities Network Annual Conference
    Tempe, Arizona. Sep. 23, 2014.

16. Workshop on Urban Innovation and Patent Analytics
    Santa Fe Institute. Santa Fe, New Mexico. July 7-8, 2014.

15. Urban Sciences Research Coordination Network annual workshop
    Urban Center for Computation and Data. Chicago, Illinois. June 10-11, 2014.

14. Urban Sustainability Research Coordination Network biennial all-hands meeting
    Arizona State University. Tempe, Arizona. Mar. 9-11, 2014.
13. Creating the Cities of Tomorrow
    Walton Sustainable Solutions Initiatives. Carefree, Arizona. Aug. 11-14, 2013.

12. Conceptual Models of Urban Systems
    Urban Sustainability Research Coordination Network working group. North Carolina State University. Raleigh, North Carolina. May 5-7, 2013.

11. Urbanization, Sustainability, Resilience, and Prosperity
    Walton Sustainable Solutions Initiatives. Tempe, Arizona. Apr. 17-19, 2013.

10. Complex networks, embedded resource trade, and ecosystems: understanding the sustainability and resilience of urban networks
    Arizona State University. Tempe, Arizona. Nov. 1-2, 2012.

9. Managing the Hive: Organization of work in business and eusocial colonies
   Arizona State University. Tempe, Arizona. May 4-5, 2011.

8. Global Collective Action and Sustainability
   Arizona State University, Tempe, Arizona. Mar. 11, 2011.

7. International Workshop on the Group as Individual in Social Dynamics
   Arizona State University, Tempe, Arizona. May 1-2, 2009.

6. 1st International Workshop on Social Computing, Behavioral Modeling, and Prediction
   Phoenix, Arizona. Apr. 1-2, 2008.

5. The Group as Individual: Workshop on Multilevel Selection
   Arizona State University. Tempe, Arizona. Mar. 19-20, 2008.

4. Empirical techniques for testing agent-based models
   Indiana University. Bloomington, Indiana. June 2-4, 2005.

3. Summer Institute on Agent-based Modeling and Natural Resources
   Indiana University. Bloomington, Indiana, May 16-June 1, 2005.

2. Complex Adaptive Social Systems
   Indiana University. Bloomington, Indiana. Oct. 14-15, 2004.

1. Managing for Resilience: An Integrated Approach to Coastal Marine Science and Conservation
   University of Washington. Friday Harbor, Washington. Aug. 23-27, 2004

SERVICE – PROFESSIONAL

2019 – 2020	Workshop organizer and program chair, *Workshop on non-Euclidian mapping of urban economies*. Complexity Science Hub, Vienna, Austria. Mar. 3 – 4, 2020.
2018	Organizing committee, *Workshop to develop a graduate curriculum on Dense Urban Areas*. Tempe, Arizona. Feb. 28 – Mar. 1, 2018.
2017 – 2018	Guest Editor, *Urban Science* special issue on Urban Modeling and Simulation
2017	Program committee, *2017 International Conference on Social Computing, Behavioral-Cultural Modeling, & Prediction and Behavior Representation in Modeling and Simulation*. Washington, DC. July 5 – 8, 2017.
2017	Panelist, *2017 WESTMARC summit on economic development*. Glendale, Arizona. May 11, 2017.
2016	Guest Editor, *International Journal of Sustainability in Economic, Social and Cultural Context*
2016	Program committee, *2016 International Conference on Social Computing, Behavioral-Cultural Modeling, & Prediction and Behavior Representation in Modeling and Simulation*. Washington, DC. June 28 – July 1, 2016.
2015	Program committee, Session on *Urban Metabolism, Morphology and Microclimate Under Global Change.* 2015 Fall Conference of the American Geophysical Union. San Francisco, California. Dec. 14 – 18, 2015
2015	Chair, Session on *Complexity and Global Security: Sustainability in a Globalizing, Urbanizing World,* 2015 European Conference on Complex Systems. Tempe, Arizona. Sep. 28 – Oct. 2, 2015.
2011 – 2012	Organizing committee, *Workshop on The Origins of Xenophobia*, Origins Project. Tempe, Arizona. Mar. 30 – Apr. 1, 2012.
2010	External faculty advisor, Summer Undergraduate Math Enrichment Program, Simpson College, Indianola, Iowa.
2010	Review Panelist, Cyberinfrastructure Program, US National Science Foundation.
2005 –	Invited reviewer for (partial list): Advances in Complex Systems • American J. of Distance Education • American J. of Experimental Agriculture • Annals of Regional Science • Applied Economics • Applied Economics Letters • Applied Geography • Applied Sciences • Asia and the Global Economy • Asian J. of Agricultural Extension, Economics and Sociology • Big Earth Data • British J. of Economics • Case Studies in Transport Policy • City, Culture, and Society • City & Community • Clean Technologies and Environmental Policy • Cogent Arts & Humanities • Cogent Engineering • Cogent Social Sciences • Computational and Mathematical Organization Theory • Democracy and Security • Ecosystems • Electronic Research Archive • Entropy • Energies • Environmental Science and Technology • Environmental, Development and Sustainability • Frontiers in Sustainable

Cities • Geographies • Geography and Sustainability • International J. of Environment and Waste Management • International J. of Geo-Information • International J. of Intelligent Systems • International J. of Management Science and Engineering Management • International J. of Sustainability in Economic, Social and Cultural Context • International J. of the Commons • J. of Artificial Societies and Social Simulation • J. of Business & Management • J. of Chinese Economic and Business Studies • J. of Cleaner Production • J. of Complex Networks • J. of Economic Behavior and Organization • J. of Environmental Design and Planning • J. of Environmental Management • J. of Geographical Systems • J. of Infrastructure, Policy and Development • J. of Open Innovation: Technology, Market, and Complexity • J. of the Royal Society Interface • J. of Theoretical Biology • J. of Urban Technology • Land • Management & Trade • Mineral Economics • Nature • Nature Cities • Nature Communications • Networks and Spatial Economics • Palgrave Communications • Planning Practice and Research • PLoS One • Physics Letters A • The Professional Geographer • Qeios • Remote Sensing • Sage Open • Scientific Reports • Sensors • Smart Cities • Sustainability • Sustainable Cities and Society • Systems • Tourism Management • Transportation Letters • Trends in Computer Science and Information Technology • Urban Affairs Review • Urban Informatics • Urban Studies

SERVICE – UNIVERSITY

2024 –	Personnel Committee, School of Complex Adaptive Systems
2023 –	Curriculum Development Committee, School of Complex Adaptive Systems
2021 –	Founding director, Laboratory for Regional Dynamics and Development
2022 – 2025	Graduate Admissions Committee, School of Complex Adaptive Systems
2020 – 2022	Decision Theater 3.0 strategic planning team
2020 – 2023	co-Founder, co-Director, Complexity Economics Lab
2018 – 2019	co-Chair, Metropolitan Informatics, ASU Leadership Academy
2016 – 2021	Founding director, The Urban Science Working Group @ ASU
2013 – 2014	co-Chair, 5-year strategic planning committee on Cities and Urban Science, Global Institute of Sustainability
2012 – 2015	Founding faculty advisor, Interdisciplinary Complexity Science Student Organization
2012 – 2014	Director, Complexity Science Speaker Series, Center for Social Dynamics & Complexity
2008	Faculty search committee for Environmental Economics, School of Life Sciences
2007	Symposium judge, Research in Interdisciplinary Science & Engineering symposium
2006 – 2008	Undergraduate mentor, Undergraduate Research Scholars program, Barrett Honors College
2006 – 2008	Founding director, Student Organization for Computational Social Science
2005 – 2006	Task force to establish the inaugural curriculum for the School of Sustainability
2005 – 2006	Director, Current topics in Life Sciences seminar series, School of Life Sciences
2003	Curator and specimen collector, Lichen Herbarium

SERVICE – COMMUNITY AND OTHER OUTREACH

2017	Judge, *MathCounts* regional competition. Rochester Community and Technical College. Rochester, Minnesota. Feb. 3, 2017.
2013 – 2020	Volunteer librarian, Broadmor Elementary School, Tempe, Arizona
2013 – 2014	Chair, External Audit Committee. Broadmor Elementary School PTA, Tempe, Arizona.
2012 – 2013	External faculty advisor, E.A.R.T.H. Club, Mesa Westwood High School, Mesa, Arizona.
2001 – 2003	Chemistry and Math Tutor. Math & Science Help Center, Scottsdale Community College, Scottsdale, Arizona.
1990 – 1991	Board of Directors, Treasurer, and Finance Chairman, Big Brothers/Big Sisters, Seymour, Indiana.

PROFESSIONAL MEMBERSHIPS – PAST AND PRESENT

Complex Systems Society (CSS)
Western Regional Science Association (WRSA)
Computational Social Science Society of the Americas (CSSSA)
Community Indicators Consortium (CiC)
On Sustainability Knowledge Community
European Complex Systems Society (CSS)
American Association for the Advancement of Science (AAAS)
National Center for Faculty Development & Diversity
American Association of Geographers (AAG)
North American Association for Computational Social and Organizational Sciences (NAACSOS)
International Network for Social Network Analysis (INSNA)
Association for Evolutionary Economics (AFEE)
American Geophysical Union (AGU)
Institute of Management Accountants (IMA)
Association for Operations Management (formerly APICS)

PROFESSIONAL DESIGNATIONS AND CERTIFICATIONS

1995 Certified Management Accountant (CMA), Institute of Management Accountants.
1994 Certification in Structured Query Language (SQL), Oracle Education.
1994 Certification in Relational Database Architecture, Oracle Education.

LANGUAGES

English – native speaker
German – basic proficiency