Van M. Savage

Curriculum Vitae

August 2025

Personal History

Professor
UCLA
Department of Computational Medicine
Department of Ecology and Evolutionary Biology
Institute for Quantitative and Computational Biosciences
Computational and Systems Biology (CaSB) IDP
Brain Research Institute

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Research Interests: effects of climate change on biotic systems; food web stability and persistence; scaling for individual, population, and community processes; plant and animal vascular networks; trait-driver theory; temperature dependence of spread of vector-borne diseases; tumor growth; sleep; higher-order interactions in ecological systems and drugs

Education

1992-1996 B.S. in Physics, Rhodes College, Memphis, TN, cum laude, Phi Beta Kappa
1996-1999 A.M. in Physics, Washington University, St. Louis, MO
1996-2001 Ph.D. in Physics, Washington University, St. Louis, MO "Analytical and numerical methods for studying PT-symmetric but non-Hermitian Hamiltonians," Carl Bender and Claude Bernard, Advisor

Professional Experience

1997-2001 Graduate Research Assistantship, Quantum Field Theory DOE grant, Washington University in St. Louis
2001-2004 Joint Postdoctoral Fellow
The Santa Fe Institute
T8 Particles and Fields Group
2004-2006 Systems Biology Postdoctoral Fellow, Bauer Center for Genomics Research, Harvard University
2006-2008 Instructor, Department of Systems Biology, Harvard Medical School
2009-2013 Assistant Professor, Department of Biomathematics, David Geffen School of Medicine at UCLA
2010-2013 Assistant Professor, Department of Ecology and Evolutionary Biology, UCLA
2013-2016 Associate Professor, Department of Ecology and Evolutionary Biology, UCLA
2013-2016 Associate Professor, Department of Biomathematics, David Geffen School of Medicine at UCLA
2022 Visiting Research Professor, Department of Energy and the Environment, Chalmers University of Technology
2010-present External Faculty, Santa Fe Institute
2016-present Professor, Department of Ecology and Evolutionary Biology, UCLA (primary appointment)
2016-present Professor, Department of Computational Medicine, David Geffen School of Medicine at UCLA

Major Administrative Roles

Director, Computational and Systems Biology (CaSB) Interdepartmental Program (IDP) Undergraduate Major, UCLA, 2016-2021

In this role, I led an advisory committee of 10 faculty, maintained and managed a group of about 50 affiliated faculty connected through research and teaching, coordinated and arranged the teaching assignments for the core and elective courses, managed one student affairs officer (SAO), one manager of undergraduate and academic services, a Chief Administrative Officer (CAO), and oversaw the budget and work with the financial team. I dealt with myriad student issues, led orientation events, and talked at recruitment events. This major existed at UCLA for about 35 years, but I changed its direction during my 5 years leading the program. This was accomplished by initially heading an Ad Hoc Committee to evaluate the overall program and writing a 40-page report. Following up with that as the new Director, I led a substantial revision and updating of the curriculum as well as an 8-year review of the program with an outside team of experts and reviewers. These efforts culminated in an 80-page self-review and vision document. ***In the nearly 5 years while I directed this program, the number of graduating seniors increased from 4 to now over 100, and the total number of majors has increased by about a factor of 10 (from 38 to about 400).*** Through major efforts I accomplished nearly every single vision goal—helping to connect, coordinate, and recruit faculty across departments and schools (College of Arts and Sciences, Engineering School, Medical School) at UCLA, dramatically growing the major (see above), increasing course offerings, modernizing the curriculum (such as biological data sciences, machine learning, network theory, complex systems, and modern dynamical systems), shortening time to degree, preparing students for jobs in industry (not just PhD programs), conducting seminar series with alumni in industry, improving internship opportunities and job placement, the creation of a new CaSB website, and more. Concurrent with these efforts, I also increased the diversity on the CaSB advisory committee through the appointment of more diverse and also incredibly talented mathematical and computational biologists who have made major contributions to the field and UCLA. I initiated URM and first-generation recruitment events within UCLA that leverage existing infrastructures, and also budgeted and increased funds for URM student retention via events, seminars, and onboarding and orientation.

Research Grants and Fellowships Funding

2000 NSF Physics Graduate Fellowship, The Santa Fe Institute, Santa Fe, NM

2006-2008 NSF-Ecology Grant, "Trait-based approaches for predicting ecosystem response to environmental change: Empirical tests and model development,"
$109,274, (listed as Senior Personnel because of academic status)

2008 ARC-NZ Workshop for Vegetation Function "WG36 Trait-Based Models,"
$25,000-$30,000 (PI and Organizer)

2008-2011 NSF-Advancing Theory in Biology Grant, "Combining theories for plant architecture, allometry, and traits to develop the next generation of scaling theory,"
$737,521 (total) (co-PI)

2009-2011 Australian Research Council (ARC)-Discovery Projects, "Predicting biodiversity from population dynamics,"
$225,000 (total) (co-PI)

2010-2013 NSF-Population and Community Ecology Grant, "Understanding the temperature dependence of consumer-resource interactions,"
$407,000 (total) (lead PI)

2011-2012 UC Mexus-Conayct, "Systematic Analysis of Genetic Interactions Underlying Aging in Yeast,"
$25,000 (total) (PI)

2013-2017 NSF: Division of Integrative Organismal Systems, "Novel lessons from ancient plants: water transport in the earliest tracheophytes,"
$490,000 (total award), $15,040 (my part) (co-PI)

2013-2020 NSF: Division of Biological Infrastructure: Biological Informatics, "CAREER: Automated extraction of vessel data from images to construct new models for vascular networks in plants and animals,"
$796,325 (sole PI)
http://www.nsf.gov/awardsearch/showAward?AWD_ID=1254159&HistoricalAwards=false
http://www.nsf.gov/awardsearch/showAward?AWD_ID=1258186&HistoricalAwards=false

2015-2019 NSF: Division of Environmental Biology: Collaborative Research: Developing integrated trait-based scaling theory to predict community change and forest function in light of global change"
$630,775 (total award), $200,264 (my part) (co-PI)
http://www.nsf.gov/awardsearch/showAward?AWD_ID=1457804&HistoricalAwards=false

2015-2021 NSF: Ecology and Evolution of Infectious Diseases: Effects of Temperature on Vector-Borne Disease Transmission: Integrating Theory with Empirical Data"
$2,331,000 (total award), $224,026 (my part) (co-PI)
http://www.nsf.gov/awardsearch/showAward?AWD_ID=1518681&HistoricalAwards=false

2016-2021 James S. McDonnell Foundation: Scholar Award in Complex Systems: Emergent Interactions in Complex Networks: Beyond Pairwise Parts in Systems Ranging from Drugs and Microbes to Consumers and Resources",
$450,000 (sole PI)
https://www.jsmf.org/grants/20150014/

New funding since last review

2022 Chalmers University, sabbatical funding for visiting research fellowship, ~$100,000

2018-present UCLA, The Dorothy and Leonard Strauss Permanent Endowment Scholar Fund, $170,000

Publications

>28,000 Total Citations (using Google scholar); h-index=53; i10-index=91

***=lab members/students; s=senior author; c=corresponding author**

Note: In particle physics, authors are listed alphabetically. According to norms in biology, I would have been first author on publications 1-4 and 6-8.

1. C. M. Bender, F. Cooper, P. N. Meisinger, **V. M. Savage** (1999) Variational ansatz for PT-symmetric quantum mechanics, *Physics Letters* **A 259**, 224-231.
2. C. M. Bender, S. Boetcher, H. F. Jones, **V. M. Savage** (1999) Complex square well—a new exactly solvable quantum mechanical model, *Journal of Physics A* **32**, 6771-6781.
3. C. M. Bender, S. Boetcher, **V. M. Savage** (2000) Conjecture on the interlacing of zeros in complex Sturm-Liouville problems, *Journal of Mathematical Physics* **41**, 6381-6387.
4. C. M. Bender, K. A. Milton, **V. M. Savage** (2000) Solution of Schwinger-Dyson equations for PT-symmetric quantum field theories, *Physical Review* **D 62**, 085001.
5. C. M. Bender, M. V. Berry, P. N. Meisinger, **V. M. Savage**, M. Simsek (2001) Complex WKB analysis of energy-level degeneracies of non-Hermitian Hamiltonians,

Journal of Physics A Letters **34**, L31-L36.
6. C. W. Bernard, **V. M. Savage** (2001) Numerical simulations of PT-symmetric quantum field theories, *Physical Review* **D 64**, 085010.
7. F. Cooper, **V. M. Savage** (2002) Dynamics of the chiral phase transition in the 2+1 dimensional Gross-Neveu model, *Physics Letters* **B 545**, 307-314.
8. C. W. Bernard, **V. M. Savage** (2003) PT–symmetric quantum field theories and the Langevin equation. *Czech Journal of Physics*, **54**, 109-118.
9. J. F. Gillooly, J. H. Brown, G. B. West, **V. M. Savage**, E. L. Charnov (2001) Effects of size and temperature on metabolic rate, *Science* **293**, 2248-2251.
10. J. F. Gillooly, E. L. Charnov, G. B. West, **V. M. Savage**, J. H. Brown (2002) Effects of size and temperature on developmental time, *Nature* **417**, 70-73.
11. J. Jun, J. W. Pepper, **V. M. Savage**, J. F. Gillooly, J. H. Brown. (2003) Allometric scaling in centrally foraging ant colonies, *Evolutionary Ecology Research* **5(2),** 297-303.
12. **V. M. Savage[c]** (2003) Is biology just chemistry?: Book review of "Ecological Stoichiometry: The Biology of Elements from Molecules to the Biosphere" by Robert W. Sterner and James J. Elser. *Complexity* **8(6)**, 42-44.
13. S. K. M. Ernest, B. J. Enquist, J.H. Brown, E. L. Charnov, J. F. Gillooly, **V. M. Savage**, E. P. White, F. A. Smith, E. A. Hadly, J. P. Haskell, S. K. Lyons, B. A. Maurer, K. J. Niklas, B. Tiffney (2003) Thermodynamic and metabolic effects on the scaling of production and population energy use. *Ecology Letters* **6**, 990-995.
14. G. B. West, **V. M. Savage**, J. Gillooly, B. J. Enquist, W. H. Woodruff, J. H. Brown. (2003) But why *does* metabolic rate scale with body size? Brief Communication. *Nature*, **421**, 713-714.
15. **V. M. Savage[c],** J. F. Gillooly, J. H. Brown, G. B. West, E. L. Charnov, (2004) Effects of body size and temperature on population growth, *The American Naturalist* **163(3),** 429-441.
16. **V. M. Savage[c]** (2004) Improved approximations to scaling relationships for species, populations, and ecosystems across latitudinal and elevational gradients. *Journal of Theoretical Biology* **227(4)**, 525-534.
17. **V. M. Savage[c]**, J. F. Gillooly, W. H. Woodruff, G. B. West, A. P. Allen, B. J. Enquist, J. H. Brown (2004) The predominance of quarter-power scaling in biology. *Functional Ecology* **18(2)**, 257-282.
18. J. H. Brown, J. F. Gillooly, A. P. Allen, **V. M. Savage**, G. B. West (2004) Toward a metabolic theory of ecology (MacArthur award paper), *Ecology* **85(7)**, 1771-1789.
19. J. F. Gillooly, A. P. Allen, J. H. Brown, J. J. Elser, C. Martinez del Rio, **V. M. Savage**, G. B. West, W. H. Woodruff, and A. Woods. (2005) The Metabolic Basis of Whole-Organism RNA and Phosphorus Content, *Proceedings of the National Academy of Sciences, USA* **102**, 11923-11927.
20. J. E. Cohen, T. Jonsson, C. B. Muller, H. C. J. Godfray, **V. M. Savage** (2005) Body sizes of hosts and parasitoids in individual feeding relationships, *Proceedings of the National Academy of Sciences, USA* **102(3)**, 684-689.
21. A.P. Allen, J. F. Gillooly, **V. M. Savage**, J. H. Brown (2006) Kinetic effects of temperature on rates of genetic divergence and speciation, *Proceedings of the National Academy of Sciences, USA*, **103**, 9130-9135.
22. **V. M. Savage[c]**, E. P. White, M. E. Moses, S. K. M. Ernest, B. J. Enquist, E. L. Charnov (2006) Comment on, "The illusion of invariant quantities in life histories", *Science* **312**, 198b.
23. **V. M. Savage[c],** G. B. West (2006) Biological scaling and physiological time: Biomedical applications. Complex System Science in Biomedicine. Ed. T. S. Deisboeck and J. Y. Kresh, New York, Kluwer Academic.

24. J. F. Gillooly, A. P. Allen, **V. M. Savage**, E. L. Charnov, G. B. West, J. H. Brown (2006) Response to Clarke and Fraser: effects of temperature on metabolic rate, *Functional Ecology* **20**, 400-404.
25. **V.M. Savage[c]**, B.J. Enquist, G.B. West (2007) Comment on Chaui-Berlinck, *Journal of Experimental Biology*, **210(21)**, 3873-3874.
26. **V. M. Savage[c]**, C. T. Webb, J. Norberg (2007) A trait-based framework for studying the effects of biodiversity on ecosystem functioning, *Journal of Theoretical Biology* **247**, 213-229.
27. **V. M. Savage[c],** G. B. West (2007) Towards a quantitative, metabolic theory of mammalian sleep, *Proceedings of the National Academy of Sciences, USA*, **104(3)**, 1051-1056.
28. **V. M. Savage[c]**, A.P. Allen, J. F. Gillooly, A. B. Herman, J. H. Brown, G. B. West (2007) Scaling of number, size, and metabolic rate of cells with body size in mammals, *Proceedings of the National Academy of Sciences, USA,* **104(11),** 4718-4723.
29. A. P. Allen, **V. M. Savage** (2007) Setting the absolute tempo of biodiversity dynamics, *Ecology Letters* **10**, 637-646.
30. C.A. Price, B.J. Enquist, **V.M. Savage** (2007) A general model in botanical form for allometric covariation and function, *Proceedings of the National Academy of Sciences, USA*, **104(32)**, 13204-13209.
31. **V. M. Savage^[c]**, E. J. Deeds^, W. Fontana (2008) Sizing up allometric scaling theory, *Public Library of Science: Computational Biology*, **4(9)**, e1000171.
    ^denotes equal contribution
32. J.P. O'Dwyer, J.K. Lake, A. Ostling, **V. M. Savage**, J.L. Green (2009) An integrative framework for stochastic, size-structured community assembly, *Proceedings of the National Academy of Sciences, USA*, **106(15)**, 6170-6175.
33. K.J. Anderson-Teixeira, **V.M. Savage**, A.P. Allen, J.F. Gillooly (2009) Allometry and metabolic scaling in ecology, *Encyclopedia of Life Sciences*, John Wiley & Sons, Ltd.: Chichester.
34. T. Kolokotrones, **V.M. Savage**, E.J. Deeds, W. Fontana (2010) Curvature in metabolic scaling, *Nature* **464**, 753-756.
35. **V. M. Savage[c],** L. P. Bentley*, B. J. Enquist, J. S. Sperry, D. D. Smith, P. B. Reich, E. I. von Allmen (2010) Hydraulic tradeoffs and space filling enable better predictions of vascular structure and function in plants, *Proceedings of the National Academy of Sciences, USA* **107(52)**, 22722-22727.
36. A. I. Dell*, S. Pawar*, **V. M. Savage[s]** (2011) Systematic variation in the temperature dependence of physiological and ecological traits, *Proceedings of the National Academy of Sciences, USA* **108(26)**, 10591-10596.
37. A. B. Herman*, **V. M. Savage**, G. B. West, (2011) A quantitative theory of solid tumor growth and vascularization, *Public Library of Science One* **6(9),** e22973.
38. P. Amarasekare, **V. M. Savage** (2012) A framework for elucidating the temperature dependence of fitness, *The American Naturalist*, **179(2)**, 178-191.
39. S. Pawar*, A. I. Dell*, **V. M. Savage[s]** (2012) Dimensionality of consumer search space drives trophic interactions strengths, *Nature* **486(7404)**, 485-489.
40. J. S. Sperry, D. D. Smith, **V. M. Savage**, B. J. Enquist, K. A. McCulloh, P. B. Reich, L. P. Bentley*, E. I. von Allmen (2012) A species-specific model of the hydraulic and metabolic allometry of trees I: model description, predictions across functional types, and implications for inter-specific scaling, *Functional Ecology* **26(5)**, 1054-1065.
41. E. I. von Allmen, J. S. Sperry, D. D. Smith, **V. M. Savage**, B. J. Enquist, P. B. Reich, L. P. Bentley* (2012) A species-specific model of the hydraulic and metabolic allometry of trees II: testing predictions of water use and growth scaling in ring- and diffuse-porous

species, *Functional Ecology* **26(5)**, 1066-1076.

42. C.A. Price, J.S. Weitz[c,s], **V. M. Savage[c,s]**, J. Stegen, A. Clarke, A.J. Kerkhoff, D.A. Coomes, K.J. Niklas, N.G. Swenson, K. McCulloh, R. Etienne, H. Olff (2013) Testing the metabolic theory of ecology, *Ecology Letters* **15(2)**, 1465-1474.
43. **V. M. Savage[c]**, A. B. Herman*, G. B. West, K. Leu* (2013) Using fractal geometry and universal growth curves as diagnostics for comparing tumor vasculature and metabolic rate with healthy tissue and for predicting response to drug therapy, *Discrete and Continuous Dynamical Systems, Series B (DCDS-B)* **18(4)**.
44. L.P. Bentley*, J. Stegen, **V.M. Savage**, B.J. Enquist (2013) An empirical assessment of tree branching networks and implications for plant allometric scaling models, *Ecology Letters* **16(8)**, 1069-1078.
45. A.I. Dell*, S. Pawar*, **V.M. Savage[s]** (2013) The thermal dependence of biological traits, *Ecology* **94(5)**, 1205-1206.
46. A.I. Dell*, S. Pawar*, **V.M. Savage[s]** (2014) Temperature dependence of trophic interactions are driven by asymmetry of species and foraging strategies, *Journal of Animal Ecology* **83(1)**, 70-84.
47. D.D. Smith, J.S. Sperry, B.J. Enquist, **V.M. Savage**, K.A. McCulloh, L.P. Bentley (2014) Deviations from symmetrically self-similar branching in trees predicts altered hydraulics, mechanics, light interception, and metabolic scaling, *New Phytologist* **201(1)**, 217-229.
48. D.A. Vasseur, J.P. DeLong, B. Gilbert, H.S. Greig, C.D.G. Harley, K.S. McCann, **V.M. Savage**, T.D. Tunney, M.I. O'Connor (2014) Increased temperature variation poses a greater risk to species than climate warming, *Proceedings of the Royal Society B: Biological Sciences* **281(1779)**.
49. B. Gilbert, T.D. Tunney, K.S. McCann, J.P. DeLong, D.A. Vasseur, **V.M. Savage**, J.B. Shurin, A.I. Dell, B.T. Barton, C.D.G. Harley, H.M. Kharouba, P. Kratina, J.L. Blanchard, C. Clements, M. Winder, H.S. Greig, M.I. O'Connor (2014) A bioenergetic framework for the temperature dependence of trophic interactions, *Ecology Letters* **17(8),** 902-914.
50. J.C. Chang, **V.M. Savage**, T. Chou (2014) A path integral approach to Bayesian inference for inverse problems using the semiclassical approximation, *Journal of Statistical Physics*, **157(3)**, 582-602.
51. B.J. Enquist, J. Norberg, S.P. Bonser, C. Violle, C.T. Webb, A. Henderson, L.L. Sloat, and **V.M. Savage[s]** (2015) Scaling from traits to ecosystems: Developing a general trait driver theory via integrating trait-based and metabolic scaling theories, *Advances in Ecological Research* **52,** 249-318.
52. J.P. DeLong, B. Gilbert, J.B. Shurin, **V.M. Savage**, B.T. Barton, C.F. Clements, A.I. Dell, H.S. Greig, C.D.G. Harley, P. Kratina, K.S. McCann, T.D. Tunney, D.A. Vasseur, M.I. O'Connor (2015) The body size dependence of trophic cascades, *The American Naturalist* **185(3)**, 354-366.
53. M.G. Newberry*, D. Ennis, **V. M. Savage[s]** (2015) Quantifying statistical self similarity in human vessel networks using data extracted automatically from MRI, *Public Library of Science: Computational Biology* **11(8)**, e1004455. doi:10.1371/journal.pcbi.1004455.
54. S. Pawar*, A. I. Dell*, **V. M. Savage[s]**, J. Knies (2015) Real versus artificial variation in the thermal sensitivity of biological traits, *The American Naturalist* **187:2**.
55. S. Pawar*, A.I. Dell*, **V.M. Savage[s]** (2015) Scaling up metabolic constraints on individuals to the dynamics of ecosystems. In *Aquatic Functional Biodiversity*

A. Belgrano, G. Woodward and U. Jacob (Eds). Elsevier.

56. E. Tekin*, C. Beppler, C. White, Z. Mao, **V. M. Savage**, P. J. Yeh (2016) Enhanced identification of synergistic and antagonistic emergent interactions among three or more drugs, *Journal of the Royal Society Interface* **13(119)**, 20160332.
57. D. Hunt*, **V.M. Savage**[S] (2016) Asymmetries arising from the space-filling nature of vascular networks, *Physical Review E* **93**, 062305.
58. E. Tekin*, D. Hunt*, M.G. Newberry*, **V.M. Savage**[S] (2016) Do vascular networks branch optimally or randomly across spatial scales? *PLoS Computational Biology* **12(11)** e1005223.
59. C. Beppler, E. Tekin*, Z. Mao, C. White, C. McDiarmid, E. Vargas, J.H. Miller, **V.M. Savage**, P.J. Yeh (2017) Uncovering emergent interactions in three-way combinations of stressors, *Journal of the Royal Society Interface* **13(125)**.
60. E.A. Mordecai, J.M. Cohen, M.V. Evans, P. Gudapati, L.R. Johnson, C.A. Lippi, K. Miazgowicz, C.C. Murdock, J.R. Rohr, S.J. Ryan, **V.M. Savage**, M.S. Shocket, A.S. Ibarra, M.B. Thomas, D.P. Weikel (2017) Detecting the impact of temperature on transmission of Zika, dengue, and chikungunya using mechanistic models, *PLoS Neglected Tropical Diseases* **11(4)**, e0005568.
61. C. Beppler, E. Tekin*, C. White, Z. Mao, J.H. Miller, R. Damoiseaux, **V.M. Savage**, P.J. Yeh (2017) When more is less: Emergent suppressive interactions in three-drug combinations, *BMC Microbiology* **17,** 107.
62. A.B. Brummer*, **V.M. Savage**, B.J. Enquist (2017) A general model for metabolic scaling in self-similar asymmetric networks, *PLoS Computational Biology* **13(3)**, e1005394.
63. E. Tekin*, **V.M. Savage**, P. Yeh, (2017) Measuring higher-order drug interactions: A review of recent approaches. *Current Opinion in Systems Biology* **4**, 16-23.
64. B.J. Enquist, L.P. Bentley*, A. Shnekin, B. Maitner, **V.M. Savage**, S. Michaeltz, B. Blonder, V. Buzzard, T.E.B. Espinoza, W. Farfan-Rios, C. Doughty, G.R. Goldsmith, R.E. Martin, N. Salinas, M. Silman, S. Diaz, G.P. Asner, Y. Malhi (2017) Assessing trait-based scaling theory in tropical forests spanning a broad temperature gradient, *Global Ecology and Biogeography* **26 (12)**.
65. S.S. Chang, S. Tu, KI. Naek, A. Pietersen, Y.H. Liu, **V.M. Savage**, S.P.L. Hwang, T.K. Hsiai, M. Roper (2017) Optimal occlusion uniformly partitions red blood cells fluxes within a microvascular network. *PLoS Computational Biology* **13(12)**, e1005892.
66. L. Lee*, **V.M. Savage**, P. Yeh (2018) Intermediate levels of antibiotics may increase diversity of colony size phenotype in bacteria. *Computational and Structural Biotechnology* **16**, 307-315.
67. E. Tekin*, C. White, T. Kang, N. Singh, M. Cruz-Loya, R. Damoiseaux, **V.M. Savage**, P. Yeh (2018) Prevalence and patterns of higher-order drug interactions in *Escherichia coli. npj Nature Systems Biology and Applications* **4**, 31.
68. M. Cruz-Loya*, T. Kang, N. Lozano, R. Watanabe, E. Tekin*, R. Damoiseaux, **V.M. Savage**, P. Yeh (2018) Stressor interaction networks suggest antibiotic resistance co-opted from stress responses to temperature. *The ISME Journal. doi: 10.1038/s41396-018-0241-7.*
69. E. Tekin*, P. Yeh, **V.M. Savage**[S] (2018) General form for interaction measures and framework for deriving higher-order emergent effects. *Frontiers in Ecology and Evolution* **6**, 166.
70. J.N. Pruitt, A. Berdahl, C. Riehl, N. Pinter-Wollman, H.V. Moeller, E.G. Pringle, L.M. Aplin, E.J.H. Robinson, J. Grilli, P. Yeh, **V.M. Savage**, M.H. Price, J. Garland, I.C. Gilby, M.C. Crofoot, G.N. Doering, E.A. Hobson (2018) Social tipping points in

animal societies, *Proceedings of the Royal Society London B* **285(1887)** 20181282.

71. D.J. Wieczynski*, B. Boyle, V. Buzzard, S.M. Duran, A.N. Henderson, C.M. Hulshof, A.J. Kerkhoff, M.C. McCarthy, S.T. Michaletz, N. Swenson, G.P. Asner, L.P. Bentley, B.J. Enquist, **V.M. Savage**[s] (2019) Climate shapes and shifts functional biodiversity in forests worldwide. *Proceedings of the National Academy of Sciences USA* **116(2)**, 587-592.
72. M. Newberry*, **V.M. Savage**[s] (2019) Self-Similar Processes Follow a Power Law in Discrete Logarithmic Space. *Physical Review Letters* **122***,* 158303.
73. S.M. Durán, R.E. Martin, S. Díaz, B.S. Maitner, Y. Malhi, N. Salinas, A. Shenkin, M.R. Silman, D.J. Wieczynski*, G.P. Asner, L. Patrick Bentley, **V.M. Savage**, B.J. Enquist (2019) Informing trait-based ecology by assessing remotely sensed functional diversity across a broad tropical temperature gradient. *Science Advances* **5(12)**, 8114.
74. E.A. Mordecai, J.M. Caldwell, M.K. Grossman, C.A. Lippi, L.R. Johnson, M. Neira, J.R. Rohr, S.J. Ryan, **V.M. Savage**, M.S. Shocket*, R. Sippy (2019) Thermal biology of mosquito-borne disease. *Ecology letters **22*****(10)**, 1690-1708.
75. A. Rodríguez-Verdugo, N. Lozano-Huntleman, M. Cruz-Loya*, **V.M. Savage**, P.J. Yeh (2020) Compounding effects of climate warming and antibiotic resistance. *iScience* **23(4)** 101024.
76. E. Tekin*, E. S. Diamant, M. Cruz-Loya*, V. Enriquez, N. Singh, **V.M. Savage**, P.J. Yeh (2020) Using a newly introduced framework to measure ecological stressor interactions. *Ecology Letters* **23(9)**, 1391-1403
77. S. Pettersson, **V.M. Savage**, M. Nilsson Jacobi (2020) Predicting collapse of complex ecological systems: quantifying the stability–complexity continuum. *Journal of Royal Society Interface* **17(166)**, 20190391.
78. J. Cao*, G.B. West, A.B. Herman, and **V.M. Savage**[s] (2020) Unraveling Why We Sleep: Quantitative Analysis Reveals Abrupt Transition from Neural Reorganization to Repair in Early Growth. *Science Advances* **6(38)**, eaba0398.
79. S. Pettersson, **V.M. Savage**, M. Nilsson Jacobi (2020) Stability of ecosystems enhanced by species-interaction constraints. *Phys. Rev. E* **102(6)**, 062405.
80. B. Borremans, A. Gamble, K.C. Prager, S.K. Helman, A.M. McClain, C. Cox, **V.M. Savage**, J.O. Lloyd-Smith (2020) Quantifying antibiotic kinetics and RNA detection during early-phase SARS-CoV-2 infection by time since symptom onset. *ELife* **9**, e60122.
81. **V.M. Savage** (2020) Transmission T-022: Van Savage on the informational pitfalls of selective testing. Santa Fe Institute COVID-19 Transmission Series. https://www.santafe.edu/news-center/news/transmission-t-022-van-savage
82. A.B. Brummer*, D. Hunt*, **V.M. Savage**[s] (2020) Improving blood vessel tortuosity measurements via highly sampled numerical integration of the Frenet-Serret equations. *IEEE Transactions of Medical Imaging* **40(1)**, 297-309.
83. A.B. Brummer*, P. Lymperopoulos*, J. Shen*, E. Tekin*, L.P. Bentley, V. Buzzard, A. Gray, I. Oliveras, B.J. Enquist, **V.M. Savage**[s] (2020) Branching principles of animal and plant networks identified by combining extensive data, machine learning, and modeling. *Journal of the Royal Society Interface* **18(174)**, 20200624.
84. C.S. Cloyed, J.M. Grady, **V.M. Savage**, J.C. Uyeda, A.I. Dell (2021) The allometry of locomotion. *Ecology* **102(7)**, e03369.

85. N.A. Lozano-Huntelman, A. Zhou, E. Tekin*, M. Cruz-Loya*, Bjørn Østman*, Sada Boyd, **V.M. Savage**, P. Yeh (2021) Hidden suppressive interactions are common in higher-order drug combinations. *iScience* **24(4)**, 102355.
86. M. Cruz-Loya*, E. Tekin*, T.M. Kang, A. Rodríguez-Verdugo, **V.M. Savage**, P.J. Yeh (2021) Antibiotics shift the temperature response curve of Escherichia coli growth. *MSystems* **6(4)**, e00228-21.
87. A.B. Brummer*, **V.M. Savage^{S}** (2021) Cancer as a model system for testing metabolic scaling theory, *Frontiers in Ecology and Evolution* 691830.

Papers since last review

88. D.J. Wieczynski*, S. Díaz, S.M. Durán, N.M. Fyllas, N. Salinas, R.E. Martin, A. Shenkin, M.R. Silman, G.P. Asner, L.P. Bentley, Y. Malhi, B.J. Enquist, **V.M. Savage^{S}** (2022) Improving landscape-scale productivity estimates by integrating trait-based models and remotely-sensed foliar-trait and canopy-structural data, *Ecography* **2022(8)**, e06078.

89. P. Mira, N. Lozano-Huntelman, A. Johnson, **V.M. Savage**, P. Yeh (2022) Evolution of antibiotic resistance impacts optimal temperature and growth rate in Escherichia coli and Staphylococcus epidermidis, *Journal of Applied Microbiology* **133(4)**, 2655-2667.

90. G. Yahya, P. Menges, P.S. Amponsah, D.A. Ngandiri, D. Schulz, A. Wallek, N. Kulak, M. Mann, P. Cramer, **V.M. Savage**, M. Räschle, Z. Storchova (2022) Sublinear scaling of the cellular proteome with ploidy, *Nature Communications* **13(1)**, 6182.

91. P. Desai-Chowdhry*, A.B. Brummer*, **V.M. Savage^{S}** (2022) How axon and dendrite branching are guided by time, energy, and spatial constraints, *Scientific Reports* **12(1)**, 20810.

92. E.S. Diamant, S. Boyd, N.A. Lozano-Huntelman, V. Enriquez, A.R. Kim, **V.M. Savage**, P.J. Yeh (2023) Meta-analysis of three-stressor combinations on population-level fitness reveal substantial higher-order interactions. *Science of The Total Environment **864***, 161163.

93. P. Desai-Chowdhry*, A.B. Brummer*, S. Mallavarapu*, **V.M. Savage** (2023) Neuronal branching is increasingly asymmetric near synapses, potentially enabling plasticity while minimizing energy dissipation and conduction time. *Journal of the Royal Society Interface* **20(206)**, 20230265.

94. J. DeLong, M.I. O'Connor, **V.M. Savage**, T. Luhring, C.E. Schaum, M. Sears (2023) Beyond individual, population, and community: Considering information, cell number, and energy flux as fundamental dimensions of life across scales, *Ideas in Ecology and Evolution* **16***,* 1-9.

95. D. Kirk, S. Straus, M.L. Childs, M. Harris, L. Couper, T.J. Davies, C. Forbes, A.L. Gehman, M.L. Groner, C. Harley, K.D. Lafferty, **V.M. Savage**, E. Skinner, M. O'Connor, E.A. Mordecai (2024) Temperature impacts on dengue incidence are nonlinear and mediated by climatic and socioeconomic factors: A meta-analysis, *PLOS Climate* **3(3)**, e0000152.

96. V.M. Savage (2024) Multilevel relations among plankton stitched together with an eco-evolutionary needle, *Cell Systems* **15(5),** 409-410.

97. B.J. Enquist, D. Erwin, **V.M. Savage**, P.A. Marquet (2024) Scaling approaches and macroecology provide a foundation for assessing ecological resilience in the Anthropocene, *Philosophical Transactions of the Royal Society B **379*(1902)**, 20230010.

98. K.A. Stark, T. Clegg, J.R. Bernhardt, T.N. Grainger, C.P. Kempes, **V.M. Savage**, M.I. O'Connor, S. Pawar (2025) Towards a more dynamic metabolic theory of

ecology to predict climate change effects on biological systems, *The American Naturalist* **205(3)**, 285-305.

99. M.S. Shocket, J.R. Bernhardt, K.L. Miazgowicz, A. Orakzai, **V.M. Savage**, R.J. Hall, S.J. Ryan, C.C. Murdock (2025) Mean daily temperatures predict the thermal limits of malaria transmission better than hourly rate summation, *Nature Communications* **16(1)**, 3441.

100. V.M. Savage (2025) Remembrance of phytoplankton's past, *Proceedings of the National Academy of Sciences USA* **122(33)** e2513874122.

101. M. Cruz-Loya*, Erin Mordecai, **V.M. Savage** (2025) A flexible model for thermal performance curves, *Ecology* in re-review after very positive first round.

Popular Science Articles

102**. V.M. Savage** (2017) An overconfident public learns the limits of predictive technology, *Zocalo Public Square,* http://www.zocalopublicsquare.org/2017/05/18/overconfident-public-learns-limits-technology/ideas/nexus/
(formulated idea and wrote paper)

103. C. Kempes, **V.M. Savage** (2018) When science hits a limit, learn to ask different questions, *Aeo*n, https://aeon.co/ideas/when-science-hits-a-limit-learn-to-ask-different-questions
(helped formulated idea and write paper)

104. **V.M. Savage** (2019) Chapter 4: Time Design, in *Interplanetary Transmissions, Genesis, Proceedings of the Santa Fe Institute's First Interplanetary Festival* edited by D.C. Krakauer and C.M. McShea.

105. **V.M. Savage**[c], P. Yeh (2019) Novelist Cormac McCarthy's tips on how to write a great science pape, *Nature* **574(7777)**, 441-443.

106. **V.M. Savage** (2021) Reflections: Van Savage on the informational pitfalls of selective testing, Chapter in: *Santa Fe Institute COVID-19 Transmission Series.* https://www.santafe.edu/news-center/news/transmission-t-022-van-savage

107. **V.M. Savage**, G.B. West. (2021) Why do we sleep?, *Aeon*, https://aeon.co/essays/a-quantitative-theory-unlocks-the-mysteries-of-why-we-sleep

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Popular Science Papers since last review

108. V.M. Savage (2024) Resilience Redounding, Introduction to Chapter in *Foundational Paper in Complexity Science,* Santa Fe Institute Press.

Popular Press Coverages

The Edge World Question Center, "What are you optimistic about (for 2007)?", Steven Strogatz, Cornell University Professor, describes my work on sleep and says it is what he is most optimistic about for the new year.
http://www.edge.org/q2007/q07_14.html

Harvard Gazette, "Sleep found to repair and reorganize the brain", cover article describing my recent work on sleep and cell size
http://www.news.harvard.edu/gazette/2007/03.15/01-sleepsize.html

Thomson Scientific's Essential Science Indicators, feature on my work and entry into top 1% of scientists in environment and ecology in terms of citations, appearing in December 2007.
http://in-cites.com/scientists/2007menu.html

Science Daily, "Species sizes affect lives of cells in mammals", highlight of paper on organismal

constraints on cell size and cellular metabolic rate
http://www.sciencedaily.com/releases/2007/03/070308220603.htm

PNAS In This Issue, "Geometry of vascular systems governs plant forms", highlighting of paper on selective pressures on plant architectures, *PNAS* **104** 12952, 2007.

Nature News and Views, "There is no single p", Craig R. White, highlighting of paper on curvature in metabolic scaling, 2010, *Nature* **464** 691-692

PNAS From the Cover, "Variation in universal temperature dependence of biological rates", 2011, *PNAS* **108(26)**, 10377-10378.

AmNat Press Release, "Are tropical species more prone to extinction due to climate warming?", 2012, http://www.asnamnat.org/node/197

UCLA Press Release, "UCLA life scientists view biodiversity through a whole new dimension", 2012, http://newsroom.ucla.edu/portal/ucla/ucla-life-scientists-view-biodiversity-234522.aspx and, Science News Daily: http://www.sciencedaily.com/releases/2012/05/120531160014.htm Santa Fe Institute: http://www.santafe.edu/news/item/savage-nature-food-spatial-scale/

UCLA Press Release, "UCLA life scientists present new insights on climate change and species interactions", 2013,
http://newsroom.ucla.edu/portal/ucla/ucla-life-scientists-provide-_new-245697.aspx

Stanford Press Release, "Stanford researchers analyze what a warming planet means for mosquito-borne diseases", 2017, https://news.stanford.edu/press-releases/2017/05/02/warming-planet-mo-borne-diseases/

UCLA Press Release, "New study is an advance toward preventing a 'post-antibiotic era'", 2017, http://newsroom.ucla.edu/releases/study-advance-toward-preventing-post-antibiotic-era

AARP Article, "Quest for a good night's sleep", 2016, https://www.aarp.org/health/conditions-treatments/info-2016/sleep-apnea-insomnia.html

UCLA Press Release, "Three-drug combinations could help counter antibiotic resistance, UCLA biologists report", 2016,
http://newsroom.ucla.edu/releases/three-drug-combinations-could-help-counter-antibiotic-resistance-ucla-biologists-report

UCLA Press Release, "8,000 new antibiotic combinations are surprisingly effective, UCLA biologists report", 2016,
http://newsroom.ucla.edu/releases/8000-combinations-antibiotics-surprisingly-effective

SFI Press Release, "Social animals have tipping points too", 2018,
https://santafe.edu/news-center/news/social-animals-have-tipping-points-too

SFI Press Release, "E. coli's adaptation to extreme temperatures helps explain resistance to certain drugs", 2018,
https://santafe.edu/news-center/news/social-animals-have-tipping-points-too

The Scientist Magazine, quoted, "Taller people more prone to cancer", 2018,
https://www.the-scientist.com/news-opinion/taller-people-more-prone-to-cancer-64995

Sampling of coverage and retweets for publication 102 above linked from here:
https://twitter.com/VanMSavage/status/1177254471291658240

Sampling of coverage for publication 78 above. Covered in 94 news stories from 78 outlets, including Smithsonian, New Scientist, Cosmos, and more:
https://scienceadvances.altmetric.com/details/90566046/news

Top 3 stories of the year under UCLA "2020 Reflections":
https://newsroom.ucla.edu/stories/ucla-reflections-on-2020

Professional Activities

Chair of Academic Affairs Committee and Student Senate Representative, Along with two others, I wrote a 40-page report based on our extensive research and dialogue with other colleges that suggested changes to the tenure-review process at Rhodes College. Rhodes College, Memphis, TN, 1994-1996

Graduate Council Representative and Student Government Senator, Washington University, St. Louis, MO, 1998-2000

Member of Selection Committee for the Complex Systems Summer School at the Santa Fe Institute, Santa Fe, NM, 2002-present

Grant Reviewer for the City University of New York (CUNY) System, 2007

External Grant Reviewer for National Science Foundation (NSF) grant for biomathematics group on Manduca Sexta, Kenyon College, Gambler, OH 2009

Co-chair, Graduate Admissions Committee, Department of Biomathematics, UCLA School of Medicine 2009-present

Seminar Series Organizer, Department of Biomathematics, UCLA School of Medicine, 2009-present

Grant Reviewer for South Carolina's Grants for Exploratory Academic Research (GEAR), 2010

Guest Editor for Public Library of Science Computational Biology, 2010-2011

Participant and poster judge, UC LEADS Research and Leadership Symposium (http://www.ucop.edu/ucleads/), UC Berkeley, Berkeley, CA 2011

Organizer, Simplicity, Complexity, and Unity: A search for underlying, quantitative principles in physics, biology, and the social sciences, symposium speakers included Murray Gell-Mann, Jim Brown, Elaine Pagels, Brian Enquist, David Krakauer, and others, Santa Fe Institute, 2011

Grant Reviewer for University of Missouri's Research Board, 2012

Panel member, EPA STAR Graduate Student Applications for EPA-F2012-STAR-B2 Air, Climate & Energy: Global Change (B2), 2012

Biological Sciences Faculty Panel member, part of Honors Research Forum (HC-101A) class at UCLA to promote research for undergraduates, 2012

Advisor in Workshop on Writing a Personal Statement, part of Honors Research Forum (HC-101A) class at UCLA to promote research for undergraduates, 2012

Grant Reviewer for European Research Council, ERC Advanced Grant, 2012

Committee Member, NIH Systems and Integrative Biology Training Grant (SIBTG) at UCLA, 2013-present

Vice Chair for Computational and Systems Biology (CaSB) InterDepartmental Program, 2013-2016

Member of Research Enterprise Task Force for David Geffen School of Medicine, UCLA, 2013

Member of Biomedical Informatics Task Force for David Geffen School of Medicine, UCLA, 2013-2014

Member of Biomathematics Chair Search Committee for David Geffen School of Medicine, UCLA, 2015

Co-Organizer for Evolutionary Medicine Month, 2014-2018

Grant Reviewer for Danish Council for Independent Research, 2015

Panel member, NSF, 2013-2015

Member of Marschak Colloquium Committee, 2016-2022

Ad Hoc Member of EEB Personnel Committee (~1 case per year), 2016-present

Member of EEB Development Committee, 2017-2018

Member of EEB Departmental Awards Committee, 2017-2023

Participant, CEILS annual workshop on teaching, 2018

Participant, 2-day workshop on Enhancing Student Success, UCLA/Hyatt Santa Barbara, 2018

Grant Reviewer for Natural Sciences and Engineering Research Council of Canada, 2017

Reviewer for UCLA Undergraduate Research Fellows Program (URFP) Committee, 2018-2020

Member of QCB Faculty Search Committee, 2016-2018
Member of EEB Faculty Search Committee, 2018-2019, 2024-2025
Faculty Advisory Board Member for Center for Education, Innovation, and Learning in the Sciences (CEILS), UCLA, 2015-present
Ad Hoc Grant Reviewer for numerous grants for National Science Foundation (NSF), 2006-present
Reviewer of applications for the Omidyar Postdoctoral Fellowship at the Santa Fe Institute, Santa Fe, NM, 2010-present
Reviewer for James S. McDonnell Postdoctoral Fellowship Committee, 2017-2022
Book Reviewer for Princeton University Press, 2017, 2018, 2021, 2024
Organizer and Speaker, Working Group on "Higher-order Interactions: experiments, Inference and Models", Santa Fe Institute, 2019
Organizer and Speaker, Complex Time Working Group on "What is Sleep?", funded by McDonnell Foundation, Santa Fe Institute, 2019
Referee—Science, Nature, Nature Communications, Proceedings of the National Academy of Sciences, PLoS Biology, Physical Review X, Physical Review Letters, Trends in Ecology and Evolution, The American Naturalist, Ecology Letters, Functional Ecology, Journal of Experimental Biology, Proceedings of the Royal Society A, Proceedings of the Royal Society B, Journal of the Royal Society Interface, British Journal of Cancer, Computers in Biology and Medicine, Physics in Medicine and Biology, Comprehensive Physiology, Oikos, Journal of Theoretical Biology, Tree Physiology, New Phytologist, Global Ecology and Biogeography, Journal of Gerontology: Biological Sciences, Integrative Zoology, Journal of Physics A: Mathematics and General, Journal of Mathematical Physics, Physics Letters A, International Journal of Modern Physics Letters, Ecology and Society, Oecologia, Journal of Animal Ecology, Journal of Biomedical Informatics, PLoS One, Plant, Cell, and Environment, Frontiers in Ecology and Evolution, Nature Ecology and Evolution, PLoS Computational Biology, Evolution, Cell Systems, Science Advances, Nature Communications, ISME, and more
Co-Investigator on University California grant for research experiences and recruiting of students from Historically Black Colleges and Universities (HBCUs), including mentoring summer HBCU students at UCLA, organizing and leading social outings for the program, helping recruit via seminars at Spelman College and meetings with faculty from Alabama A&M and Hampton College, 2013-2020
External Tenure Reviewer and Letter Writer for Arizona State University, Kansas University, University of New Mexico, UC Merced, Colorado School of Mines, UM Rolla, University of St. Thomas, UC Santa Barbara, Yale University, University of Michigan, University of Oxford, 2016-present
Nominator for Japan Prize (http://www.japanprize.jp/en/index.html), 2018-present
Member of Santa Fe Institute (SFI) Scientific Steering Committee (SSC), 11 member panel to provide scientific direction and review appointments at the Santa Fe Institute, 2018-2022
Grant Reviewer for 6 grants for Science Foundation of Ireland, 2020-2024
EEB Faculty-Staff-Partnership Award, presented to one faculty member each year and chosen by the staff for their work with them, 2020

New service since last review

Refereed for Nature (3), Science (3), Proceedings of the National Academy of Sciences (3), Ecology Letters (4), The American Naturalist (2), Ecology, Science Advances, Journal of the Royal Society Interface, Current Opinion in Microbiology
Guest Editor for Proceedings of the National Academy of Sciences
Review of *Quantitative Biosciences* textbook by Joshua Weitz for Princeton University Press.
Tenure Review Letters for Yale University, UCSB (2), University of Michigan, Arizona State

University
Full Professor Review Letter for UC Riverside, Colorado School of Mines
Grant Reviewer for 6 grants for Science Foundation of Ireland, 2020-2024
EEB Departmental Awards Committee, 2022-2023
EEB Graduate Curriculum Committee, 2024-present
Faculty Executive Committee Elected Representative for campuswide decisions and representing Life Sciences Division at UCLA, 2023-present
Legislative Assembly Elected Representative for campuswide decisions and representing EEB department at UCLA, 2024-present
Conservation Genomics Faculty Search Committee, EEB department at UCLA, 2024-2025

Lectures and Presentations
Invited Speaker, Santa Fe Institute workshop: Towards an ecology based on first principles of size, temperature, and stoichiometry, "Effects of size and temperature on population growth," Santa Fe, NM, 2002
Invited Speaker, Biology Seminar, "Scaling in populations and ecosystems," University of Arizona, Tucson, AZ, 2002
Invited Speaker, International workshop on non-Hermitian Hamiltonians, "PT–symmetric quantum field theories and the Langevin equation," Prague, Czech Republic, 2003.
Invited Speaker, Physics Theory Seminar, "Numerical simulations of PT–symmetric but non-Hermitian Hamiltonians," Ohio State University, Columbus, OH, 2002
Colloquium Speaker, PRIMES program (joint between biology, engineering, and math departments), "Resource-distribution networks and biochemical kinetics," Colorado State University, Fort Collins, CO, 2003
Symposium Speaker, Ecological Society of America Annual Meeting, *"*Effects of body size and temperature on population growth," Savannah, GA, 2003
Invited Speaker, Gordon Research Conference, "The Allometry of Stoichiometry," Bates College, ME, 2004.
Plenary Speaker, Undergraduate Research and Creative Activity Symposium, Rhodes College, Memphis, TN, 2004
Colloquium Speaker, "Scaling from unicells to whales: constraints on evolution and Development," University of Mississippi, Oxford, MS 2005
Invited Speaker, Physics and Complex Systems Seminar, "Scaling in biology," Chalmers University, Gothenburg, Sweden, 2005.
Colloquium Speaker, "Scaling in biology: A unifying approach to cells, individuals, and Ecosystems," James Cook University, Townsville, Australia, 2005.
Invited Speaker and Participant, Vascular Design A: Working meeting of the ARC-NZ Research Network for Vegetation Function, Macquarie University, Sydney, Australia, 2005.
Faculty, Integrative Biology Course Evolutionary and Ecological Genomics, lectured on scaling methods for studying biological systems Patzcuaro, Mexico, 2006
Faculty, Complex Systems School, joint between the Indian Institute for Mathematical Sciences and the Santa Fe Institute*,* Chennai, India, 2006
Poster Presentation, Gordon Research Conference on the Metabolic Basis of Ecology, "Coldblooded killers: Effects of body size and temperature on predator-prey relations," Bates College, Lewiston, ME 2006
Colloquium Speaker, "Scaling from unicells to whales," Washington State University, Pullman, WA 2006
Seminar Speaker, "Modeling and measuring ecological diversity," Louisiana State

University, Baton Rouge, LA 2007
Seminar Speaker, "A quantitative, metabolic theory for mammalian sleep," Division of Sleep Medicine, Brigham and Women's Hospital, Boston MA 2007
Seminar Speaker, "A quantitative theory of tumor growth and vascularization," Center for Cancer Systems Biology, Dana Farber Cancer Institute, Boston MA 2007
Seminar Speaker, "Scaling from unicells to whales: New methods for studying physiological and ecological systems," University of Washington, Seattle, WA 2007
Faculty, Santa Fe Institute Complex Systems Summer School*,* Beijing, China, 2005-2007
Invited Speaker, PIBBS Seminar, "Biological scaling and climate change: Effects of temperature on population growth, species interactions, and rates of adaptation," University of New Mexico, Albuquerque, NM 2007
Colloquium Speaker, "Scaling in biology", Rhodes College, Memphis, TN 2007
Seminar Speaker, "Scaling and biological networks," Fidelity Investments, Boston, MA 2007
Faculty, Santa Fe Institute Complex Systems Summer School, lectured on mathematical methods, including scaling theory, diffusion equations, probability and statistics, data analysis, and coupled ordinary and partial differential equations for studying systems in ecology, evolution, physiology, physics, medicine, and economics*,* Santa Fe, NM, 2007-2009
Colloquium Speaker, "Allometric scaling and physiological networks," Dartmouth College, Hanover, NH 2008
Invited Speaker, SIAM conference on the Life Sciences, MS4: Investigating neural mechanisms of sleep and anesthesia through modeling, "A quantitative, metabolic theory of mammalian sleep," Montreal, Quebec, Canada 2008
Invited Speaker, Gordon Research Conference on the Metabolic Basis of Ecology, "Modeling and measuring ecological diversity: moving from individual physiology to interactions and the environment," University of New England, Biddeford, ME 2008
Speaker and Organizer, "WG 36 trait-driver models," ARC-NZ Vegetation Function Network, Macquarie University, Sydney, Australia 2008
Colloquium Speaker, "Understanding and managing change from ecosystems and the environment to the economy and education," Santa Fe Institute, Santa Fe, NM 2008
Seminar Speaker, "New models for understanding physiological and ecological systems," New Jersey Institute of Technology, Newark, NJ 2008
Seminar Speaker, "Linking individuals with ecosystems," Ohio State University, Columbus, OH 2008
Seminar Speaker, "Modeling and measuring ecological diversity and organization," Tulane University, New Orleans, LA 2008
Seminar Speaker, "Linking individuals with ecosystems: New mathematical methods for studying physiological and ecological systems," UCLA, Los Angeles, CA 2008
Seminar Speaker, "Linking individuals with ecosystems: New models for understanding physiological and ecological systems," University of California at Irvine, Irvine, CA 2008
Seminar Speaker, "New mathematical methods for studying physiological and ecological Systems," North Carolina State University, Raleigh, NC 2008
Guest Lecturer, Circadian Biology: From cellular oscillators to sleep regulation, Harvard University, Cambridge, MA, 2008
Colloquium Speaker, "Biological scaling of sleep times and tumor angiogenesis and growth," Biomathematics Annual Plenary Speaker, Kenyon College, Gambler, OH 2009
Seminar Speaker, "Linking temperature, metabolic rate, and ecological dynamics," Ecology and Evolutionary Biology Seminar Series, UCLA, Los Angeles, CA 2009

Colloquium Speaker, "Using models of vascular networks to understand biological scaling within individuals and across species," Physics Seminar Series, California State University at Northridge (CSUN), Los Angeles, CA 2009

Colloquium Speaker, "Power laws, fractals, and the structure and dynamics of vascular systems," Nanomedicine Seminar Series, Tarzana Hospital, Los Angeles, CA 2009

Colloquium Speaker, "Scaling in vascular networks and applications to tumor angiogenesis and Growth," Biomathematics seminar series, David Geffen School of Medicine at UCLA, Los Angeles, CA 2009

Invited Speaker, "Scaling in vascular systems with applications to tumor growth," UCLA Cardiology Group, David Geffen School of Medicine at UCLA, Los Angeles, CA 2009

Plenary Speaker, "Using vascular networks to understand biological scaling, sleep, and tumor growth," Young Researchers in Mathematical Biology, Mathematical Biosciences Institute, Ohio State University, Columbus, OH 2010.

Discussion Leader, Gordon Research Conference on the Metabolic Basis of Ecology, "A metabolic trait basis for ecology/evolution," University of New England, Biddeford, ME 2010.

Faculty, Exploring complexity in science and technology from a Santa Fe Institute perspective, lectured on network structure, dynamics, and power laws in biological systems, social systems, economics, and energy technology, Portland, OR, 2010

Guest Lecturer, Elements of Biomathematics, David Geffen School of Medicine at UCLA, Los Angeles, CA, 2010

Poster Presentation, Gordon Research Conference, "Hydraulic tradeoffs and space filling enable better predictions of vascular structure and function in plants," University of New England, Biddeford, ME 2010

Invited Speaker, "An introduction to biological scaling: Empirical trends and mechanistic models," Bioinformatics Seminar Series, UCLA, Los Angeles, CA 2010

Invited Speaker, "Modeling speciation-extinction dynamics to better understand diversity Levels," Darwin's Living Legacy: An International Conference on Evolution and Society, Bibliotheca Alexandrina, Egypt 2010

Seminar Speaker, "How do organismal traits and environmental factors constrain trophic interaction strengths?" Department of Ecology and Evolutionary Biology, Seminar Series, University of California at Riverside, Riverside, CA 2011

Contributing Speaker, "The temperature dependence of consumer-resource interactions," Ecological Society of America Annual Meeting, Austin, TX 2011

Workshop Speaker, "Quantitative models for how organismal traits and environmental drivers influence consumer-resource pairs, trophic interactions strengths, and food webs," Casablanca Workshop on Mathematical Biology, Casablanca, Morocco 2011

Session Speaker, "An Analytical Model of Tumor Growth and Angiogenesis That Links Together Cellular Energetics and Host Vasculature," Casablanca Workshop on Mathematical Biology, Casablanca, Morocco 2011

Seminar Speaker, "Understanding how consumption rates and interaction strengths change with search strategy, body size, and temperature," Center for Ecology and Evolutionary Biology Seminar Series, University of Oregon, Eugene, OR 2011

Invited Speaker, "Basic science of global warming and climate change," Connect to Science, Portland and Beaverton School Districts along with Portland State University, Portland, OR 2011

Seminar Speaker, "Influence of temperature, size, and dimensionality on consumer-resource interactions", Department of Ecology, Behavior, and Evolution Seminar Series,

University of California at San Diego, San Diego, CA 2011

Workshop Speaker, "Current perspectives on biological networks and what leaves might teach us", The Ecology and Evolution of Leaf Vein Networks, University of Western Australia, Perth, Australia 2011

Invited Speaker, "Effects of size ratios and dimensionality on consumer-resource interactions", Brown2Fest in honor of James and Astrid Brown's retirement, University of New Mexico, Albuquerque, NM 2012

Invited Speaker, "Automated measurements from images and video to enable better modeling: Vascular geometry, consumer-resource interactions, and bacterial colony sizes", Biomathematics Seminar, UCLA, Los Angeles, CA 2012

Invited Speaker, "Modeling and measuring vascular networks to better understand biological scaling and tumor growth", SiViRT (Center for Simulation, Visualization, and Real Time Prediction) meeting, University of Texas at San Antonio, San Antonio, TX 2012

Invited Speaker, "Modeling Solid Tumor Growth, Metabolic Rate, and Vascularization", Failures in Clinical Treatment of Cancer, National Cancer Institute Meeting, Princeton University, Princeton, NJ 2012

Invited Speaker, "Automated measurements from digital media enable better modeling: Vascular geometry, consumer-resource interactions, and bacterial colony sizes", Systems Biology Seminar, UC Irvine, Irvine, CA 2012

Colloquium Speaker, "Combining traits and scaling theory to understand how temperature, size, and dimensionality affect consumer-resource interactions", Kellogg Biological Station, Michigan State University, Kalamazoo, MI 2013

Symposium Speaker, "Scaling relationships for the temperature dependence of species performance", Warming consumers and their prey: General principles and applications for how temperature affects trophic interactions, Ecological Society of America conference, Minneapolis, MN 2013

*Invited Speaker, "*Cold-blooded killers and their bodies: How temperature and size affect consumer-resource interactions*",* Marschak Colloquium, UCLA, Los Angeles, CA 2013

*Invited Speaker, "*How analysis of large databases enables better modeling and deeper understanding of consumer-resource interactions, vascular geometry, and bacterial colony sizes*",* Promises of Big Data Across Disciplines at Okinawa Institute for Science and Technology, Okinawa, Japan 2013

*Invited Speaker, "*What I know now that I wish I knew then*",* Omidyar Postdoctoral Fellows Retreat, Santa Fe Institute, Santa Fe, NM 2014

*Invited Speaker, "*How big data enables better modeling and deeper understanding of vascular geometry and tumor growth*",* Big Data To Knowledge (BD2K) conference, UCLA, Los Angeles, CA 2014

*Invited Speaker, "*Cancer vasculature and evolution*",* Transformative Medical Alliance, Phoenix, Arizona 2015

*Invited Speaker, "*Combining mechanistic modeling with big data to better understand biological systems*",* Seminar, Chalmers University, Gothenburg, Sweden 2015

*Invited Speaker, "*Combining mechanistic models with big data to answer big questions about physiology and ecology*",* Seminar, Imperial College, Silwood Park Campus, Silwood, UK 2015

*Invited Speaker, "*Combining mechanistic models with big data to answer big questions about consumer-resource interactions and climate change*",* Seminar, Saïd Business School, University of Oxford, Oxford, UK 2015

Invited Speaker, "Consequences of Variation in Biological Scaling", Santa Fe Institute, Santa Fe, NM 2015

*Invited Speaker, "*Traits, Temperature and Trophic Interactions*",* Gordon Research Conference: Unifying Ecology Across Scales, University of New England, Biddeford, ME 2016
Discussion Leader, Gordon Research Conference: Unifying Ecology Across Scales, University of New England, Biddeford, ME 2016
Complex Systems Colloquium Speaker, "Higher-Order Interactions among Drugs, Genes, and Species", Northwestern University, Chicago, IL 2017
SFI Seminar, "The Complexity-Stability Continuum: Calculating Collapse, Santa Fe Institute", Santa Fe, NM 2018
SFI Seminar, "Sharp Transitions in the Function of Sleep", Santa Fe Institute, Santa Fe, NM 2018
Discussion Leader, Gordon Research Conference: Unifying Ecology Across Scales, University of New England, Biddeford, ME 2018
Seminar Speaker, "Scaling across body size, temperature, and traits to predict food-web stability and functional biodiversity", University of Arizona, Tucson, AZ 2018
Seminar Speaker, "A Triumvirate of Temperature, Traits, and Trophic Interactions", Yale University, New Haven, CT 2018
Seminar Speaker, "Developmental transitions in sleep times and synaptic properties help reveal sharp shifts in sleep function", University College of London, New Haven, CT 2018
Speaker, "Combining Mechanistic Modeling with Big Data to Better Understand Vascular Systems and Allometric Scaling", Spelman College, 2019
Speaker, "What I wished I knew as an SFI and Harvard postdoc that I know now— The Challenges of Collaborating Across Disciplines", Santa Fe Institute REU program, 2020
Speaker, "Advice on Applying and Interviewing for Academic Positions", Santa Fe Institute Omidyar fellows postdoc meeting, 2020
Seminar Speaker, "How does a physicist become a biologist? and What I know now that I wish I knew as an Rhodes undergraduate physics major", Physics Department, Rhodes College, 2020
Speaker, "What is Sleep?", U.S. Kavli Frontiers of Science and National Academy of Sciences Virtual Symposium, 2020
Seminar Speaker, "Developmental transitions in sleep times and synaptic properties help reveal sharp shifts in sleep function", Harvard University, Sleep Research Seminar, 2021
Speaker, McDonnell Foundation Symposium, 2021

New talks since last review

Invited Speaker, The Company of Biologists Workshop on *'*Cell size and growth, from single cells to the tree of life', (cancelled) 2022
Invited Speaker, James S. McDonnell Complex Systems Scholars Meeting at the Max Planck Institute of Animal Behavior in Konstanz, Germany, (cancelled) 2022
Seminar Speaker, "The Complexity-Stability Continuum: Calculating collapse and impacts of consumption constraints, body size, and charging temperature", Computational Biology and Bioinformatics Program, Duke University, 2022
Faculty Lecturer, Santa Fe Institute Complex Systems Summer School*,* Santa Fe, NM, 2007-2023
Seminar Speaker, "How Ecological Constraints Synergize Complexity and Stability", Complexity Science Hub, Vienna, Austria, 2024
Seminar Speaker, "Developmental transitions in sleep times reveal sharp shifts in sleep function and synapse formation", Frontiers in Computational Medicine Seminar Series, 2024
Speaker, "Ecological Constraints Beget Both Complexity and Stability: Building More General Mathematical Bounds for More Realistic Systems", Ecological Society of America Annual Meeting, 2024
Public Seminar Speaker, "Impacts of Higher-Order Interactions among Drugs, Genes, and Species", Program in Ecology, Evolution, and Conservation Biology, University of Illinois,

2024

Colloquium Speaker, "Integrating Mechanistic Models, Machine Learning, and Data to Gain Insights into Tumors, Neurons, and Food Webs", Computational Biology Department, Cornell University, 2025

Invited Speaker, "Structuralist versus Individualist Reasoning in Biology", Ergodicity Economics Conference, Lisbon, Portugal 2025

Speaker, "How Does Sleep Scale with Brain Metabolic Rate", Brain Research Institute, UCLA 2025

Invited Speaker, "Higher-Order Interactions, Fitness Landscapes, Antibiotic Resistance, and Stability Measures", Eco-Evo Processes in Context, Company of Biologist's Meeting, London, England, 2025

Invited Speaker, "Scaling tradeoffs of cell size, genome size, and metabolism in yeast", Nordita Institute, Stockholm, Sweden, 2025

Teaching Experience

Teaching Assistant, Introductory Physics, taught 3 lab sections per week, assigned final lab grades, one of 4 out of 12 TAs to hold office hours, and graded, Washington University, St. Louis, MO, 1996-1998

Teaching Assistant, Physics and Society, provided solution sets, held office hours, helped assign final grades, and graded, Washington University, St. Louis, MO, 1998

Teaching Assistant, Mathematical Methods in Physics and Advanced Mathematical Methods in Physics, made solution sets and graded, Washington University, St. Louis, MO, 1998-1999

Teaching Assistant, Epic of Evolution (joint course between Physics, Biology, and Earth and Planetary Sciences Departments), provided solution sets, helped with in-class demonstrations and assigning of final grades, and graded, Washington University, St. Louis, MO, 2000

Guest Lecturer, Introductory Physics, Washington University, St. Louis, MO, University College, 1998, and Summer, 2001

Faculty, Santa Fe Institute Complex Systems Summer School, Beijing, China, 2005-2007

Faculty, Integrative Biology Course Evolutionary and Ecological Genomics, lectured on scaling methods for studying biological systems Patzcuaro, Mexico, 2006

Faculty, Complex Systems School, joint between the Indian Institute for Mathematical Sciences and the Santa Fe Institute, Chennai, India, 2006

Faculty, Santa Fe Institute Complex Systems Summer School, lectured on mathematical methods, including scaling theory, diffusion equations, probability and statistics, data analysis, and coupled ordinary and partial differential equations for studying systems in ecology, evolution, physiology, physics, medicine, and economics, Santa Fe, NM, 2007-2009

Guest Lecturer, Circadian Biology: From cellular oscillators to sleep regulation, Harvard University, Cambridge, MA, 2008

Faculty, Exploring complexity in science and technology from a Santa Fe Institute perspective, lectured on network structure, dynamics, and power laws in biological systems, social systems, economics, and energy technology, Portland, OR 2010

Guest Lecturer, Elements of Biomathematics, UCLA School of Medicine, Los Angeles, CA 2010

Professor, Mathematical Ecology, EEB 200B, designed and taught sections on community ecology, including homework and presentation assignments at UCLA, Los Angeles, CA, 2011

Lecturer, ASU-SFI Masters Program in Complexity, Recorded in Santa Fe, NM, 2018

Professor, Biomathematics 213, Modeling vascular networks with applications, sole designer, creator, teacher, and grader for graduate course on fluid dynamics, fractals, RLC circuit models, and other techniques for modeling and understanding vascular systems, UCLA School of Medicine, Los Angeles, CA 2009-present

Professor, Biomathematics 202, The structure, function, and evolution of biological systems, sole designer, creator, teacher, and grader for graduate course on evolutionary theory, network structure and motifs, network dynamics, stochastic modeling, power laws in networks, and other techniques that are useful for modeling and understanding biological systems, UCLA School of Medicine, Los Angeles, CA 2010-present

Professor, Computational and Systems Biology (CaSB) 186, UCLA, Los Angeles, CA 2016-2018

Co-Designer, Mathematics 32T, Essential Calculus for Mathematical Biologists, UCLA, Los Angeles, CA 2018

Professor, Computational and Systems Biology (CaSB) 150, sole designer, creator, and teacher to junior and senior level CaSB majors on how to use mathematics and computation to model biological systems, UCLA, Los Angeles, CA 2019-present

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New service since last review

Organizer, Santa Fe Institute Complex Systems Summer School, Co-organizer for 1 week of this school in which I invited and organized about 10 scientists for lectures and panels, arranged the schedule for the week, and facilitated the panels and interactions with the students as well as giving my own lectures, that week was called "Theory and Ecological Applications for stability, persistence, and resilience in ecological systems", Santa Fe, NM 2023

Popular Talks

Speaker on multiverses and quantum mechanics for audience after performance of the play *Constellations*. Two radio interviews to promote the event as well: https://santafe.com/ktrc/podcasts/dale-dunn-lynn-goodwin-van-savage-on-constellations-the-adobe-rose-theatre

Speaker for Complex Time Panel at SFI Science Board/Trustees Symposium, Santa Fe, NM 2018

Speaker, Interplanetary Festival, Panel on Time Design, Santa Fe, NM 2018: https://www.youtube.com/watch?v=PYytXWDsc7I

Interview with Radio New Zealand in 2021: https://www.rnz.co.nz/national/programmes/ninetonoon/audio/2018780991/why-we-need-sleep

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New popular talks since last review

Interview Alien Crash Site Podcast in 2022: https://www.youtube.com/watch?v=tITPeUmfDyM

Interview on Big Biology Podcast "Fractals in the Foliage" in 2022: https://www.bigbiology.org/search?q=van+savage