

EROL AKÇAY

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University of Pennsylvania
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EDUCATION

- 2008 Ph.D. in Biology, Stanford University.
Advisor: Joan Roughgarden
- 2004 B.S. in Physics & Biology with Honors, Middle East Technical University, Turkey

ACADEMIC APPOINTMENTS

- 2014-current **Assistant Professor**
Department of Biology, University of Pennsylvania
- 2011-2013 **Associate Research Scholar**
Princeton University, Department of Ecology and Evolutionary Biology
Advisor: Simon Levin
- 2011 **Postdoctoral Fellow**
UC Berkeley, Department of Integrative Biology
Advisor: Ellen Simms
- 2009-2011 National Institute for Mathematical and Biological Synthesis (NIMBioS)
Mentor: Sergey Gavrillets
- 2008-2009 Stanford University, Department of Biology
Advisor: Joan Roughgarden

FELLOWSHIPS AND AWARDS

- 2016 Young Investigator Award
Turkish-American Scholars and Scientists Association
- 2009 NIMBioS Postdoctoral Fellowship
- 2008 Samuel Karlin Prize in Mathematical Biology
Stanford University, Department of Biology
- 2008 Excellence in Teaching Award
Stanford University, Department of Biology
- 2001-2004 Undergraduate Fellowship in Physics
National Scientific and Technological Research Council of Turkey

EDITORIAL BOARD SERVICE

- 2017-current Associate Editor, *The American Naturalist*
- 2017-current Recommender, *Peer Community in Evolutionary Biology*

PUBLICATIONS

*: Equal contributions, \diamond : Undergraduate advisee, \dagger : Graduate student advisee,
 \ddagger : Postdoc advisee

Preprints, in review

Smolla, M. \ddagger and Akçay, E. . Cultural selection shapes network structure. In review (preprint available on bioRxiv, doi:10.1101/464883)

Morsky, B. \ddagger and Akçay, E. . The blind choreographer: evolution of social norms and correlated equilibria. In review (preprint available on bioRxiv, doi:10.1101/435586)

Molina, C. \ddagger , Akçay, E. *, Dieckmann, U. *, Levin, S.A. *, and Rovenskaya, E.A. *. Combating climate change with matching-commitment agreements. In review. (preprint available on SocArXiv, doi:10.31235/osf.io/7yc3g)

Zhou, H. \dagger , Akçay, E. , and Helliker, B. Deriving C_4 photosynthesis parameters by fitting intensive A/C_i curves. In revision. (preprint available on bioRxiv, doi:10.1101/153072)

Brown, A. \dagger and Akçay, E. Phylogenetic analysis suggests joint control of transmission mode in a grass-endophyte symbiosis. In revision. (preprint available on bioRxiv, doi:10.1101/085746)

Akçay, E., Roughgarden, J., Fearon, J., Ferejohn, J. & Weingast, B. Biological institutions: The political science of animal cooperation. (available on SSRN)

Published, peer reviewed

in press Brown, A. L. \dagger and Akçay, E. (in press) Evolution of transmission mode in conditional mutualisms with spatial variation in symbiont quality. *Evolution* (preprint available on bioRxiv, doi:10.1101/315119)

2018 Haoran Z. \dagger , Helliker, B.R., Huber, M., Dicks, A., and Akçay, E. (2018) C_4 photosynthesis and climate through the lens of optimality. *Proceedings of the National Academy of Sciences*. 115:12057-12062. doi:10.1073/pnas.1718988115

Akçay, E., Meirowitz, A., & Ramsay, K. (2018) Two-sided unobservable investment, bargaining, and efficiency. *Review of Economic Design* doi: 10.1007/s10058-018-0213-4.

Akçay, E. (2018) Collapse and rescue of cooperation in evolving dynamic networks. *Nature Communications*. 9: 2692

Qian, J. J. \diamond and Akçay, E. (2018) Competition and niche construction in a model of cancer metastasis. *PLoS One*. 13: e0198163

Aguilar, E. \ddagger and Akçay, E. (2018) Gene-culture co-inheritance of a behavioral trait. *The American Naturalist*. 192: 311-320

Dridi, S. \ddagger and Akçay, E. (2018) Learning to cooperate: The evolution of social rewards in repeated interactions. *The American Naturalist*. 191: 58-73

2017 Bienvenu, F. \dagger Akçay, E., Legendre, S., & McCandlish, D.M. (2017) The genealogical decomposition of a matrix population model with applications to the aggregation of stages. *Theoretical Population Biology*. 115: 69-80

Akçay, E. (2017) Population structure reduces benefits from partner choice in mutualistic symbiosis. *Proceedings of the Royal Society B* 284: 20162317

- 2016 Lehmann, L., Mullon, C., **Akçay, E.**, & Van Cleve, J. (2016) Invasion fitness, inclusive fitness, and reproductive numbers in heterogeneous populations. *Evolution*. 70:1689-1702. doi: 10.1111/evo.12980
- Ilany, A.[‡] & **Akçay, E.** (2016) Personality and social networks: a generative model approach. *Integrative and Comparative Biology* doi: 10.1093/icb/icw068
- Ilany, A.[‡] & **Akçay, E.** (2016) Social inheritance can explain the structure of animal social networks. *Nature Communications*. 7:12084
- Akçay, E.** & Van Cleve, J. (2016) There is no fitness but fitness, and the lineage is its bearer. *Philosophical Transactions of the Royal Society B*. 371:20150085. doi:10.1098/rstb.2015.0085
- 2015 **Akçay, E.**, Linksvayer, T. & Van Cleve, J. (2015) Bridging social evolution theory and emerging empirical approaches to social behavior. *Current Opinion in Behavioral Sciences*. 6:59-64
- Jones, E.I., Afkhami, M.E., **Akçay, E.**, Bronstein, J.L., Bshary, R., Frederickson, M.E., Heath, K.D., Hoeksema, J.D., Ness, J.H., Pankey, S.M., Porter, S.S., Sachs, J.L., Scharnagl, K., & Friesen, M.L. (2015) Cheaters must prosper: reconciling theoretical and empirical perspectives on cheating in mutualism. *Ecology Letters* 18(11): 1270-1284
- Akçay, E.** (2015) Evolutionary models of mutualism. in *Mutualism*, edited by J. Bronstein, Oxford University Press
- Bewick, S., Chisholm, R.A., **Akçay, E.**, & Godsoe, W. (2015) A stochastic biodiversity model with overlapping niche structure. *Theoretical Ecology* 8(1):81-109 doi:10.1007/s12080-014-0227-7
- 2014 Van Cleve, J. & **Akçay, E.** (2014) Pathways to social evolution: reciprocity, relatedness, and synergy. *Evolution* 68:2245-2258
- Shen, S.-F., **Akçay, E.**, & Rubenstein, D. R. (2014) Group size and social conflict in complex societies. *The American Naturalist* 183:301-310
- 2013 Pringle, E. G., **Akçay, E.**, Raab, T. K., Gordon, D. M., & Dirzo, R. (2013) Water stress strengthens mutualism among ants, trees, and scale insects. *PLoS Biology* 11(11): e1001705
- 2012 **Akçay, E.**, Meirowitz, A., Ramsay, K.W., & Levin, S. A. (2012) Evolution of cooperation and skew under imperfect information. *Proceedings of the National Academy of Sciences* 109: 14936-14941
- Akçay, E.*** & Van Cleve, J.* (2012) Behavioral dynamics in structured populations pave the way to group optimality. *The American Naturalist* 179:257-269
- Akçay, E.** (2012) Incentives in the family II: Behavioral dynamics and the evolution of non-costly signaling. *Journal of Theoretical Biology* 294:9-18
- 2011 Şekercioğlu, Ç. H., Anderson, S., **Akçay, E.**, Bilgin, R., Can, E., Semiz, G., Tavşanoğlu, Ç., Soyumert, A., Yokeş, M. B., Ipekdağ, K., Sağlam, I., Yücel, M., & Dalfes, N. (2011) Turkey's globally important biodiversity in crisis. *Biological Conservation* 144: 2752-2769
- Akçay, E.** & Simms, E.L. (2011) Negotiation, sanctions and context dependency in the legume-rhizobium mutualism. *The American Naturalist* 178:1-14
- Mesterton-Gibbons, M., Gavrillets, S., Gravner, J., & **Akçay, E.** (2011) Models of coalition or alliance formation. *Journal of Theoretical Biology* 274:187-204

- ≤2010 Akçay, E. & Roughgarden, J. (2011) The evolution of payoff matrices: providing incentives to cooperate. *Proceedings of the Royal Society B* 278:2198-2206
- Roughgarden, J. & Akçay, E. (2010) Do we need a Sexual Selection 2.0? *Animal Behaviour* 79(3):e1-e4
- Roughgarden, J. & Akçay, E. (2010) Final response: sexual selection needs an alternative. *Animal Behaviour* 79(3):e18-e23
- Akçay, E.*, Van Cleve, J.*, Feldman, M. W., & Roughgarden, J. (2009) A theory for the evolution of other-regard integrating proximate and ultimate perspectives. *Proceedings of the National Academy of Sciences* 106:19061-19066
- Akçay, E. & Roughgarden, J. (2009) The perfect family: decision making in biparental care. *PloS One*, 4:E7345
- Akçay, E. & Roughgarden, J. (2007) Extra-pair parentage: a new theory based on transactions in a cooperative game. *Evolutionary Ecology Research* 9:1223-1243
- Akçay, E. & Roughgarden, J. (2007) Extra-pair paternity in birds: review of the genetic benefits. *Evolutionary Ecology Research* 9:855-868
- Akçay, E. & Roughgarden, J. (2007) Negotiation of mutualism: Rhizobia and legumes. *Proceedings of the Royal Society B* 274:25-32
- Roughgarden, J., Oishi, M., & Akçay, E. (2006) Reproductive social behavior: Cooperative games to replace sexual selection. *Science* 311:965–970
- Letters and commentary**
- 2016 Kovaka, K., Santana, C., Patel, R., Akçay, E. , & Weisberg, M. (2016) Agriculture increases individual fitness. *Behavioral and Brain Sciences* 39:e103
- 2015 Akçay, E. An apology for inclusive fitness (Review of Marshall, J. 2015. Social evolution and inclusive fitness.) *Evolution*. 69:3224-3225 doi: 10.1111/evo.12804
- 2011 Şekercioğlu, Ç.H., Anderson, S., Akçay, E & Bilgin, R. Turkey's rich natural heritage under assault. *Science* 334: 1637-1638
- 2007 Akçay, E. & Roughgarden, J. Neither should competition be assumed. *Trends in Ecology and Evolution* 22:4
- 2006 Roughgarden, J., E. Akçay & M. Oishi. in E. Kavanagh, ed., Debating sexual selection and mating strategies. *Science* 312:689-697

MENTORING

Postdoctoral fellows

- 2017-current Andrew Tilman (co-advised with Joshua Plotkin)
- 2017-current Marco Smallo
- 2017-current Bryce Morsky
- 2016-current Chai Molina (co-advised with Simon Levin, Ulf Dieckmann, and Elena Rovenskaya)
- 2015-current Elliot Aguilar
- 2015-2017 Slimane Dridi – *current position: IAST Fellow, Institute for Advanced Study, Toulouse*
- 2015-2016 Amiyaal Ilany – *current position: Senior Lecturer, Bar-Ilan University*

Ph.D. students: primary advisor

- 2014-current Alexandra Brown

2014-current Haoran Zhou (coadvised with Brent Helliker)

Ph.D. students: other

Dissertation committees (at Penn Biology unless indicated otherwise): Mitchell Newberry, Wei Zhou, Pinar Ertör-Akyazi (Bogazici University), Justin Walsh, Bianca Charbonneau, Seth Madlon-Kay (Penn Neuroscience), Ammon Perkes

Rotation students: Ammon Perkes, Justin Walsh, Kevin Zhou, Michael Warner, Ozan Kiratlı

Short term visitor: François Bienvenue (ENS, Paris, France)

Undergraduate students (primary advisor)

Madeleine Andrews, Natalie Weiss, Jimmy Qian

TEACHING

University of Pennsylvania

2016-2017 Bio 417: Theoretical Population Biology; Spring Semesters
 2015-2017 Bio 240: Introductory Ecology (jointly with Brent Helliker); Fall Semesters
 2016 Bio 535: Theory of Living Systems (jointly with 5 others; Spring 2016)
 2015 Bio 610: Advanced Topics in Evolutionary Biology; Spring 2015
 2014 Bio 414: Advanced Ecology (jointly with Brent Helliker); Fall 2014

Undergraduate Advising

2016-current Advisor for Computational and Mathematical Biology Concentrations

PRESENTATIONS

Invited talks

2018 Dartmouth College, Willamette University, Moffitt Cancer Center, Georgia Tech
 2017 Drexel University
 2016 Bogazici University, University of Kentucky, Rutgers University Camden
 2015 Arizona State University, Michigan State University
 2013 NC State University, University of Pennsylvania, Indiana University, Cornell University
 2012 Florida State University, UC Irvine, University of Minnesota
 2011 Santa Fe Institute, NC State University
 2010 UC Riverside, University of Paris VI, UCLA, UC Berkeley
 2009 Istanbul Technical University, Cal State San Marcos
 2008 University of Florida, Harvard University
 2007 Middle East Technical University, Ankara, Turkey
 2006 University of Paris VI, Ecole Normale Supérieure

Conference presentations

Evolution Meetings: 2009, 2010, 2011, 2012, 2013, 2014, 2016

ASN Asilomar meeting: 2014, 2018

Ecological Society of America Meetings: 2007, 2008, 2011, 2015

Animal Behavior Meetings: 2010, 2012

WORKSHOPS, WORKING GROUPS, SYMPOSIA

As organizer/co-organizer

- 2019 Penn Cultural Evolution Symposium. University of Pennsylvania
- 2018 Towards a new theoretical biology. University of Pennsylvania
- 2009 Ecology and evolutionary biology in Turkey and abroad. Istanbul Technical University, Istanbul, Turkey
- 2009-2011 Integrating functional and evolutionary Dynamics, NIMBioS
- 2009 Politics of animal cooperation, Stanford University
- 2008 New Approaches to the evolution of social behavior
Ecological Society of America Meeting, Milwaukee, WI

As invited participant/speaker

- 2018 Evolution and Financial Markets, American Academy of Arts and Sciences, Cambridge, MA
- 2018 Modeling Collective Behavior, Mathematical Biosciences Institute, Ohio State
- 2018 ASN-ESEB meeting, Vice-Presidential symposium, Montpellier, France
- 2017 The biology and economics of mutualisms, Max Planck Institute for Evolutionary Biology, Plön, Germany
- 2017 Q-Bio 2017 Symposium, University of Notre Dame, Indiana.
- 2016 Ant Biotic interactions symposium, Ludwig Maximilians University, Munich, Germany
- 2016 New Frontiers in the integrative study of animal behavior, Society for Integrative and Comparative Biology Meeting
- 2015 Coevolution of institutions and behavior, Santa Fe Institute
- 2014 Integrative animal behavior, Columbia University
- 2014 Social evolution: merits and limitations of inclusive fitness theory, Uni. of Lausanne
- 2014 Economics and biology workshop, Institute for Advanced Study, Toulouse.
- 2013 Cancer and game theory, Johns Hopkins University
- 2013 Inclusive fitness and game theory, University of Lausanne
- 2013 Sexual selection studies: progress, challenges, and future directions, NESCent
- 2012-2014 Cheaters in mutualisms, National Center for Ecological Analysis and Synthesis
- 2012-2014 Play as a window into cognitive evolution and the rules of sociality, NIMBioS
- 2010-2011 Coalitions and alliances in primates, NIMBioS
- 2008 Life History and ant-plant interactions, Santa Fe Institute
- 2005 World Summit on Evolution, Galapagos Islands, Ecuador