

Sarah Mathew

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School of Human Evolution and Social Change
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Education

- 2011 University of California, Los Angeles
Ph.D. in Anthropology
- 2003 Princeton University
A.B. (with Honors) in Ecology and Evolutionary Biology

Academic Appointments

- 2013 – now Assistant Professor, School of Human Evolution and Social Change,
Arizona State University
- 2012 – 2013 Assistant Professor, Department of Anthropology, Stony Brook University
- 2011 – 2012 Postdoctoral Fellow, Center for the Study of Cultural Evolution
Stockholm University

Additional Institutional Affiliations

Research faculty, *Institute of Human Origins* (IHO)
Core faculty, *Adaptation, Behavior, Culture and Society Research Group* (ABCS)
Faculty affiliate, *Center for Evolution and Medicine* (CEM)
Faculty affiliate, *Global Biosocial Complexity Initiative* (GBCI)
Arizona State University—Santa Fe Institute Fellow

Research Area

Field site:

Turkana pastoralists (Kwatela and Ngiyapakuno territorial sections)

Topics:

Evolutionary social sciences

1. Why do humans cooperate more than other animals? 2. How does the capacity for culture enable cooperation? 3. How does cooperation enable warfare?

East African pastoralism

1. How does social control occur in politically uncentralized pastoralist societies? 2. What are the cultural and genetic relationships among East African pastoralist populations? 3. What is the etiology of combat-related Post-traumatic Stress Disorder in Turkana warriors?

I. RESEARCH

Honors and Awards

2015 *Andrew Carnegie Fellowship*. One among 32 scholars nationally to receive an award of \$200,000 for outstanding scholars in the social sciences and humanities addressing “current and future challenges to U.S. democracy and international order”

Grant Activity

Tenure-track at ASU

External

2014-17 Investigator on “Evolutionary Foundations of Human Uniqueness: Recovering Patterns of Cognition, Cumulative Culture and Cooperation” (PI: William Kimbel) from *John F. Templeton Foundation*. Grant total: \$4,934,107; percent allocation: 11% [completed]

2014-15 Collaborator Investigator on “The Emergence of Prosocial Religions” (PI: Ara Norenzayan)” from *John F. Templeton Foundation* to University of British Columbia. Amount to ASU for subproject conducted by S. Mathew: CAD 16,675 [completed]

Internal

2015-21 Principal Investigator on "The evolution of human cooperation: field studies among Turkana pastoralists in Kenya", *President's Strategic Initiative Funds*; \$495,385 [active]

Doctoral

2010 Harry Frank Guggenheim Dissertation Fellowship
2009 NSF Doctoral Dissertation Improvement Grant
2009 Leakey Foundation Dissertation Research Grant
2007 Owen Aldis Award, International Society for Human Ethology
2004 - 07 NSF Graduate Research Fellowship

Publications

Authorship explanation:

- * Postdoctoral trainees
- ** Graduate students
- † Joint first authorship with both authors contributing equally.
- ^a First author took lead. All other authors contributed equally with authorship order determined alphabetically.

IF 5-year journal impact factor in 2019 from Journal Citation Reports

First authorship indicates major contribution in data collection/developing of model, data analysis and manuscript preparation. On papers with postdocs or students, last authorship indicates leadership in conceiving of and designing the study, and mentoring of postdocs or students in conducting the study and writing the paper.

Peer-reviewed journal articles

1. Handley, C.* and **Mathew, S.** *in press*. Human large-scale cooperation as a product of competition between cultural groups. *Nature Communications*. IF = 13.8
2. Lang, M., Purzycki, B., Apicella, C., Atkinson, Q., Bolyanatz, A., Colleran, H., Curtis, R., Handley, C*., Klocova, E., Lesorogol, C., **Mathew, S.**, Moya, C., Placek, C., Soler, M., Stagnaro, N., Vardy, T., Weigel, J., Xygalatas, D., Norenzayan, A. and Henrich, J. 2019. Moralizing gods, impartiality and religious parochialism across 15 societies. *Proceedings of the Royal Society, Series B* 286 (1898): 20190202 IF = 5.6
3. Ghrear S. E., Chudek M.*, Flung K., **Mathew, S.**, and Birch, S. A. J. 2019. Cultural Variations in the Curse of Knowledge: the Curse of Knowledge Bias in Children from a Nomadic Pastoralist Culture. *Journal of Cognition and Culture* 9 (3-4), 366-384 IF = NA

4. **Mathew, S.** 2017. How the second-order free rider problem is solved in a small-scale society. *American Economic Review: Papers & Proceedings* 107 (5) 578-81. IF = 6.5
5. **Mathew, S.[†]** and Perreault, C.[†] 2016. Cultural history, not ecological environment, is the main determinant of human behavior. *Proceedings of the Royal Society, Series B* 283 (1826): 20160177 IF = 5.6
6. ^a Richerson, P., Baldini, R., Bell, A., Demps, K., Frost, K., Hillis, V., **Mathew, S.**, Newton, E., Narr, N., Newson, L., Ross, C., Smaldino, P., Waring, T., Zefferman, M. 2016. Cultural group selection follows Darwin's classic syllogism for the operation of selection. *Behavioral and Brain Sciences* 39, e58. IF = 21.2
7. Richerson, P., Baldini, R., Bell, A., Demps, K., Frost, K., Hillis, V., **Mathew, S.**, Newton, E., Narr, N., Newson, L., Ross, C., Smaldino, P., Waring, T., Zefferman, M. Cultural Group Selection Plays an Essential Role in Explaining Human Cooperation. A Sketch of the Evidence. 2016. *Behavioral and Brain Sciences* 39, e30. IF = 21.2
8. **Mathew, S.[†]** and Perreault, C.[†]. 2015. Behavioral variation in 172 small-scale societies indicates social learning to be the main mode of human adaptation. *Proceedings of the Royal Society, Series B* 282(1810): 20150061 IF = 5.6
9. Boyd, R. and **Mathew S.** 2015. Third-party monitoring and sanctions aid the evolution of language. *Evolution and Human Behavior* 36(6): 475-479. IF = 3.6
10. Zefferman, M. and **Mathew, S.** 2015. An Evolutionary Theory of Large-scale Human Warfare: Group-structured Cultural Selection. *Evolutionary Anthropology: Issues, News and Reviews* 24(2): 50-61. IF = 4.8
11. **Mathew, S.** and Boyd, R. 2014. The cost of cowardice: third-party punitive sentiments towards free riders in Turkana raids. *Evolution and Human Behavior* 35: 58-64. IF = 3.6
12. Perreault, C.[†] and **Mathew, S.[†]** 2012. Dating the origin of language using phonemic diversity. *PLoS ONE* 7(4): e35289. IF = 3.4
13. **Mathew, S.** and Boyd, R. 2011. Punishment sustains large-scale cooperation in prestate warfare. *Proceedings of the National Academy of Sciences* 108 (28): 11375 – 11380. IF = 10.3
14. **Mathew, S.** and Boyd, R. 2009. When does optional participation allow the evolution of cooperation? *Proceedings of the Royal Society, Series B* 276: 1167 – 1174. IF = 5.6

Book Chapters

1. **Mathew, S.**, Boyd, R. and van Veelen, M. 2013. Human cooperation among kin and close associates may require enforcement of norms by third parties. In: *Cultural Evolution*, ed. P. J. Richerson and M. Christiansen. *Strüngmann Forum Report 12*, series editor J. Lupp. Cambridge, MA: MIT Press.
2. ^a Jordan, F. M., C. van Schaik, P. François, H. Gintis, D. B. M. Haun, D. J. Hruschka, M. A. Janssen, J. A. Kitts, L. Lehmann, **S. Mathew**, P. J. Richerson, P. Turchin, and P. Wiessner. 2013. Cultural evolution of the structure of human groups. In: *Cultural Evolution*, ed. P. J. Richerson and M. Christiansen. *Strüngmann Forum Report 12*, series editor J. Lupp. Cambridge, MA: MIT Press.

Comments and Invited Articles

1. Zefferman M., Baldini R. and **Mathew, S.** 2015. Solving the puzzle of human warfare requires an explanation of battle raids and cultural institutions. *Proceedings of the National Academy of Sciences* 112(20): E2557. IF = 10.3
2. Panchanathan, K., **Mathew, S.** and Perreault, C. 2014. Explaining group-level traits requires distinguishing process from product. *Behavioral and Brain Sciences* 37(3): 269-270. IF = 21.2
3. Bowles, S., Boyd, R. **Mathew, S.** and Richerson, P. J. 2012. The punishment that sustains cooperation is often coordinated and costly. *Behavioral and Brain Sciences* 35(1): 20-21. IF = 21.2
4. **Mathew, S.** and Boyd, R. 2011. Mechanistic accounts need to specify why reputation systems yield cooperative outcomes on observed scales. *Proceedings of the National Academy of Sciences* 108(39): E754. IF = 10.3
5. Boyd, R. and **Mathew, S.** 2007. A Narrow Road to Cooperation, *Science*, 316: 1858 – 1859. IF 40.6

Encyclopedia Articles

1. **Mathew, S.** 2015. The evolution of human cooperation. *International Encyclopedia of the Social and Behavioral Sciences 2nd edition* 11: 259-266.

Book Reviews

1. **Mathew, S.** 2015. Are Cultural and Evolutionary Views of Human Warfare Converging? A Review of “War, Peace and Human Nature: The Convergence of Evolutionary and

Cultural Views, edited by Douglas P. Fry (Oxford University Press, 2015)".
Cliodynamics: The Journal of Quantitative History and Cultural Evolution 6 (1).
<https://escholarship.org/uc/item/4125090f>

Unpublished Manuscripts

Under review

1. **Mathew, S.**, and Boyd, R. Arbitration supports reciprocity when there are frequent perception errors. (revise and resubmit, *Nature Human Behavior*)
2. Zefferman M.*, and **Mathew, S.** under review. An evolutionary theory of moral injury with insight from Turkana warriors
3. Zefferman M.*, and **Mathew, S.** under review. Combat stress in small-scale warriors highlight evolutionary roots of Post-traumatic stress disorder and moral injury in war.

Invited Talks

External

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| 2020 | Canadian Institute for Advanced Research Interdisciplinary Workshop on Culture and Preference Formation. University of California Los Angeles. (Feb 6-7, 2020)
The cultural evolution of cooperative norms: insights from pastoral Kenya. |
| 2019 | Human Behavior and Evolution Society Preconference on “Integrated Approaches to Research on Culture: Professional and Practical Considerations”. Boston, MA
Three recent projects, three unique challenges. |
| 2019 | Mind, Technology and Society Series, <i>University of California Merced</i>
Is the cultural boundary also the moral boundary? An empirical test of cultural group selection |
| 2017 | Center for Behavior, Evolution and Culture, <i>University of California Los Angeles</i>
Peer sanctioning and cultural group selection promotes large-scale cooperation: Evidence from Kenyan pastoralists |
| 2017 | Anthropology Department, <i>University of Missouri</i>
Conflict and Cooperation In A Pastoral Society Shows That Cultural Transmission Enabled The Evolution Of Human Prosociality |
| 2017 | Descent of Moral Sentiments Symposium, <i>Utrecht University</i> , Netherlands
(Key speaker) Is the cultural boundary also the moral boundary? |

- 2016 Workshop on African History and Economics: Towards a Deeper Understanding of African Culture and Society, *Hutchins Center for African and African American Research, Harvard University*
Conflict and Cooperation in A Pastoral Society Shows That Selection Among Cultural Groups Enabled the Evolution of Human Cooperation
- 2016 Toulouse Economics and Biology Workshop, *Toulouse School of Economics & Institute for Advanced Study in Toulouse, Toulouse, France*
Altruistic Warriors and Moral Citizens: Conflict and Cooperation In A Pastoral Society Shows That Cultural Transmission Enabled The Evolution Of Human Prosociality
- 2016 Center for Philosophy, Arts and Literature (PAL) and the Franklin Humanities Institute (FHI), *Duke University*
How Turkana pastoralists cooperate, and what it means for the origins of human prosociality
- 2014 Anthropology Colloquium, *University of California, Davis*
The evolution of large-scale cooperation in humans: insights from Turkana warfare
- 2014 Collective Intentionality Conference, *Indiana University, Bloomington*
Group-functional design in informal institutions: Cooperation & punishment among acephalous Turkana herder
- 2013 *International Max Planck Research School on Retaliation, Mediation and Punishment, Winter University 2013. Heppenheim, Germany*
Punitive sentiments towards free riders in Turkana raids
- 2012 The Research Group for Evolutionary Theory, *Max Planck Institute for Evolutionary Biology, Plön, Germany*
Evolution of cooperation via enforcement of cultural norms:cattle-raiding among acephalous Turkana pastoralists
- 2012 Modeling Social Complexity Workshop, National Institute for Mathematical and Biological Synthesis & National Evolutionary Synthesis Center, Knoxville
Has cultural group selection enabled human ultrasociality?
- 2011 *California Polytechnic University, San Luis Obispo*
Warfare, collective action and the scale of human cooperation
- 2010 Workshop: Evolutionary Perspectives of Human Behavior, San Luis Obispo
Warfare and collective action: cattle raiding among Turkana pastoralists

- 2010 Workshop: Coevolution of Behaviors and Institutions, *Santa Fe Institute*
 Collective action in pre-state warfare: cooperative cattle-raiding among
 Turkana pastoralists
- 2009 *Leakey Foundation* Board Meeting, San Francisco
 Altruistic warriors: cooperative cattle-raiding among Turkana pastoralists

Internal

- 2017 *Faculty Cross-Talks on Health in the Social Sciences: Mental Health*, College of
 Liberal Arts and Sciences, ASU
 Finding the roots of PTSD and Moral Injury in warriors of small-scale
 societies
- 2016 *Institute of Human Origins Board Meeting*, ASU
 How Turkana pastoralists cooperate, and what it means for the origins of
 human prosociality
- 2014 *Center for the Study of Institutional Diversity*, ASU
 Informal sanctions solve the collective action problem in acephalous
 warfare

Conferences

Sessions Chaired

- 2014 Empathy, conformity, and (im)moral killing: anthropology at the limits of
 knowledge. Co-chaired session with Carolyn R. Nordstrom.
 American Anthropological Association. Washington D. C.

Presentations

- 2019 Is the cultural boundary also the moral boundary? An empirical test of cultural
 group selection among pastoral populations in Kenya.
 Human Behavior and Evolution Society Conference, Boston, MA (May 31-Jun 2,
 2019)
- 2017 Is the cultural boundary also the moral boundary? A cross-cultural test of cultural
 group selection.
 Cultural Evolution Society Inaugural Meeting, Jena, Germany (Sep 12-15, 2017)

- 2017 Conflict and cooperation in a pastoral society shows that selection among cultural groups enabled the evolution of human cooperation
American Economic Association Annual Meeting Chicago IL (Jan 6-8 2017)
- 2014 Mechanisms of self-regulation in moral norms and psychology: a study of meta-norms governing punishment in Turkana society
American Anthropological Association Conference, Washington D. C.
- 2010 A causal understanding of warfare, based on the origins of human cooperation: case study of cattle raiding among Turkana pastoralists in East Africa
American Anthropological Association Conference, New Orleans, LA
- 2010 The collective action problem in warfare: data from cattle raiding among Turkana pastoralists
Human Behavior and Evolution Society Conference, Eugene, OR
- 2009 Cooperation and human warfare: case study of cattle raiding among Turkana pastoralists
American Anthropological Association Conference, Philadelphia, PA
- 2008 The empirical details of cooperation are key to its origins: some types of cooperative interactions evolve more easily than others, if participation is optional. [Poster]
American Anthropological Association Conference, San Francisco, CA
- 2008 When does optional participation allow the evolution of cooperation?
European Human Behavior and Evolution Society, Montpellier, France
- 2007 Does optional participation favor large-scale cooperation?
Human Behavior and Evolution Society Conference, Williamsburg, VA
- 2007 Modeling the role of solitary strategies, resource excludability and resource exhaustibility on the evolution of altruistic behavior
South. Calif. Animal Behavior Society Conference, Santa Barbara, CA
- 2006 The effect of excludability in stabilizing cooperation in an n-person public goods game.
Human Behavior and Evolution Society Conference, Philadelphia, PA

Workshops

Organized

- 2018 Co-organized an international, interdisciplinary workshop “Understanding the origins of combat stress and moral injury through cross-cultural research” hosted by *Center for Evolution and Medicine, ASU (Mar 1-2, 2018)*.

Attended

- 2017 *National Science Foundation* workshop, “Enhancing robustness and generalizability in the social and behavioral sciences”, Washington D. C. (Mar 2017)
- 2014 The origin of violence: from brain to world war, *The Origins Project*, ASU, Tempe, AZ
- 2014 The Evolution of Institutions, *National Institute for Mathematical and Biological Synthesis (NIMBioS)*, Knoxville, TN
- 2012 *Ernst Strüngmann Forum* on Cultural Evolution, Frankfurt, Germany
- 2012 Modeling Social Complexity, *National Institute for Mathematical and Biological Synthesis (NIMBioS) & National Evolutionary Synthesis Center (NESCent)* Investigative Workshop, Knoxville, TN
- 2012 Cooperation in multi-partner settings: biological markets & social dilemmas, *Lorentz Center*, Leiden, The Netherlands
- 2010 Coevolution of Behaviors and Institutions, *Santa Fe Institute*, NM

II. TEACHING

Recognition

- 2018 Nominee, College of Liberal Arts and Sciences *Zebulon Pearce Distinguished Teaching Award*
- 2018 Nominee, Graduate & Professional Student Association *Centennial Professorship Award*
- 2018 Nominee, Graduate College *Outstanding Faculty Mentor Award* (Outstanding Master’s Mentor Category)

Courses

Arizona State University

- ASM 394 Special Topics: War and Peace—The Evolution of Conflict and Cooperation
- Spring 2015, Fall 2016, Fall 2019

- ASM 342 Evolution and Human Behavior
- Spring 2014, Fall 2014, Spring 2016, Spring 2019, Spring 2020
- ASM 300 Anthropological Sciences
- Fall 2018
- ASB 210 Human Sexuality (online).
- Spring 2017, Fall 2017
- ASM 590 Reading and Conference Graduate Course
- Spring 2014, 2015, 2017; Fall 2017, 2018, 2019

Stony Brook University

- ANP 403 Seminar in Biological Anthropology: The evolution of cooperation (Fall 2012)
- ANP 200 Evolution of Human Behavior (Spring 2013)
- ANP 391 Behavioral ecology (Spring 2013)

Mentoring

Undergraduate Research Apprenticeship

1. Abhishek Tomar Supervising data coding of Turkana field data (Spring 2020)
2. Liam Gleason Supervised a research internship resulting in a successful *NSF GRFP* proposal (Fall 2016)

Undergraduate Honors Thesis

1. Sarah Long Supervising Barrett Honor's Thesis based on coding and analysis of data previously collected at the Turkana fieldsite.

Master's committee member

1. Kelly Reina Committee member (2015 – 16)
2. Leonid Tiokhin Committee member (2015 – 16)
3. Scott Collins Committee member (2018 – 19)

Doctoral supervision

1. Liam Gleason Advisor (Fall 2017 – now)
Completed MA requirement in Spring 2019
2. Minhua Yan Co-advisor (Fall 2016 – now)
Completed MA requirement in Spring 2018

Doctoral committee

1. Angela Taravella Committee member (Spring 2017 – now)

Post-doctoral supervision

1. Matthew Zefferman Post Traumatic Stress and Moral Injury in Turkana warriors
(Nov 2015-Aug 2017)
Current position: Assistant Professor at the
Naval Postgraduate School (NPS), Monterey, CA.
2. Carla Handley Cooperation and population structure among Borana,
Rendille, Samburu and Turkana pastoralists
(Dec 2014-Aug 2017)
Current position: Research consultant, Indica Consulting,
Washington D.C.
3. Hillary Lenfesty Economic experiments assessing the role of arbitration on
reciprocal cooperation when errors are common
(Aug 2015- Aug 2017).
Current position: Assistant Research Professor, School of
Human Evolution and Social Change.

Field site supervision

* postdocs ** graduate students

1. Carla Handley* Conducted study of cooperation among Turkana, Borana, Rendille
and Samburu pastoralists in Kenya (4 visits of 2-3 months each
between Dec 2014-Aug 2017).
2. Matthew Zefferman* Conducted study of post-traumatic stress disorder and moral injury
among warriors at the Turkana fieldsite (3 visits of 2 months each

between Nov 2015-Aug 2017).

3. Bailey House* Conducted study of the development of prosocial sentiments at the Turkana field site to pilot field methods to use in a larger cross cultural study (Apr-May 2016)
4. Matthew Chudek* Conducted study of indirect reciprocity assessing how goodness is determined among Turkana and Canadian subjects (Jun-Jul 2014)
5. Liam Gleason** Conducted six-week study of the role of gossip and reputation in sustaining cooperation among Turkana warriors (Jul-Sep 2018)
6. Angela Taravella** Conducted two-week science outreach and dissemination effort to communicate lab DNA methods and preliminary results to communities who contributed DNA samples for genetic analysis (Jul – Aug 2018).

Mentoring of community members at field site:

Conducted these activities at the fieldsite to improve education access in the Turkana host community (Sep 2014 - Aug 17)

1. Implemented online learning via Khan Academy Lite at the local primary school
2. Established a scholarship and mentoring program for the six top-scoring secondary school students from the community.
3. Hosted a teacher who teaches kindergarten through second grade students in the community who are not attending the main primary school.
4. Implemented an adult literacy initiative for the host community led by the Turkana field research assistants.
5. Provided non-financial logistic support for the Turkana field research assistants to continue their education via online distance learning programs.

III. SERVICE

Professional Service

Editorial Service

2015-2016 Consulting Editor, *Evolution and Human Behavior*

Journal Referee

1. Adaptive Behavior,
2. Behavioral Ecology and Sociobiology
3. Biology Letters
4. Biological Reviews
5. Current Biology
6. Evolution and Human Behavior
7. Human Nature
8. Journal of the Commons
9. Journal of the Royal Society Interface
10. Journal of Theoretical Biology
11. PLoS Computational Biology
12. PLoS ONE
13. Philosophical Transactions of the Royal Society B
14. Proceedings of the Royal Society B
15. Science

Committee Service

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| Fall 2019 | Elected as an executive committee member of the <i>Cultural Evolution Society</i> (two-year term). |
| Spring 2016 | Served on the election committee for the inaugural election of the <i>Cultural Evolution Society</i> . |
| Fall 2018 | Served on the inclusivity committee of the <i>Cultural Evolution Society 2nd Annual Meeting</i> |

Conference Organizing

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| Fall 2018 | Served on the local organizing committee for the 2 nd international annual meeting of the <i>Cultural Evolution Society</i> hosted by Arizona State University, Oct 22-24, 2018 |
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University Service

Departmental

Leadership

Chair, SHESC Graduate research awards committee	Fall 2017
Organizer, <i>Evolution of Social Complexity</i> Colloquium Series	Spring 2017
Organizer, <i>Adaptation, Behavior, Culture & Society</i> Journal Club	Spring 2017

Committee member

Search committee, SHESC Director	Fall '19-Spring '20
Search committee, evolutionary anthropology hire	Fall '17-Spring '18
SHESC Graduate research awards committee	Fall '16-Spring '17
SHESC Director search committee	Fall 2016
Panelist, Postdoc and grad student career advise session	Fall 2016
Search committee for target hire opportunity	Spring 2016
Diversity task force	Spring& Fall 2015
Personnel committee	Spring 2015
Professional conduct committee	Fall 2015
Search committee for Southwest Borderlands hiring initiative	Fall 2014
Search committee for two evolutionary anthropology hires	Spring 2014

Public Outreach

Blog contributions

“The Paradox of Human Warfare Explained” Social Evolution Forum Blog, The Evolution Institute: <https://evolution-institute.org/blog/the-paradox-of-human-warfare-explained/> (2016)

Public presentations

“Is the cultural boundary also the moral boundary?” Project presentation for the “Evolution of Human Uniqueness” *Templeton Research Symposium* hosted by *Institute of Human Origins* at Tempe Center for the Arts (Apr 2017). <https://iho.asu.edu/2017-symposium-video>

Panelist, *Origins Project Great Debates “Transcending Our Origins: Violence, Humanity and the Future”* hosted by Steven Pinker, Grady Gammage Memorial Auditorium, Tempe (Apr 2014). <https://youtu.be/vxMP4IAkqpU>

Selected Media Coverage

“The Evolution of Shaming”, Ed Yong, *The Atlantic*, Feb 2016

“Why Its Brave To Think Like A Coward”, Chris Walsh, *Aeon*, Feb 2015

“Friends, not foes, boost warriors’ success”, Elizabeth Wade, *Science*, Nov 2014

“Transformers”, Colin Barras, *New Scientist*, Oct 2014

“It Is Human Nature to Cooperate With Strangers”, Michael Marshall, *New Scientist*, Jun 2011