

# J. ARVID ÅGREN, PhD

Wenner-Gren Fellow

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## RESEARCH & TEACHING INTERESTS

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My research lies at the intersection between transmission genetics and social evolution. I study the biology of genomic conflicts and selfish genetic elements, genes that can promote their own transmission at the expense of other genes in the genome and to the detriment of the fitness of the individual organism. I develop population genetic theory and perform comparative analyses to ask questions about how and why such conflicts occur and what they can tell us about the evolution of conflict and cooperation more generally. I am also interested in the conceptual implications of these results for evolutionary theory, and I am currently writing the first book-length treatment of the history and current state of the so-called gene's-eye view of evolution.

## POSITIONS

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**2018 – Wenner-Gren Fellow**, Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA  
Host: David A. Haig, George Putnam Professor of Biology

**2015–18 Postdoctoral Associate**, Department of Molecular Biology and Genetics, Cornell University, Ithaca, NY  
Faculty Advisor: Andrew G. Clark, Jacob Gould Schurman Professor of Population Genetics

## EDUCATION

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**2015 Ph.D. in Ecology and Evolutionary Biology**, University of Toronto, Canada  
Thesis: Mating System Shifts and Transposable Element Evolution  
Faculty Advisor: Stephen I. Wright, Professor and Canada Research Chair in Population Genomics

**2010 B.Sc. in Biological Sciences (Honours in Evolutionary Biology)**, University of Edinburgh, UK

## PUBLICATIONS

Total number of citations = 584, h-index = 10 (Google Scholar August 27, 2019)

‡Denotes equal contribution.

### Submitted

1. McCoy DE, Ågren JA, Kotler J, B Weir. Evolutionary conflict explains health problems during pregnancy

### Published

2. Ågren JA‡, Davies NG‡, and KR Foster. 2019. Enforcement is central for the evolution of cooperation. *Nature Ecology & Evolution*. 3: 1018–1029.
3. Rubenstein DR, JA Ågren, L Carbone, HE Hoekstra, NC Elde, KM Kapheim, L Keller, CS Moreau, AL Toth, S Yeaman, and HA Hofmann. 2019. Coevolution of genome architecture and social behavior. *Trends in Ecology and Evolution* <https://doi.org/10.1016/j.tree.2019.04.011>
4. Ågren JA‡, Munasinghe M‡, and AG Clark. 2019. Sexual conflict through Mother's Curse and Father's Curse. *Theoretical Population Biology* <https://doi.org/10.1016/j.tpb.2018.12.007>
5. Ågren JA and AG Clark. 2018. Selfish genetic elements. *PLoS Genetics* 14: e1007700
6. Ågren JA. 2018. The Hamiltonian view of social evolution. *Studies in History and Philosophy of Biological and Biomedical Science* 68–69: 88–93.
7. Ågren JA and GDD Hurst. 2017. Selfish Genes. In *Oxford Bibliographies in Evolutionary Biology* (K. Pfennig ed.). Oxford University Press: New York.
8. Ågren JA‡, Williamson RJ‡, Campitelli BE, and J Wheeler. 2017. Greenbeards in yeast: An undergraduate laboratory exercise to teach the genetics of cooperation. *Journal of Biological Education* 51: 228–236.
9. Ågren JA. 2016. Selfish genetic elements and the gene's-eye view of evolution. *Current Zoology* 62: 659–665
10. Ågren JA, Huang H, and SI Wright. 2016. Transposable element evolution in the allotetraploid *Capsella bursa-pastoris*. *American Journal of Botany* 103: 1197–1202
11. Ågren JA, S Greiner, MTJ Johnson, and SI Wright. 2015. No evidence that sex and transposable elements drive genome size variation in evening primroses. *Evolution* 69: 1053–1062
12. Douglas G, G Gos, K Steige, A Salcedo, K Holm, JA Ågren, K Hazzouri, W Wang, AE Platts, EB Josephs, RJ Williamson, B Neuffer, M Lascoux, T Slotte, SI Wright. 2015. Hybrid origins and the earliest stages of diploidization in the highly successful recent polyploid *Capsella bursa-pastoris*. *Proceedings of the National Academy of Sciences USA* 112: 2806–2811
13. Hough J‡, JA Ågren‡, SCH Barrett, and SI Wright. 2014. Chromosomal distribution of cyto-nuclear genes in a dioecious plant with sex chromosomes. *Genome Biology and Evolution* 6: 2439–2443

14. **Ågren JA**, Wang W, Koenig D, Neuffer B, Weigel D, SI Wright. 2014. Mating system shifts and transposable element evolution in the plant genus *Capsella*. *BMC Genomics* 15: 602
15. **Ågren JA**. 2014. Evolutionary transitions in individuality: insights from transposable elements. *Trends in Ecology and Evolution* 29: 90–96
16. Slotte T, Hazzouri KM, **Ågren JA**, Koenig D, Maumus F, Guo Y, Steige K, Platts AE, Escobar JS, Newman LK, Wang W, Mandáková T, Vello E, Smith LM, Steffen J, Takuno S, Brandvain Y, Coop G, Andolfatto P, Hu TT, Blanchette M, Clark RM, Quesneville H, Nordborg M, Gaut BS, Lysak MA, Jenkins J, Grimwood J, Chapman J, Prochnick S, Shu S, Rokhsar D, Schmutz J, Weigel D, Wright SI. 2013. The *Capsella rubella* genome and the genomic consequences of rapid mating system evolution. *Nature Genetics* 45: 831–835
17. **Ågren JA**. 2013. Selfish genes and plant speciation. *Evolutionary Biology* 40: 439–449
18. Ross RI, **Ågren JA**, and JR Pannell. 2012. Exogenous selection shapes germination behaviour and seedling trait of populations at different altitudes in a *Senecio* hybrid zone. *Annals of Botany* 110: 1439–1447
19. **Ågren JA** and Wright SI. 2011. Co-evolution between transposable elements and their host: a major factor in genome size evolution? *Chromosome Research* 19: 777–786
20. Charlesworth D, Qiu S, Bergero R, **Ågren JA** and SI Wright. 2010. Using DNA sequence diversity to test for selection in *Silene*. *International Journal of Plant Science* 171: 1072–1082

### **Perspectives, Commentaries, and Short Book Reviews**

1. Elliott TE and **JA Ågren**. 2016. A naturalist's guide to mobile genetic elements. *Evolution: Education and Outreach*. 9: 1–3
2. **Ågren JA**. 2016. The social life of the genome. *Trends in Ecology and Evolution*. 31: 494–495
3. **Ågren JA** and SI Wright. 2015. Selfish genetic elements and plant genome size evolution. *Trends in Plant Science* 20: 195–196
4. **Ågren JA**. 2015. Bortom det acceptablas gränser. Bengt Lidforss och lundaradikalismen [Beyond the limits of acceptability. Bengt Lidforss and the Lund radicalism]. *History and Philosophy of the Life Sciences* 37: 126–128
5. **Ågren JA**. 2013. Plant Transposable Elements: Impact on Genome Structure and Function. *Quarterly Review of Biology* 88: 252
6. **Ågren JA**. 2013. Sex, spite, and selfish genes – Nature's Oracle: The Life and Work of W. D. Hamilton. *Journal of Genetics* 92: 341–343
7. Wright SI and **JA Ågren**. 2011. Sizing up *Arabidopsis* genome evolution. *Heredity* 107: 509–510

## Teaching Material

1. Ågren JA, Williamson RJ and J Wheeler. 2013. Greenbeards and the evolution of cooperation in yeast. In Wheeler, J. *BIO220: From genomes to ecosystem in a changing world. Laboratory Manual Winter 2013*. Department of Ecology and Evolutionary Biology, University of Toronto. (Re-published annually since.)
2. Ågren JA, Hay D, and L Swafe-Gonzales. 2011. *Biology Higher and Standard Level*. Lanterna Education International Baccalaureate Online Revision Courses

## Popular Science

1. Ågren JA. 2014. Are aggressive sperm a barrier to cross species sex? *Seeds of Science*
2. Ågren JA. 2013. A book that changed me: *The Selfish Gene*. *GuardianWitness*
3. Ågren JA. 2012. An ambitious take on human nature, a review of EO Wilson's *The Social Conquest of Earth*. *Chirograph: Toronto Review of Books*
4. Ågren JA. 2012. Sci-lenced: A PEN Canada evening on scientists' freedom of expression. *Chirograph, The Toronto Review of Books*
5. Ågren JA. 2011. Genomics helps us all. *The Varsity*
6. Ågren JA. 2011. Play Nice, a review of Martin Nowak and Roger Highfield's *SuperCooperators*. *The Varsity*
7. Ågren JA and C White. 2011. What's in a name? *EUSci*
8. Ågren JA. 2010. Själviska gener. *Bi-lagan*
9. Ågren JA. 2010. Ännu ett kapitel i evolutionens historiebok. *evolutionsteori.se*

## PRESENTATIONS

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### Invited Seminars

- 2020. Department of Biology, Brandeis University, USA (forthcoming)
- 2019. Department of Ecology and Evolution, Stony Brook University, USA (forthcoming)
- 2019. Theory Division, Lerner Research Institute, Cleveland Clinic, USA
- 2019. Department of Biology, Lund University, Sweden
- 2019. Museum of Comparative Zoology, Harvard University, USA
- 2018. Department of Biology, Syracuse University, USA
- 2018. Department of Biology, University of Kentucky, USA
- 2018. Gregor Mendel Institute, Vienna, Austria
- 2018. Petrov Group, Department of Biology, Stanford University, USA
- 2018. Department of Evolution and Ecology, University of California, Davis, USA
- 2017. Department of Biology, University of Rochester, USA

- 2017. Behaviour and Genetics of Social Insects Lab, University of Sydney, Australia
- 2017. New Directions in the Emergence and Maintenance of Individuality Conference, Sydney, Australia
- 2017. Social Evolution and Genome Complexity Symposium, Columbia University, USA
- 2016. Department of Biology, University of Maryland, USA
- 2015. Evolutionary Biology Centre, Uppsala University, Sweden
- 2015. Institute of Population Genetics, University of Veterinary Medicine, Vienna, Austria
- 2015. Magdalen College, Oxford, UK
- 2013. Department of Integrative Biology, University of Guelph, Canada
- 2013. Graduate Student Seminar Series, Institute of Integrative Biology, University of Liverpool, UK
- 2013. Foster Group, Department of Zoology, University of Oxford, UK

### **Conference Contributions**

- 2019. Society for the Study of Evolution. Providence, RI, USA (talk)
- 2019. The Evolution of Cooperation and Conflict: From Theory to Experimental Evaluation, Uppsala, Sweden (talk)
- 2018. 2<sup>nd</sup> Joint Congress on Evolutionary Biology. Montpellier, France (talk)
- 2018. Society for Molecular Biology and Evolution. Yokohama, Japan (poster)
- 2018. American Society of Naturalists symposium on "150 Years Of *The American Naturalist*". Asilomar, CA, USA (talk)
- 2017. European Society for Evolutionary Biology. Groningen, Netherlands (talk)
- 2016. The Allied Genetics Conference. Orlando, FL, USA (poster)
- 2015. European Society for Evolutionary Biology. Lausanne, Switzerland (talk)
- 2014. National Academies Keck Futures Initiative (NAKFI) Conference on Collective Behavior: From Cells to Societies. Irvine, CA, USA (poster)
- 2014. Society for the Study of Evolution. Raleigh, NC, USA (talk)
- 2013. Society for Molecular Biology and Evolution. Chicago, IL, USA (talk)
- 2012. Population Genetics Group 46. Glasgow, UK (talk)
- 2012. 1<sup>st</sup> Joint Congress on Evolutionary Biology. Ottawa, Canada (talk)
- 2011. European Society for Evolutionary Biology. Tübingen, Germany (poster)
- 2011. Canadian Society for Ecology and Evolution, Banff, Canada (poster)

### **Popular Science**

- 2019. Mitochondria, sex, and the mother's curse. Harvard Postdoc Science Café, Cambridge
- 2015. Transposable elements and the evolution of conflict and cooperation. iBiology Young Scientist Series

2014. Jumping genes and other Mendelian outlaws. *Treehouse Lecture Series*, Toronto
2013. The Society of Genes. *Massey College Junior Fellow Lecture Series*, Toronto
2012. Genetic conflicts: a persistent hangover from sex? *Massey WIDEN*, Toronto
2012. Internal conflicts: The biology of selfish genetic elements. *Nerdmite*, Toronto
2010. Did selfish genes drive salamanders stupid? *Massey College Junior Fellow Lecture Series*, Toronto
2010. Why hasn't natural selection made us immortal? *Workshops for Interdisciplinary Exchange and Novelty*, Toronto
2009. A war within us – Selfish genes and intragenomic conflict. *EUSci Seminar Series*, Edinburgh, UK

## TEACHING & ADVISING EXPERIENCE

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### Solo Instructor

*Mendelian Outlaws: The Biology of Selfish Genetic Elements*. Spring 2018. Cornell University, 7 students. I developed this freshman seminar course from scratch.

### Guest Lecturer

*Selfish Genetic Elements and Genomic Conflicts* (Graduate students/postdocs), Winter 2020 (forthcoming), Interdisciplinary Study of Cooperation Winter School, Arizona State University

*Human Genomics* (3<sup>rd</sup>/4<sup>th</sup> year undergraduate/1<sup>st</sup> year grad), Fall 2015, 2016, 2017, Cornell University, 30 students.

### Teaching Assistant (University of Toronto)

Responsibilities included developing new class materials, leading class discussions, supervising labs, and grading assignments.

- *Evolutionary Medicine* (3<sup>rd</sup> year undergraduate), Spring 2015. 10 students
- *Adaptation and Biodiversity* (1<sup>st</sup> year undergraduate), Fall 2010– 2015. 25 students
- *From Genomes to Ecosystems* (2<sup>nd</sup> year undergraduate), Spring 2012–2014, 25 students
- *Molecular and Cell Biology* (1st year undergraduate), Spring 2011, 25 students

### Other

*Biology and Mathematics*. Easter and summer 2008–2010. Lanterna Education International Baccalaureate Revision Courses, London, UK and Stockholm, Sweden. 3-12 students.

*Statistics*. Summer 2010. Sweden Biology Olympics team, Swedish Centre for School Biology and Biotechnology, Uppsala, Sweden. 4 students.

### **Pedagogical Training**

Advanced University Teaching Preparation Certificate, Centre for Teaching Support and Innovation, University of Toronto, 2012–2014.

### **Advising Experience**

Two undergraduate students at the University of Toronto (2014) and one at Cornell University (2016-2017).

## **GRANTS, FELLOWSHIPS & AWARDS**

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### **Research Grants**

Pending. *The gene's-eye view of evolution and the purpose of adaptation*. John Templeton Foundation. PIs: David A. Haig and J. Arvid Ågren

### **Fellowships**

2018 – 2021. Wenner-Gren Fellow, The Wenner-Gren Foundations

2017 – 2018. Postdoctoral Fellowship, The Sweden-America Foundation

2010 – 2015. Junior Fellow, Massey College, Toronto, Canada

2010 – 2015. University of Toronto Fellowship

### **Academic Recognition**

2017, 2018. Finalist, Life Science Research Foundation postdoctoral competition

2015. Finalist, iBiology Young Scientist Series

2014. National Academy of Sciences Keck Futures Initiative Fellow

2013. Outstanding Teaching Assistant Award, Department of Ecology and Evolutionary Biology, University of Toronto

2013. The Alfred and Florence Aiken and Dorothy Woods Memorial Graduate Scholarship in Ecology and Evolutionary Biology

2013. Ramsay Wright Award, Department of Ecology and Evolutionary Biology, University of Toronto

2013. AAAS/ *Science* Program for Excellence in Science

2012. Best Student Talk (last day), PopGroup46, Glasgow, UK

2008. Gatsby Plants Scholar, The Gatsby Foundation Plant Science Summer School, UK

2007. Direct entry to second year, University of Edinburgh, UK

### **Travel Grants**

2013 + 2018. Young Investigator Travel Award, Society for Molecular Biology and Evolution

2012. University of Toronto School of Graduate Studies Conference Grant

2011, 2012, 2013, 2015. Massey College Travel Grant

2011 + 2012. Massey College Scholarship

2008 + 2009. Grants from the Gatsby Plants Foundation, the Student Fund of the University of Edinburgh, the James Rennie Bequest, and the British Association for summer research at the University of Oxford and the University of Toronto.

## **WORKING GROUPS**

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2017. *Social Evolution and Genome Complexity*. Columbia University and the National Science Foundation Sociogenomics Research Coordination Network. New York, NY, USA (Invited participant)

2014. *Evaluate the degree to which cooperation and conflict need to be balanced in order to facilitate the evolution, expansion, optimal performance, and maintenance of collective behaviors*. National Academies Keck Futures Initiative (NAKFI) Conference on Collective Behavior: From Cells to Societies. Irvine, CA, USA

## **PROFESSIONAL SERVICE**

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### **Reviewing**

#### Journals

*Trends in Ecology and Evolution; Journal of Evolutionary Biology; Evolution; Molecular Biology and Evolution; eLife; G3: Genes, Genomes, Genetics; Proceedings of the Royal Society B; Genome Biology and Evolution; Plant Science; Current Zoology; Mobile DNA; Journal of Molecular Evolution; New Phytologist; Peer J; Nature Communications; Evolution, Medicine, and Public Health; Integrative and Comparative Biology; Theoretical Population Biology*

#### Publishing Houses

World Scientific Publishing

#### Funding bodies

European Research Council (ERC); French National Research Agency (ARN); Sigma Xi.

### **Symposia Organized**

2018. Mode of Inheritance and Genomic Conflicts. 2<sup>nd</sup> Joint Congress on Evolutionary Biology. Montpellier, France. Co-organized with Hanna Johannesson, Uppsala University.

2015. Cooperation without Kinship: From Genomes to Mutualisms. 15<sup>th</sup> Congress of the European Society for Evolutionary Biology. Lausanne, Switzerland. Co-organized with Kevin Foster, University of Oxford.



### **Other Service**

- 2018. Poster judge, Cornell Undergrad Research Forum
- 2017. Skype a Scientist. Paired with a school in New Jersey , USA.
- 2016. Poster judge, The Allied Genetics Conference, Orlando, FL, USA
- 2014 – 2015. Member, Network of Experts, Evidence for Democracy, Canada
- 2010 – 2015. Co-President and several other elected positions in the Ecology and Evolution Graduate Student Association, University of Toronto, including Ombudsperson, Organizer of Graduate Student Seminar Series, Darwin Day, and Summer Book Clubs
- 2013. Brunch with Scientists, Cafe Scientifique, Toronto Science Festival
- 2013 – 2015. Student Representative, Academic Appeals Committee, Department of Ecology and Evolutionary Biology, University of Toronto
- 2012 – 2014. Judge, Toronto Science Fair
- 2010 – 2012. Tutor, Massey College High School Tutor and Mentorship Programme
- 2010, 2013. Atwood Lecture Selection Committee, Department of Ecology and Evolutionary Biology, University of Toronto
- 2010 – 2012. Treasurer and President, Massey College Junior Fellow Lecture Series

### **PROFESSIONAL MEMBERSHIPS**

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Society for the Study of Evolution  
European Society for Evolutionary Biology  
Society for Molecular Biology and Evolution  
Friends of the Stanford Encyclopedia of Philosophy