

Jonathan P. Bollback

CONTACT INFORMATION

Functional and Comparative Genomics
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ACADEMICS

Positions

2016 -	Senior Lecturer	University of Liverpool
2010 - 2016	Assistant Professor	IST Austria
2010 - 2014	Deputy Graduate Program Chair, IST Austria	IST Austria

Degrees

2004	Ph.D. (Evolutionary Genetics)	University of Rochester, New York
2000	M.Sc. (Evolutionary Genetics)	University of Rochester, New York
1995	B.Sc. (Biology)	University of Maryland, Maryland

History

2008 - 2010	Postdoctoral Research Associate	University of Edinburgh (A. Leigh-Brown and A. Rambaut)
2004 - 2008	Postdoctoral Research Associate	University of Copenhagen (R. Nielsen)
1998 - 2004	Doctoral Student	University of Rochester (J. P. Huelsenbeck)
1995 - 1998	Doctoral Student	University of Maryland (G. Borgia)
1993 - 1995	Undergraduate Studies	University of Maryland
1990 - 1993	Undergraduate Studies	SUNY College at Purchase

Fellow Appointments

1995 - 1998	Predocctoral Fellow, Laboratory of Molecular Systematics, Smithsonian Institution
1997	NSF RTG Fellow, University of Maryland

Research Grants

2015 - 2020	ERC Consolidator Grant - Horizon 2020 European Research Council No. 648440, 1,820,865 Euro
2015 - 2018	NOE Forschungs- und Bildungsges.m.b.H. (NFB) Grant (Co-PI) No. LS14-006, 267,440 Euro
2007 - 2008	Danish Agency for Science, Technology and Innovation The Danish Natural Science Research Council Forskningsrådet for Natur og Univers, FNU (Ref. No. 272-06-0316), 1,498,528 DKK <i>[Note: At the time this was the largest 2 year grant ever awarded to an independent post-doctoral researcher.]</i>
2006 - 2007	Danish Agency for Science, Technology and Innovation (Co-PI) Danish Medical Research Council Forskningsrådet for Sundhed og Sygdom, FSS (Ref. No. 271-05-0599), 576,000 DKK

Teaching Experience: Courses

Course	Level	Duration	Teaching Hours	Instructor(s)
Advanced Skills in Biology	Undergrad	24 weeks	30	Bollback (coordinator)
3 rd Year Genetics Tutorial	Undergrad	12 weeks	20	Bollback
Statistical Phylogenetics	Graduate	12 weeks	58	Bollback
Microbial Genetics	Graduate	12 weeks	26	Bollback & Guet
Classics in Evolutionary Biology	Graduate	12 weeks	26	Barton & Bollback
Molecular Population Genetics	Graduate	12 weeks	5	Multiple instructors
Introduction to Programming	Introductory	2 weeks	50	Bollback
Principles of Evolution	Introductory	6 weeks	24	Barton & Bollback & Cremer

Teaching Experience: Workshops

Workshop	Co-ordinators	Teaching Time
Evolutionary Genetics Workshop	Nick Barton; J. Bollback	2hrs
NGS for Population Genetics and Experimental Evolution	C. Kosiol; V. Mustonen C. Schlötterer; J. Bollback	2hrs

GROUP MEMBERS

Current Postdoctoral Research Associates

- 2017 - **Hande Acar** (University of Liverpool)
2017 - **Pavel Payne** (University of Liverpool)

Current PhD Students

- 2017 - **Rama Bhatia** (University of Liverpool)
2017 - **Jack Fitzpatrick** (University of Liverpool)
2014 - **Claudia Iglar** (IST Austria)
2014 - **Isabella Tomanek** (IST Austria)

Former Postdoctoral Research Associates

- 2013 - 2017 **Mato Lagator** (IST Austria)
2016 - 2016 **Nela Nikolic** (IST Austria)
2015 - 2016 **Xiaoyun Tu** (IST Austria)
2010 - 2014 **Rodrigo A. F. Redondo** (IST Austria)
2010 - 2013 **Anne Kupczok** (IST Austria)

Former PhD Students

- 2011 - 2016 **Hande Acar** (IST Austria)
2012 - 2016 **Fabienne Jesse** (IST Austria)
2012 - 2016 **Pavel Payne** (IST Austria)

Former Master Students

- 2016 - 2017 **Adam Harris** (University of Liverpool)
2016 - 2016 **Katharina Poecher** (FH Campus Wien)
2014 - 2014 **Anaísa Moreno** (Erasmus Program, University of Porto)

SCIENTIFIC IMPACT AND SERVICE

Invited Lectures

- 1) March 2017. Instituto Gulbenkian de Ciencia. Lisbon, Portugal.
- 2) February, 2017. IEB Seminar Series, University of Edinburgh.
- 3) December, 2016. Ewha BRL Colloquium: Advances in evolutionary biological research: adaptation in microbial and other systems. Organized by Basic Research Laboratory for the Genomics of Adaptive Evolution, Ewha Womans University, Seoul, South Korea
- 4) July, 2015. Biosciences, University of Exeter, Exeter, UK
- 5) April, 2015. Department of Genetics, University of Cambridge, Cambridge, UK
- 6) August, 2014. Department of Pathobiology, VetMedUni, Vienna, Austria

- 7) February, 2011. Host-parasite coevolution, Winter-school of the DFG Priority Programme SPP 1399, IST Austria
- 8) May, 2011. Institute of Population Genetics, VetMedUni, Vienna, Austria
- 9) November, 2010. Symposium, EvolVienna, Vienna, Austria
- 10) September, 2009. Symposium, ICHAIR Annual Workshop, Interdisciplinary Centre for Avian and Human Influenza Research, Edinburgh, Scotland
- 11) April, 2007. Mathematical Genetics of Selection and Adaptation — University of Aarhus
- 12) October, 2005. Reunión Anual Sociedad de Biología de Chile, Sociedad de Ecología - Sociedad de Botánica
- 13) May, 2005. Evolutionary Biology Center, Uppsala Universitet, Uppsala, Sweden
- 14) March, 2005. Symposium: Using Ancestral Sequence Reconstruction to Understand Protein Function, Kristineberg, Sweden
- 15) November, 2003. Journées de la Société Française de Systématique, Muséum National d'Historie Naturelle, Paris, France
- 16) August, 2002. Bayesian inference of phylogeny and molecular evolution, Ph. D. Student course — Department of Systematic Zoology, Uppsala University, Uppsala, Sweden.
- 17) December, 2001. Department of Biologie II, Evolutionary Biology, Ludwig-Maximilians-University, Munich, Germany
- 18) Fall, 1996. Department of Plant Biology, University of Maryland

Referee (Journals)

American Naturalist, Evolution, Journal of General Virology, Journal of Molecular Evolution, Molecular Biology and Evolution, Molecular Phylogenetics and Evolution, BMC Evolutionary Biology, Genetics, and Systematic Biology

Referee (Funding Agencies)

NSF, URF, ERC, SNSF, FCT (Panel Member 2017)

Conference/Programme Organizer

SMBE 2016, MASAMB 2011, MASAMB 2017

Scientific Software

SIMMAP: Stochastic Mutational Mapping on Phylogenies.

Program Description: A program for stochastically mapping the evolutionary history of discrete molecular and morphological characters. Program evaluates the posterior history of characters facilitating addressing questions in molecular and phenotypic evolution. SIMMAP uses predictive distributions to test a variety of hypotheses of character evolution.

Current version: 1.5

Download Source: <http://www.simmap.com>

PUBLICATIONS

Peer-reviewed Articles, Reviews, and Book Chapters by Year [Citations as of 02/2017]

2018

- 1) Payne, P., Geryerhofer, L., Barton, N.H., and **Jonathan P. Bollback**. (2018) CRISPR-based Herd Immunity Limits Phage Epidemics in Bacterial Populations. *eLife* 2018;7:e32035.

2017

- 2) Lagator, M., Sarikas, S., Acar, H., **Jonathan P. Bollback***, Guet, C.C.* (2017) Regulatory network structure determines patterns of intermolecular epistasis. *eLife* In Press. [* Co-senior authors]
- 3) Lagator, M., Paixao, T., Barton, N.H., **Jonathan P. Bollback***, and Guet, C.C.* (2017) On the Mechanistic Nature of Epistasis in a Canonical *cis*-Regulatory Element. *eLife* 6. [* Co-senior authors]
- 4) Harold P. de Vladar, Rodrigo A.F. Redondo, Tomek Wlodarski, and **Jonathan P. Bollback**. (2017) Evolutionary interplay between structure, energy and epistasis in the coat protein of the ϕ X174 phage family. *Journal of the Royal Society Interface*. 14:20160139.

2016

- 5) Lagator, M., Iglar, C., Moreno, A., Guet, C.C., and **Jonathan P. Bollback**. (2016) Epistatic interactions in the Arabinose *cis* regulatory element. *Molecular Biology and Evolution*. 33 (3): 761-769.

2014

- 6) Kupczok, A. and **Jonathan P. Bollback**. (2014) Motif depletion in bacteriophages infecting hosts with CRISPR systems. *BMC Genomics*. 15:663. [5]

2013

- 7) Melissa J. Ward, Samantha J. Lycett, Dorita Avila Rojas, **Jonathan P. Bollback** and Andrew J. Leigh Brown. (2013) Evolutionary interactions between haemagglutinin and neuraminidase in avian influenza. *BMC Evolutionary Biology*. 13:222. [10]
- 8) Rodrigo Redondo, Anne Kupczok, Gertraude Stift, and **Jonathan P. Bollback**. (2013) Complete genome sequence of the novel phage MG-B1 infecting *Bacillus weihenstephanensis*. *Genome Announcements*. 1 (3), e00216-13. [6]
- 9) Anne Kupczok and **Jonathan P. Bollback**. (2013) Probabilistic models for CRISPR spacer content evolution. *BMC Evolutionary Biology*. 13:54. [7]

2012

- 10) Peter Gravlund, Kim Aaris-Sørensen, Michael Hofreiter, Matthias Meyer, **Jonathan P. Bollback**, Nanna Noe-Nygaard. (2012) Ancient DNA extracted from Danish aurochs (*Bos primigenius*): Genetic diversity and preservation. *Annals of Anatomy*. 194:103-111. [11]

2010

- 11) Caitriona M. Guinane, Nouri L. Ben Zakour, Maria A. Tormo-Mas, Lucy A. Weinert, Bethan V. Lowder, Robyn A. Cartwright, Davida S. Smyth, Cyril J. Smyth, Jodi Lindsay, Katherine A. Gould, Adam Witney, Jason Hinds, **J. P. Bollback**, Andrew Rambaut, Jos Penads, and J. Ross Fitzgerald. (2010) Evolutionary genomics of *Staphylococcus aureus* reveals insights into the origin and molecular basis of ruminant host adaptation. *Genome Biology and Evolution*. 2:454-466. [108]

2009

- 12) **Jonathan P. Bollback** and John P. Huelsenbeck. (2009) Parallel genetic evolution within and among species of varying degrees of divergence. *Genetics*. 181: 225–234. [46]

2008

- 13) **Jonathan P. Bollback**, Tom York, and Rasmus Nielsen. (2008) A likelihood method for estimating $2N_e s$ from serially sampled di-allelic data. *Genetics*. 179: 497–502. [62]

2007

- 14) Petersen, L., **J. P. Bollback**, M. Dimmic, M. Hubisz, Rasmus Nielsen. (2007) Genes under positive selection in *Escherichia coli*. *Genome Research*. 17: 1336–1343. [111]
- 15) **Jonathan P. Bollback** and John P. Huelsenbeck. (2007) Clonal interference is alleviated by high mutation rates in large populations. *Molecular Biology and Evolution*. 24(6):1397–1406. [57]
- 16) Jonas Binladen, M. T. P. Gilbert, **Jonathan P. Bollback**, F. Panitz, C. Bendixen, R. Nielsen, E. Willerslev. (2007) The use of coded PCR primers enables high-throughput sequencing of multiple homolog amplification products by 454 parallel sequencing. *PLoS ONE*. 2(2): e197. [404]
- 17) Eva Freyhult, **Jonathan P. Bollback**, and Paul P. Gardner. (2007) Exploring genomic dark matter: homology search for non-coding RNA. *Genome Research*. 17:117–125. [108]
- 18) Sheila M. Reynolds, Katie Dryer, **Jonathan P. Bollback**, J. Albert C. Uy, Gail L. Patricelli, Timothy Robson, Gerald Borgia, and Michael J. Braun (2007) Behavioral paternity predicts genetic paternity in satin bowerbirds, a species with a non-resource-based mating system. *The Auk*. 124(3):857–867. [21]
- 19) **Jonathan P. Bollback**, Paul P. Gardner, and Rasmus Nielsen. (2007) Estimating the history of mutations on a phylogeny. In “Ancestral Sequence Reconstruction” (Liberles, D. Ed.) Oxford University Press, UK. [1]

2006

- 20) **Jonathan P. Bollback** (2006) SIMMAP: Stochastic character mapping of discrete traits on phylogenies. *BMC Bioinformatics*. 7:88. [349]
- 21) Jan E. Conn, Joseph H. Vineis, **Jonathan P. Bollback**, David Y. Onyabe, Richard C. Wilkerson and Marinete M. Póvoa. (2006) Population structure of the malaria vector *Anopheles darlingi* in a malaria-endemic region of eastern Amazonian Brazil. *Am. J. Trop. Med. Hyg.* 74(5): 798–806. [40]
- 22) Andrea J. Betancourt and **Jonathan P. Bollback**. (2006) The mutational landscape model in experimental evolution. *Current Opinions in Genetics and Development*. 16:618–623. [23]

2005

- 23) **Jonathan P. Bollback**. (2005) Posterior mapping and predictive distributions. In “Statistical methods in Molecular Evolution” (Nielsen, R. Ed.) Springer Verlag New York, Inc. New York, USA. [24]

2003

- 24) John Harshman, Christopher J. Huddleston, **Jonathan P. Bollback**, Thomas J. Parsons, and Michael J. Braun. (2003) True and false gavials: A nuclear gene phylogeny of Crocodylia. *Systematic Biology* 52(3): 386–402. [77]
- 25) John P. Huelsenbeck, Rasmus Nielsen, **Jonathan P. Bollback**. (2003) Stochastic mapping of morphological characters. *Systematic Biology* 52(2):131–158. [342]

2002

- 26) **Jonathan P. Bollback** (2002) Bayesian model adequacy and choice in phylogenetics. *Molecular Biology and Evolution*. 19 (7): 1171–1180. [145]
- 27) John P. Huelsenbeck, **Jonathan P. Bollback**, and Amy Levine. (2002) Inferring the root of a phylogenetic tree. *Systematic Biology*. 51 (1): 32–43. [149]

2001

- 28) John P. Huelsenbeck, Frederick Ronquist, Rasmus Nielsen and **Jonathan P. Bollback**. (2001) Bayesian inference of phylogeny and its impact on evolutionary biology. *Science*. 294: 2310–2314. [2001]
- 29) Jan E. Conn, **Jonathan P. Bollback**, Davide Y. Onyabe, Tessa N. Robinson, Richard C. Wilkerson, and Marinete M. Póvoa. (2001) Isolation of polymorphic microsatellite markers from the malaria vector *Anopheles darlingi*. *Molecular Ecology Notes*. 1 (4): 223–225. [20]
- 30) John P. Huelsenbeck and **Jonathan P. Bollback**. (2001) Empirical and hierarchical Bayesian estimation of ancestral states. *Systematic Biology*. 50 (3): 351–366. [303]
- 31) John P. Huelsenbeck and **Jonathan P. Bollback**. (2001) Application of the likelihood function in phylogenetic analysis. In “Handbook of Statistical Genetics” (Balding. D.J., Bishop, M., and Cannings, C., Eds.) Chapter 15, pp. 415–439. John Wiley and Sons, Inc. New York, USA. [42]

- 32) **Jonathan P. Bollback** and John P. Huelsenbeck. (2001) Phylogeny, genome evolution, and host specificity of single-stranded RNA bacteriophage (Family Leviviridae). *Journal of Molecular Evolution*. 52: 117-128. [71]

1994

- 33) Dexter B., J. Utter, S. Ferguson, **J. P. Bollback**, B. Moss, T. W. Nalli. (1994) Analysis of organic pollutants in a suburban stream - environmental chemistry at State-University-of-New-York Purchase *Abstract of papers of the American Chemical Society*. 207: 124-CHED, Part 1.

Manuscripts Submitted/Under Review

- 1) Claudia Iglar, Mato Lagator, Gasper Tkacik, **Jonathan P. Bollback**, Calin C. Guet. Evolutionary potential of transcription factors for gene regulatory rewiring. **In Review** *Nature Ecology and Evolution*.

Manuscripts in Preparation

- 1) Acar, H. and **Jonathan P. Bollback**. Protein-protein interactions, gene length, and dosage act as potential selective barriers to horizontal gene transfer.
- 2) Acar, H., Poecher, K., and **Jonathan P. Bollback**. The success of horizontal gene transfer is determined by environmental conditions.

GROUP MEMBER PUBLICATIONS

The following list contains publications that came from one or more of my group members as a product of their work conducted solely during their tenure in my research group. While they received financial support from me for the research, salary, and intellectual support I do not feel that this alone was sufficient for me being included as an author. I strongly support the development of my group members as independent researchers and as such I refrain from listing myself as a co-author when I feel my contributions fall below the bar.

Manuscripts

- 1) BG Hall, **H Acar**, A Nandipati, M Barlow. (2014) Growth rates made easy. *Molecular Biology and Evolution*. 31(1): 232-238