

Alison G. Boyer

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Education

- Ph.D. Biology. 2008. University of New Mexico, Albuquerque, NM. Advisor: James H. Brown.
Dissertation applied machine learning algorithms to the classification and prediction of avian ecological traits and conservation status.
- B.A. Biology (*Cum Laude with Distinction*). 2003. Hendrix College, Conway, AR
Major in Biology, with coursework toward a Minor in Computer Science.

Professional Experience

- 2014 – *Research Staff*, Environmental Sciences Division and Climate Change Science Institute, Oak Ridge National Laboratory, Oak Ridge, TN
- 2014 – *Joint Faculty Assistant Professor*, Ecology and Evolutionary Biology, University of Tennessee, Knoxville
- 2011 – 2014 *Research Assistant Professor*, Ecology and Evolutionary Biology, University of Tennessee, Knoxville
- 2009 – 2010 *Postdoctoral Fellow in Biological Informatics*, Ecology and Evolutionary Biology, Yale University
- 2008 *Postdoctoral Fellow*, National Museum of Natural History, Smithsonian Institution
- 2004 Participant, *Complex Systems Summer School*, Santa Fe Institute, Santa Fe, NM

Technical Skills

Machine Learning: Classification, clustering, text mining, association rule mining, regression trees, supervised and unsupervised learning.

Statistical Methods: General linear models, nonlinear model fitting, Bayesian modeling, principal component analysis and dimensionality reduction, time series analysis.

Software and Programming Languages: R, SQL, Linux, shell scripting, LaTeX, Python, NetCDF Operators (NCO), ArcGIS, HTML and CSS, Git.

Honors and Awards

- 2009 National Science Foundation, Postdoctoral Fellowship in Biological Informatics. *Using the past to predict the future: A computational approach to broad-scale patterns of avian biodiversity* (DBI- 0805669).
- 2008 Smithsonian Institution Postdoctoral Fellowship
- 2008 National Evolutionary Synthesis Center Postdoctoral Fellowship (declined)
- 2003 Graduate Research Fellowship in Biocomplexity, Univ. New Mexico

Funding

ORNL Climate Change Science Institute, Call for Ideas. PI. (2018) \$20k. *Data Synthesis Activities for the North American Carbon Program*.

National Aeronautics and Space Administration, ROSES Earth Venture Suborbital-2. Institutional PI. (2014 – 2019) \$840k. *Atmospheric Carbon and Transport (ACT)-America*.

National Aeronautics and Space Administration, ROSES Carbon Cycle. Institutional PI. (2014 – 2018) \$900k. *Multi-Scale Synthesis and Terrestrial Model Intercomparison Project Phase II*.

Smithsonian Institution, Natural History Research Endowment. Co-PI. (2011-2012) \$25k. *Quantitative analysis of potential changes in avian community structure due to extinctions in two archipelagos*.

National Geographic Society, Committee for Research and Exploration. PI. (2010-2012) \$20k. *Long-term ecological change in a conservation hotspot: the vertebrate fossil record of New Caledonia*.

Proposals Submitted (since 2012)

National Aeronautics and Space Administration, ROSES 2017: Advancing Collaborative Connections for Earth System Science (ACCESS). PI. \$1.05M. *UREKA: Unified Records of Earthdata collections through Knowledge extraction Algorithms*.

Department of Energy, Office of Biological and Environmental Research (BER). Co-I. (2017) \$1.2M. *Environmental System Science Data Archive*.

National Aeronautics and Space Administration, ROSES 2016: Advanced Information Systems Technology (AIST). Co-I. (2017) \$1.2M. Boyer responsible for \$262k. *Technologies to Integrate Data and Advance Climate Impact Knowledge Across the Arctic-Boreal Region*.

National Aeronautics and Space Administration, ROSES 2016: Advanced Information Systems Technology (AIST). Co-I. (2017) \$1.35M. *Develop Near Real-Time Continuous Gridded Surfaces of Meteorological Variables for Conterminous United States through Integrated Hybrid Workflow Automation*.

National Aeronautics and Space Administration, ROSES 2016: Biodiversity. PI. (2016) \$106k. *Linking Macroecology and Earth System Modeling: Toward a general simulation model of functional biodiversity*.

National Aeronautics and Space Administration, ROSES 2014: Advanced Information Systems Technology. PI. (2014) \$1.14M. *PhenoFusion: Data Fusion Framework to Advance Validation and Enhance Usability of Multisource Phenological Data Sets*.

National Center for Ecological Analysis and Synthesis. Working group proposal. Co-PI. (2012) \$75k. *Rarity and extinction risk: Synthesizing modern patterns of extinction using a null modeling approach*.

National Science Foundation, Geography and Spatial Sciences. Co-PI. (2012) Responsible for: \$96k, Total: \$350k. *Extinction risk in a changing world: who, where, and why?*

Publications (Citations = 1312; h-index = 16; [Google Scholar Profile](#))

- 32 Shrestha, R and **Boyer AG**. 2017. Bringing harmony to heterogeneous soil moisture data across North America. In Review at *PeerJ*.
- 31 **Boyer AG**, M Brenner, DA Burney, JM Pandolfi, M Savarese, GP Dietl, and KW Flessa. 2017. Conservation paleobiology roundtable: From promise to application. In GP Dietl and KW Flessa, eds. *Conservation Paleobiology: Science and Practice*. University of Chicago Press.
- 30 Armsworth, PR, Larson, ER, **Boyer, AG**. 2017. Adaptability: As important in conservation organizations as it is in species. In PM Kareiva, M Marvier, and BR Silliman, eds. *Effective Conservation Science: Data Not Dogma*. Oxford University Press.
- 29 Lyons SK, Miller JH, Fraser D, Smith FA, **Boyer A**, Lindsey E, Mychajliw AM. 2016. The changing role of mammal life histories in Late Quaternary extinction vulnerability on continents and islands. *Biol. Lett.* 12: 20160342. <http://doi.org/10.1098/rsbl.2016.0342>
- 28 Cook, R.B., S. K.S. Vannan, B.F. McMurry, D.M. Wright, Y. Wei, **A.G. Boyer** and J.H. Kidder. 2016. Implementation of data citations and persistent identifiers at the ORNL DAAC. *Ecological Informatics*. <http://doi.org/10.1016/j.ecoinf.2016.03.003>
- 27 Larson, E.R, **Boyer, A.G.** and Paul R. Armsworth. 2014. A lack of response of the financial behaviors of biodiversity conservation nonprofits to changing economic conditions. *Ecology and Evolution*. 4:4429-4443. <http://dx.doi.org/10.1002/ece3.1281>
- 26 Saarinen, J.J, **Boyer, A.G.**, Brown, J.H., *et al.* (18 authors). 2014. Patterns of maximum body size evolution in Cenozoic land mammals: eco-evolutionary processes and abiotic forcing. *Proceedings of the Royal Society of London B, Biological Sciences*. 281:20132049. <http://dx.doi.org/10.1098/rspb.2013.2049>
- 25 Theodor, J., **Boyer, A.G.** and Currie, D. 2014. Species Diversity. pp. 649-758, in F.A. Smith, J. Gittleman, J.H. Brown, eds. *Foundations of Macroecology*. Univ. Chicago Press, Chicago, IL
- 24 **Boyer, A.G.** and W. Jetz. 2014. Extinctions and the loss of ecological function in island bird communities. *Global Ecology and Biogeography*. 23:679-688. <http://dx.doi.org/10.1111/geb.12147>

Altmetrics Top 25% of all articles.

- 23 Fishburn, I., **Boyer, A.G.**, Kareiva, P., Gaston, K. and P.R. Armsworth. 2013. Tracking a Shift from Opportunistic to Systematic Patterns of Conservation Investment by a Major Land Trust. *Biological Conservation*. 161:223-229. <http://dx.doi.org/10.1016/j.biocon.2013.02.007>
- 22 Okie, J. G., **Boyer, A. G.**, Brown, J. H., *et al.* (18 authors). 2013. Effects of allometry, productivity and lifestyle on rates and limits of body size evolution. *Proceedings of the Royal Society B*. 280: 20131007. <http://dx.doi.org/10.1098/rspb.2013.1007>
- 21 Duncan, R., **Boyer, A.G.** and T. Blackburn. 2013. Magnitude and variation of prehistoric bird extinctions in the Pacific. *Proceedings of the National Academy of Sciences USA*. 110: 6436-6441. <http://dx.doi.org/10.1073/pnas.1216511110>

Boyer interviewed by Canadian Broadcasting Company and local NPR affiliate WUOT. PNAS news highlight, Science NOW, Huffington Post, and 'The EEB and Flow' blog.

- 20 McClain, C.R., Durst, P.A.P., **Boyer, A.G.** and C.D. Francis. 2013. Unraveling the Determinants of Insular Body Size Shifts. *Biology Letters*. 9: 20120989.
<http://doi.org/10.1098/rsbl.2012.0989>
- 19 Payne, J.L., F.A. Smith, M. Kowalewski, R.A. Krause Jr., **A.G. Boyer**, C.R. McClain, S. Finnegan, P.M. Novack-Gottshall and L. Sheble. 2012. A Lack Of Attribution: Closing The Citation Gap Through A Reform Of Citation And Indexing Practices. *Taxon*. 61: 1349-1351
- 18 **Boyer, A.G.** and W. Jetz. 2012. Conservation Biology, pp. 271-279 in R. Sibly, J.H. Brown, A. Kodric-Brown, eds. *Metabolic Ecology: a scaling approach*. Wiley-Blackwell
- 17 Smith, F.A. and **Boyer, A.G.** 2012. Losing time? Incorporating a deeper temporal perspective into modern ecology. *Frontiers of Biogeography*. 4: 26-39
- 16 Evans, A.R., Jones, D., **Boyer, A.G.**, et al. (17 authors). 2012. The maximum rate of mammal evolution. *Proceedings of the National Academy of Sciences USA*. 109: 4187-4190
PNAS cover image and featured article. Boyer interviewed for print feature in *National Geographic Magazine*. Extensive media coverage (MSNBC, Nature News, Australian Broadcast. Corp.)
- 15 Davidson, A.D., **Boyer, A.G.**, Kim, H., Pompa-Mansilla, S., Hamilton, M.J., Costa, D.P., Ceballos, G., and J.H. Brown. 2012. Drivers and hotspots of extinction risk in marine mammals. *Proceedings of the National Academy of Sciences USA*. 109: 3395-3400
124 citations. Featured in University of New Mexico publication "UNM Today."
- 14 Kowalewski, M., J.L. Payne, F.A. Smith, S. C. Wang, D.W. McShea, S. Xiao, P. Novack-Gottshall, C.R. McClain, R.A. Krause Jr., **A.G. Boyer**, et al. (15 authors). 2011. The Geozoic Supereon. *Palaios*. 26: 251-255
- 13 Payne, J.L., McClain, C.R., **Boyer, A.G.**, et al. (14 authors). 2011. The evolutionary consequences of oxygenic photosynthesis: a body size perspective. *Photosynthesis Research*. 107: 37-57
- 12 Smith, F.A., **Boyer, A.G.**, et al. (20 authors). 2010. The evolution of maximum body size of terrestrial mammals. *Science*. 330: 1216-1219
Extensive media coverage with >400 print articles including *New York Times*, *BBC World News*, *USA Today*, *Discovery News*, *National Geographic News*. Boyer interviewed by *New Haven Register*.
- 11 **Boyer, A.G.**, James, H.F., Olson, S.L. and Grant-Mackie, J.A. 2010. Long-term ecological change in a conservation hotspot: The fossil avifauna of Mé Auré Cave, New Caledonia. *Biodiversity and Conservation*. 19:3207–3224
- 10 **Boyer, A.G.** and W. Jetz. 2010. Biogeography of body size in Pacific island birds. *Ecography*. 33: 369–379
- 9 **Boyer, A.G.** 2010. Consistent ecological selectivity through time in Pacific island avian extinctions. *Conservation Biology*. 24: 511-519
41 citations. Discussed in numerous conservation biology blogs.
- 8 **Boyer, A.G.**, J.L.E. Cartron and J.H. Brown. 2010. Interspecific pairwise relationships among body length, clutch size, and latitude: anatomy of a macroecological paradox in birds. *Journal of Biogeography*. 37:47-56
- 7 Davidson, A.D., Hamilton, M.J., **Boyer, A.G.**, Brown, J.H. and Ceballos, G. 2009. Multiple ecological pathways to extinction in mammals. *Proceedings of the National Academy of Sciences USA*. 106:10702-10705
> 250 citations.

- 6 McClain, C.R. and **Boyer A.G.** 2009. Biodiversity and body size are linked across metazoans. *Proceedings of the Royal Society of London B, Biological Sciences*. 276:2209-2215
 - 5 Payne, J., **Boyer, A.G.**, et al. (13 authors). 2009. Two-phase increase in the maximum size of life over 3.5 billion years reflects biological innovation and environmental opportunity. *Proceedings of the National Academy of Sciences USA*. 106:24-27
Top 10 most-viewed articles in PNAS during January 2009. Press coverage including wired.com and numerous blogs. Research group featured in podcast by National Evolutionary Synthesis Center.
 - 4 J.C. Nekola, A.L. Šizling, **A.G. Boyer**, and D. Storch. 2008. Artifacts in the log-transformation of species abundance distributions. *Folia Geobotanica*. 43:259-268
 - 3 **Boyer, A.G.** 2008. Extinction patterns in the avifauna of the Hawaiian Islands. *Diversity and Distributions*. 14: 509-517
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- > 80 citations
- 2 McClain, C.R., **A.G. Boyer**, and G. Rosenberg. 2006. The island rule and the evolution of body size in the deep sea. *Journal of Biogeography*. 33:1578-1584
 - 1 **Boyer, A.G.**, R.E. Swearingen, M.A. Blaha, C.T. Fortson, S.K. Gremillion, K.A. Osborn, and M.D. Moran. 2003. Seasonal variation in top-down and bottom-up processes in a grassland Arthropod community. *Oecologia*. 136:309-316

Datasets Published

- Moghaddam, M., A.R. Silva, D. Clewley, R. Akbar, S.A. Hussaini, J. Whitcomb, R. Devarakonda, R. Shrestha, R.B. Cook, G. Prakash, S.K. Santhana Vannan, and **A.G. Boyer**. 2016. Soil Moisture Profiles and Temperature Data from SoilSCAPE Sites, USA. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORN LDAAC/1339>
- Thornton, M.M., P.E. Thornton, Y. Wei, R.S. Vose, and **A.G. Boyer**. 2017. Daymet: Station-Level Inputs and Model Predicted Values for North America, Version 3. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORN LDAAC/1391>

Seminars, workshops, and conference presentations last 5 years (** denotes undergrad student)

- 2018 *A Data Workflow for Synthesis, Analysis, and Publication*. 4th Annual ABoVE Science Team Meeting. January 2018. Seattle, WA.
- 2017 NASA Earthdata webinar: NetCD-what? *An ecologist's guide to working with Daymet and other NetCDF-formatted data*. August 2017.
- 2017 Ecological Society of America, *A new tool for analysis and visualization of heterogeneous soil moisture data*. Portland, OR. (<https://doi.org/10.6084/m9.figshare.5287717.v1>)
- 2017 Ecological Society of America, Organized and led the *Ecology from Space: How Can NASA Remote-Sensing Data Inform Your Research?* Workshop. Portland, OR
https://daac.ornl.gov/workshops/EcologyFromSpace_No55_08102017.html
- 2017 Joint NACP & Ameriflux meeting, Organized and led *Data Management Best Practices* workshop. Bethesda, MD
- 2017 Joint NACP & Ameriflux meeting, *The North American Carbon Program Multi-scale Synthesis and Terrestrial Model Intercomparison Project Phase II: Environmental Driver Data in 2011-2100*. Poster led by Yaxing Wei. Bethesda, MD

- 2017 Joint NACP & Ameriflux meeting, *Soil Moisture Visualizer: Bringing harmony to heterogeneous soil moisture data*. Poster led by Rupesh Shrestha. Bethesda, MD
- 2016 American Geophysical Union Fall Meeting, “*Small*” data in a big data world: archiving terrestrial ecology data at ORNL DAAC. Presentation led by S. Vannan. San Francisco, CA.
- 2016 SciDataCon 2016, *Credit where credit is due: Implementing data citations at ORNL DAAC*. Denver, CO. (<https://dx.doi.org/10.6084/m9.figshare.3830733.v1>)
- 2016 NASA Earthdata webinar: *Data Management Best Practices for NASA ABoVE*. August 2016. <https://www.youtube.com/watch?v=4BO5-r3mrz4>
- 2015 American Geophysical Union Fall Meeting, *Data Management Challenges for Airborne NASA Earth Ventures Sub-Orbital Investigations* (poster). San Francisco, CA. (<https://dx.doi.org/10.6084/m9.figshare.3467489.v1>)
- 2015 Panelist for Women in Science group, *Careers Outside Academia*, University of Tennessee, Knoxville
- 2015 Departmental Seminar speaker, Ecology and Evolutionary Biology, University of Tennessee, Knoxville
- 2015 Fifth North American Carbon Program (NACP) Principal Investigator Meeting, *SoilSCAPE: A unified web portal for soil moisture* (poster). Washington, DC (<http://dx.doi.org/10.6084/m9.figshare.1301638>)
- 2015 Fifth North American Carbon Program (NACP) Principal Investigator Meeting, Workshop Instructor: *Data Management Practices for Early Career Scientists*. Washington, DC (<http://daac.ornl.gov/workshops/NACP2015.shtml>)
- 2014 Ecological Society of America, Invited speaker for *Next Generation of Methods and Techniques to Address Global Change Problems*. Sacramento, CA (<http://dx.doi.org/10.6084/m9.figshare.1187047>)
- 2014 Ecological Society of America, Invited participant in *Symposium on Island Biogeography: Recent Advances and an Emerging Synthesis*. Sacramento, CA (<http://dx.doi.org/10.6084/m9.figshare.1162889>)
- 2014 Haworth**, I. and Boyer, A.G. Island Biology Conference, Honolulu, HI. (poster)
- 2014 University of California Museum of Paleontology, Invited speaker for “*Where have all the species gone?*” *Short Course on Extinction*. Berkeley, CA.
- 2013 Society of American Archaeologists, Invited speaker for *Birds and Pacific Peoples symposium*, Honolulu, HI.
- 2013 International Biogeography Society, Invited speaker for *Island Biogeography symposium*, Miami, FL.

Teaching Experience

University of Tennessee, Knoxville, TN

- 2012 - 2013 General Ecology (BIO 250). Core biology course with lab, 4 credit hours, with enrollment of ~100 students per lecture. Provides an introduction to the science of ecology illustrated with in-class exercises and examples from the primary literature. Laboratories include field methods, statistical analysis, and culminate in a group research project and paper. Boyer was responsible for all aspects of the course, including lectures, exams, labs, and supervising graduate teaching assistants. Taught three semesters.
- Fall 2011 Graduate Seminar in Paleobiology (GEOL 640), co-instructor. Interdisciplinary discussion group on taphonomy, preservation biases, and biodiversity in the fossil record. Enrollment of 8 graduate students.

Spring 2011 Community Ecology (EEB 421). Elective 3 credit-hour course with enrollment of 25 EEB majors. Lectures covered the main ideas and history of thought in the field, with special emphasis on reading the primary literature, developing scientific writing skills, and methods of data analysis. The final project was based on field research conducted during an overnight trip to the Great Smoky Mountains National Park.

Mentoring Experience

ORNL postdoctoral fellow: Rupesh Shrestha (2016-2017)

ORNL undergraduate interns: Zoey Werbin (2017-2018), Olivia Harber (2014), Kathryn Grabenstein (2014-2015)

ORNL graduate student interns: Kari Norman (DOE CSGF 2018), Tyler Martindale (2017-18), Hannah Blanco (2017-18)

UTK graduate student committees: Melquisedec Gamba Rios (Ph.D.), Daniela Rivarola (Ph.D.), Harmony Yomai (M.S.). Past: Morgan Douglas (M.S. 2013), Lacy D. Chick (Ph.D. 2015), Rachel Fovargue (Ph.D. 2017), Jessica Welch (Ph.D. 2017)

UTK undergraduate researchers (2010-2014): Ivan Haworth, Olivia Harber, Colby Brooks, Ricki Draper, Kate DeVries, Ethan Fulwood, Ian Herrell, Cynthia Valenzuela, Jessica Welch.

Professional and Community Service

Editorial Boards: *Ecography* (2014 – 2017). *PeerJ* (2017-)

Community Leadership:

North American Carbon Program (NACP) Science Leadership Group (2017-)

National Ecological Observatory Network (NEON) data standards working group (2017-)

Organizing committee, NASA's 4th ABoVE Science Team meeting (2018)

Proposals reviewed

US Dept. of Defense, Strategic Environmental Research and Development Program (SERDP), 2017

Czech Science Foundation (GACR), Biological Sciences, 2012

American Chemical Society, Petroleum Research Fund, 2012

National Science Foundation, Division of Earth Sciences, 2010

International Biogeography Society, student travel grants, 2008 & 2012

Manuscript reviewer for *The American Naturalist*, *Biology Letters*, *Conservation Biology*, *Diversity and Distributions*, *Ecography*, *Ecological Applications*, *Ecological Informatics*, *Ecology*, *Ecology Letters*, *Evolutionary Ecology Research*, *Global Ecology and Biogeography*, *The Holocene*, *Journal of Animal Ecology*, *Journal of Biogeography*, *Nature Communications*, *Proceedings of the National Academy of Sciences USA*, *Proceedings of the Royal Society B.*, *The Wilson Journal of Ornithology*.

Member: American Ornithologists' Union, American Geophysical Union, Ecological Society of America, International Biogeography Society