Kevin Surya

Department of Mathematical Sciences
Montana State University, Bozeman, MT 59717
kevinsurya@montana.edu | suryakevin.github.io | Deep Time Biology Lab

Curriculum Vitae
January 2025

Education

2021– Ph.D. Montana State University, Statistics

2021–23 M.Sc. (en-route) Montana State University, Statistics
Thesis: *A Bayesian analysis of the genetic evolution in living fossils*

2020–21 Ph.D. Montana State University, Molecular Biosciences Program
(1-year program before acceptance into a home department)

2015–19 B.Sc. Montana State University, Directed Interdisciplinary Studies
(biology, statistics, and earth sciences)

Appointments

2021– Graduate teaching assistant
Department of Mathematical Sciences, Montana State University

2020– Graduate research assistant
Deep Time Biology Lab (PI: Chris Organ)

2020–21 Graduate research assistant
Molecular Biosciences Program, Montana State University

2020–20 Research intern/volunteer
DinoChicken Lab (PI: Dana Rashid), Montana State University

2016–19 Undergraduate research assistant
MSU Macroevolution Lab (PI: Chris Organ), Montana State University

2015–19 Undergraduate research assistant
DinoChicken Lab

2017–19 Undergraduate research assistant
Varricchio Lab (PI: David Varricchio), Montana State University

Publications

10. **Surya, K.**, and C. L. Organ. (2025). Molecular change, not time, drives phenotypic diversity. *To be submitted to Nature.*
9. Gardner, J. D., J. P. Wilson, **K. Surya**, H. M. Flora, X. Xing, and C. L. Organ. (2025). Emergent evolution of limb mechanics during major evolutionary transformations in dinosaurs. *To be submitted.*
8. Prall*, J., **K. Surya***, L. Feigin, E. Bender, A. Meade, and C. L. Organ. (2024). Predicting discrete traits in evolving systems. *In review at Nature Communications.*
   * contributed equally to the study
7. Rashid, D. J., J. R. Sheheen, T. Huey, **K. Surya**, J. B. Sanders, J. R. Horner, J. Voyich, and S. C. Chapman. (2023). Nonpathological inflammation drives the development of an avian flight adaptation. *PNAS.* Link.
6. **Surya, K.**, J. D. Gardner, and C. L. Organ. (2023). Detecting punctuated evolution in SARS-CoV-2 over the first year of the pandemic. *Frontiers in Virology*. Link.

5. Fernandes-Martins, M. C., L. M. Keller, M. Munro-Ehrlich, K. R. Zimlich, M. K. Mettler, A. M. England, R. Clare, **K. Surya**, E. L. Shock, D. R. Colman, and E. S. Boyd. (2021). Ecological dichotomies arise in microbial communities due to mixing of deep hydrothermal waters and atmospheric gas in a circumneutral hot spring. *Applied and Environmental Microbiology. Link*.
4. Nemudryi, A., A. Nemudraia, T. Wiegand, **K. Surya**, M. Büyükyörük, C. Cicha, K. Vanderwood, R. Wilkinson, and B. Wiedenheft. (2020). Temporal detection and phylogenetic assessment of SARS-CoV-2 in municipal wastewater. *Cell Reports Medicine. Link*.
3. Rashid, D. J., R. Bradley, A. M. Bailleul, **K. Surya**, H. N. Woodward, P. Wu, Y-H. Wu, D. B. Menke, S. G. Minchey, B. Parrot, S. L. Bock, C. Merzdorf, E. Narotzky, N. Burke, J. R. Horner, and S. C. Chapman. (2020). Distal spinal nerve development and divergence of avian groups. *Scientific Reports. Link*.
2. Gardner*, J. D., **K. Surya***, and C. L. Organ. (2019). Early tetrapodomorph biogeography: Controlling for fossil record bias in macroevolutionary analyses. *Comptes Rendus Palevol. Preprint. Link*.
   * contributed equally to the study
1. Rashid, D. J., **K. Surya**, L. M. Chiappe, N. R. Carroll, K. L. Garrett, B. Varghese, A. Bailleul, J. K. O'Connor, S. C. Chapman, and J. R. Horner. (2018). Avian tail ontogeny, pygostyle formation, and interpretation of juvenile Mesozoic specimens. *Scientific Reports. Link*.

Grants & Awards ($43,762)

21. Dr. William A. Stannard Awards for Excellence - Graduate Student Award for Teaching. 2024. $500.
20. Montana State University (MSU) College of Letters and Science Dean's Student Travel Fund. 2024. $899.
19. MSU Department of Mathematical Sciences Student Travel Award. 2024. $1,000.
18. MSU Department of Mathematical Sciences Outstanding Graduate Student Award. 2023.
17. MSU Office of Student Engagement Student Club Rolling Funding: Molecular Biosciences Program student club. 2021. $522.
16. MSU Graduate School Community-Building Mini-Grant. (2021). $500.
15. Molecular Biosciences Program Fellowship. (2020). $22,000++.
14. Society for the Study of Evolution (SSE)/BEACON Center for the Study of Evolution in Action Undergraduate Diversity at Evolution travel award. (2019). $250++.
13. MSU Undergraduate Scholars Program (USP) Research Grant: Which phylogenetic branch length unit better fits species' phenotypic traits: Time or genetic substitution? (2018–2019). $1,800.
12. MSU Office of Student Engagement Student Club Mass Funding: Dead Lizards Society, a paleontology journal club. (2018–2019). $1,726.
11. Sigma Xi Grants-In-Aid of Research Program: Which phylogeny better fits species' trait data: Time or molecular tree? (2017–2018). $1,000.
10. Geological Society of America (GSA) Rocky Mountain Section Travel Grant. (2017). $90.
9. MSU USP Research Grant: Which phylogeny better fits species' trait data: Time or molecular tree? (2017–2018). $1,800.
8. MSU College of Letters and Science Student Research Travel Grant. (2017). $375.
7. GSA On To The Future Travel Awards. (2017). $500++.
6. MSU USP Travel Grant: Paleohistology technique for sub-fossilized bone. (2017). $500.
5. Kenny Dye Memorial Scholarship. (2017–2018). $1,900.

4. Natural History Museum of Los Angeles Student Collections Study Award: Avian pygostyle fusion. (2017). $1,300.
3. Montana Academy of Sciences Student Research Grant: Chicken pygostyle fusion sheds light on ankylosing spondylitis pathology. (2017–2018). $700.
2. Montana IDeA Network of Biomedical Research Excellence (INBRE) Undergraduate Student Research Program: Chicken pygostyle fusion sheds light on ankylosing spondylitis pathology. (2017). $4,600.
1. MSU USP Research Grant: Pelvic sexual dimorphism in Palaeognathae (Aves: Neornithes) and its evolutionary relationship with relative egg size. (2016–2017). $1,800.

Teaching

As an instructor

2024– STAT 216 – Introduction to Statistics, MSU (x1), Eval: TBD
2021–22 M 121 – College Algebra, MSU (x2), Eval: 4.3/5

As an assistant

2023–24 STAT 412/512 – Methods for Data Analysis II, MSU (x2), Eval: 4.4/5
2022–23 STAT 216 – Introduction to Statistics, MSU (x2), Eval: 4.5/5

Software

1. **Surya, K.** (2022) `fallpaddy`: an R package for simulating, detecting, and visualizing punctuated evolution in any clades, from dinosaurs to viruses. *Link*.

Presentations

24. **Surya, K.** (2024) Montana State University (MSU) M430 – Mathematical Biology: Simulations show that how we think about large-scale evolution is likely inaccurate. *Guest Lecture.*
23. **Surya, K.**, J. D. Gardner, J. J. Borkowski, and C. L. Organ. (2024) Simulations show that how we think about large-scale evolution is likely inaccurate. MSU Department of Mathematical Sciences Applied Math Seminar.
22. **Surya, K.**, J. D. Gardner, J. J. Borkowski, and C. L. Organ. (2024) Speciation's role in evolutionary divergence is systematically underestimated in comparative studies. MSU Student Research Celebration.
21. **Surya, K.**, J. D. Gardner, J. J. Borkowski, and C. L. Organ. (2024) Speciation's role in evolutionary divergence is systematically underestimated in comparative studies. MSU Earth Sciences Colloquium.
20. **Surya, K.**, J. D. Gardner, J. J. Borkowski, and C. L. Organ. (2024) Speciation's role in evolutionary divergence is systematically underestimated in comparative studies. Perspectives on Speciation (Hybrid meeting).
19. **Surya, K.** (2023) A Bayesian analysis of the genetic evolution in living fossils. Master's en-route Thesis Defense.
18. **Surya, K.**, J. J. Borkowski, and C. L. Organ. (2022) The genomic evolution of living fossils. Montana American Statistical Association (ASA) Chapter Meeting.
17. **Surya, K.**, J. D. Gardner, and C. L. Organ. (2021) SARS-CoV-2 evolution is punctuated. Molecular Biosciences 1st-Year Fellow Presentations.

16. **Surya, K.**, and W. J. Freimuth. (2019) MSU ERTH101 – Earth System Sciences: Fossils and Evolution. *Guest Lecture.*
15. **Surya, K.**, and C. L. Organ. (2019) Molecular branch lengths fit trait evolution better than does time. Evolution Meeting.
14. Gardner, J. D., **K. Surya**, and C. L. Organ. (2019) Phylogeography of the tetrapod water-land transition. MSU Earth Sciences Colloquium.
13. **Surya, K.**, and C. L. Organ. (2019) Does trait evolution follow time or genetic substitution? National Conference of Undergraduate Research (NCUR).
12. **Surya, K.**, D. J. Rashid, and S. C. Chapman (2019) Chicken tail vertebral fusion sheds light on a human backbone disease. Montana Academy of Sciences Annual Meeting.
11. **Surya, K.**, D. J. Rashid, L. M. Chiappe, N. R. Carroll, K. L. Garrett, B. Varghese, A. Bailleul, J. K. O'Connor, S. C. Chapman, and J. R. Horner. (2018) Bird tail growth necessitates re-interpretation of Mesozoic bird fossils. MSU Earth Sciences Colloquium.
10. **Surya, K.**, and C. L. Organ. (2018) Which phylogeny better fits species' trait data: Time or molecular tree? MSU Student Research Celebration Topical Session: *Macroevolution: The Fellowship of the Tree.*
9. **Surya, K.**, and C. L. Organ. (2018) Which phylogeny better fits species' trait data: Time or molecular tree? NCUR.
8. **Surya, K.**, I. M. Brenes, J. D. Gardner, L. W. Viñola López, C. L. Organ, and D. J. Varricchio (2017) Pelvic coevolution with egg size and shape: Implications for extinct dinosaurs. Geological Society of America Annual Meeting.
7. Rashid, D. J., **K. Surya**, S. C. Chapman, L. M. Chiappe, A. M. Bailleul, and J. R. Horner (2017) Pygostyle development and its implications for the Cretaceous long- to short-tailed avian transition. Society of Vertebrate Paleontology Annual Meeting.
6. **Surya, K.**, D. J. Rashid, and S. C. Chapman (2017) Chicken pygostyle fusion sheds light on ankylosing spondylitis pathology. Montana IDeA Network of Biomedical Research Excellence (INBRE) Summer Research Poster Session.
5. **Surya, K.**, L. W. Viñola López, and E.-T. Lamm (2017) Paleohistology technique for sub-fossilized bone. International Symposium on Paleohistology.
4. **Surya, K.**, I. M. Brenes, L. W. Viñola López, J. D. Gardner, C. L. Organ, and D. J. Varricchio (2017) Pelvic sexual dimorphism in modern birds (Aves: Neornithes) and its evolutionary relationship with relative egg size. MSU Student Research Celebration.
3. **Surya, K.**, I. M. Brenes, L. W. Viñola López, J. D. Gardner, C. L. Organ, and D. J. Varricchio (2017) Pelvic sexual dimorphism in modern birds (Aves: Neornithes) and its evolutionary relationship with relative egg size. MSU Earth Sciences Colloquium.
2. **Surya, K.**, L. W. Viñola López, I. M. Brenes, J. D. Gardner, C. L. Organ, and D. J. Varricchio (2017) Pelvic sexual dimorphism in modern birds (Aves: Neornithes) and its evolutionary relationship with relative egg size. NCUR.
1. **Surya, K.** (2016) Assessment on the origins of avian active flight. MSU Earth Sciences Colloquium.

Professional Service

Panel Organizer

2021 Molecular Biosciences Career Panel: Primarily Undergraduate Institutions
2021 Molecular Biosciences Career Panel: NIH and Health/Bioinformatics Industries (moderator)

Service to Profession

- Peer co-reviewer (*n* = 7; *Biology Letters* [1], *Evolution* [1], *Journal of Evolutionary Biology* [2], *Proceedings of the Royal Society B* [2], and *Science Advances* [1])

Memberships

- Society for the Study of Evolution (2017–)
- American Statistical Association Student Chapter at MSU (2022– ; vice president 2024–)
- Society of Systematic Biologists (2017–2023)
- MSU Molecular Biosciences Program Student Committee (treasurer/general student committee member 2020–2022)
- MSU Dead Lizards Society (paleontology journal club; co-president 2017–2018)
- MSU Asian Student Interracial Association (officer 2021)
- Sigma Xi (2017–2018)
- Montana Academy of Sciences (2016–2018)
- Society of Vertebrate Paleontology (2015–2019)
- Geological Society of America (2016–2018)

Volunteer & Public Outreach

2018, 19 Montana State University (MSU) Family Science Day
2018 Montana Science Olympiad
2018 Morning Star Elementary School STEM Expo
2017 Society of Vertebrate Paleontology volunteer at the Geological Society of America Annual Meeting
2017 Museum of the Rockies (MOR) Scout's Day
2016 MOR volunteer in *MSU Catapalooza*
2016 MOR volunteer in *Adventures in the Lost World*
2016–17 MOR dinosaur educational cart and fossil preparation volunteer (212.5 hours)
2015–16 Volunteer fossil preparator for L. J. Krumenacker, Ph.D.

National and International Conferences Attended

2024 Perspectives on Speciation (Hybrid meeting)
2019, 21 Evolution Meeting
2017 Geological Society of America Annual Meeting
2017 International Symposium on Paleohistology
2016, 17 Society of Vertebrate Paleontology Annual Meeting

Workshop Attended

2020 Multiscale Microbial Dynamics Modeling Summer School (online)
2018 RevBayes Demonstration and Mini Workshop by Tracy Heath

Paleontological Field Experience

2018 Excavation, Foremost Formation, north of Rudyard, MT, USA (10 days)
2016 Excavation and prospection, Two Medicine Formation, west of Choteau, MT, USA (31 days)

Skills

- Data science and programming (R, PYTHON, GIT, BASH, SQL, and using an HPC cluster)
- Bayesian modeling (NIMBLE, STAN, JAGS, PYMC, and REVBAYES)
- Mathematical statistics (and using LATEX)
- Package development (R)
- Machine learning (*e.g.,* random forest), multivariate statistics (*e.g.,* PCA and factor analysis), nonparametric statistics (R), and biostatistics (R)
- Phylogenetic comparative methods (R, BAYESTRAITS, and LEVOLUTION)
- Multiple sequence alignment and editing (ALIVIEW, JALVIEW, MUSCLE, MAFFT, PAGAN, TRIMAL)
- Phylogenetic inference and divergence time estimation (MESQUITE, RAPIDNJ, SDM, PHYD*, TREEPL, LSD2, FASTTREE, PHYML, RAXML, IQ-TREE, MRBAYES, BEAST1, and BEAST2)
- Selection inference (HYPHY/DATAMONKEY)
- Light and fluorescence microscopy
- Histochemistry (picrosirius red, alcian blue, modified tetrachrome, von Kossa, Giemsa, hematoxylin, eosin, and toluidine blue stainings)
- Immunohistochemistry (tuj1, TUNEL assay, and sambucus nigra stainings)
- Bone demineralization with a cation exchange resin
- Dissection (embryonic and post-hatching birds)
- Paleontology field work (excavation and prospection)
- Paleontology techniques (fossil preparation, molding, and casting)
- Paleohistology techniques

References

1. **Chris Organ**
   Department of Earth Sciences
   Montana State University, Bozeman, MT, USA
   organ@montana.edu | 406 994 6920

2. **Andrew Hoegh**
   Department of Mathematical Sciences
   Montana State University, Bozeman, MT, USA
   andrew.hoegh@montana.edu | 406 994 2032

3. **John Borkowski**
   Department of Mathematical Sciences
   Montana State University, Bozeman, MT, USA
   john.borkowski@montana.edu | 406 994 4606

4. **Dana Rashid**
   Department of Microbiology and Cell Biology
   Montana State University, Bozeman, MT, USA
   danarashid5@gmail.com | 406 994 6525

5. **David Varricchio**
   Department of Earth Sciences
   Montana State University, Bozeman, MT, USA
   djv@montana.edu | 406 994 6907