

# Kevin Surya

Department of Mathematical Sciences  
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## Curriculum Vitae

February 2024

### Education

- 2021– Ph.D. Montana State University, Statistics
- 2021–23 M.Sc. (en-route) Montana State University, Statistics
- 2020–21 Ph.D. Montana State University, Molecular Biosciences Program (1-year program)
- 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)
- 2020–20 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

9. **Surya, K.**, and C. L. Organ. (2024). Molecular change, not time, drives phenotypic diversity. *To be submitted to Nature*.
8. Gardner, J. D., J. P. Wilson, **K. Surya**, H. M. Flora, X. Xing, and C. L. Organ. (2024). Emergent evolutionary processes linked dinosaur locomotion with ecological diversification and speciation. *To be submitted to Nature*.
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 (\$41,363)

18. Montana State University (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

### Teaching Assistantships

- 2023– STAT 412/512 – Methods for Data Analysis II, MSU (x1), Eval: 4.4/5  
2022–23 STAT 216 – Introduction to Statistics, MSU (x2), Eval: 4.5/5  
2021–22 M 121 – College Algebra, MSU (x2), Eval: 4.3/5

### Software

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

### Presentations

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 1<sup>st</sup>-Year Fellow Presentations.
16. **Surya, K.**, and W. J. Freimuth. (2019) Montana State University (MSU) EARTH101 – 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* [1], and *Science Advances* [2])

### Memberships

- Society for the Study of Evolution
- American Statistical Association Student Chapter at MSU (2022–)
- 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

### **Conferences Attended**

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 (R, NIMBLE, STAN, JAGS, PYTHON, and REVBayes)
- Package development (R)
- Machine learning (e.g., random forest), multivariate statistics (e.g., PCA), 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)
- Probability and mathematical statistics (and using LATEX)
- 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  
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2. **John Borkowski**

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Montana State University, Bozeman, MT, USA  
[john.borkowski@montana.edu](mailto:john.borkowski@montana.edu) | 406 994 4606

3. **Andrew Hoegh**

Department of Mathematical Sciences  
Montana State University, Bozeman, MT, USA  
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4. **Dana Rashid**

Department of Microbiology and Immunology  
Montana State University, Bozeman, MT, USA  
[danarashid5@gmail.com](mailto:danarashid5@gmail.com) | 406 994 6525

5. **David Varricchio**

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