Department of Biology

University of Missouri - St. Louis

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**Nathan Muchhala**

**EDUCATION**

**Ph.D., Biology** (5/07), University of Miami, Coral Gables, FL (with Dr. Theodore Fleming)

**B.A., Biology** (5/98), Earlham College, Richmond, IN (college and departmental honors)

**PROFESSIONAL EXPERIENCE**

Associate Professor (2019-Present), Department of Biology, University of Missouri – St. Louis, St. Louis, MO

Co-Director of the Whitney Harris World Ecology Center (2022-Present), University of Missouri – St. Louis, St. Louis, MO

Assistant Professor (2013-2019), Department of Biology, University of Missouri – St. Louis, St. Louis, MO

Postdoctoral Research Fellow (2011-2013), School of Biological Sciences, University of Nebraska, Lincoln, NE (with Dr. Stacey Smith)

Postdoctoral Research Fellow (2007-2010), Dept. of Ecology and Evolutionary Biology, University of Toronto, Toronto, ON (with Dr. James Thomson)

**GRANTS & FELLOWSHIPS**

* NSF International Research Experiences for Students (IRES) Grant (Co-PI), “Understanding pollinator-mediated diversification in Neotropical plants”; M. Carlsen, N. Muchhala, Julian Aguirre-Santoro, A. Zuluaga (Submitted)
* Czech-US INTER-ACTION Grant (Co-PI), “Pollinators Across the Globe: Unraveling patterns in plant-pollinator interactions Through Phylogeny and Geography”; J. Hadrava, M. Mikát, N. Muchhala, and T. Herben (Submitted)
* St. Louis Zoo Field Research for Conservation Grant (PI), “Plant-animal interactions and gene flow in Neotropical cloud forests”; N. Muchhala, C. Edwards **$8,920** (2023-24)
* UMSL Mid-Career Research Grant (PI), “Plant-animal interactions and gene movement in Neotropical cloud forests”; N. Muchhala **$24,690** (2023-24)
* US Department of Agriculture, National Institute of Food and Agriculture (Co-PI), “Maximizing Pollination Services in Urban Orchards”; A. Dunlap, G. Camilo, P. Hoch, K. Krakos, N. Miller-Struttmann, N. Muchhala, E. Spevak; **$633,000** (2021-2025)
* Living Earth Collaborative Grant (Co-PI), “Origin and diversification of the flowering plants of the Gulf of Guinea Archipelago”; P. Barberá, J. Garcia-Porta, N. Muchhala, T. Stévart, M. Landis; **$29,883** (2021-22)
* National Council for Scientific and Technological Development, Brazil (PI), Visiting Professor Fellowship (Call No. 08/2019); **$11,283** (2020; Declined)
* Living Earth Collaborative Grant (Co-PI), “Testing the role that biotic interactions play in shaping elevational-diversity gradients: An ecological metabolomics approach”; J. Myers, J.S. Tello, N. Muchhala, B.E. Sedio; **$29,010** (2020-21)
* Living Earth Collaborative Grant (Co-PI), “Floral scent differentiation as a method for pollinator partitioning in *Anthurium* (Araceae)”; M. Carlsen, N. Muchhala, G. Camilo, E. Spevak; **$28,885** (2019-20)
* NSF Full Proposal (PI), “Quantifying the roles of pollination and post-pollination barriers in angiosperm speciation: a case study of the diverse Neotropical genus *Burmeistera* (Campanulaceae)”; N. Muchhala; DEB–Phylogenetic Systematics Panel; **$731,385** (2018-24)
* UMSL ORA Research Award (PI), “Interspecific pollen transfer and gene flow during the rapid diversification of bat‐pollinated *Burmeistera* (Campanulaceae)”; **$10,900** (2018-19)
* UMSL ORA Research Award (PI), “Is speciation faster in the tropics? Effects of seasonality and mutualists on plant genetic structure”; **$9,174** (2016-17)
* St. Louis Zoo Field Research for Conservation Grant (Co-PI), “From bat to bird: Investigating a potential case of sympatric speciation via pollinator shift in the Andes”; **$10,000** (2016)
* UM Research Board Grant (PI), “Speciation in *Burmeistera*”; **$50,000** (2015)
* University of Nebraska Program of Excellence Postdoctoral Fellowship (2012-13)
* Prometeo Fellowship for Visiting Scholars to Ecuador; **$36,000** (2012; Declined)
* Encyclopedia of Life Rubenstein Fellowship; **$24,000** (2012)
* Fulbright Scholar Grant; **$12,000** (2010)
* National Geographic Society Grant (PI), “Coevolution in an extremely specialized bat-flower mutualism: exploring the geographic mosaic”; **$22,577** (2010)
* University of Toronto Departmental Postdoctoral Fellowship (2007-09)
* Bat Conservation International Postdoctoral Grant; **$1,000** (2007)
* National Science Foundation Graduate Research Fellowship (2002-05)
* Curtis Scholarship, University of Miami; **$500** (2004)
* Bat Conservation International Student Grant; **$2,524** (2003)
* Curtis Scholarship, University of Miami; **$500** (2002)
* Organization for Tropical Studies Post-Course Award; **$500** (2002)
* Maytag Fellowship (2005-07; 2001)
* Fulbright Fellowship (1999-2000)

**PUBLICATIONS** (*3079 total citations, h-Index 26, i10-Index 39*)

66. Alvestegui, B., J.S. Tello, and N. Muchhala. (In review). Trees with zygomorphic flowers occur at lower abundances in megadiverse communities. *Ecology*

65. Ashokan, A., J. Bagley, and N. Muchhala. (In review). Climbing higher: exploring Northern Andean origin, introgression and non-floral trait evolution in a rapid, recent angiosperm radiation. *Journal of Biogeography*

64. Ashokan, A., A. Zuluaga, and N. Muchhala. (In review). An unusual new ropy-stemmed species of *Burmeistera* from the Western Cordillera of the Colombian Andes. *Phytotaxa*

63. Gamba, D., R. Maguiña-Conde, C. Calderón-Acevedo, S. Burneo, and N. Muchhala. (In review). Nectar drinking efficiency in lonchophylline and glossophagine bats: Are ‘straw-like’ or ‘mop-like’ tongues better? *Journal of Mammalogy*

62. Hendersen, D., B.E. Sedio, J.S. Tello, L. Cayola, A. Fuentes, B. Alvestegui, N. Muchhala, and J. Myers. (In review). Testing the role of biotic interactions in shaping elevational diversity gradients: An ecological metabolomics approach. *Ecology*

61. Lascher-Posner, A., C. Calderón, R. Maguiña, D. Gamba, and N. Muchhala. (In review). Pollen carryover curves for three species of nectar-feeding bats. *Biotropica*

60. Gamba, D. and N. Muchhala. (In review). A review of fine-scale genetic structure in plants shows the importance of growth form, pollinators, and latitudinal region. *New Phytologist*

59. Muchhala, N., J. Moreira, and A. Zuluaga. (2024). Putting yourself out there: Why well-exposed flowers are an adaptation for bat pollination. *New Phytologist* 244:1137–1142

58. Barreto, E., M.A. Boehm, E. Ogutcen, S. Abrahamczyk, M. Kessler, J. Bascompte, A.S. Dellinger, C. Bello, D. M. Dehling, F. Duchenne, M. Kaehler, L.P. Lagomarsino, L. Lohmann, M. Maglianesi, H. Morlon, N. Muchhala, J.F. Ornelas, M. Perret, N.R. Salinas, S.D. Smith, J.C. Vamosi, I.G. Varassin & C.H. Graham. 2024. Macroevolution of the plant-hummingbird pollination system. *Biological Reviews* doi: 10.1111/brv.13094

57. Muchhala, N., R. Maguiña, A. Caiza, and D. Proaño. 2024. Bat-flower trait matching: Extreme phenotypic specialization affects diet choices but not diet breadth. *Ecosphere* 15 (4), e4823

56. Mashburn, B. A. Trigueros, C. Ulloa Ulloa, and N. Muchhala. 2024. Morphometrics in the recurved corolla clade of *Burmeistera* (Campanulaceae) clarifies species limits and identifies a new species. *Systematic Botany* 49(1):128-153

55. Yu, R. and N. Muchhala. 2024. Foraging dependent ecosystem services. Chp 15 in B. Fenton and D. Russo (eds), *A Natural History of Bat Foraging.* Academic Press, Elsevier.

54. Opedal, O. H., R. Pérez-Barrales, V. L. G. Brito, N. Muchhala and A. Dellinger. 2023. Pollen as the link between floral phenotype and fitness. *American Journal of Botany* 110 (6), e16200

53. Moreira-Hernández, J., H. Ghai, N. Terzich, R. Zambrano-Cevallos, N. Oleas and N. Muchhala. 2023. Limited reproductive interference despite high rates of heterospecific pollen transfer among co-occurring bat-pollinated *Burmeistera*. *American Journal of Botany,* 110 (6), e16199

52. Gamba, D. and N. Muchhala. 2023. Pollinator type strongly impacts gene flow within and among plant populations for six Neotropical species. *Ecology*. 104 (1), e3845

51. Lagomarsino, L., L. Frankel, S. Uribe-Convers, A. Antonelli and N. Muchhala. 2022. Increased resolution in the face of conflict: phylogenomics of the Neotropical bellflowers (Campanulaceae: Lobelioideae), a rapid plant radiation. *Annals of Botany* 129 (6), 723-736

50. Calderón-Acevedo, C., J. Bagley, and N. Muchhala. 2022. Genome-wide ultraconserved elements resolve phylogenetic relationships and biogeographic history among Neotropical leaf-nosed bats in the genus *Anoura* (Phyllostomidae). *Molecular Phylogenetics and Evolution* **167** (2022) 107356.

49. Moreira-Hernández, J., C. Calderón-Acevedo, and N. Muchhala. 2021. Fur, wings, and flowers: development and progress on nectarivorous bat research in the last 50 years. Chp 9 (pp. 135-149) in Lim B.K. et al. (eds), *50 Years of Bat Research.* Springer, Cham.

48. Muchhala, N., and B. Mashburn. 2021. Three new species of *Burmeistera* (Campanulaceae) endemic to Ecuador. *Phytotaxa* **490**(3):253-262.

47. Mashburn, B., C. Ulloa Ulloa, and N. Muchhala. 2021. Six new species of *Burmeistera* (Campanulaceae) from Ecuador. *Novon* **29**:51-69.

46. Calderón-Acevedo, C., M. E. Rodríguez-Posada and N. Muchhala. 2021. Morphology and genetics concur that *Anoura carishina* is a synonym of *Anoura latidens* (Chiroptera, Glossophaginae). *Mammalia* **85**(5): 471–481.

45. Calderón-Acevedo, C., and N. Muchhala. 2020. First report of the Broad-toothed Tailless Bat, *Anoura latidens* Handley 1984 (Chiroptera, Phyllostomidae) in Bolivia. *Checklist* **16** (6): 1545–1550.

44. Gamba, D., and N. Muchhala. 2020. Global patterns of population genetic differentiation in seed plants. *Molecular Ecology* **29**:3413-3428.

43. Mashburn, B., A. J. Pérez, C. Persson, C. Zapata, D. Cevallos, and N. Muchhala. 2020. *Burmeistera quimiensis* (Lobelioideae, Campanulaceae): A new species from the Cordillera del Cóndor range in southeast Ecuador. *Phytotaxa* **433**(1), 67-74.

42. Armbruster, S., and N. Muchhala. 2020. Floral reorientation: the restoration of pollination accuracy after accidents. *New Phytologist* **227**: 232–243

41. Muchhala, N. and M. Tschapka. 2020. The ecology and evolution of nectar-feeding phyllostomids. Chp. 16 in T. H. Fleming, L. Davalos, and M. Mello (eds.) *Phyllostomid Bats, a Unique Mammalian Radiation*. University of Chicago Press.

40. Bagley, J.C., S. Uribe-Convers, M. M. Carlsen, and N. Muchhala. 2020. Utility of targeted sequence capture for phylogenomics in rapid, recent angiosperm radiations: Neotropical *Burmeistera* bellflowers as a case study. *Molecular Phylogenetics and Evolution*, 106769.

39. Moreira-Hernández, J. and N. Muchhala. 2019. Importance of pollinator-mediated interspecific pollen transfer for angiosperm evolution. *Annual Review of Ecology, Evolution, and Systematics* **50**:191-217

38. Muchhala, N. 2019. Quantum dots shed light on angiosperm speciation. *New Phytologist* **224** (3), 1005-1008

37. Moreira- Hernández, J., N. Terzich, R. Zambrano-Cevallos, N. H. Oleas, and N. Muchhala. 2019. Differential tolerance to heterospecific pollen deposition in two sympatric species of *Burmeistera* (Campanulaceae: Lobelioideae). *International Journal of Plant Systematics* **180** (9), 987-995

36. Lagomarsino, L. and N. Muchhala. 2019. A gradient of pollination specialization in three species of Bolivian *Centropogon*. *American Journal of Botany* **106**(5):1-10

35. Vallejo, A. F., A. J. Pérez, D. Cevallos, and N. Muchhala. 2018. New species of *Burmeistera* (Campanulaceae: Lobelioideae) from Ecuador. *Phytotaxa* **362**(3):263-270

34. Calderón-Acevedo, C., and N. Muchhala. 2018. Identification and diagnosis of *Anoura* *fistulata* with remarks on its presumed presence in Bolivia. *Journal of Mammalogy* **99**(1):131-137

33. Lagomarsino, L., B. Forrestel, N. Muchhala, and C. C. Davis. 2017. Repeated evolution of vertebrate pollination syndromes in a recently diverged Andean plant clade. *Evolution* **71**(8):1970-1985

32. Maguiña, R., and N. Muchhala. 2017. Do artificial nectar feeders affect bat-plant interactions in an Ecuadorian cloud forest? *Biotropica* **49**(5):586–592

31. Gamba, D., R. Maguiña, C. Calderón-Acevedo, K. Torres, and N. Muchhala. 2017. Seed dispersal for the unusual inflated berries of *Burmeistera* (Campanulaceae). *Neotropical Biodiversity* **3**(1):10-17.

30. Uribe-Convers, S., M. M. Carlsen, L. P. Lagomarsino, and N. Muchhala. 2017. Phylogenetic relationships of *Burmeistera* (Campanulaceae: Lobelioideae): Combining whole plastome with targeted loci data in a recent radiation. *Molecular Phylogenetics and Evolution* **107**(2017):551-563

29. Lagomarsino, L. P., D. Santamaría Aguilar, and N. Muchhala. 2015. Two new species of *Burmeistera* (Campanulaceae: Lobelioideae) from the Cordillera de Talamanca of Costa Rica and Panama, with a key to the Central American species. *Systematic Botany* **40**(3):914-921.

28. Muchhala, N., and D. Serrano. 2015. The complexity of background clutter affects nectar bat use of flower odor and shape cues. *PlosONE* **10**(10):e0136657.

27. Muchhala, N., and A. Pérez. 2015. *Burmeistera zamorensis* (Campanulaceae: Lobelioideae), a new species from southern Ecuador. *Novon* **24**(1), 36-38.

26. Clark J. L., L. Clavijo, and Muchhala, N. 2015. Convergence of anti-bee pollination mechanisms in the Neotropical plant genus *Drymonia* (Gesneriaceae). *Evolutionary Ecology* **29**(3), 355-377.

25. Lagomarsino, L. P., A. Antonelli, N. Muchhala, S. Mathews, and C. C. Davis. 2014. Phylogeny, classification, and fruit evolution of the species-rich Neotropical bellflowers (Campanulaceae: Lobelioideae). *American Journal of Botany* **101**(12): 2097-2112.

24. Muchhala, N., S. Johnsen, and S. D. Smith. 2014. Competition for hummingbird pollination shapes flower color variation in Andean Solanaceae. *Evolution* **68**(8): 2275–2286.

23. Muchhala, N., and J. D. Thomson. 2012. Interspecific competition in pollination systems: costs to male fitness via pollen misplacement. *Functional Ecology* **26**(2):476-482.

22. Jorgensen, P.M., N. Muchhala, and J.M. MacDougal. 2012. *Passiflora unipetala*, a new bat-pollinated species of *Passiflora* supersection *Tacsonia*. *Novon* **22**(2):174-179.

21. Moreno, M.P. and N. Muchhala. 2011. Campanulaceae. In: R. Valencia, N. Pitman, S. León-Yánez, and P.M. Jørgensen (eds.). *Libro rojo de las plantas endémicas del Ecuador, segunda edición.* Herbario QCA, Pontificia U. Católica del Ecuador, Quito.

20. Garibaldi, L.A., N. Muchhala, I. Motzke, L. Bravo-Monroy, R. Olschewski, and A.M. Klein. 2011. Services from plant-pollinator interactions in the Neotropics. Pp. 119-139 in B. Rapidel, F. DeClerck, J.F. Le Coq, J. Beer (eds.), *Ecosystem Services from Agriculture and Agroforestry: Measurement and Payment.* Earthscan, London, UK.

19. Muchhala, N., Z. Brown, W.S. Armbruster, and M.D. Potts. 2010. Competition drives specialization in pollination systems through costs to male fitness. *American Naturalist* **176**(6):732-743.

18. Muchhala, N., and J.D. Thomson. 2010. Fur versus feathers: Pollen delivery by bats and hummingbirds, and consequences for pollen production. *American Naturalist* **175**:717-726

\* Featured in Science Podcast and ScienceNOW

17. Muchhala, N., and J.D. Thomson. 2009. Going to great lengths: selection for long corolla tubes in an extremely specialized bat-flower mutualism. *Proceedings of the Royal Society B* **276**:2147-2152

 \* Featured in Nature's Research Highlights, *Nature* **458**:388

16. Muchhala, N., A. Caiza, J.C. Vizuete, and J.D. Thomson. 2009. A generalized pollination system in the tropics: Bats, birds, and *Aphelandra acanthus*. *Annals of Botany* **103**(9):1481-1487

15. Armbruster, W.S. and N. Muchhala. 2009. Associations between floral specialization and species diversity: Cause, effect, or correlation? *Evolutionary Ecology* **23**:159-179

14. Knox, E.B., A.M. Muasya, and N. Muchhala. 2008. The predominantly South American clade of Lobeliaceae. *Systematic Botany* **33**(2):462-468.

13. Muchhala, N. 2008. Functional significance of interspecific variation in *Burmeistera* flower morphology: Evidence from nectar bat captures. *Biotropica* **40**(3): 332–337

12. Fleming, T.H. and N. Muchhala. 2008. Nectar-feeding bird and bat niches in two worlds: pantropical comparisons of vertebrate pollination systems. *Journal of Biogeography* **35**(5): 764–780

11. Muchhala, N. and M.D. Potts. 2007. Character displacement among bat-pollinated flowers of the genus *Burmeistera*: analysis of mechanism, process, and pattern. *Proceedings of the Royal Society B* **274**:2731-2737.

\* Featured in Science Daily News

10. Muchhala, N. 2007. Adaptive tradeoff in floral morphology mediates specialization for flowers pollinated by bats and hummingbirds. *American Naturalist* **169**:494-504.

 \* Featured in Science Daily News and LiveScience

9. Muchhala, N. 2006. Nectar bat stows huge tongue in its rib cage. *Nature* **444**:701-702.

\* Featured in The New York Times, Quirks & Quarks, New Scientist, Scientific American, and various other news outlets

8. Muchhala, N. 2006. The pollination biology of *Burmeistera* (Campanulaceae): Specialization and syndromes. *American Journal of Botany* **93**(8):1081-1089.

7. Muchhala, N., P. Mena V., and L. Albuja V. 2005. A new species of *Anoura* (Chiroptera: Phyllostomidae) from the Ecuadorian Andes. *Journal of Mammalogy* **86**:457-461.

6. Fleming, T.H., N. Muchhala, and P. Ornelas. 2005. New world nectar-feeding vertebrates: Community patterns and processes. Pp. 161-182 in V. Sanchez-Cordero and R. A. Medellín (eds.) *Contribuciones Mastozoológicos en Homenaje a Bernardo Villa-R. Instituto de Biología e Instituto de Ecología*, UNAM, Mexico City.

5. Muchhala, N. and T. G. Lammers. 2005. A new species of *Burmeistera* (Campanulaceae) from Ecuador. *Novon* **15**(1):176-179.

4. Muchhala, N. and T.A. Munroe. 2004. A new species of *Soleichthys* (Soleidae: Pleuronectiformes) from tropical seas off northern Australia. *Ichthyological Research* **51**:57-62.

3. Muchhala, N. 2003. Exploring the boundary between pollination syndromes: Bats and hummingbirds as pollinators of *Burmeistera cyclostigmata* and *B. tenuiflora*. *Oecologia* **134**:373-380.

2. Cramer, J. M., M. L. Cloud, N. Muchhala, A. E. Ware, B. H. Smith, and G. B. Williamson. 2003. A test of the bicolored fruit display hypothesis: Berry removal with artificial fruit flags. *Journal of the Torrey Botanical Society* **130**(1):30–33.

1. Muchhala, N. and P.J. Jarrin-V. 2002. Flower visitation by bats in cloud forests of western Ecuador. *Biotropica* **34**:387-395.

**TEACHING EXPERIENCE**

Instructor, *General Ecology*, UMSL, St. Louis, MO (2013-23, 2024)

Instructor, *Immense World (Graduate Seminar)*, UMSL, St. Louis, MO (2023)

Instructor, *Advanced Evolution*, UMSL, St. Louis, MO (2015-23, biennially)

Instructor, *Theory of Systematics*, UMSL, St. Louis, MO (2020 & 2022)

Instructor, *Tangled Tree (Graduate Seminar)*, UMSL, St. Louis, MO (2022)

Instructor, *Genetics & Archaeology (Senior Seminar)*, UMSL, St. Louis, MO (2019 & 2021)

Instructor, *Pollination in Agricultural & Urban Settings (Graduate Seminar)*, UMSL, St. Louis, MO (2021)

Instructor, *Introduction to Graduate Research*, UMSL, St. Louis, MO (2019 & 2020)

Instructor, *Introgression (Graduate Seminar)*, UMSL, St. Louis, MO (2020)

Instructor, *Speciation (Graduate Seminar)*, UMSL, St. Louis, MO (2018)

Instructor, *Ethical Issues in Biology*, UMSL, St. Louis, MO (2018)

Faculty Resource Person, *Tropical Biology*, Organization for Tropical Studies, Las Cruces, Costa Rica (June 22-29, 2017)

Faculty Resource Person, *Tropical Biology*, Organization for Tropical Studies, Cabo Blanco, Costa Rica (June 16-22, 2015)

Instructor, *Senior Seminar on Plant-Animal Interactions*, UMSL, St. Louis, MO (2015)

Guest Lecturer, *Introductory Biology* (BIOL1821), UMSL, St. Louis, MO (2015)

Guest Lecturer, *Phylogenetic Biology*, University of Nebraska, Lincoln, NE (2013)

Instructor, *Scientific Writing*, University of Nebraska, Lincoln, NE (2012)

Guest Lecturer, *Phylogenetics*, University of Nebraska, Lincoln, NE (2012)

Instructor, *Speciation*, University of Nebraska, Lincoln, NE (2011)

Guest Lecturer, *Ecology and Evolution*, University of Nebraska, Lincoln, NE (2011)

Guest Lecturer, *Tropical Field Research*, Truman State University, Kirksville, MO (2010)

Guest Lecturer, *Animal Behavior*, Pontificia Univ. Catolica del Ecuador, Quito (2010)

Guest Lecturer, *Introductory Biology*, University of Miami, Miami, Fl (2005)

Teaching Assistant, *Biodiversity*, University of Miami, Miami, FL (2000-01)

Teaching Assistant, *Evolution*, Earlham College, Richmond, IN (1997-98)

Teaching Assistant, *Ecological Biology*, Earlham College, Richmond, IN (1996-97)

**MENTORING EXPERIENCE**

 **Advisor:**

* Alejandra Serna (UMSL), PhD (2024-Present)
* Lindsey Dennison (UMSL), MS (2023-Present)
* Raj Prasai (UMSL), PhD (2022-Present)
* Ajith Ashokan (UMSL), Postdoctoral Researcher (2022-2024)
* Belén Alvestegui (UMSL; co-advised with Sebastian Tello, MOBOT), PhD (2021-Present); MS 2021: “Zygomorphic flowers may reduce extinction rates by allowing angiosperms to occur in low abundances”
* Giulia De Gennaro (UMSL; co-advised with Monica Carlsen, MOBOT), PhD (2020-Present)
* Sebastian Forward (UMSL), non-thesis MS (2024)
* Jordan Hathaway (UMSL), MS 2023: “Identifying the drivers of pollen limitation in apples (*Malus domestica*) within the urban orchards of St. Louis, MO”
* Binoshi Hettihawa (UMSL; co-advised with Christy Edwards, MOBOT), MS 2023: “Phylogeny and taxonomy of genus *Physaria* in North America”
* Rieka Yu (UMSL), PhD 2022: “Assessing threats to plant populations: Linking pollinator differences to patterns of plant fitness and population genetics”
* Daniel Tarazona-Ocana (UMSL; co-advised with Monica Carlsen, MOBOT), MS 2022: “Taxonomic revision and morphometric analysis of selected *Anthurium* species from Bolivia and Peru”
* Shawn Kelley (UMSL; co-advised with James Miller, MOBOT), MS 2022: “*Trilepisium* (Moraceae): Four new species from Madagascar”
* Juan Moreira-Hernández (UMSL), PhD 2022: “Interspecific pollen transfer, gene flow, and speciation in bat-pollinated *Burmeistera* (Campanulaceae: Lobelioideae)”
* Alexander Lascher-Posner (UMSL), MS 2021: “The influence of pollinator behavior on patterns of pollen dispersal and its implications for floral evolution”
* Justin Bagley (UMSL), Postdoctoral Researcher (2018-2020)
* Diana Gamba (UMSL), PhD 2020: “Investigating drivers of genetic structure in plants: Global, regional and local scales”
* Brock Mashburn (UMSL; co-advised with Carmen Ulloa, MOBOT), MS 2019: “A taxonomic revision of the genus *Burmeistera* in Ecuador”
* Serena Achá (UMSL; co-advised with Christy Edwards, MOBOT), PhD 2019: “Vines in the Neotropics: Phylogenomics, biogeography and systematics in passion flowers (*Passiflora* subgenus *Decaloba* section *Decaloba*)”
* Camilo Andrés Calderón-Acevedo (UMSL), PhD 2019: “Taxonomy, species limits, and phylogenetic relationships of *Anoura* Gray 1838 (Chiroptera: Phyllostomidae)”
* Simon Uribe-Convers (UMSL), Postdoctoral Researcher (2015-2017)
* Laura Lagomarsino (UMSL), Postdoctoral Researcher (2015-2017)
* Mayra Ninazunta (UMSL), non-thesis MS (2017)
* Rossana Maguiña (UMSL), MS 2016: “Nectar bats and their flowers across cloud forests of Ecuador and the effect of artificial nectar feeders”
* Mónica Carlsen (UMSL), Postdoctoral Researcher (2014-2015)
* Juan Carlos Vizuete (U. Central, Ecuador), MS 2011: “Influence of aspects of bat ecology on the richness and abundance of ectoparasites (*Diptera*) in Wisui, Ecuador”
* Guillermo Javier Gilbert (U. de Guayaquil, Ecuador), Licenciatura 2011: “Learning, identification, and discrimination by nectar bats”
* Diana Serrano (Pontificia U. de Ecuador), Licenciatura 2011: “Use of vision and scent in flower foraging by nectar bats”
* Juan Carlos Vizuete (U. Central, Ecuador), Licenciatura 2008: “Seed dispersal by fruits bats of the genus *Sturnira*”
* Angelica Caiza (U. Central, Ecuador), Licenciatura 2007: “Feeding ecology of *Anoura* and their role as pollinators in cloud forests in eastern and western Ecuador”

 **Committee Member:**

* Soren Johnson (Tobler Lab, UMSL), PhD (2024-Present)
* Kristen Rosamond (Parker Lab, UMSL), PhD (2023-Present)
* John Bender (Parker Lab, UMSL), PhD (2023-Present)
* George Todd (Dunlap Lab, UMSL), MS (2023-Present)
* Becky Hansis-O’Neill (Dunlap Lab, UMSL), PhD (2022-Present)
* Taiwo Iromini (Inglis Lab, UMSL), MS (2022-Present)
* Jeremy Howard (Dunlap Lab, UMSL), PhD (2022-Present)
* Emily Beahm (Dunlap Lab, UMSL), MS (2022-Present)
* Pedro Juárez (Kay Lab, UC Santa Cruz), PhD (2022-Present)
* Andrea Trigueros (Parker Lab, UMSL), PhD (2021-Present)
* Emma Young (Ricklefs Lab, UMSL), PhD (2014-Present)
* Avery Baker (Dunlap Lab, UMSL), MS (2022): “The effects of floral and social information on bumblebee forager learning and memory”
* Eva Colberg (Marquis Lab, UMSL), PhD (2022): “The effects of prescribed fire on ant-mediated seed dispersal in Missouri”
* Yingtong (Amanda) Wu (Ricklefs Lab, UMSL), PhD (2022): “The ecology and evolution of species rarity in oaks (*Quercus* spp.)”
* Patrick Ross (Parker Lab, UMSL), MS 2022: “Survey of the threatened rainforest corridor protected area COMATSA and Marojejy National Park, Madagascar”
* Rachel Brant (Dunlap Lab, UMSL), PhD 2022: “Bee brains: Dissecting pollinator behavior and the importance of plasticity in the face of changing environments”
* Estefania Fernandez (Marquis Lab, UMSL), PhD 2022: “Effects of forest restoration on the recovery of dead wood, associated arthropods, and insect-mediated wood decomposition”
* Andreia Figueiredo (Dunlap Lab, UMSL), PhD 2021: “Cognitive Ecology of Color Vision in Orchid Bees”
* Matthew Austin (Dunlap Lab, UMSL), PhD 2020: “The role of plasticity in bumble bee responses to environmental variability”
* Isabel Loza (Ricklefs Lab, UMSL), PhD 2019: “Regional and historical influences on the spatial distribution of Neotropical trees”
* Meghann Humphries (Ricklefs Lab, UMSL), PhD 2019: “Phylogeographic relationships of *Coereba flaveola* and their malaria parasites”
* Rani Asmarayani (Stevens Lab, UMSL), PhD 2018: “Systematics of Malesian-Pacific *Piper* (Piperaceae)”
* Samoa Asigua (Parker Lab, UMSL), PhD 2018: “The ecology and feeding behavior of mosquitoes in the Galapagos Islands”
* Galen Priest (Marquis Lab, UMSL), PhD 2018: “The ecology of nest cavity use by arboreal ants in the Brazilian Cerrado: resource availability, nest modification, and trophic interactions”
* Justen Zweck (Bernhardt Lab, Saint Louis U.), PhD 2017: “The evolutionary ecology of pollination systems in papilinoid vs non-papilinoid legumes (Fabaceae)”
* Priya Maharaj (Bourne Lab, UMSL), PhD 2016: “Color-mediated foraging by pollinators: A comparative study of two passionflower butterflies at *Lantana camara*”
* Ben Abts (Dunlap Lab, UMSL), MS 2016: “Forgetting and the value of social information”
* Leticia Soares (Ricklefs Lab, UMSL), PhD 2016: “Historical biogeography, spatial distribution, and within-host interactions of avian haemosporidian parasites (Apicomplexa, Haemosporida)”
* Haydee Hernandez (Marquis Lab, UMSL), MS 2015: “The role of herbivores and soils as limiting factors in *Piper*’s distribution in a tropical rain forest”
* Cassandra Lynn Coleman (Clark Lab, U. of Alabama), MS 2012: “A phylogeny and study of pollinator shifts and floral traits in the Neotropical genus *Gasteranthus* (Gesneriaceae)”

 **External Reviewer:**

* Allison Muñoz Castillo (Universidad del Valle, Colombia), MS 2024: “Redes de interacción plant-polinizador mediadas por fragancias florales en un ensamblaje de Araceas en un bosque andino de Colombia”
* Ethan Newman (U. of Stellenbosch, South Africa), PhD 2017: “The convergence and divergence of floral traits are driven by the heterogeneity of pollinator and plant communities”
* Marinus de Jager (U. of Stellenbosch, South Africa), PhD 2013: “The role of pollinators in generating and maintaining floral polymorphism: phylogeographic and behavioral aspects”

**HONORS & AWARDS**

* UMSL Co-Investigator of the Year Award (2022, with Dr. Aimee Dunlap)
* Named honorary member of the UMSL Chapter of the Golden Key International Honor Society (2017)
* SSE Student Travel Award, Evolution Meeting (2007)
* Best Graduate Student Paper, University of Miami (2007)
* Best Student Talk (Lubee Prize), North American Symposium on Bat Research (2006)
* SBDN Student Travel Award, North American Symposium on Bat Research (2006)
* Best Student Talk (Gentry Award), Association for Tropical Biology (2004)
* Best Student Talk (Lubee Prize), North American Symposium on Bat Research (2000)
* National Merit Scholar (1994-1998)

**PRESENTATIONS**

 **Scientific Meetings**

* North American Symposium on Bat Research, Annual Meetings (2024, 2019, 2015, 2014, 2013, 2012, 2008, 2006, 2000)
* Congreso Latinoamericano y del Caribe de Murciélagos (2024)
	+ Invited as Keynote Speaker
* International Botanical Conference, Madrid, Spain (2024)
* Congreso Internacional de Ciencias Biológicas, Santa Rosa de Cabal, Colombia (2023)
	+ Invited as Keynote Speaker
* Association for Tropical Biology & Conservation, Annual Meetings (2023, 2013, 2007, 2004, 2002)
	+ Invited as Keynote Speaker (2023)
	+ Co-organized symposium: “Bats and hummingbirds as pollinators: from ecological differences to evolutionary consequences” L. Lopes, N. Muchhala, S. Buzato (2013)
* Scandinavian Association for Pollination Ecology (SCAPE) Meeting, (2022, 2020)
	+ Invited as Keynote Speaker (2022)
* Botany Meeting (2022, 2020, 2019)
	+ Co-organized symposium: "Ecological factors that drive patterns of population genetic structure in plants" D. Gamba and N. Muchhala (2019)
* American Society of Naturalists Conference, Pacific Grove, CA (2018)
* International Botanical Conference, Shenzhen, China (2017)
* Society for the Study of Evolution, Annual Meetings (2015, 2012, 2011, 2008, 2006)
* Congreso Latinoamericano de Murcielagos (2014)
* International Bat Research Conference (2016, 2013)
	+ Co-organized symposium: "The ecology and evolution of the mutualism between nectar bats and bat-pollinated flowers" N. Muchhala and M. Holderied (2013)
* Congreso Ecuatoriano de Mastozoología, Puyo, Ecuador (2013)
* Ecological Society of America, Annual Meetings (2009, 2008, 2006)
* American Society of Mammalogists Meeting, Amherst, Mass. (2006)
* Jornadas Ecuatorianas de Biología, Annual Meetings, Ecuador (2004, 2003)
* Congreso Ecuatoriano de Botánica, Loja, Ecuador (2003)

**Invited Lectures**

* Universidad de Caldas, Manizales, Colombia (5/24)
* Universidad de Tolima, Ibague, Colombia (5/24)
* Universidad del Valle, Cali, Colombia (5/24)
* Chicago Plant Science Symposium, Chicago Botanic Garden, Chicago, IL (4/24)
* Universidad Nacional de Colombia, Bogota, Colombia (4/24)
* Smithsonian Tropical Science Institute, Panama City, Panama (4/24)
* QCA Herbarium, PUCE, Quito, Ecuador (11/23)
* Escuela Politécnica Nacional, Quito, Ecuador (10/23)
* Pontificia Universidad Católica del Ecuador, Quito, Ecuador (10/23)
* Indian Institute of Science Education and Research, Bhopal, India (7/23)
* Maryville University, St. Louis, MO (3/23)
* University of Uppsala, Sweden (10/22)
* University of Akron, OH (3/22)
* University of Connecticut, CT (virtual talk; 2/22)
* University of Tennessee – Knoxville, TN (virtual talk; 9/21)
* Universidad Federal de Pernambuco, Recife, Brazil (virtual talk; 8/21)
* Universidad Yachay Tech, San Miguel de Urcuquí, Ecuador (virtual talk; 6/21)
* Universidad Tecnológica Indoamérica, Quito, Ecuador (virtual talk; 12/20)
* Ministerio del Ambiente, Quito, Ecuador (virtual talk; 10/20)
* Master Gardener Series, Missouri Botanical Garden, St. Louis, MO (virtual talk; 5/20)
* Southern Illinois University – Edwardsville, IL (2/20)
* Washington University of St. Louis, MO (1/20)
* Universidad del Valle, Cali, Colombia (7/19)
* University of São Paolo, São Paolo, Brazil (3/19)
* Universidad Nacional de Colombia, Bogota, Colombia (1/19)
* Universidad del Valle, Cali, Colombia (1/19)
* Columbia University, New York, NY (11/18)
* Keynote Speaker, Congreso Latinoamericano de Mastozoologia (Latin American Mammalogy Conference), La Paz, Bolivia (7/18)
* Rancho Santa Ana Botanic Garden, Claremont, CA (2/18)
* Plenary Speaker, Annual Student Research Symposium, SIU Carbondale, IL (11/17)
* St. Louis Ecology, Evolution, and Conservation (SLEEC) Retreat, St. Louis, MO (9/17)
* University of Miami, Coral Gables, FL (9/17)
* Tyson Biological Station, Washington University of St. Louis, St. Louis, MO (6/17)
* Purdue University, Purdue, IN (11/16)
* Murray State University, Murray, KY (11/16)
* University of KwaZulu-Natal, Pietermaritzburg, South Africa (8/16)
* PGAV Design Firm, St. Louis, MO (5/16)
* Smithsonian Botanical Symposium, “Bat, Birds, Bees, and Bouquets: New Research in Pollination Biology”, Washington, DC (5/16)
* Universidad Mayor de San Andres, La Paz, Bolivia (3/16)
* University of Pittsburgh, Pittsburgh, PA (11/15)
* Missouri University of Science & Technology, Rolla, MO (9/15)
* Sigma Xi Seminar, UMSL Chapter, St. Louis, MO (4/15)
* Simposio de Biodiversidad Neotropical, Quito, Ecuador (2/15)
* Washington University of St. Louis, MO (11/14)
* Saint Louis University, St. Louis, MO (2/14)
* University of Missouri, Columbia, MO (10/13)
* St. Louis Ecology, Evolution, and Conservation (SLEEC) Retreat, St. Louis, MO (9/13)
* Ohio State University, Columbus, OH (1/13)
* University of Missouri – St. Louis, St. Louis, MO (10/12)
* University of California -Davis, Davis, CA (5/12)
* Chicago Plant Science Symposium, Field Museum, Chicago, IL (4/12)
* Universidad de Antioquia, Medellin, Colombia (4/12)
* University of Denver, Denver, CO (2/12)
* Harvard University, Cambridge, MA (10/11)
* Humboldt State University, Arcata, CA (2/11)
* Pontificia Universidad Católica de Ecuador, Quito, Ecuador (4/10)
* Universidad de San Francisco, Quito, Ecuador (3/10)
* University of Wisconsin-Milwaukee, Milwaukee, WI, USA (1/10)
* University of Guelph, Guelph, ON, Canada (3/09)
* Texas Tech University, TX, USA (1/09)
* Queens University, Kingston, ON, Canada (12/08)
* Trent University, Peterborough, ON, Canada (11/08)
* University of Calgary, Calgary, AB, Canada (11/08)
* Sea & Learn, Saba, Netherlands Antilles (10/08)
* University of Toronto, Toronto, ON, Canada (4/08)
* Fulbright Commission, Quito, Ecuador (8/05)

**MEDIA COVERAGE**

**Press Interviews:** The New York Times, ABC, CNN, Reuters, FOX, BBC Wildlife Magazine, The Telegraph, New Scientist, Scientific American, Science News, and various other print and on-line media

**Radio Interviews:** Science Friday, Crash Davis (KFAB Radio, Omaha, NE), Quirks and Quarks (Canadian Broadcasting Corporation), Good Dirt Radio (Grassroots Educational News), Nature Podcast (Nature), pollinators.info

**Interviews for Books:** Bats: Biggest! Littlest! (S. Markle, 2013); Plant and Animal Systems (R. Johnson, 2011); Why the Lion Grew its Mane (L. Smith, 2009); Dry Storeroom No. 1 (R. Fortey, 2008)

**SERVICE & OUTREACH**

* Hosted MS Student (Zoleka Maphanga; University of Western Cape) as a UM/UWC Henry Mitchell scholar for her visit to UMSL (10/24)
* Member of Board of Directors for North American Society for Bat Research (2024-Present)
* Co-editor for a Special Issue of the *American Journal of Botany* (2023) titled “Pollen as the link between floral phenotype and fitness” (with R. Pérez-Barrales, V.L.G. Brito, A. Dellinger, and Ø.H. Opedal)
* Presented public lecture at the St. Louis Zoo (5/23) for their annual Pollinator Dinner titled “Bats, birds, and bellflowers: The evolution of specialized pollination systems in the tropics”
* Outreach event at the Orchard on Virginia’s Blossom Festival (4/23); ran a pollination-themed activity and staffed a table to discuss our urban orchard work (with K. Krakos)
* Co-presented talk “Supporting pollinators in community gardens & orchards” at Seed St. Louis’s Community Agriculture Conference (2/23) and helped staff a table to present information on local pollinators and our urban orchard project (with A. Dunlap. G. Camilo, and N. Miller-Struttman)
* Co-Director, Whitney R. Harris World Ecology Center (UMSL, 2022-Present)
* Reviewer for:

*American Naturalist American J. of Botany*

*Annals of Botany*

*Biol. J. Linnean Soc.*

*Biology Letters*

*Biotropica*

*Brittonia*

*Caldasia*

*Check List*

*Ecology*

 *Ecography*

 *Ecology and Evolution*

*Evolution*

*Evolutionary Ecology*

*Functional Ecology*

*Int’l J. of Plant Sciences*

*J. of Evolutionary Biology*

*J. of Ornithology*

*J. of Plant Ecology*

*J. of Pollination Ecology*

*J. of Tropical Ecology*

*Mammalian Species*

 *Nature Communications*

 *Naturwissenschaften*

*Neotropical Biodiversity*

*New Phytologist*

*Oecologia*

*Oikos*

*Plant Biology*

*Plant Syst. and Evolution*

*PLoS One*

*PNAS*

*Proc. of the Royal Society B*

*Science*

*Selbyana*

* Chair, Harris Center Grants Committee (UMSL, 2022-Present)
* Biology Physical Facilities and Space Committee Member (UMSL, 2021-23)
* Biology Graduate Committee Member (UMSL, 2022-Present)
* Member of the Board of Directors for the Organization for Tropical Studies (2019-Present)
* Faculty Senate Research Grants Committee, Fall Panel Member (UMSL, 2022)
* Mentor for orchard pollination research project with high school students for Collaborative Laboratory Internships and Mentoring Blueprint (CLIMB) program (UMSL, 2021)
* Biology Graduate Program Director (UMSL, 2019-2022)
* Associate Editor for *Neotropical Biodiversity* (2015-2022)
* Reviewer for three NSF proposals, two National Geographic Society grant proposals, two South African National Research Foundation researcher evaluations, a U. of Missouri Research Board proposal, and a US-Israel Binational Science Foundation grant proposal
* Judge for the OTS Outstanding Student Paper Award (Apr. 2019)
* Sciences Representative for the ‘Saturday Academy Event’ of the UMSL Bridge Program, designed to introduce local high school students to UMSL (Sept. 2018)
* Biology Graduate Committee Member (UMSL, 2015-2019)
* Representative for the Organization for Tropical Studies (UMSL, 2014-Present)
* Presenter for the Science in STL Seminar Series, St. Louis County Library (Weber Branch), St. Louis, MO (Oct. 2017)
* Presenter at the Missouri Bat Festival (June 2017)
* Presenter at the 10th Annual Indiana Bat Festival (Terra Haute, IN); three lab members also attended and presented their research (Sept. 2016)
* Judge for UMSL Graduate Research Fair (2016)
* Volunteer for bat survey at Queeny Park, MO; part of a restoration project with the Missouri Department of Conservation (2014)
* Advised undergraduate project with Missouri Botanical Garden’s REU program (2014)
* Scientific advisor for National Geographic Magazine article “Call of the Bloom” (2014)
* Executive Council Member (UMSL, 2016-2017)
* Student Awards Committee Member (UMSL, 2014-2017)
* Harris Scholarship Committee Member (UMSL, 2013 - Present)
* Volunteer presenter for ‘Sunday with a Scientist’, Nebraska State Museum (2011)
* Judge for elementary school science fair (Sheridan Elementary, 2011),
* Judge for Biology Graduate Student Association poster session (U. Nebraska, 2011 and 2013)
* Judge for SSE Hamilton Award, Evolution Meeting (2008)
* Student Representative, Graduate Admission Committee (2006-07 and 2001-02)
* Student Representative, Faculty Search Committee (2005-06 and 2000-01)
* Biology Representative, Graduate Student Association, (2000-01)

**REFERENCES**

 **Dr. Theodore H. Fleming Dr. W. Scott Armbruster**

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