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PROFESSIONAL APPOINTMENTS

Smithsonian Tropical Research Institute (11/2009–present), Panamá

Staff Scientist

Animal behavior, sensory and cognitive ecology, predator-prey interactions

(stri.si.edu/scientist/rachel-page)

McGill University (1/2014–present), Montreal, Canada

Adjunct Professor, Department of Biology, Faculty of Science and McGill-STRI Neotropical Environment Option (www.mcgill.ca/neo/)

Max Planck Institute for Ornithology (10/2008–10/2009), Seewiesen, Germany

Humboldt Postdoctoral Research Fellow

Comparative cognition in bats: Ecological correlates of learning and novelty response; Host: Björn Siemers

EDUCATION

University of Texas at Austin (2002–2008), Austin, Texas

Ph.D. in Ecology, Evolution & Behavior, Section of Integrative Biology, Advisor: Michael J. Ryan

Columbia University (1992–1996), New York, New York

B.A. in East Asian Languages and Cultures, Concentration in Anthropology

PUBLICATIONS

2023

124. Amichai E, Boerma DB, Page, RA, Swartz S, ter Hofstede HM. 2023. By a whisker: the sensory role of vibrissae in hovering-flight in nectarivorous bats. *Proceedings of the Royal Society B*. 290: 20222085. doi: 10.1098/rspb.2022.2085.
123. Bernal XE, Leavell BC, Page RA. 2023. Assessing patterns of eavesdropper risk on sexual signals and the use of meta-analysis in behavioural ecology: a comment on: ‘The exploitation of sexual signals by predators: a meta-analysis’ White et al. (2022). *Proceedings of the Royal Society B*. 290: 20221866. doi: 10.1098/rspb.2022.1866.
122. Dixon MM, Carter GG, Ryan MJ, Page RA. Spatial learning overshadows learning novel odors and sounds in both predatory and frugivorous bats. *Behavioral Ecology and Sociobiology*.

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2022

121. Bernal XE, Page RA. 2022. Tactics of evasion: strategies used by signallers to deter eavesdropping enemies from exploiting communication systems. *Biological Reviews*. doi: 10.1111/brv.12904.
120. Bernal XE, Page RA. 2022. Editorial: How enemies shape communication systems: sensory strategies of prey to avoid eavesdropping predators and parasites. *Frontiers in Ecology and Evolution*. 10. 989763. doi: 10.3389/fevo.2022.989763.
119. Bernal XE, Page RA (editors). 2022. e-Book: How enemies shape communication systems: sensory strategies of prey to avoid eavesdropping predators and parasites. *Frontiers in Ecology and Evolution*. 6391.
118. Coss D, Ryan MJ, Page RA, Hunter K, Taylor R. 2022. Can you hear/see me? Multisensory integration of signals does not always facilitate mate choice. *Behavioral Ecology*. arac061. doi: 10.1093/beheco/arac061.
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115. Kernan CE, Yiambilis AN, Searcy ZE, Pulica RM, Page RA, Caldwell MS. 2022. Mid-flight prey switching in the fringed-lipped bat (*Trachops cirrhosus*). *The Science of Nature*. 109: 43.
114. Larter L, Bernal XE, Page RA, Ryan MJ. 2022. Local competitive environment and male condition influence within-bout calling patterns in túngara frogs. *Bioacoustics*. 10.1080/09524622.2022.2070544.
113. Muñoz-Romo M, Cohen G, Page RA. 2022. Place your bets: a small prey faces large predators. *Behaviour*. 159: 989-997. doi: 10.1163/1568539X-bja10157. Coverage by the *New York Times*: <https://www.nytimes.com/2022/04/13/science/bats-bullies-slap.html>
112. Muñoz-Romo M, Page RA, Vilar EM, Dewynter M, Lim BK. 2022. Revealing hidden sexually dimorphic male traits in the little white-shouldered bat, *Ametrida centurio* Gray 1847 (Chiroptera: Phyllostomidae). *Mammalian Biology*. doi: 10.1007/s42991-022-00227-5.
111. Page RA, Dechmann DKN. 2022. Primer: Roost making in bats. *Current Biology*.

2021

110. Brokaw, AF, Davis, E, Page, RA, Smotherman, M. 2021 Flying bats use serial sampling to locate odour sources. *Biology Letters*. 17, 20210430. doi: 10.1098/rsbl.2021.0430.
109. Gessinger G, Page RA, Wilfert L, Surlykke A, Brinklöv S, Tschapka M. Phylogenetic patterns in mouth posture and echolocation emission behavior of phyllostomid bats. *Frontiers in Ecology and Evolution*. 9. doi: 10.3389/fevo.2021.630481.
108. Geipel I, Lattenkamp EZ, Dixon MM, Wiegrefe L, Page RA. 2021. Hearing sensitivity: an underlying mechanism for niche differentiation in gleaning bats. *Proceedings of the National Academy of Sciences*. 118: e2024943118.
107. Hemingway, CT, Aversa J, Ryan MJ, Page RA. 2021. Context-dependent preferences in wild

- fruit bats. *Animal Behaviour*. doi: 10.1016/j.anbehav.2021.06.016.
106. Hiller T, Vollstädt MGR, Brändel SD, Page RA, Tschapka M. 2021. Bat–bat fly interactions in Central Panama: host traits relate to modularity in a highly specialized network. *Insect Conservation and Diversity*. doi: 10.1111/icad.12508.
105. James LS, Halfwerk W, Hunter KL, Page RA, Taylor RC, Wilson PS, Ryan MJ. 2021. Covariation among multimodal components in the túngara frog’s courtship display. *The Journal of Experimental Biology*. 224. doi: 10.1242/jeb.241661.
104. Muñoz-Romo M, Page RA, Kunz TH. Redefining the study of sexual dimorphism in bats: following the odor trail. *Mammal Review*. doi: 10.1007/s00265-020-02914-0.
103. Page RA, ter Hofstede HM. 2021. Sensory and cognitive ecology of bats. *Annual Review of Ecology, Evolution, and Systematics*. 52: 541-562. doi: 10.1146/annurev-ecolsys-012921-052635.
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101. Taylor RC, Wilhite KO, Ludovici RJ, Mitchell KM, Halfwerk W, Page RA, Ryan MJ, Hunter KL. 2021. Complex sensory environments alter mate choice outcomes. *The Journal of Experimental Biology* 224: jeb233288. doi: 10.1242/jeb.233288.

2020

100. Brändel SD, Hiller T, Halczok TK, Kerth G, Page RA, Tschapka M. 2020. Consequences of fragmentation for Neotropical bats: The importance of the matrix. *Biological Conservation*. 252: 108792.
99. Brown BKG, Leffer L, Valverde Y, Toshkova N, Nystrom J, Page RA, Carter GG. 2020. Do bats use guano and urine stains to find new roosts? Tests with three group-living bats. *Royal Society Open Science*. 7: 201055. doi: 10.1098/rsos.201055.
98. Carter GG, Farine DR, Crisp RJ, Vrtilek JK, Ripperger SP, Page RA. 2020. Development of new food-sharing relationships in vampire bats. *Current Biology*. 30: 1275-1279. e1273. doi: 10.1016/j.cub.2020.01.055.
97. Flores V, Carter GG, Halczok TK, Kerth G, Page RA. 2020. Social structure and relatedness in the fringe-lipped bat (*Trachops cirrhosus*). *Royal Society Open Science*. 7: 192256. doi: 10.1098/rsos.192256.
96. Geipel I*, Kernan CE*, Litterer AS, Carter GG, Page RA#, ter Hofstede HM#. *Co-first authors; #Co-last authors. 2020. Predation risks of signalling and searching: bats prefer moving katydids. *Biology Letters*. 16: 20190837. doi: 10.1098/rsbl.2019.0837.
95. Hemingway C*, Dixon MM*, Page RA. 2020. The omnivore’s dilemma: the paradox of the generalist predators. In: Phyllostomid Bats, a Unique Mammalian Radiation (editors: TH Fleming, L Davalos, M Mello). University of Chicago Press. *Equal contribution.
94. Hemingway CT, Ryan MJ, Page RA. 2020. State-dependent learning influences foraging behaviour in an acoustic predator. *Animal Behaviour*. 163: 33-38.
93. Hermanns K, Marklewitz M, Zirkel F, Overheul GJ, Page RA, Loaiza JR, Drost C, van Rij RP, Junglen S. 2020. Agua Salud alphavirus defines a novel lineage of insect-specific alphaviruses discovered in the New World. *Journal of General Virology*. 101: 96-104.
92. Hiller T, Brändel SD, Honner B, Page RA, Tschapka M. 2020. Parasitization of bats by bat flies (Streblidae) in fragmented habitats. *Biotropica* 52: 488–501. doi: 10.1111/btp.12757.

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89. Muñoz-Romo M, Flores V, Ramoni-Perazzi P, Page RA. 2020. The crust of a male: does size matter when females are fertile? *Behavioral Ecology and Sociobiology*. 74: 151. doi: 10.1007/s00265-020-02914-0.
88. Page RA, Bernal XE. 2020. The challenge of detecting prey: Private and social information use in predatory bats. Invited review in ‘The role of sensory ecology and cognition in social decisions’ (eds. K Schneeberger, M Taborsky). *Functional Ecology*. 34: 344-363. doi: 10.1111/1365-2435.13439.
87. Paraskevopoulou S, Pirzer F, Goldmann N, Schmid J, Corman VM, Gottula LT, Schroeder S, Rasche A, Muth D, Drexler JF, Heni AC, Eibner GJ, Page RA, Jones TC, Müller MA, Sommer S, Glebe D, Drosten C. 2020. Mammalian deltavirus without hepadnavirus coinfection in the neotropical rodent, *Proechimys semispinosus*. *Proceedings of the National Academy of Sciences* 117: 17977-17983. doi: 10.1073/pnas.2006750117.
86. Ripperger SP, Carter GG, Page RA, Duda N, Koelpin A, Weigel R, Hartmann M, Nowak T, Thielecke J, Schadhauser M, Robert J, Herbst S, Meyer-Wegener K, Wägemann P, Schröder-Preikschat W, Cassens B, Kapitza R, Dressler F, Mayer F. 2020. Thinking small: Next-generation sensor networks close the size gap in vertebrate biologging. *PLOS Biology*. 18: e3000655.
85. Stockmaier S, Bolnick DI, Page RA, Carter GG. 2020. Sickness effects on social interactions depend on the type of behaviour and relationship. *Journal of Animal Ecology*. 89: 1387-1394. doi: 10.1111/1365-2656.13193.
84. Stockmaier S, Bolnick DI, Page RA, Josic D, Carter GG. 2020. Immune-challenged vampire bats produce fewer contact calls. *Biology Letters* 16: 20200272. doi: 10.1098/rsbl.2020.0272
83. Szczygieł H, Page RA. 2020. When the hunter becomes the hunted: foraging bat attacked by pit-viper at frog chorus. *Ecology*. The Scientific Naturalist. e03111. doi: 10.1002/ecy.3111.
82. ter Hofstede HM, Symes LB, Martinson SJ, Robillard T, Faure P, Madhusudhana S, Page RA. 2020. Calling songs of Neotropical katydids (Orthoptera, Tettigoniidae) from Panama. *Journal of Orthoptera Research*. 29: 137-201. doi: 10.3897/jor.29.46371.
81. Velilla E, Muñoz M, Quiroga N, Symes L, ter Hofstede HM, Page RA, Simon R, Ellers J, Halfwerk W. 2020. Gone with the wind: Is signal timing in a neotropical katydid an adaptive response to variation in wind-induced vibratory noise? *Behavioral Ecology and Sociobiology*. 74: 1-11. doi: 10.1007/s00265-020-02842-z.

2019

80. Berrío-Martínez J, Kaiser S, Nowak M, Page RA, Carter GG. 2019. The role of past experience in development of feeding behavior in common vampire bats. *PeerJ*. 7:e7448. doi: 10.7717/peerj.7448.
79. Cronin AD, Ryan MJ, Page RA, Hunter KL, Taylor RC. 2019. Environmental heterogeneity alters mate choice behavior for multimodal signals. *Behavioral Ecology and Sociobiology*. 73:

43. doi: 10.1007/s00265-019-2654-3.
78. Dixon MM, Hulgard K, Ratcliffe JM*, Page RA*. 2019. Habituation as an indicator of ecological relevance: Insights into the foraging ecology of a frog-eating bat. *Behavioral Ecology and Sociobiology*. *Ratcliffe and Page contributed equally to this work. 73: 101. doi: 10.1007/s00265-019-2700-1.
77. Flores EE, Batista A, Rodríguez V, Page RA. 2019. Vicente's poison frog (*Oophaga vicentei*) in the wild: calling activity, bioacoustics and diet. *The Herpetological Bulletin*. 149: 11-17. 10.33256/hb149.1117.
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75. Flores V, Mateo JM, Page RA. 2019. The role of male forearm crust odor in fringe-lipped bats (*Trachops cirrhosus*). *Behaviour*. 156: 1-24. doi: 10.1163/1568539X-00003573.
74. Geipel I*, Amin B*, Page RA†, Halfwerk W†. 2019. Does bat response to traffic noise support the misleading cue hypothesis? *Behavioral Ecology*. 30: 1775–1781. doi: 10.1093/beheco/arz148. *Joint first authors; †Joint senior authors.
73. Geipel I, Smeekes MJ, Halfwerk W, Page RA. 2019. Noise as an informational cue for decision-making: the sound of rain delays bat emergence. *Journal of Experimental Biology*. 222: jeb.192005. doi: 10.1242/jeb.192005.
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71. Halfwerk W, Blaas M, Kramer L, Hijner N, Trillo PA, Bernal XE, Page RA, Goutte S, Ryan MJ, Ellers J. 2019. Adaptive changes in sexual signaling in response to urbanization. *Nature Ecology & Evolution*. 3: 374-380. doi:10.1038/s41559-018-0751-8.
70. Hemingway CT, Lea AM, Page RA, Ryan MJ. 2019. Effects of information load on response times in frogs and bats: mate choice vs. prey choice. *Behavioral Ecology and Sociobiology*. 73: 111. doi: 10.1007/s00265-019-2726-4.
69. Hemingway CT, Ryan MJ, Page, RA. 2019. Transitive foraging behaviour in frog-eating bats. *Animal Behaviour*. 154: 47-55. doi: 10.1016/j.anbehav.2019.05.005.
68. Legett HD, Page RA, Bernal XE. 2019. Synchronized mating signals in a communication network: the challenge of avoiding predators while attracting mates. *Proceedings of the Royal Society B*. 286. doi: 10.1098/rspb.2019.1067.
67. Marklewitz M, Dutari LC, Paraskevopoulou S, Page RA, Loaiza JR, Junglen S. 2019. Diverse novel phleboviruses in sandflies from the Panama Canal area, Central Panama. *Journal of General Virology*. 100: 938-949.
66. Ripperger SP, Carter GG, Duda N, Koelpin A, Cassens B, Kapitza R, Josic D, Berrío-Martínez J, Page RA, Mayer F. 2019. Vampire bats that cooperate in the lab maintain their social networks in the wild. *Current Biology*. 29: 4139-4144. doi:10.1016/j.cub.2019.10.024.

2018

65. Carter GC, Forss S, Page RA, Ratcliffe JM. 2018. Younger vampire bats (*Desmodus rotundus*) are more likely to explore novel objects. *PLOS One*. 13(5): e0196889. doi: 10.1371/journal.pone.0196889.
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- survey of the bats of Coiba National Park, Panama and their associated ectoparasites. *Acta Chiropterologica*. 20: 161–176. doi: 10.3161/15081109ACC2018.20.1.012.
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60. Hiller T, Honner B, Page RA, Tschapka M. 2018. Leg structure explains host site preference in bat flies (Diptera: Streblidae) parasitizing neotropical bats (Chiroptera: Phyllostomidae). *Parasitology*. 1–8. doi: 10.1017/S0031182018000318.
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54. Ryan MJ, Page RA, Hunter KL, Taylor RC. 2018. “Crazy love”—nonlinearity and irrationality in mate choice. Invited contribution to Cognitive Ecology issue of *Animal Behaviour* (eds JM Ratcliffe, R Dukas). 147: 189-198. doi: 10.1016/j.anbehav.2018.04.004.
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52. Stockmaier S, Bolnick DI, Page RA, Carter GG. 2018. An immune challenge reduces social grooming in vampire bats. *Animal Behaviour*. 140: 141-149. doi: 10.1016/j.anbehav.2018.04.021.
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S. 2018. Astrovirus infections induce age-dependent dysbiosis in gut microbiomes of bats. *ISME*. doi:10.1038/s41396-018-0239-1.

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45. Gomes DGE, Halfwerk W, Taylor RC, Ryan MJ, Page RA. 2017. Multimodal weighting differences by bats and their prey: probing natural selection pressures on sexually selected traits. *Animal Behaviour*. <https://doi.org/10.1016/j.anbehav.2017.10.011>.
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2015

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 20. Jones PL, Ryan MJ, Page RA. 2014. Population and seasonal variation in response to prey calls by an eavesdropping bat. *Behavioral Ecology and Sociobiology*. 68: 605-615. DOI 10.1007/s00265-013-1675-6.
 19. O'Mara MT, Dechmann DKN, Page RA. 2014. Frugivorous bats evaluate the quality of social information when choosing novel foods. *Behavioral Ecology*. 25: 1233–1239. doi:10.1093/beheco/aru120.
 18. Page, RA, Ryan, MJ, Bernal, XE. 2014. Be loved, be prey, be eaten. In: Animal Behavior, vol 3. Case Studies: Integration and Application of Animal Behavior (ed., K. Yasukawa), New York: Praeger. pp. 123-154.

2013

17. Clarin TMA, Ruczyński I, Page RA, Siemers BM. 2013. Foraging ecology predicts learning performance in insectivorous bats. *PLOS ONE*. 8: e64823.
16. Jones PL, Farris HE, Ryan MJ, Page RA. 2013. Do frog-eating bats perceptually bind the complex components of frog calls? *Journal of Comparative Physiology A*. 199: 279-283.
15. Jones PL, Ryan MJ, Flores V, Page RA. 2013. When to approach novel prey cues? Social learning strategies in frog-eating bats. *Proceedings of the Royal Society Series B*. 280: 20132330, <http://dx.doi.org/10.1098/rspb.2013.2330>.
14. Surlykke A, Jakobsen L, Kalko EKV, Page RA. 2013. Echolocation intensity and directionality of perching and flying fringe-lipped bats, *Trachops cirrhosus* (Phyllostomidae). *Frontiers in Physiology*. 4:143, doi: 10.3389/fphys.2013.00143.

2012

13. Page RA, Schnelle T, Kalko EKV, Bunge T, Bernal XE. 2012. Sequential assessment of prey through the use of multiple sensory cues by an eavesdropping bat. *Naturwissenschaften* 99: 505-509.
12. Page RA*, von Merten S*, Siemers BM. 2012. Associative memory or algorithmic search: a comparative study on learning strategies of bats and shrews. *Animal Cognition* 15: 495-504. *Equal contribution.

2011

11. Akre, KL, Farris, HE, Lea, AM, Page, RA, Ryan, MJ. 2011. Signal perception in frogs and bats and the evolution of mating signals. *Science* 333: 751-752.
10. Jones, PL, Page, RA, Hartbauer, M, Siemers, BM. 2011. Behavioral evidence for eavesdropping on prey song in two Palearctic sibling bat species. *Behavioral Ecology and Sociobiology* 65: 333-340.

2009

9. Bernal, XE, Page, RA, Ryan, MJ, Argo, TF, Wilson, PS. 2009. Acoustic radiation patterns of mating calls of the túngara frog (*Physalaemus pustulosus*): implications for multiple receivers. *Journal of the Acoustical Society of America* 126: 2757-2767.
8. Siemers, BM, Page, RA. 2009. Behavioral studies of bats in captivity: methodology, training, and experimental design. In: Ecological and Behavioral Methods for the Study of Bats (ed. TH Kunz & S. Parsons), Baltimore: Johns Hopkins University Press. pp. 373-392.

2008 and earlier

7. Page, RA, Ryan, MJ. 2008. The effect of signal complexity on localization performance in bats that localize frog calls. *Animal Behaviour* 76: 761-769.
6. Bernal, XE, Page, RA, Rand, AS, Ryan, MJ. 2007. Cues for eavesdroppers: do frog calls indicate prey density and quality? *American Naturalist* 169: 409-415.
5. Page, RA. 2007. Prey-predator communication: for your sensors only. Dispatch for *Current Biology* 17: R965-R966.
4. Page, RA, MJ. Ryan. 2006. Social transmission of novel foraging behavior in bats: frog calls and their referents. *Current Biology* 16: 1201-1205.
3. Page, RA, Bernal, XE. 2006. Túngara frogs. Quick guide for *Current Biology* 16: R979-980.
2. Page, RA, Ryan, MJ. 2005. Flexibility in assessment of prey cues: frog-eating bats and frog calls. *Proceedings of the Royal Society Series B* 272: 841-847.
1. Gabor, CR, Page, RA. 2003. Female preference for large males in sailfin mollies, *Poecilia latipinna*: the importance of predation pressure and reproductive status. *Acta Ethologica* 6: 7-12.

RESEARCH GRANTS AND FELLOWSHIPS

Human Frontier Science Program. SELFCURE: Evolutionary and cognitive processes underlying self-medication of immune-challenged bats. PIs: Daniel Becker (University of Oklahoma, USA); Ralph Simon (Nuremberg Zoo, Germany); Rachel Page (STRI, Panama). Three years: Sept 2023-Aug 2026. \$1,200,000; 1/3 directly to STRI. \$133,333 per year for 3 years = \$400,000 to STRI in total.

Smithsonian Scholarly Studies, Bond Endowment. Unlocking secrets of longevity: Factors underlying variation in aging in a Neotropical bat. PI: Rachel Page, co-PI: Dina Dechmann (Max Planck Institute of Animal Behavior). Jan 2023-Jan 2024. \$52,350

Scholarly Studies Grant, Smithsonian Institution. Collateral damage and beyond: The implications of eavesdropping predators and parasites for signalers calling in mixed-species choruses. PI: Rachel Page, co-PIs: Michael Caldwell (Gettysburg College), Alex Trillo (Gettysburg College), Hannah ter Hofstede (Dartmouth College). April 2022-April 2023. \$48,250.

National Science Foundation, IOS: Collaborative Research: RUI: Cognitive overload versus enhanced performance: Is more information always better?. PI: Ryan Taylor (Salisbury University). Co-PIs: Michael J. Ryan (University of Texas at Austin), Kimberly Hunter (Salisbury University).

Co-I: Rachel Page (STRI). Four years: Sept 2019-Aug 2023. Total: \$1,855,813.

Scholarly Studies Grant, Smithsonian Institution. The evolutionary dance between eavesdropping predators and their sexually signaling prey: Testing the role of predator sensory limitations in the evolution of ‘private’ channels in prey communication. PI: Rachel Page. Co-PIs: Hannah ter Hofstede (Dartmouth College), Inga Geipel (STRI), Ciara Kernan (Dartmouth College). One year: Jan 2020-Jan 2021. \$37,220.

American Women’s History Initiative Programming and Education Fund Award, Smithsonian Institution. How to Be a Scientist: Smithsonian Women as Career Role Models. PI: Darren Milligan. Co-PIs: Cody Coltharp, Pino Monaco, Michelle K. Smith, Rachel Page. One year: Jan 2019-Dec 2020. \$18,300.

Scholarly Studies Grant, Smithsonian Institution: Multimodal signal evolution: Is more information always better? PI: Rachel Page (STRI). Co-PIs: Ryan Taylor (Salisbury University), Kim Hunter (Salisbury University), Mike Ryan (University of Texas at Austin). One year: 2017-2018. \$46,240.

Wildlife Acoustics Scientific Product Grant: Effectiveness of artificial roosts for Neotropical bat species. PI: Michael Schöner (University of Greifswald). Co-PIs: Gloriana Chaverri (University of Costa Rica), Rachel Page (STRI). Two years: Oct 2017-Aug 2019. \$4921.

U.S.–Israel Binational Science Foundation (BSF): The benefits of social sleeping: behavior and neuroimaging of sleep within a group. PIs: Yossi Yovel (Tel-Aviv University), Rachel Page (STRI), Barrett Klein (University of Wisconsin, La Crosse). Four years: Sept 2017-Sept 2021. \$220,000.

National Geographic Society Research Grant (WW-057R-17): Food-sharing vampire bats: manipulating and tracking cooperative relationships in the lab and field. PI: Gerry Carter. Co-PIs: Simon Ripperger, Rachel Page, Frieder Mayer. One year: 2017-2018. \$19,275.

Scholarly Studies Grant, Smithsonian Institution: Tracking and manipulating cooperative relationships in vampire bats. PI: Rachel Page, Co-PIs: Gerry Carter, Simon Ripperger, Frieder Mayer. One year: 2016-2017. \$54,200.

Smithsonian Competitive Grants Program for Science, Pell Grant: Improved learning as a shared functional benefit of sleep. PI: Rachel Page. Co-PIs: Bill Wcislo, Barrett Klein. One year: 2014-2016. \$26,043.

Human Frontier Science Program: Multimodal sensing in the natural environment. PI: Cindy Moss. Co-PIs: Yossi Yovel, John Hallam, Annemarie Surlykke, Rachel Page. Three years: 2013-2016. \$1,350,000.

National Science Foundation: Multimodal communication, mate choice and predation risk. PIs: Mike Ryan, Ryan Taylor. Co-PI: Rachel Page. Five years: 2011-2016. \$1,174,954.

National Geographic Society Research Grant (9794-15): Acoustic-GPS tracking of frog-eating bats to reveal foraging flexibility in a changing world. PI: Yossi Yovel. Co-PIs: Rachel Page and Gerry Carter. One year: April 2016-April 2017. \$25,000.

Smithsonian Institution Barcode Network Opportunity: Barcoding Central American bats and their ectoparasites including a new type of acoustic voucher. PI: Rachel Page. Co-PIs: Matt Miller, Thomas Sattler, Marco Tschapka, Thomas Hiller, Jose Loaiza Rodriguez. One year: 2013-2014. \$14,283.

Alexander von Humboldt Postdoctoral Research Fellowship: 2008-2009

Smithsonian Institute Postdoctoral Fellowship: 2008-2010 (declined)
Smithsonian Institute Predoctoral Fellowship: 2007-2008
P.E.O. Scholar Award: 2007-2008
National Science Foundation Doctoral Dissertation Improvement Grant: 2006-2008
American Association of University Women Dissertation Fellowship: 2006-2007
National Science Foundation Graduate Research Fellowship: 2003-2006.
American Society of Mammalogists, Elisabeth Horner Award for best research proposal: 2005.
Zoology Scholarship Endowment for Excellence, UT Austin: 2004.
Center for Perceptual Systems Travel Grant, UT Austin: Summer 2007, 2004, 2003.
Dorothea Bennett Memorial Graduate Fellowship, UT Austin: 2003.
American Museum of Natural History, Theodore Roosevelt Memorial Fund: 2003.
Smithsonian Tropical Research Institute Short-Term Fellowship: Spring 2003; Spring 2002.
Terrell H. Hamilton Endowed Graduate Fellowship Fund: 2002.
Dean's Excellence Award, UT Austin: 2002

CONFERENCES AND INVITED TALKS

Page RA. Frog-eating bats and prey mating calls: efficient eavesdroppers, evasive advertisers, and multimodal cocktails. 50th North American Symposium for Bat Research / 19th International Bat Research Conference. Austin, Texas, USA. August 7-12, 2022.

Page RA. Efficient eavesdroppers, evasive advertisers, and multimodal cocktails. Animal Behavior Society. San Jose, Costa Rica. July 20-23, 2022.

Page RA. Cognitive constraints, flexibility and decision-making: Insights from a frog-eating bat. Invited speaker in the Ecology and Biodiversity seminar series at the University of Hong Kong. Sept 10, 2021.

Page RA. Foraging flexibility in the Neotropical frog-eating bat, *Trachops cirrhosus*. Invited seminar at Salford University, UK. March 30, 2021.

Page RA. Cognitive constraints and decision-making: Insights from an eavesdropping bat. Invited seminar at the University of Bristol, UK. Dec 7, 2020.

Page RA. Efficient eavesdroppers, evasive advertisers, and multimodal cocktails: The sensory and cognitive ecology of a frog-eating bat. Tupper talk, Smithsonian Tropical Research Institute, Panamá. June 5, 2020.

Page RA. Ecology and behavior of bats: the link between bats' immune systems, their longevity and the transmission of zoonotic disease. STRI Zoom Seminar Series. May 20, 2020.

Page RA. Sleep in bats: Moving to the tropics. Invited talk in the symposium: Sleep Across Taxa. Sleep Conference, Tel Aviv University, Israel. May 23-25, 2019.

Page RA. The sensory and cognitive ecology of bat foraging behavior: A tribute to Alexander von

Humboldt. 2019 Von Humboldt Kolleg. Universidad del Norte, Barranquilla, Colombia. March 19, 2019.

Page RA, Bernal XE. The ecology and evolution of information acquisition by predatory bats. 48th North American Symposium for Bat Research. Puerto Vallarta, Mexico. Oct 24-27, 2018.

Page RA, Bernal XE (equal contributors / co-speakers). How enemies shape communication systems. Introductory symposium talk at the 55th Annual Conference of the Animal Behavior Society. University of Wisconsin, Milwaukee, Wisconsin. Aug 2-6, 2018.

Page RA, Bernal XE (equal contributors / co-speakers). Sensory strategies of prey to avoid eavesdropping predators and parasites. Behavior Seminar Series. Tupper Center, Smithsonian Tropical Research Institute. July 3, 2018.

Page RA. The cognitive ecology of predator eavesdropping behavior: Learning and memory in a frog-eating bat. Invited seminar in the Department of Ecology, Environment and Evolution, School of Life Sciences, La Trobe University, Melbourne, Australia. September 20, 2017.

Page RA. Learning, flexibility and memory: Cognitive ecology of an eavesdropping bat. Zoology Department, University of Otago. Dunedin, New Zealand. August 11, 2017.

Page RA. The costs and benefits of sexual signaling: Learning, memory and signal detection in an eavesdropping bat. Invited seminar, Head of School Seminar Series, Queensland University of Technology (QUT). Brisbane, Australia. July 24, 2017.

Page RA, Ryan MJ, Jones PL. Social eavesdropping in bats: When, where, why and how? 45th Meeting of the Australasian Society for the Study of Animal Behaviour. Mooroolbark, Victoria, Australia. July 19-22, 2017.

Page RA. Efficient eavesdroppers, evasive advertisers, and multimodal cocktails: The sensory and cognitive ecology of a frog-eating bat. Invited seminar, School of Biological Sciences, University of Auckland. Auckland, New Zealand. May 15, 2017.

Page RA, Bernal XE, Caldwell MS, Halfwerk WH, Wessel MO, Trillo PA. Collateral damage or shadow of safety? Effect of predatory bats and parasitic midges on frog calling. North American Symposium for Bat Research. San Antonio, TX. Oct 12-15, 2016.

Page RA. Eavesdropping predators and sexual signals: Bat exploitation of frog calls. Harvard Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts. August 1, 2016.

Page RA. Conservation in the Neotropics: Challenges and triumphs. Invited lecture in International Conservation course at the University of Greifswald, Germany. November 23, 2015.

Page RA. Foraging flexibility in the Neotropical frog-eating bat, *Trachops cirrhosus*: Behavioral metrics for genetic correlation. Invited talk at the University of Greifswald, Germany. November 18, 2015.

Page RA, Taylor R, Ryan MJ, Halfwerk W. Water-borne vibrations and dynamically inflating vocal sacs: a multimodal cocktail for frog-eating bats. North American Symposium for Bat Research. Monterey, California. October 28-31, 2015.

Page RA, Taylor R, Ryan MJ, Halfwerk W. Costs and benefits of multimodal signaling in environmental complexity. 52nd Annual Conference of the Animal Behavior Society. Anchorage, Alaska. June 10-14, 2015.

Page RA. La flexibilidad, el aprendizaje y la memoria: Cuentos de un murciélago que come ranas.

Smithsonian Tropical Research Institute, Panama. Charla Pública (public outreach talk in Spanish). May 2014.

Page RA. The dark side of the túngara frog call: 30 years of research on frog-eating bats. Invited speaker for symposium: Brain, behavior and evolution: three decades of scientific exploration. University of Texas at Austin. January 17, 2014.

Page RA. Predator use of prey cues: Sensory and cognitive ecology of a frog-eating bat. Invited departmental seminar for consideration as adjunct faculty. McGill University, Montreal, Canada. December 5, 2013.

Page RA. Of bats, frogs and flies: Cognitive and sensory insights from a communication network. Gamboa Seminar, Smithsonian Tropical Research Institute. December 2, 2013.

Page RA, Falk J, Jones PL, ter Hofstede H, Dixon M, Faure PA, Kalko EKV. Neotropical mosaic: an Eli Kalko approach to understanding sensory niche partitioning, species coexistence, and eavesdropping in Phyllostomid bats. Invited talk in the Memorial Symposium, Two curious explorers: the work of Elisabeth Kalko and Björn Siemers. 16th International Bat Research Conference, San Jose, Costa Rica, August 11-15, 2013.

Page RA, O'Mara, MT, Jones, PL. Learning, decision-making, and flexibility in the fringe-lipped bat, *Trachops cirrhosus*. Invited talk in the Behavioral Ecology Symposium. 16th International Bat Research Conference, San Jose, Costa Rica, August 11-15, 2013.

Page RA. Sensory perception in frog-eating bats – and other recent projects with Elisabeth Kalko. Elisabeth Kalko Memorial Symposium, Tupper Auditorium, Smithsonian Tropical Research Institute, August 20-21, 2012.

Page RA, Akre, KL, Farris, HE, Lea, AM, Ryan, MJ. Psychoacoustics, ratio-comparisons, sex and dinner: stimulus perception in frogs and bats. 41st North American Symposium on Bat Research, Toronto, Canada, October 26-29, 2011.

Page RA, Ryan, MJ. The acoustic universe of a frog-eating bat. 13th International Society for Behavioral Ecology, Perth, Australia, September 26-October 1, 2010.

Page RA. Bat-frog interactions: Learning, categorization and memory. Invited talk in the Adaptations and Evolutionary Ecology Symposium. 15th International Bat Research Conference, Prague, Czech Republic, August 22-27, 2010.

Page RA. Social transmission of novel foraging behavior in bats: Frog calls and their referents. Invited talk for Interdisciplinary Symposium and Workshop on Copying, Zurich, Switzerland. Host: Dr. Gerald Kerth. February 5-7, 2009.

Page RA. Flexibility, learning and memory in foraging behavior. German Bat Research Conference (Treffen der Fledermausforscher). Frauenchiemsee, Germany. January 22-24, 2009.

Page RA. Learning and flexibility in foraging: Bats, frogs and shrews. Max Planck Institute for Ornithology, Seewiesen, Germany. November 25, 2008.

Page RA, Kalko EKV, Ryan MJ. Flexibility in sensory strategy use during foraging in the fringe-lipped bat, *Trachops cirrhosus*. Invited talk in the Adaptability and Functional Significance of Echolocation Symposium. 14th International Bat Research Conference, Mérida, Mexico, August 19-23, 2007.

Page RA. Foraging flexibility in the frog-eating bat, *Trachops cirrhosus*. Allee Competition.

Animal Behavior Society Meeting, Burlington, VT, July 21-25, 2007.

Page RA. Predator use of prey cues: Learning and flexibility in a frog-eating bat. Invited talk at the Max Planck Institute for Ornithology, Seewiesen, Germany. Host: Dr. Björn Siemers. March 16, 2007.

Page RA. Predator use of prey cues: Frog-eating bats and frog calls. Invited talk for the Acoustics Seminar Series, Engineering Department, University of Texas at Austin. Host: Dr. Preston Wilson. November 10, 2006.

Page RA. Predator use of prey cues: Frog-eating bats and frog calls. Biology Department, Texas A&M University. Host: Dr. Michael Smotherman. November 6, 2006.

Page RA. Sensory mode switching in prey detection by the frog-eating bat, *Trachops cirrhosus*. 35th Annual North American Symposium on Bat Research, Wilmington, NC, October 18-21, 2006.

Page RA. Predator use of prey cues: Frog-eating bats and frog calls. Invited talk at the University of Tübingen, Germany. Host: Dr. Björn Siemers and Dr. Hans-Ulrich Schnitzler. February 2, 2006.

Page RA. Whisper in my pinna: Social learning, persistence, and memory in the frog-eating bat, *Trachops cirrhosus*. 35th Annual North American Symposium on Bat Research, Sacramento, CA, October 19-22, 2005.

Page RA. Flexibility in foraging: Tales of a frog-eating bat. Bambi seminar, Smithsonian Tropical Research Institute, Barro Colorado Island, Panama, May 5, 2005.

Page RA. Frogs, toads, or Bob Marley? Flexibility and learning in the frog-eating bat, *Trachops cirrhosus*. 34th Annual North American Symposium on Bat Research, Salt Lake City, UT, October 27-30, 2004.

Page RA. Behavioral flexibility in the frog-eating bat, *Trachops cirrhosus*. Invited talk at the University of Ulm, Germany. Host: Dr. Elisabeth Kalko. August 31, 2004.

Page RA, Ryan MJ. Foraging flexibility and response to prey mating calls in the frog-eating bat, *Trachops cirrhosus*. Invited talk in Sensory Ecology in Bat Foraging Behaviour Symposium, 13th International Bat Research Conference, Mikolajki, Poland, August 23-27, 2004.

Page RA. Behavioral flexibility in the frog-eating bat, *Trachops cirrhosus*. Smithsonian Tropical Research Institute Science Symposium, Panama City, Panama, July 8-9, 2004.

Page RA, Bernal XE. Eavesdroppers are listening: Convergent acoustic preferences in frogs, bats, and flies. Invited talk in Sexual Communication in Túngara Frogs Symposium, 41st Animal Behavior Society Meeting, Oaxaca, Mexico, June 13-16, 2004.

Page RA. Prey preferences and localization performance: Behavioral flexibility in a frog-eating bat. Tupper talk, Smithsonian Tropical Research Institute, Panama, June 2003.

TEACHING AND MENTORSHIP

Masters and PhD advisor (2009 to present). Smithsonian Tropical Research Institute, Panamá. Since my start as a STRI staff scientist, I have co-advised thesis research for numerous Masters and PhD students. I host students in the field; advise on experimental design, data analysis and manuscript writing; participate in committee meetings; and evaluate thesis defenses. Institutes I

have partnered with include:

- *University of Texas at Austin, McGill University, Purdue University, University of Chicago, Max Plank Institute for Ornithology*

Field course teacher (2009 to present). Smithsonian Tropical Research Institute, Panamá. My team and I give lectures and lead bat field components for the many graduate and undergraduate field courses that come through STRI each year. For example:

- *McGill-STRI Neotropical Environment Option (NEO)* field course, part of STRI's partnership with McGill University (www.mcgill.ca/neo/).
- *STRI's Gigante Course*, a course designed for Latin American students to gain experience with tropical research (stri.si.edu/academic-programs/programs-and-field-courses).

Intern mentor (2009-present). Smithsonian Tropical Research Institute, Panama. I host numerous interns in my lab, guiding them through the basics of experimental design and tropical field biology, often mentoring through graduate school applications and the publication of their first manuscript. Since my arrival at STRI, I have hosted over 100 interns, the majority from underrepresented groups (women and Latin American scientists).

CONSERVATION AND OUTREACH

Bat Conservation (2014 to present). I serve on the board of directors for Merlin Tuttle's Bat Conservation, an organization dedicated to bat conservation worldwide.

Bat Night (2015 to present). Every month, our lab hosts an outreach event, Bat Night, sharing with the public the wonder and fascination of Neotropical bats. Visitors join us mistnetting in the forest understory; they see the diversity of bat species up close; we discuss sensory and morphological adaptations for distinct foraging niches, and the critical role bats play in maintaining balanced, healthy ecosystems. Bat Night, a fully bilingual event conducted in both Spanish and English, has become extremely popular in Panamá, with large numbers of visitors attending each month, of all age ranges and walks of life. Bat Night has been featured on Panamanian national television, and has been written up by the Huffington Post as one of the top ten ways to discover wildlife in Panamá.

REVIEWER FOR

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| • Acta Chiropterologica | • Ethology |
| • American Naturalist | • Evolutionary Ecology |
| • Animal Behaviour | • Journal of Experimental Biology |
| • Behavioral Ecology | • Journal of Mammalogy |
| • Behavioral Ecology and Sociobiology | • Journal of the Acoustical Society of America |
| • Behavioural Processes | • Mammalia |
| • Biology Letters | • PLOS One |
| • Biotropica | • PNAS |
| • BMC Biology | • Proceedings of the Royal Society, Series B |
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