

## Dr. A. Leonie Baier

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My research interests lie in neuroethology and sensory ecology: How does the way that organisms perceive their environment influence their behavior and how does their behavior shape their perception? I study these questions in bats, a very successful clade of mammals. Living their lives in darkness, bats have switched vision with echolocation as their main remote sense. I want to understand this immense reshaping of their sensory world and find answers to the question to what extent vision can even be replaced by a sensory system that originally evolved to complement it. My largest contribution to my field is establishing dynamic virtual realities for psychophysical lab studies in echolocating bats. I have used these techniques to address the neurophysiological aspects of what Niko Tinbergen called “Physiology of Behaviour” and what is now known as the field of neuroethology. More recently, I have studied these questions in the wild, employing state-of-the-art biologging methods. Throughout my career, I have always actively pursued the path towards independent research. This is reflected in the numerous grants and scholarships that I gained over the years, the most recent of which are the “Feodor Lynen Research Fellowship” awarded by the Alexander-von-Humboldt foundation and the “Marie Skłodowska-Curie Research Fellowship” awarded by the European Commission.

### Professional experience

- 01/09/2022 - MARIE SKŁODOWSKA-CURIE RESEARCH FELLOWSHIP  
present *Aarhus University, Aarhus, Denmark; hosted by Prof. Peter Teglberg Madsen*  
Awarded by the European Commission to foster excellence in research and innovative collaborations, knowledge transfer, and methodologies. My research focus lies on biosonar dynamics as a function of natural behaviour, applying state-of-the-art biologging technology.
- 01/11/2022 - GUEST RESEARCHER  
present *Max Planck Institute for Biological Intelligence, Seewiesen, Germany; hosted by Dr. Henrik Brumm*  
I collaborate on bioacoustics in bats with the Animal Communication and Urban Ecology lab.
- 23/07/2021 - FEODOR-LYNEN RESEARCH FELLOWSHIP  
31/08/2022 *Smithsonian Tropical Research Institute, Gamboa, Panamá; hosted by Dr. Rachel Page*  
Awarded by the Alexander-von-Humboldt Foundation to support excellent scientists in their postdoctoral research abroad. My research focused on information perception and processing in the context of multisensory perception in echolocating bats.
- 15/06/2019 - POSTDOCTORAL RESEARCHER POSITION  
14/04/2020 *Technical University, Munich, Germany*  
With Prof. Uwe Firzlaff I worked on phase-randomization sensitivity in biosonar and co-supervised a joint PhD-project on echo-acoustic processing of single objects in complex scenarios in biosonar.
- 15/12/2018 - POSTDOCTORAL RESEARCHER POSITION  
14/06/2019 *Ludwig Maximilians University, Munich, Germany*  
With Prof. Lutz Wiegrebe I worked on echo-delay resolution in bat biosonar.
- 01/11/2006 - TECHNICAL ASSISTANT POSITION  
30/10/2014 *Max Planck Institute for Ornithology, Seewiesen, Germany*  
As the lab manager in the Sensory Ecology group of Dr. Björn Siemers (led by Prof. Wiegrebe after Dr. Siemers passed in 2012), my tasks were i.a. animal capturing, animal husbandry, animal training, conducting of field and lab experiments, data analysis, administration, public relations.

**Education**

- 01/11/2014 - DOCTORAL GRADUATE SCHOOL  
 25/01/2019 *International Max Planck Research School for Organismal Biology, Seewiesen, Germany*  
 As IMPRS fellow, I completed an individually tailored curriculum to acquire transferable skills such as scientific writing and project management. My PhD co-advisor was Dr. Holger Goerlitz.
- 01/11/2014 - DOCTORAL RESEARCHER POSITION  
 31/08/2018 *Ludwig Maximilians University, Munich, Germany*  
 My PhD work addressed the coding of spatial and temporal frequency of water ripples in bat biosonar. I conducted my research both in lab and field with three different bat species. My PhD advisor was Prof. Lutz Wiegrebe.
- 01/10/2001 - DIPLOMA STUDIES  
 15/10/2006 *Ludwig Maximilians University, Munich, Germany*  
 I graduated from university in the subjects Neurobiology, Ecology, Human Genetics/Anthropology, and Pharmacology/Toxicology. My thesis title was "Absolute hearing thresholds of the lesser spear-nosed bat *Phyllostomus discolor*".

**Short-term appointments**

- 01/06/2020 - GUEST RESEARCHER  
 01/09/2020 *Max Planck Institute for Ornithology, Seewiesen, Germany*  
 Because my departure to Panama had to be postponed due to SARS-CoV-2, I instead worked on a project on flight behaviour in severely hearing-impaired bats in the lab of Dr. Holger Goerlitz.
- 07/06/2019 - SCIENTIFIC ADVISOR  
 11/06/2019 *Aarhus University, Aarhus, Denmark*  
 In the lab of Prof. Peter Teglberg Madsen, I consulted on a project about target detection and ranging abilities in the bat *Myotis daubentonii*.
- 15/03/2017 - SHORT-TERM FELLOWSHIP FOR DOCTORAL STUDENTS  
 14/08/2017 *Smithsonian Tropical Research Institute, Gamboa, Panamá*  
 During a fellowship stay in the lab of Dr. Rachel Page, I studied the attack behaviour of the frog-eating bat *Trachops cirrhosus*.
- 15/02/2017 - TRAVELLING FELLOWSHIP FOR DOCTORAL STUDENTS  
 14/03/2017 *Vrije Universiteit, Amsterdam, The Netherlands*  
 During a visit to the lab of Prof. Wouter Halfwerk, I worked on bioacoustics of water ripples and trained in the underlying techniques.

**Funding**

- 2021 MSCA Individual Fellowship (European Commission REA): 24 months/€ 207.312,-  
 2020 Feodor Lynen Research Fellowship (Alexander-von-Humboldt-Foundation): 18 months/€ 66.584,-  
 2019 Short-Term Postdoctoral Research Fellowship (German Academic Exchange Service): 6 months/€ 21.528,-  
 2018 Travel Grant (German Academic Exchange Service): € 747,-  
 2018 Contingency Grant (International Max Planck Research School): 6 months/€ 15.115,-  
 2017 A. Stanley Rand Fellowship (Smithsonian Society): \$ 1.500,-  
 2016 Short-term Fellowship for Graduate Students (German Academic Exchange Service): 5 months/€ 6.333,-  
 2016 Travelling Fellowship (The Company of Biologists): € 1.800,-  
 2015 Project Grant (International Max Planck Research School): € 1.429,-  
 2015 Travel Grant (International Max Planck Research School): € 1.000,-  
 2015 Research Grant\* (German Research Foundation, DFG): 36 months/€ 176.757,-  
 \*The grant was awarded to Prof. L. Wiegrebe, who wrote the grant proposal with me.

**Awards**

- 2017 At the German Ethological Society Meeting 2017 in Bonn, Germany, I was awarded with the **Eberhard-Gwinner-Preis** for best oral presentation of a junior scientist.

## Publications

ORCID: 0000-0002-0327-0378 Citations (GoogleScholar): 114 h-index: 5

Manuscripts in peer-reviewed journals:

- Logan SJ, **Baier AL**, Page RA, Clements P, Hunter KL, Taylor RC, Ryan MJ (2022) Cross-modal facilitation of auditory discrimination in a frog. *Biology Letters* 18: 20220098. [Full text](#)
- Hörpel SG\*, **Baier AL\***, Peremans H, Reijniers J, Wiegrebe L, and Firzloff U (2021) Communication Breakdown: Limits of spectro-temporal resolution for the perception of bat communication calls. *Scientific Reports* 11:13708. [Full text](#) \*shared first authors
- Wagenhäuser PA, Wiegrebe L, and **Baier AL** (2020) Biosonar spatial resolution along the distance axis: revisiting the clutter interference zone. *Journal of Experimental Biology* 223 (20): jeb224311. [Full text](#)
- **Baier AL** (2019) Evolution: how bat biosonar bests prey camouflage. *Current Biology* 29 (16): R790-R792 [Full text](#)
- **Baier AL**, Wiegrebe L, and Goerlitz HR (2019) Echo-imaging exploits an environmental high-pass filter to access spatial information with a non-spatial sensor. *iScience* 14:335-344 [Full text](#)
- **Baier AL** and Wiegrebe L (2018) Flutter sensitivity in FM bats. Part I: delay modulation. *Journal of Comparative Physiology A* 204 (11): 929-939 [Full text](#)
- **Baier AL**, Stelzer K-J, and Wiegrebe L (2018) Flutter sensitivity in FM bats. Part II: amplitude modulation. *Journal of Comparative Physiology A* 204 (11): 941-951 [Full text](#)
- Hoffmann S, Genzel D, Prosch S, **Baier L**, Weser S, Wiegrebe L, and Firzloff U (2015) Biosonar navigation above water I: estimating flight height. *Journal of Neurophysiology* 113(4): 1135-1145 [Full text](#)
- Voigt CC, **Baier L**, Speakman JR, and Siemers BM (2008) Stable carbon isotopes in exhaled breath as tracers for dietary information in birds and mammals. *Journal of Experimental Biology* 211: 2233-2238 [Full text](#)
- Hoffmann S\*, **Baier L\***, Borina F\*, Schuller G, Wiegrebe L, and Firzloff U (2008) Psychophysical and neurophysiological hearing thresholds in the bat *Phyllostomus discolor*. *Journal of Comparative Physiology A* 194: 39-47 \*shared first authors

## Teaching and supervising

2024 University course “Behavioral Biology” – Aarhus University | I held the 180-minute class on Foraging Ecology and supervised a group of students on their practical assignment.

2023 Supervision Research Project – Aarhus University & Smithsonian Tropical Research Institute | I supervised a Research Project on “The Lombard Effect in a gleaning bat”. My teaching responsibilities were experimental planning, animal training, programming, data acquisition, data analysis, and scientific writing.

2022/23 Supervision Research Project – Smithsonian Tropical Research Institute | I supervised a Research Project on “Decision-making in a predatory bat”. My teaching responsibilities were experimental planning, animal training, programming, data acquisition, data analysis, and scientific writing.

2021 Webinar “Bioacoustics 101” – Smithsonian Tropical Research Institute | I organised and carried out a weekly webinar on bioacoustics for undergrad and doctorate students at the Smithsonian Tropical Research Institute.

2019-20 University lecture “Fundamentals in Neuroscience II” – LMU Munich | For the undergrad lecture series “Fundamentals in Neuroscience II: Motor system and higher functions”, I gave 90-minute lectures on the principles of echolocation and assisted with the holding and grading of written exams

2018-19 University practical course “Animal Physiology” – LMU Munich | For the courses on hearing, vision, and ion diffusion, I co-taught the 2-week practicals and assisted with holding of the written exams.

2015 Workshop “Acoustic Communication 101” – Max Planck Institute for Ornithology | I organised and carried out a one- day workshop on bioacoustics for undergrad and doctorate students of the MPIO.

2013-19 University excursion “Bat Biology” – LMU Munich | I first co-organised and later organised this four-day field trip with 18 bachelor and master students on the biology and ecology of native bats for several years. My on-site responsibilities were lectures and practical teaching of field methods.

2004-06 University practical course “Animal Physiology” – LMU Munich | For the courses on hearing, vision, and ion diffusion, I assisted in teaching the 2-week practicals and holding of the written exams.

2020 Supervision Research Project – Max Planck Institute for Ornithology | I supervised a Research Project on “Navigation in hearing-impaired echolocating bats” for the Master’s program of the Graduate School of Systemic Neurosciences, Munich. My teaching responsibilities were experimental planning, animal training, programming, data acquisition, data analysis, and scientific writing.

2019/20 Supervision PhD Thesis – LMU Munich & TUM Munich | After Prof. Wiegrebe passed away, I took on the practical and administrative supervision of his PhD student and oversaw the transition of the project to the lab of Prof. Firzlaff at the Technical University

2019/20 Supervision Master’s Thesis – FernUniversität in Hagen, Germany | I took on supervision of the biological aspects of an interdisciplinary master’s thesis on “Die Wirkung von Lärm auf heimische Fledermäuse und ihre artenschutzrechtliche Würdigung”. I supervised thesis preparation and assessed the thesis and oral defense.

2018/19 Supervision Master’s Thesis – LMU Munich | I carried out the practical supervision of a master’s thesis on “Delay acuity in FM bats”. My teaching responsibilities were animal handling and training, programming, data analysis, and scientific writing.

2016/17 Supervision Master’s Thesis – LMU Munich | I carried out the practical supervision of a master’s thesis on “Amplitude-modulation sensitivity in FM bats”. My teaching responsibilities were animal handling and training, programming, data analysis, and scientific writing.

2016 Supervision Bachelor’s Thesis – LMU Munich | I carried out the practical supervision of a bachelor’s thesis on “Sound analysis of biosonar emissions”. My teaching responsibilities were programming, data analysis, scientific presenting and writing.

### Invited talks

- 2024 A bruit secret: Interdisciplinary Symposium on Hearing and Vision – Basel, CH | "Laut-Malerei: Der sechste Sinn der Fledermäuse"
- 2023 Batsheva de Rothschild conference on Active Sensing – Rehovot, IL | "A brilliant mind - In memory of Lutz Wiegrebe"
- 2022 Studienstiftung des deutschen Volkes: SmP Menschliche Echoortung - Bonn | "Fledermäuse und ihr sechster Sinn"
- 2022 D21 Human Nature virtual conference | “Animal Kin and Intelligence”
- 2021 European Zoo Nutrition virtual conference | “The snacking bat - nutritional husbandry of chiropterans”

**Oral conference presentations**

- 2023 Neuroethology Symposium at German Zoological Society meeting - Kassel | "How sensory information streams govern behavioural transitions in the wild"
- 2022 International Bat Research Conference – Austin, TX | "Vocalization and navigation behavior in normal-hearing and hearing-impaired bats"
- 2021 Animal Behavior Society virtual meeting | " Dialogue of the Deaf? Vocalization and navigation behavior in normal-hearing and hearing-impaired bats "
- 2020 Network Meeting of the Alexander von Humboldt Foundation| "Multisensory signalling - is less more?"
- 2020 Animal Behavior Society virtual meeting | "Spatial resolution along the depth axis in bat biosonar"
- 2019 112th Annual DZG Meeting– Jena | "Peeking through the foliage - Range resolution in echolocating bats"
- 2019 XXVII Internat. Bioacoustics Congress – Brighton | " Range resolution in echolocating bats"
- 2019 6th BioRobotics Workshop – Odense | "Spatial resolution along the depth axis in bat biosonar"
- 2018 5th BioRobotics Workshop – Odense | "Detection of target motion by FM bats"
- 2017 STRI Behavior Discussion Group – Panamá City | "Can sound paint a picture?"
- 2017 Animal Behavior Society meeting – Toronto | "Water wave perception with echolocation"
- 2017 Annual Meeting of the Ethological Society – Bonn | "Biosonar encoding of surface waves"
- 2016 DZG graduate meeting – Gülpe | "Never mind those ripples – spatial frequency and bat sonar"

**Outreach activities**

- 2020 Webinar “Soundcamp” – Stave Hill Ecological Park, Rotherhite, United Kingdom & Radio Cona, Ljubljana, Slovenia | I was invited as international expert to an online debate about bats and SARS-CoV-2.
- 2019 “Neurocamp” – Munich Centre for Neurosciences, Germany | For the summer school for high-school students, I gave a lecture on “The extraordinary powers of mammalian echo-imaging”.
- 2019 “Soapbox Science” – Munich, Germany | During this public talk event, I gave a stand-up presentation on echolocation research: “Sehen mit den Ohren? Wie ich den sechsten Sinn der Fledermäuse erforsche”
- 2018 “FUN” – LMU Munich, Germany | For the undergrad summer school on neuroscience, I gave a lecture on “The extraordinary powers of mammalian echo-imaging”.
- 2017 “Noches de Murciélagos” (Gamboa Bat Nights) – STRI Gamboa, Panamá | I participated in these monthly events that advocate bats to both residents and tourists, scientists and laymen.
- 2014 “Science After Work” – NaMu Natural History Museum, Munich, Germany | For this public talk series, I gave a lay talk on bat echolocation: “Nacht zum Tage – Fledermäuse und ihr Erfolgsmodell Echoortung”
- 2014 - 2016 “Bat Night” – Bund Naturschutz e.V., Herrsching a. Ammersee, Germany | For the local conservation centre, I gave regular bat nights and guided tours and organised events for children and adults.

**Organisation of international conferences**

I was part of the organizing committee for the **German Bat Research Meeting** in Frauenchiemsee, January 10-12 2020. Historically a German meeting, this biannual conference brings together ~100 international bat scientists.

**Scientific society memberships**

Animal Behavior Society, German Zoological Society, German Ethological Society, International Society for Neuroethology

**Peer-reviewing activities**

Biology Letters, Current Biology, Journal of the Royal Society Interface, PLOS One, Proceedings of the Royal Society B, The Journal of Experimental Biology, The Animal Behavior Society Student Research Grants

**Language skills**

German (native), English (C2), Spanish (B1), French (A2), Dutch (A2), Danish (A1)