Peter T. Rühr

Curriculum vitae

Mainzer Straße 16
D-50678 Cologne, Germany
☎ +49 (228) 73 5130
✉ pruehr@uni-bonn.de

Education

2018–present **Ph.D.**, *Working title: "Head shape evolution of biting-chewing insects"*, Universities of Cologne & Bonn, Germany..

2013–2017 **M.Sc.**, *"Organismic Biology, Evolutionary Biology and Palaeobiology (OEP-B)"*, University of Bonn & Zoological Research Museum A. Koenig (ZFMK), Bonn, Germany.
Grade: 1.2

2013 **Lab course**, *"Research techniques for embryological studies on primary wingless hexapods"*, Sugadaira Montane Research Center, University of Tsukuba, Japan.

2009–2013 **B.Sc.**, *"Biologie"*, University of Bonn, Germany.
Grade: 2.0

2012 **Lab and field course**, *"Marine Zoology"*, HYDRA Institute, Centro Marino, Fetovaia, Elba, Italy.

2012 **ERASMUS Intensive Program**, *"Origin, Evolution and Future of the Biosphere"*, Observatoire Océanologique, Banyuls-sur-Mer, France.

Employment History and Research Stays

2025 **Ant vision research**, *Biodiversity and Biocomplexity Unit, Okinawa Institute of Science and Technology (OIST)*, Onna, Okinawa, Japan, 3 weeks research stay funded by OIST to investigate ant vision.

2023–2024 **Research assistant**, University of Cologne, Germany.

2023 **Sick leave**, Severe head trauma and subsequent rehabilitation (January - August).

2018–2023 **Research assistant**, Funded by the European Research Council (ERC), Universities of Cologne & Bonn, Germany.

2016–2018 **Student assistant**, *"µCT scanning, reconstruction, data analysis, visualization and maintenance of µCT systems"*, ZFMK, Bonn, Germany.

2014 & 2015 **Hexapod embryology**, *Laboratory for the Comparative Arthropod Embryology, Sugadaira Montane Research Center, University of Tsukuba*, Sugadaira Kogen Ueda, Japan, 2 x 1 month research stay funded by the DAAD.

2015 **Student assistant**, *"Scientific analysis of SR-µCT data in the project 'Biomechanics of biting in dragonflies, mayflies and silverfish'"*, ZFMK, Bonn, Germany.

2015 **Student assistant**, *"Screening and sorting of ZFMK in-house publication library"*, ZFMK, Bonn, Germany.

2013–2023 **Multiple synchrotron-µCT beamline visits**, *Deutsches Elektronen Synchrotron (DESY)*, Hamburg, Germany; *Karlsruhe Institute of Technology*, Karlsruhe, Germany; *Swiss Light Source (SLS)*, Paul Scherrer Institute, Villigen, Switzerland; *SPring-8*, Hyogo Prefecture, Japan.

Teaching Experience

Theses

2021 **M.Sc. Thesis**, *"The evolution of vision in earwigs (Hexapoda: Dermaptera)"*, M.Sc. OEP, University of Bonn, Germany.
Supervisor.

University Courses

2024 **B.Sc. Wahlpflichtmodul Eco5 (MN-B-WP I)**, *"Biologie der Insekten"*, University of Cologne, Germany.
Co-organizer & 2nd examiner: lectures, field trips, identification courses.

2023 **B.Sc. Basismodul Biologie II/A**, *"Evolution, Entwicklung und Systematik der Tiere"*, University of Cologne, Germany.
Lectures and dissection courses.

2021 **M.Sc. OEP-Free A IND**, *"Analysis of vision in a compound eye"*, University of Bonn, Germany.
Organizer and supervisor.

2016 **M.Sc. OEP-Free A IND**, *"Image processing, segmentation of SR-µCT sections, and 3D-rendering of the stylet-like mouthparts of Neanura muscorum (Hexapoda: Collembola)"*, ZFMK, Bonn, Germany.
Organizer and supervisor.

2015–2017 **M.Sc. OEP-Free 1 E**, *"Evolution, Diversity and Biology of Arthropods"*, ZFMK, Bonn, Germany.
Yearly lecture on "Modern Morphology".

Workshops

2025 **Workshop**, *How to use the novel 3D-Scanning system MicroMorph3D*, Ilia State University (ISU), Tbilisi, Georgia.

2016–2018 **Regular workshops**, *"µCT scanning, image processing, manual & semiautomatic segmentation, volume rendering and visualization of 3D data"*, ZFMK, Bonn, Germany.

2013 **Workshop**, *"Image processing and three-dimensional reconstruction of serial histology sections"*, Laboratory for the Comparative Arthropod Embryology, Sugadaira Montane Research Center, University of Tsukuba, Japan.

Programming and Software Skills

Selected Projects

2022 `forceR`: Force Measurement Analyses. R package on *CRAN*.

2022 `PiscAnt`: Python code to control the `scAnt` 3D-scanning setup with a Raspberry Pi. Available on *GitHub*.

Programming Languages

Working knowledge:

- R, ImageJ macro language, LaTeX, (R)markdown

Basic knowledge:

- Python, Perl, C++

Software

Working knowledge:

- ImageJ/Fiji, Biomedisa, Drishti, ITK-SNAP, VOX-FE2
- Meshroom, MeshLab, Checkpoint, Blender, Fusion 360
- GIMP, Scribus, MS Office

Basic knowledge:

- 3D Slicer
- COMSOL

Community Engagement

2025–present **Scientific Advisory Board Member**, International Society for Invertebrate Morphology.

2020–present **Multiple courses**, *Collection and identification of arthropods, R-course for beginners*, FörTax and Taxonomiewerkstatt, ZFMK, Bonn, Germany.

2018–present **Co-founder and co-manager**, *"ESKB - Entomologischer Stammtisch Köln/Bonn"*, Cologne & Bonn, Germany.

2017 **Multiple workshops**, *"µCT-scanning and three-dimensional visualization", "Morphological databanks", and "Comparison of fish shapes through 2-dimensional landmark analysis"*, Alexander-Koenig-Science-Club (AKSC), ZFMK, Bonn, Germany.

Field Work

2025 2 weeks field trip to Georgia.

2025 1 week field trip to Tenerife, Spain.

2024 2 weeks field trip to the Oman and Egypt.

2023 1 week field trip to the United Arab Emirates.

2019 5 weeks field trip to Queensland and New South Wales, Australia.

2018–2021 Regular field trips to measure bite forces of insects in the Cologne/Bonn area, Germany.

Honors and Recognitions

2024 1st poster prize for 'More than One Eye Can See - semiautomated analyses of visual trait topologies across a compound eye' at the *25 th Annual Conference of the Society of Biological Systematics (GfBS)*, Bonn, Germany.

2022 2nd talk prize for 'Measuring and analysing animal closing forces: a mobile setup and new R package' at the *SEB Annual Conference*, Montpellier, France.

2018 3rd poster prize for 'Die Biomechanik eines Springschwanzkopfes' at the *60. Phylogenetisches Symposium*, Tübingen, Germany.

2016 1st poster prize for 'A New ImageJ – FIJI Plugin for Counting Objects in Bi-Color Images' at the *World Congress of Malacology*, Penang, Malaysia.

Other Skills and Qualifications

2023 **NatureDimensions**, Foundation of company for entomological supply, custom lab machines, and laser engraving.

2021 **Certificate "Strahlenschutz Fachkundegruppe R3"**.

2012 **Open Water Diver (OWD) certificate**.

2006 **German driver's license category B**, currently suspended due to acquired brain damage.

Arduino and Raspberry Pi programming and electronics.

3D scanning and printing with self-built devices.

Media Appearances

- Iselt, L. (**2022**): "Wie stark beißen Insekten zu?". Radio interview with *Frührausch*, Köln, Germany.
- Wong, C. (**2022**): "Australian raspy cricket has the strongest bite of 650 insect species". Interview with *New Scientist* **253** (3374).
- Schlömer, K. (**2019**): "Glänzende Idee: Gold macht unsichtbare Oberflächen sichtbar". TV feature at *Lokalzeit Bonn*, WDR, Germany.
- Knoll, D. (**2016**): "Unbekannte Mückenart im Bernstein entdeckt". Radio interview with *Logo*, NDR Info, Germany.

Society Memberships

2014 – present **International Society for Invertebrate Morphology (ISIM)**.
2017 – present **Deutsche Zoologische Gesellschaft (DZG)**.
2017 – present **Deutsche Gesellschaft für allgemeine und angewandte Entomologie (DGaaE)**.
2025 – present **Society for Integrative and Comparative Biology (SICB)**.

Academic Service

Manuscript Reviews

- *Journal of Morphology*
- *Proceedings of the Royal Society B: Biological Sciences*

Publications

Peer-Reviewed

T. Wesener, **Rühr, P.T.**(**2025**): Internal gonopod reconstruction in an amber-preserved millipede from the Cretaceous: *Laeviglyphiulus patrickmuelleri* n. gen., n. sp. (Diplopoda, Spirostreptida, Cambalopsidae). *Swiss Journal of Palaeontology* **144**(1). doi: 10.1186/s13358-025-00353-w.

Peris, D., Jelínek, J., Sabatelli, S, Liu, M.-K., Peña-Kairath C., Zhao, Q, Cai, C.-Y. , Kairišs, K., Mähler, B., **Rühr, P.T.**, Hammel, J.U. Audisio, P. (**2024**): Archaic sap beetles (Coleoptera: Nitidulidae) as Cretaceous pollinators. *Palaeoentomology* **7**(5). doi: 10.11646/palaeoentomology.7.5.4.

Edel, C., **Rühr, P.T.**, Frenzel, M., van de Kamp, T., Faragó, T., Hammel, J.U., Wilde, F. & Blanke, A. (**2024**): Bite force transmission and mandible shape in grasshoppers, crickets, and allies is not driven by dietary niches. *Evolution*: qpae121. doi: 10.1093/evolut/qpae121.

Rühr, P.T., Edel, C., Frenzel, M., & Blanke, A. (**2024**): A bite force database of 654 insect species. *Scientific Data* **11**: 58. doi: 10.1038/s41597-023-02731-w.

Beurel, S., Bachelier, J. B., Hammel, J.U., Shi, G., **Rühr, P.T.** & Sadowski, E.-M. (**2023**): Flower inclusions of *Canarium* (Burseraceae) from Miocene Zhangpu amber (China). *Palaeoworld* **32**(4): 592-606. doi: 10.1016/j.palwor.2023.02.006.

Rühr, P.T. & Blanke, A. (**2022**): forceX and `forceR`: a mobile setup and R package to measure and analyse a wide range of animal closing forces. *Methods in Ecology and Evolution* **13**(9): 1938-1948. doi: 10.1111/2041-210X.13909.

Rühr, P.T., van de Kamp, T., Faragó, T., Hammel, J.U., Wilde, F., Borisova, E., Edel, C., Frenzel, M., Baumbach, T. & Blanke, A. (**2021**): Juvenile ecology drives adult morphology in two insect orders. *Proceedings of the Royal Society B* **288** (1953): 20210616. doi: 10.1098/rspb.2021.0616.

Strauß, J., Moritz, L. & **Rühr, P.T.** (**2021**): The subgenual organ complex in stick insects: Functional morphology and mechanical coupling of a complex mechanosensory organ. *Frontiers in Ecology and Evolution* **9**: 632493. doi: 10.3389/fevo.2021.632493.

Schucht, P.J., **Rühr, P.T.**, Geier, B., Glaw, F. & Lambertz, M. (**2020**): Armored with skin and bone: A combined histological and µCT-study of the exceptional integument of the Antsingy leaf chameleon Brookesia perarmata (Angel, 1933). *Journal of Morphology* **281** (7): 754–764. doi: 10.1002/jmor.21135.

Rühr, P.T. & Lambertz, M. (**2019**): Surface contrast enhancement of integumentary structures in X-ray

tomography. *Journal of Anatomy* **235** (2): 379-385. doi: 10.1111/joa.13008.

Stritih Peljhan, N, **Rühr, P.T.**; Buh, B & Strauß, J. (**2019**): Low-frequency vibration transmission and mechanosensory detection in the legs of cave crickets. *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology* **233**: 89-96. doi: 10.1016/j.cbpa.2019.04.003.

Mail, M., Klein, A., Bleckmann, H., Schmitz, A., Scherer, T., **Rühr, P.T.**, Lovric, G., Fröhlingsdorf, R., Gorb, S.N. & Barthlott, W. (**2018**): A new bioinspired method for pressure and flow sensing based on the underwater air retaining surfaces of the backswimmer *Notonecta*. *Beilstein Journal of Nanotechnology* **9**: 3039–3047. doi: 10.3762/bjnano.9.282.

Liu, W., **Rühr, P.T.** & Wesener, T. (**2017**): A look with µCT technology into a treasure trove of fossils: The first two fossils of the millipede order Siphoniulida discovered in Cretaceous Burmese amber (Myriapoda, Diplopoda). *Cretaceous Research* **74**: 100-108. doi: 10.1016/j.cretres.2017.01.009.

Stebner, F., Szadziewski, R., **Rühr, P.T.**, Singh, H., Hammel, J.U., Kvifte, G.M. & Rust, J. (**2016**): A fossil biting midge (Diptera: Ceratopogonidae) from early Eocene Indian amber with a complex pheromone evaporator. *Scientific Reports* **6**: 34352. doi: 10.1038/srep34352.

Laetz, E.M.J., **Rühr, P.T.**, Bartolomaeus, T., Preisfeld & Wägele, H. (**2016**): Examining the retention of functional kleptoplasts and digestive activity in sacoglossan sea slugs. *Organisms Diversity & Evolution* **17**: 89-99. doi: 10.1007/s13127-016-0308-0.

Sato, Y., **Rühr, P.T.**, Schmitz, H., Egas, M. & Blanke, A. (**2016**): Age-dependent male mating tactics in a spider mite — A life-history perspective. *Ecology and Evolution* **6**: 7367–7374. doi: 10.1002/ece3.2489.

Blanke, A., **Rühr, P.T.**, Mokso, R., Stampanoni, M., Wilde, F., Machida, R. & Misof, B. (**2015**): Structural Mouthpart Interaction Evolved Already in the Earliest Lineages of Insects. *Proceedings of the Royal Society B* **282** (1812): 20151033. doi: 10.1098/rspb.2015.1033.

Bookchapters

Blanke, A., Sander, S. & **Rühr, P.T.** (**2025**): Ecomorphology of the insect head with a focus on the mouthparts of adults. In *Insect Ecomorphology - Linking Functional Insect Morphology to Ecology and Evolution* (ed. Betz, O.), pp. 59-92. Academic Press, Cambridge, US. doi: 10.1016/B978-0-443-18544-1.00004-1.

Non Peer-Reviewed

Rühr, P.T., Blanke & Lambertz, M. (**2020**): How gold plasma can make hidden structures visible. Article for *q&more / chemeurope.com*.

Conference Presentations

Talks (* invited)

* **Rühr, P.T.**, & Blanke, A. (**accepted**): Coupling Across Stages: Evolutionary Consequences of Life-Cycle Complexity in Two Hemimetabolous Insect Orders. *Annual Meeting of the The Society for Integrative & Comparative Biology (SICB)*, Portland, OR, US.

Rühr, P.T., Gautam S., Blanke, A., & Economo, E. (**2025**): Ant Vision: A High-Throughput Pipeline for 3D Compound Eye Topologies. *International Congress on Invertebrate Morphology (ICIM-6)*, Concepción, Chile.

Rühr, P.T., Pande, A. & Blanke, A. (**2024**): Multifaceted Analysis of Arthropod Vision. *116th Annual Meeting of the DZG*, Hohehnheim, Germany.

Rühr, P.T. & Blanke, A. (**2023**): Measurement and Analysis of Animal Closing Forces: Unlocking Insights into Micro- and Macroevolution. *115th Annual Meeting of the DZG*, Kassel, Germany.

Rühr, P.T., Chesters, D., Edel, C., Frenzel, M. & Blanke, A. (**2022**): Macroevolutionary patterns of bite performance in insects. *114th Annual Meeting of the DZG*, Bonn, Germany.

Rühr, P.T. & Blanke, A.(**2022**): The evolution of bite force in insects. *26th International Congress of Entomology (ICE)*, Helsinki, Finland.

Strauß, J. & **Rühr, P.T.** (**2022**): Evolution and function of an elaborate mechanosensory organ: the subgenual organ complex in the tibia of stick insects. *26th International Congress of Entomology (ICE)*, Helsinki, Finland.

Rühr, P.T. & Blanke, A.(**2022**): Measuring and analysing animal closing forces: a mobile setup and new R package. *SEB Annual Conference 2022*, Montpellier, France.

Rühr, P.T. & Blanke, A. (**2022**): The evolution of bite force in insects. *27th Annual DZG Graduate Meeting in Evolutionary Biology*, Bielefeld, Germany.

Pande, A., Blanke, A. & **Rühr, P.T.** (**2022**): Allometry in Earwig Vision. *27th Annual DZG Graduate Meeting in Evolutionary Biology*, Bielefeld, Germany.

Rühr, P.T. & Blanke, A.(**2021**): Juvenile ecology drives adult head shape evolution in earwigs and stoneflies. *113th Annual Meeting of the DZG*, organized by the University of Würzburg, Würzburg, Germany.

Rühr, P.T. & Blanke, A.(**2020**): Complex life cycles do not necessarily result in adaptive decoupling. *6th Graduate Meeting Evolutionary Biology of the DZG*, organized by the Institute of Population Genetics, Vetmeduni, Vienna, Germany.

Rühr, P.T. & Blanke, A. (**2019**): Nymphal life history influences adult head shape variation in Dermaptera and Plecoptera. *1st combined conference of the Australian Entomological Society (AES), the Society of Australian Systematic Biologists (SASB) and the Australasian Arachnological Society (AAS)*, Brisbane, Australia.

Rühr, P.T. & Blanke, A. (**2018**: The evolution of biting-chewing effectivity in non-holometabolan insects. *111th Annual Meeting of the DZG*, Greifswald, Germany.

*** Rühr, P.T.**, Fagan, M.J., Misof, B. & Blanke, A. (**2017**): Die Biomechanik eines Springschwanzkopfes. *30th Westdeutscher Entomologentag*, Düsseldorf, Germany.

Rühr, P.T., Fagan, M.J., Misof, B. & Blanke, A. (**2017**): Head Biomechanics of a Springtail. *110th Annual Meeting of the DZG*, Bielefeld, Germany.

Rühr, P.T., Koch, M, Blanke, A., Shigekazu, T., Fukui, M., Machida, R. & Misof, B. (**2016**): CT is not enough: Understanding the collembolan endoskeleton. *9th Graduate Meeting Morphology of the DZG*, Laboratorium für Applikationen der Synchrotronstrahlung, Karlsruhe Institute of Technology, Karlsuhe, Germany.

*** Rühr, P.T.**, Blanke, A. & Misof, B. (**2014**): Synchrotron-µCT-scans allow an unprecedented insight into insect morphology and evolution. *Science 3D Workshop*, Deutsches Elektrononen Synchrotron (DESY), Hamburg, Germany

Rühr, P.T., Blanke, A. & Misof, B. (**2014**): Die cephale Morphologie von *Pogonognathellus flavescens* (Hexapoda: Collembola): Eine 3D-Rekonstruktion. *6th Graduate Meeting Morphology of the DZG*, Universität Ulm, Germany.

Rühr, P.T., Blanke, A. & Misof, B. (**2013**): The cephalic structure of *Tomocerus flavescens* (Hexapoda: Collembola): A 3D-reconstruction. *49th Annual Meeting of the Arthropodan Embryological Society of Japan (AES)*, Tsukuba, Ibaraki, Japan.

Posters

Rühr, P.T., Gautam S., Blanke, A., & Economo, E. (**2025**): Ants on trees have a better view!. *117th Annual Meeting of the DZG*, Berlin, Germany.

Strauß, J., Moritz, L. & **Rühr, P.T.** (**2023**): Functional morphology of a leg mechanoreceptor complex in stick insects. *Annual Meeting of the Centre for Mind, Brain and Behavior (CMBB)*, Marburg, Germany.

Schucht, P.J., **Rühr, P.T.**, Moritz, L., Ludwig, J. & Lambertz, M. (**2022**): Functional Morphology and Ontogeny of the Swim Bladder–Vertebrae Association in *Pantodon buchholzi* Peters, 1876. *114th Annual Meeting of the DZG*, Bonn, Germany.

Pande, A., Blanke, A. & **Rühr, P.T.** (**2021**): Visual Ecology of Earwigs. *113th Annual Meeting of the DZG*, organized by the University of Würzburg, Würzburg, Germany.

Strauß, J., Moritz, L. & **Rühr, P.T.** (**2021**): Neuroanatomy and postembryonic development of the subgenual organ complex in stick insects. *14th Göttingen Meeting of the German Neuroscience Society (NWG)*.

Rühr, P.T. & Lambertz, M. (**2019**): Unveiling the invisible: surface contrast enhancement in X-ray tomography with a thin layer of gold. *1st combined conference of the Australian Entomological Society (AES), the Society of Australian Systematic Biologists (SASB) and the Australasian Arachnological Society (AAS)*, Brisbane, Australia.

Rühr, P.T. & Lambertz, M. (**2019**): Unveiling the invisible: a new approach for the selective contrast enhancement of integumentary structures in X-ray tomography. *12th International Congress of Vertebrate Morphology*, Prague, Czech Republic.