

CURRICULUM VITAE

Peter Rupprecht

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Employment History

03/2023-02/2027	SNSF Ambizione Junior Group Leader , University of Zurich, Brain Research Institute, Switzerland
07/2019-02/2023	Postdoctoral Research Fellow , University of Zurich, Brain Research Institute, Switzerland, with Prof. Fritjof Helmchen
10/2018-06/2019	Postdoctoral Research Fellow , FMI Basel, Switzerland, with Prof. Rainer Friedrich
04/2014-10/2018	PhD Student , FMI Basel, Switzerland, with Prof. Rainer Friedrich
09/2013-02/2014	Research Intern , IMP Vienna, Austria, with Prof. Alipasha Vaziri
04/2013-09/2013	Research Intern , FMI Basel, Switzerland, with Prof. Rainer Friedrich
04/2012-03/2013	Diploma Student , University of Bayreuth, Germany, with Prof. Matthias Weiss
03/2011-07/2011	Research Intern , University of Lyon, France, with Prof. Jean-Paul Rieu

Education

04/2014-10/2018	PhD in Neuroscience , University of Basel, with Prof. Rainer Friedrich PhD defense on 19th October 2018 (Grade 6.0 , summa cum laude)
07/2011-03/2013	Diplom in Physics , University of Bayreuth, Germany (Grade 1.0 , top of the year), Thesis supervisor: Prof. Matthias Weiss
08/2010-07/2011	Master M2 in Physics, Master M1 in Biology , ENS Lyon, France
09/2007-08/2010	Vordiplom in Physics , University of Bayreuth, Germany (Grade 1.0 , top of the year)
09/2006-05/2007	Civil service , Hospital in Weiden i.d.OPf., Germany
07/2006	Abitur (German A levels), Kepler Gymnasium Weiden, Germany (Grade 1.0)

Awards and Fellowships

2025-2026	FAN Academic Excellence Fellowship (58,000 CHF)
2023-2027	SNSF Ambizione Fellowship (910,050 CHF)
2020-2021	Postdoc Forschungskredit of the University of Zürich (64,000 CHF)
09/2017	Ruth-Chiquet Ehrismann Originality Prize of the FMI (3,200 CHF)
06/2016	Helmsley Fellowship for a Cold Spring Harbor Laboratory course (3,000 \$)
05/2017	First prize in the "Spikefinder" competition for spike prediction (1,500 €)
2014-2017	PhD Fellowship of the Boehringer Ingelheim Fonds (91,000 €)
2006-2013	Scholarship of the German National Academic Foundation (40,000 €)
2006-2013	Scholarship of the Bavarian Elite Foundation (5,500 €)
08/2005	First prize in the Bavarian competition for Ancient Languages

Service to the Scientific Community

Peer Reviewer for Journals:

- Nature Neuroscience, Nature Methods, Nature Communications, Nature Machine Intelligence, Optica, Optics Letters, Optics Express, Biomedical Optics Express, PNAS, Cell Reports Methods, Bioinformatics, BMC Neuroscience, eLife, Advanced Science, Digital Discovery, Neurophotonics, Scientific Reports, PLoS Computational Biology.

Reviewer for Conferences and Funding Agencies:

- COSYNE conference, Branco Weiss Fellowship Society in Science, UK Research and Innovation Funding Service.

Teaching:

- Lecturer for *Physiology and Anatomy II* for medical students (lectures on Basics of Neuroscience, Synaptic physiology, Neuronal biophysics, Motor systems), Faculty of Medicine, University of Zurich (2022-2026)
- Supervisor and examiner for the *Physiology Practical Course* for medical students (practicals on Nerve conduction, CNS reflex arcs, Auditory physiology, Calcium signaling in heart and colon muscle), Faculty of Medicine, University of Zurich (2023-2026)
- Lecturer and instructor for the *Electrophysiological Practical Course*, a 6-week block course, Faculty of Science, University of Zurich (2019-2025)
- Mentor for the *Computational Neuroscience Course* at Neuromatch Academy (2024)
- Instructor for the *Excite Summer School for Biomedical Imaging*, Faculty of Science, University of Zurich (2019-2020)

Publications

Total of **8 first-author** publications (among those 2x Nature Neuroscience, 1x Neuron, 1x Nature Methods) and **2 last author or co-senior author** publications (preprints with manuscripts under review as of May 2026), among those 7x as corresponding or co-corresponding author. Last updated in May 2026.

Preprints

† = corresponding author, * = co-first author

1. **Rupprecht P†**, Rózsa M, Fang X, Svoboda K, Helmchen F. *Spike inference from calcium imaging data acquired with GCaMP8 indicators*. Nature Methods (accepted). Preprint at <https://doi.org/10.1101/2025.03.03.641129>
2. Duss SN, Wilhelm M, Marinescu AM, Runzhong Z, Helmchen F, Bohacek J†, **Rupprecht P†**. *Locus coeruleus noradrenaline elicits response profiles distinct from natural arousal in hippocampal neurons and astrocytes*. bioRxiv, accepted at eLife (2026). <https://doi.org/10.64898/2026.01.16.699885>
3. Reuss AM, Groos D, Cerisoli M, Nordberg L, Frick L, Voigt FF, Vladimirov N, Bethge P, Reimann R, Helmchen F, **Rupprecht P†**, Aguzzi A†. *aDISCO: A clearing method to enable 3D microscopy of large archival paraffin-embedded human tissue blocks* (2025). <https://www.biorxiv.org/content/10.1101/2025.05.21.655358v3>
4. Hu B*, Temiz NZ*, Chou CN, **Rupprecht P**, Meissner-Bernard C, Titze B, Chung SY, Friedrich RW. Representational learning by optimization of neural manifolds in an olfactory memory network. bioRxiv (2024). <https://doi.org/10.1101/2024.11.17.623906>

Peer-Reviewed Publications

† = corresponding author, * = co-first author

1. **Rupprecht P†**, Fan W, Sullivan SJ, Helmchen F, Sdrulla A†. *Spike rate inference from mouse spinal cord calcium imaging data*. Journal of Neuroscience (2025). <https://doi.org/10.1523/JNEUROSCI.1187-24.2025>
2. Meissner-Bernard C, Jenkins B, **Rupprecht P**, Arn Boudoires E, Zenke F, Friedrich RW†, Frank T†. *Computational functions of precisely balanced neuronal assemblies in an olfactory memory network*. Cell Reports (2025). <https://doi.org/10.1016/j.celrep.2025.115330>
3. Groos D, Reuss AM#, **Rupprecht P#**, Stachniak T, Lewis C, Han S, Roggenbach A, Sturman O, Sych Y, Wieckhorst M, Bohacek J, Karayannis T, Aguzzi A, Helmchen F. *A distinct hypothalamus-habenula circuit governs risk preference*. Nature Neuroscience (2025). <https://www.nature.com/articles/s41593-024-01856-4>, # = equal contribution
4. **Rupprecht P†**, Duss SN, Becker D, Lewis CM, Bohacek J, Helmchen F†. *Centripetal integration of past events by hippocampal astrocytes regulated by locus coeruleus*. Nature Neuroscience (2024). <https://www.nature.com/articles/s41593-024-01612-8>
5. O'Neill PS, Baccino-Calace M, **Rupprecht P**, Lee S, Hao YA, Lin MZ, Friedrich RW, Mueller M, Delvendahl I. *A deep learning framework for automated and generalized synaptic event analysis*. eLife (2024). <https://doi.org/10.7554/eLife.98485>
6. Masala N, Mittag M, Ambrad Giovannetti E, O'Neil DA, Distler FJ, **Rupprecht P**, Helmchen F, Yuste Y, Fuhrmann M, Beck H, Wenzel M†, Kelly T†. *Aberrant hippocampal Ca²⁺ micro-waves following synapsin-dependent adenoviral expression of Ca²⁺ indicators*. eLife (2024). <https://elifesciences.org/articles/93804>
7. **Rupprecht P†**, Carta S, Hoffmann A, Echizen M, Blot A, Kwan AC, Dan Y, Hofer SB, Kitamura K, Helmchen F† & Friedrich RW†. *A database and deep learning toolbox for noise-optimized, generalized spike inference from calcium imaging*. Nature Neuroscience (2021).

<https://www.nature.com/articles/s41593-021-00895-5>

8. Schoenfeld G*, Carta S*, **Rupprecht P**, Ayaz A & Helmchen F. *In vivo calcium imaging of CA3 pyramidal neuron populations in adult mouse hippocampus*. eNeuro (2021). <https://www.eneuro.org/content/8/4/ENEURO.0023-21.2021>
9. Huang KH, **Rupprecht P**, Frank T, Kawakami K, Bouwmeester T & Friedrich RW. *A virtual reality system to analyze neural activity and behavior in adult zebrafish*. Nature Methods (2020). <https://www.nature.com/articles/s41592-020-0759-2>
10. **Rupprecht P**† & Friedrich RW†. *Precise synaptic balance in the zebrafish homolog of olfactory cortex*. Neuron (2018). <https://doi.org/10.1016/j.neuron.2018.09.013>
11. Berens P, Freeman J, Deneux T, Chenkov N, McColgan T, Speiser A, Macke JH, Turaga SC, Mineault P, **Rupprecht P**, Gerhard G, Friedrich RW, Friedrich J, Paninski L, Pachitariu M, Harris KD, Bolte B, Machado TA, Ringach D, Stone J, Rogerson LE, Sofroniew NJ, Reimer J, Froudarakis E, Euler T, Rosón MR, Theis L, Tolias AS & Bethge M. *Community-based benchmarking improves spike inference from two-photon calcium imaging data*. PLoS Computational Biology (2018). <https://doi.org/10.1371/journal.pcbi.1006157>
12. Jacobson GA, **Rupprecht P** & Friedrich RW. *Experience-dependent plasticity of odor representations in the telencephalon of zebrafish*. Current Biology (2018). <https://doi.org/10.1016/j.cub.2017.11.007>
13. **Rupprecht P**, Prendergast A, Wyart C & Friedrich RW. *Remote z-scanning with a macroscopic voice coil motor for fast 3D multiphoton laser scanning microscopy*. Biomedical Optics Express (2016). <https://www.osapublishing.org/boe/fulltext.cfm?uri=boe-7-5-1656>
14. **Rupprecht P**, Prevedel R, Groessl F, Haubensak WE & Vaziri A. *Optimizing and extending light-sculpting microscopy for fast functional imaging in neuroscience*. Biomedical Optics Express (2015). <https://www.osapublishing.org/boe/fulltext.cfm?uri=boe-6-2-353>
15. **Rupprecht P***, Golé L*, Rieu JP, Vézy C, Ferrigno R, Mertani HC & Riviere C. *A tapered channel microfluidic device for comprehensive cell adhesion analysis, using measurements of detachment kinetics and shear stress-dependent motion*. Biomicrofluidics (2012). <https://aip.scitation.org/doi/10.1063/1.3673802>

Software

1. **Data analysis of neuronal calcium imaging data**. A continuously updated and actively maintained Python-based toolbox and database for spike inference from calcium imaging data: <https://github.com/HelmchenLabSoftware/Cascade>
2. **Data analysis of astrocytic calcium imaging data**. A Python or Matlab toolbox to compute centripetal propagation maps from astrocytic calcium recordings using pixel-wise correlation functions: https://github.com/HelmchenLabSoftware/Centripetal_propagation_astrocytes
3. **Cell detection in light-sheet imaging data**. A set of Python-based tools to locate and detect neurons in large light-sheet imaging data from the cleared human brain: https://github.com/PTRRupprecht/Cell_Detection
4. **ROI-selection for calcium imaging data**. A Matlab-based toolbox to screen and select ROIs for analysis of calcium imaging data: <https://github.com/PTRRupprecht/Drawing-ROIs-without-GUI>
5. **Microscope control software**. A Matlab-based software to control a resonant point-scanning microscope: <https://github.com/PTRRupprecht/Instrument-Control/>

Talks

1. *Optimized recording and interpretation of two-photon calcium imaging data.*
EMBL Rome Retreat, invited by Cornelius Gross, Subiaco, Italy (2026).
2. *Two unresolved problems in neurobiology: understanding subcellular signaling in astrocytes and interpreting neuronal calcium imaging data.*
Seminar, invited by Adrian Wanner, Paul Scherrer-Institute, Switzerland (2026).
3. *Astrocytes as subcellular integrators of brain-wide and local signals.*
Symposium talk, invited by Daniel Pinschewer. Department of Biomedicine. Basel, Switzerland (2026).
4. *Rethinking arousal: neuronal and astrocytic integration of noradrenaline signals from locus coeruleus in the hippocampus.*
Seminar, invited by Benjamin Judkewitz. Bernstein Center for Computational Neuroscience. Berlin, Germany (2026).
5. *Watching the brain think, and what we can learn from it.*
Brain Fair public talk on neurotechnology and the neurobiological basis of addiction, for highschool students at Schule Stettbach, Zürich, Switzerland (2026).
6. *aDISCO: A broadly applicable method for 3D microscopy of archival paraffin-embedded human tissues.*
Talk at the mesoSPIM 10-year symposium. Zürich, Switzerland (2025).
7. *Two unsolved problems in neurobiology: describing astrocytic calcium signaling and interpreting neuronal calcium imaging data.*
Seminar, invited by Philipp Berens. Hertie Institute for AI in Brain Health. Tübingen, Germany (2025).
8. *Two unsolved problems in neurobiology: describing astrocytic calcium signaling and interpreting neuronal calcium imaging data.*
Seminar, invited by Jakob Macke. University of Tübingen, Germany (2025).
9. *Effects of locus coeruleus on hippocampal astrocytes and neurons during natural and artificial arousal.*
Public talk, invited by David Weinshenker. Blue Spot Seminar, an online seminar series on the locus coeruleus (2025).
10. *Spike inference from calcium imaging data with GCaMP8.*
Selected talk at the Braincoder conference on brain-machine interfaces and neurotechnologies for transmitting information to the brain. Gardanne, France (2025).
11. *Signal integration in astrocytes and how it is controlled by the locus coeruleus.*
KNZ Symposium talk (Clinical Neuroscience Zürich), invited by the KNZ organizing committee. Zürich, Switzerland (2024).
12. *Closed-loop experiments to study neuronal plasticity in mice.*
ZNZ PI Retreat talk. Au (ZH), Switzerland (2024).
13. *Somatic integration in astrocytes, controlled by the locus coeruleus.*
Swisskern Meeting talk. Zürich, Switzerland (2024).
14. *Centripetal integration of past events in hippocampal astrocytes and its regulation by the locus coeruleus.*
Selected conference talk, Bonn Brain³ Conference. Bonn, Germany (2023).
15. *Calcium imaging in vivo: How astrocytic somata slowly integrate important input.*
Public talk in the Astrocyte Café, invited by Nilhan Gunhanlar and Carmen Falcone. Astrocyte Café Online Seminar Series. (2023).

16. *Interpretation of calcium imaging data: post-processing, spike inference and artifacts.* Nemonic Workshop, invited by Spencer Smith. UCSB, California, USA. (2023).
17. *Astrocytes as computational units.* Public seminar of the Science Society, invited by Serena Michaels & Catarina Cunha. Clubhouse platform Seminar Series (2022).
18. *Precise synaptic balance in the zebrafish homolog of olfactory cortex,* Selected conference talk at the DPG Spring Meeting. Regensburg, Germany (2019).
19. *Quantitative imaging of neuronal activity in the adult zebrafish: voice coil motors, deep networks and the detection of single action potentials.* Optics seminar at the EMBL, invited by Robert Prevedel. Heidelberg, Germany (2019).
20. *Precise synaptic balance in the zebrafish homolog of olfactory cortex.* Public postdoc application talk, invited by Kevin Briggman. Caesar Institute Bonn, Germany (2018).
21. *Precise synaptic balance in the zebrafish homolog of olfactory cortex.* Public postdoc application talk, invited by Karel Svoboda and Vivek Jayaraman. Janelia, USA (2018).

Outreach

Invited blog posts:

1. How to compute $\Delta F/F$ from calcium imaging data, *Scientifica Resource Center* (2025) [link](#)
2. How to use Google Scholar as a neuroscientist, *Scientifica Resource Center* (2025) [link](#)
3. I never meant to study the brainstem, *ANSYME substack* (2025) [link](#)

Personal scientific blog:

<http://www.gcamp6f.com>, with >130 blog posts since 2014, >100,000 visitors. Selected blog posts:

1. Interesting papers on the role of neuronal cell organelles in calcium signaling (2025) [link](#)
2. Detecting single spikes from calcium imaging (2025) [link](#)
3. Annual report of my intuition about the brain (2024) [link](#)
4. Why your two-photon images are noisier than you expect (2024) [link](#)
5. Three recent interesting papers on computational neuroscience (2024) [link](#)
6. Improving the resonant scanner's sync signal using a phase locked loop (PLL) (2023) [link](#)
7. Interesting papers on behavioral timescale synaptic plasticity (experiments) (2023) [link](#)
8. Self-supervised denoising of calcium imaging data (2022) [link](#)
9. Simple geometrical optics to understand and design point-scanning microscopes (2022) [link](#)
10. Large-scale calcium imaging & noise levels (2021) [link](#)
11. Fast scanning, triplet states and photon yield (2021) [link](#)
12. Heating up the objective for two-photon imaging (2021) [link](#)
13. Hodgkin-Huxley model in current clamp and voltage clamp (2020) [link](#)
14. Interview with Bruno Pichler (2020) [link](#)
15. Discrepancies between calcium imaging and extracellular ephys recordings (2020) [link](#)
16. Alignment tools (2020) [link](#)
17. Photon yield and pulse dispersion (2019) [link](#)
18. The power of correlation functions (2019) [link](#)
19. Alvarez lenses and other strangely shaped optical elements (2018) [link](#)
20. Blue light-induced artifacts in glass pipette-based recording electrodes (2018) [link](#)
21. Understanding style transfer (2017) [link](#)
22. All-optical entirely passive laser scanning with MHz rates (2017) [link](#)
23. A short report from a Cold Spring Harbor lab course (2017) [link](#)
24. Whole-cell patch clamp (III): Limitations of quantitative whole-cell voltage clamp (2017) [link](#)
25. The crow as an animal model for neuroscience (2016) [link](#)

26. Preampfier bandwidth & two ways of counting photons (2016) [link](#)
27. Modulating laser intensity on multiple timescales (x, y and z) (2016) [link](#)
28. Point spread functions (2015) [link](#)
29. A simple non-graphical user interface in Matlab: keyboard callback functions (2015) [link](#)