# Paula Navarro, PhD

*Curriculum vitae*

*Department of Fundamental Microbiology*
*University of Lausanne*
✱ *21 December 1990*
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## Education

2015–2019 **PhD in Structural Biology and Biophysics**, *Biozentrum, University of Basel*, Basel, *Summa Cum Laude*
Advisor: Prof. Henning Stahlberg
Computational advancements in Cryo-Electron Tomography: a quantitative characterization of Parkinson's Disease hallmarks in the human brain

2013–2014 **MSc in Molecular Biology**, *Biozentrum, University of Basel*, Basel
Advisor: Prof. Jean Pieters

2008–2013 **Licenciate in Biology**, *Complutense University of Madrid*, Madrid

## Academic appointments

2024–present **SNSF Assistant Professor**, *Department of Fundamental Microbiology, University of Lausanne*, Lausanne
My research group applies and develops advanced imaging methods to study bacterial cell morphogenesis and phage-host interactions. We follow an integrative approach where we combine cryo-electron microscopy (cryo-EM) and cryo-electron tomography (cryo-ET) with superresolution light microscopy (LM), microfluidics, atomic force microscopy (AFM), biophysical biomodelling, AI-aided pipelines and software tools as subtomogram averaging (STA) for *in situ* structure determination. Our main goal is to establish mechanistic understanding of the molecular processes mediating bacterial morphogenesis, cell surface evolution and phage-host interactions.

2019–2024 **Postdoctoral fellow**, *Harvard Medical School*, Boston
Advisor: Prof. Thomas Bernhardt
I studied the molecular mechanisms involved in bacterial cell division and mitochondrial cristae remodelling by implementing and applying *in situ* structural biology methods as cryo-focused ion beam milling (cryo-FIB), cryo-ET and AFM through advanced image processing and biophysical modeling. This work has been published in *Cell*, *Nature Microbiology*, *The EMBO Journal*, *PNAS* and *Frontiers in Molecular Biology*. Some of this work is currently on *bioRxiv* and in a revised form at *Nature Microbiology*

2015–2019 **PhD student**, *Biozentrum, University of Basel*, Basel

Advisor: Prof. Henning Stahlberg

I integrated diverse 3D electron microscopy methods (3DEM) as electron tomography, serial-block face scanning electron microscopy (SBFSEM), cryo-FIB and light microscopy together with RAMAN and X-ray ptychography to study the structural basis of brain aggregates in Parkinson's Disease human brain samples. I contributed to the development of new software tools for the computational analysis of cryo-electron tomograms and structure determination via subtomogram averaging. This work resulted in 6 publications in *Nat. Neuroscience*, *Frontiers in Mol. Biosc.*, *Scientific reports*, *Microscopy and Microanalysis*, *Structure* and *Methods in Cell Biology*. Our sofware package is open source and can be found here.

### Research stays

2018 **The Scripps Research Institute**, San Diego, USA

Supervisor: Prof. Gabriel Lander

I spent a scientific visit funded by the Antelope PhD Fellowship from University of Basel to learn innovative methods for sample preparation and image processing for single particle cryo-EM.

2018 **University of California San Diego**, San Diego, USA

Supervisor: Prof. Elizabeth Villa

I spent a scientific visit funded by Prof. Villa to learn cryo-FIB milling, and I also instructed a workshop on subtomogram averaging for the lab.

## Funding acquisition

### Grants

2024–2025 **Total funding acquistion: 4.87 Mio. CHF**

2026–2027 **Swiss National Science Foundation SPARK 2025**, *CRSK-3-237167*, Role: Principal Investigator, Grant Coordinator, 100KCHF

Title: Visualization of vitrified intact cells by four-dimensional scanning transmission electron ptychographic tomography (4D-STEPT)

2025–2029 **Swiss National Science Foundation Collaborative Project Grant 2025**, *320030-236069*, Role: Leading investigator and Principal Investigator, Grant Coordinator, 2.7Mio. CHF

Title: TomoPath: AI-driven high-resolution analysis of protein packing flexibility by in situ structural biology showcased on dynamics of corynephage architecture

2025 **Soutien aux projets en cryo-microscopie électronique, FBM, UNIL**, *20K CHF*, Role: Principal investigator

2024–2026 **Fondation Pierre Mercier pour la science**, *250K CHF*, Role: Principal Investigator

Title: *In situ* structural biology of the phage CL31 in *Mycobacteriales*

2024–2029 **Swiss National Science Foundation Starting Grant 2023**, *TMSGI3_218251*, Role: Principal Investigator, 1.8Mio. CHF

Title: *In situ* structural studies to understand the assembly, organization and phage-dependent remodeling of the corynebacterial cell envelope

### Contributions to ongoing funded research

2021–2026 **NIH R35**, *Principal Investigator: Prof Luke Chao*, Role: contributor of preliminary data, figures and text.
Title: Probing structural and biophysical mechanisms of mitochondrial membrane ultrastructure

### Contributions to prior funded research

2018–2021 **Swiss National Science Foundation Sinergia Grant**, *177195*, Principal Investigators: Prof. Henning Stahlberg, Prof. Roland Riek, Prof. Paola Picotti, Role: employee
Title: Molecular and Cellular Modulation in Parkinson's Disease

2014–2018 **Swiss National Science Foundation Sinergia Grant**, *154461*, Prof. Henning Stahlberg, Prof. Roland Riek, Prof. Paola Picotti, Prof. Lawrence Rajendran, Prof. Jonas Ries., Role: employee
The Time- and Spatially Resolved Aggregation of a-Synuclein and its Relationship to Cell-Cell Transmissibility

### Other funding

2026 **Fondation Herbette**, *Cryo-EM club at UNIL montly seminar series. Role: organizer.*

### Fellowships

2021–2022 **SNSF Postdoc.Mobility Fellowship**, *P400PB_199252*

2019–2021 **SNSF Early Postdoc.Mobility Fellowship**, *P2BSP3_188112*

2018 **Antelope Fellowship**, *University of Basel*, Role: PhD student

2011–2012 **ERASMUS Grant**, *Complutense University of Madrid*

## Honors and Awards

2024 **Organizer**, *Cryo-EM club at UNIL*

2024 **Organizer**, *DMF Impromptu Symposium: The Bacterial Cell Across Scales*

2024 **Session Chair**, *Dubochet Center for Imaging Symposium, Lausanne*

2023 **Chair**, *Three Dimensional Electron Microscopy, Gordon Research Seminar*

2022 **Scientific Poster Judge**, *Three Dimensional Electron Microscopy, Gordon Research Seminar*

2021 **Outstanding women citizen**, *Achievements and career*, Navalcarnero, Madrid, Spain

2021 **Talk Award**, *Three Dimensional Electron Microscopy, Gordon Research Conference*

2020 **M&M Posdoctoral Award**, *Microscopy Society of America*

## Memberships and societies

**LS2: Life Sciences Switzerland**, *FEBS*

**AcademiaNet**, *Outstanding Women Academics*

## Teaching experience

2025-2026 **Co-lecturer and co-organizer**, *FBM, UNIL*, Recent Advances in Microbiology: topic group
Proposition d'enseignement optionnel 2025-2026, Doctoral program

2025-2026 **Co-lecturer and co-organizer**, *FBM, UNIL*, Introduction à la cryomicroscopie électronique
Proposition d'enseignement optionnel, MLS, 2025-2026

2024 **Co-lecturer and co-organizer**, *DMF, UNIL, CUSO Microbiology*, The Do's and Don'ts in Scientific Collaborations
Day workshop

2021 **Guest lecturer**, *Yale University*
I gave a theoretical lecture on subtomogram averaging and image processing as part of a workshop organized by Prof. Jun Liu.

2018 **Instructor**, *California Institute of Technology*, USA
Course: *Dynamo* image processing workshop

2018 **Instructor**, *EMBL Heidelberg*, Germany, Course: EMBO Practical Course: Cryo-Electron Microscopy and 3D Image Processing.

2018 **Instructor**, *Biozentrum, University of Basel*, Switzerland, Course: *Dynamo* image processing workshop

2018 **Instructor**, *University of California San Diego*, USA, Course: *Dynamo* image processing workshop

2018 **Lecturer**, *Biozentrum, University of Basel*, Switzerland, Graduate teaching program: New Insights into Cryo-Electron Tomography

2017 **Lecturer**, *Biozentrum, University of Basel*, Switzerland, Bachelor teaching program: 1055-01, Einführung in die Biologie HS 2017

2017 **Instructor**, *CCP-EM RAL/Diamond Facility*, Oxford, UK, Course: *Dynamo* image processing workshop

2017 **Instructor**, *Delft Technical University*, The Netherlands, Course: *Dynamo* image processing workshop

2017 **Instructor**, *Biozentrum, University of Basel*, Switzerland, Course: *Dynamo* image processing workshop

2017 **Instructor**, *Institut Pasteur*, Paris, France, Course: Integrative Structural Biology Course

2015–2018 **Instructor**, *Biozentrum, University of Basel*, Switzerland, Bachelor teaching program: Structural Biology Blockkurs

2013–2015 **Instructor**, *Biozentrum, University of Basel*, Switzerland, Bachelor teaching program: Biochemistry Blockkurs

## Mentoring experience

2026 **Hugo Arnau Alemany**, *High-school student stay*, DMF, UNIL

2026–present **Céline Schmuziger**, *Lab manager*, DMF, UNIL

2026–present **Kareena Strunden**, *First step master student*, DMF, UNIL

2026–present **Massimo Borrani**, *First step master student*, DMF, UNIL

2026–present **Shamphavi Sivabalasarma**, *Postdoctoral researcher*, DMF, UNIL

2025–present **Virly Ananda**, *PhD student*, DMF, UNIL

2025–present **Marina Arnau Alemany**, *Master student*, DMF, UNIL

2025–present **Erica Cordero**, *Postdoctoral researcher*, DMF, UNIL

2024–present **Ekaterina Kravchuk**, *PhD student*, DMF, UNIL

2024–present **Elsa Astorga**, *Postdoctoral researcher*, DMF, UNIL

2024–present **Aurélien Gregor**, *Data analyst*, DMF, UNIL

2025 **Saana Londono**, *Research assistant*, DMF, UNIL

2024 **Alejandro López de Tavares**, *Research assistant*, DMF, UNIL

2024 **Virginie Trieu**, *Visiting scientist*, DMF, UNIL

2021–2023 **Virly Ananda**, *data analyst since 2022 and master student 2021/22*, MGH / HMS, Boston, USA

2020–2022 **Camila Makhlouta Lugo**, *Research technician*, MGH / HMS, Boston, USA

2021–2022 **Harrison Wang**, *PhD rotation student*, HMS, Boston, USA

2020 **Ilzat Ali**, *PhD rotation student*, HMS, Boston, USA

2019–2020 **Julie McDonald**, *research technician*, MGH / HMS, Boston, USA

2016 **Job Nexar Quispe Huamán**, *Swiss Medical Student exchange program*, Biozentrum, University of Basel

## Oral presentations

2026 **Invited speaker, Infection Biology Seminar, Biozentrum**

2026 **Invited speaker, ChemBio-VIII, San Sebastian**

2026 **Invited speaker and instructor, Macromolecular Cyrstallography and Cryo-EM School Madrid**

2025 **Invited speaker, The Great Wall Meeting**, *Sicily, Italy*

2025 **Invited speaker, Swiss Society for Microbiology Annual Congress**, *Interlaken, Switzerland*

2025 **Invited speaker, FEBS Advanced Lecture Course: Emerging Insights from Structural Biology into Molecular Mechanisms of Diseases**, *Groningen, The Netherlands*

2025 **Invited speaker, Structural Biology Symposium**, *University of Pennysilvania, USA*, declined due to sustainability reasons

2025 **Invited speaker, Centro Nacional de Biotecnologia (CNB), CSIC**, *Madrid, Spain*

2025 **Invited speaker, Institut de Biologie Structurale**, *Grenoble, France*

2025 **Invited speaker, Life Sciences Switzerland, LS2 Annual Meeting**, *Fribourg, Switzerland*

2024 **DMF Science Day 2024**, *DMF, UNIL*

2024 **Cryo-ET lab retreat of Prof. Wanda Kukulski, Prof. Misha Kudryashev and Prof. Oriol Gallego**, *Faffleralp, Switzerland*

2023 **Invited speaker, American Society for Cellular Biology Conference**, *Boston, USA*

2023 **Invited speaker, FMI**, *Basel, Switzerland*

2023 **Invited speaker, DMF, UNIL**, *Lausanne, Switzerland*

2022 **Invited speaker, Structural and Computational Biology Unit**, *EMBL Heidelberg, Germany*

2022 **Invited speaker, MultiModal Molecular Imaging Institute**, *The Netherlands*, online

2022 **Invited speaker, Biozentrum**, *University of Basel, Switzerland*

2021 **Invited speaker, New England Cryo-EM Symposium**, *University of Massachusetts, USA*

2021 **Selected poster talk, 3DEM, GRC**, *New Hampshire, USA*

2021 **Invited speaker, 3DEM, GRS**, *New Hampshire, USA*

2020 **Invited speaker, New England Cryo-EM Symposium**, *Harvard Medical School, USA*, online

2020 **Invited speaker, Microscopy and Microanalysis**, *virtual meeting*, online

2019 **Talk, Cryo-EM club**, *HMS, Boston, USA*

2019 **Talk, 25 years of Cryo-EM in Spain: a tribute to José L. Carrascosa**, *Madrid, Spain*

2018 **Talk, The Scripps Research Institute**, *San Diego, USA*

2018 **Talk, Harvard Medical School**, *Boston, USA*

2018 **Talk, Yale School of Medicine**, *New Haven, USA*

2018 **Talk, New York Structural Biology Center**, *New York City, USA*

2018 **Selected poster talk, 8th International Conference on Electron Tomography**, *Switzerland*

2018 **Talk, NCCR Workshop for cryo-EM**, *Basel, Switzerland*

## Institutional responsibilities

2024-2025 **Committees**, *Interdisciplinary Research Projects Faculty of Biology and Medicine (FBM), FBM awards, DMF faculty search, FBM cryo-EM project funding, external expert at international PhD programs (PhDCare, EMBL-Heidelberg, University of Geneva)*

2019-2024 **Responsible for Cryo-FIB user training and communication with TFS local engineer**, *MIT.nano*, Boston, USA

2019-2024 **Responsible for introducing and establishing Cryo-ET data acquisition of cryo-FIB milled samples**, *MIT.nano and HMS Cryo-EM facilities*, Boston, USA

2019-2024 **Responsible for workstations and cluster user training for image data processing**, *MGH*, Boston, USA

## Professional Services

**Journal Reviewer**, *Nature Microbiology, Current Opinion in Structural Biology, Nature Communications, Journal of Structural Biology, Micropublication Biology, Ultramicroscopy.*

**Grant Reviewer**, *SNSF, ETH-Z, UKRI - UK research and Innovation - United Kingdom, Agence Nationale de la Recherche (ANR) France*

## Languages

**Spanish (native), English (proficient), French (working proficiency, B1), German (basic knowledge, A2).**

## Career breaks

2016 **Leave**, *1st child*

## Personal development and workshops

2024 **DEI Leadership Workshop for Assistant Professors at UNIL**, *hpf consulting*

2024 **Foundation of Female Leadership**, *SNSF*

2018 **Time Management for young scientists**, *Antelope Program, University of Basel*

## Outreaching activities

2026 **Lausanne High-school stays, introducing young generations to science**, *mentoring*

2026 **Cryo-EM club at UNIL**, *seminar and pizza!*

2022 **Seeing division like never before!**, *News and Press at Harvard Medical School*, video

2022 **Scenes from the nanoscale**, *MIT.nano*, link

## 10 Most important publications

1. **Navarro PP.#,***, Vettiger A.#, Hajdu R., Ananda V.Y., López-Tavares A., Schmid E., Walter J.C., Loose M., Chao L.C., Bernhardt T.G.* (**2025**) **The aPBP-type cell wall synthase PBP1b plays a specialized role in fortifying the *Escherichia coli* division site against osmotic rupture.** *BioRxiv*.(in revised form at Nature Microbiology). DOI.
2. Pelech P., **Navarro PP.,** Vettiger A., Chao LH., Allolio C. (**2025**) Stress-mediated growth determines *E. coli* division site morphogenesis. *PNAS*. DOI.
3. Corel R., **Navarro PP.**, Scaramuzza S., Stahlberg H., Castaño-Díez D. (**2024**) Automated Fiducial-Based Alignment of Cryo-Electron Tomography Tilt Series in Dynamo. *Structure*. DOI.
4. Fry MY.#, **Navarro PP.#**, Hakim P., Ananda VY., Qin X., Landoni JC., Rath S., Inde Z., Makhlouta Lugo C., Luce BE., Ge Y., Ge Y., McDonald HL., Ali I., Ha LL., Kleinstiver BP., Chan DC., Sarosiek KA., Chao LH. **(2024**) *In situ* architecture of Opa1-dependent mitochondrial cristae remodeling. *The EMBO Journal*. DOI.
5. **Navarro PP.#**, Vettiger A.#, Ananda VY., Montero Llopis P., Allolio C., Bernhardt TG., Chao LH. **(2022) Cell wall synthesis and remodeling dynamics determine bacterial division site architecture and cell shape in *Escherichia coli*.** *Nature Microbiology*. DOI.
6. **Navarro PP.* (2022) Quantitative cryo-electron tomography.** *Frontiers in Molecular Biosciences*. DOI.
7. Shahmoradian, SH., Lewis, AJ., Genoud, C., Hench, J., Moors, T., **Navarro, PP.**, et al., (**2019**) Lewy pathology in Parkinson's disease consists of a crowded organellar, membranous medley. *Nature Neuroscience*. 22 (7), 1099-1109. DOI.
8. Leigh, KE., **Navarro, PP.**, Scaramuzza, S., Chen, W., Zhang, Y., Castaño-Díez, D., Kudryashev, M. (**2019**) Subtomogram averaging from cryo electron tomograms. *Methods in Cell Biology*. Volume 152, 217-259. DOI.
9. **Navarro, PP.**, Genoud, C., Castaño-Díez, D., Graff-Meyer, A., Lewis, AJ., Gier, Y. de, Lauer, ME., Britschgi, M., Bohrmann, B., Frank, S., Hench, J., Schweighauser, G., Rozemuller, AJM., van de Berg, WDJ., Stahlberg, H., Shahmoradian, SH. (**2018**) Cerebral Corpora amylacea are dense membranous labyrinths containing structurally preserved cell organelles. *Scientific Reports* 8, 18046. DOI.
10. **Navarro PP.**, Stahlberg H., Castaño-Díez D. (**2018) Protocols for subtomogram averaging of membrane proteins in the Dynamo software package.** *Frontiers in Molecular Biosciences*. 5:82. DOI.

# indicates equal contribution. * indicates corresponding authorship.

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## Software

13. The *Dynamo* software package for cryo-electron tomography and subtomogram averaging. Role: contributor. WikiPage.

14. CryoNAV: software platform for high-throughput data handling of large datasets. Role: developer and contributor. WikiPage.

## Data sets

15. EMPIAR-11090
16. EMPIAR-11087
17. EMPIAR-11089
18. EMPIAR-11088
19. EMPIAR-11818
20. EMPIAR-11817
21. EMPIAR-11816
22. EMPIAR-11820
23. EMPIAR-11819
24. EMD-27479
25. EMD-27485
26. EMD-27486
27. EMD-27484
28. EMD-43067
29. EMD-43069
30. EMD-43070
31. EMD-43068
32. EMD-43061
33. EMD-43058
34. EMD-43059
35. EMD-43060
36. EMD-43062
37. EMD-43057
38. EMD-43056
39. EMD-43055
40. EMD-43054
41. EMD-43053
42. EMD-43063
43. EMD-43064
44. EMD-43065
45. EMD-43066
46. EMD-43050
47. EMD-43049
48. EMD-43051
50. EMD-43052
51. EMD-53351
52. EMD-53363
53. EMD-53357