Stanford

Matthias Garten

Assistant Professor of Microbiology and Immunology and of Bioengineering

Bio

BIO

Matthias Garten, Ph.D., is an assistant professor in the department of Immunology and Microbiology and the department of Bioengineering. He is a membrane biophysicist who is driven by the question of how the malaria parasite interfaces with its host-red blood cell, how we can use the unique mechanisms of the parasite to treat malaria and to re-engineer cells for biomedical applications.

He obtained a physics master's degree from the Dresden University of Technology, Germany with a thesis in the laboratory of Dr. Petra Schwille and his Ph.D. life sciences from the University Paris Diderot, France through his work in the lab of Dr. Patricia Bassereau (Insitut Curie) investigating electrical properties of lipid membranes and protein - membrane interactions using biomimetic model systems, giant liposomes and planar lipid membranes.

In his post-doctoral work at the National Institutes of Health, Bethesda in the laboratory of Dr. Joshua Zimmerberg, he used molecular, biophysical and quantitative approaches to research the malaria parasite. His work led to the discovery of structure-function relationships that govern the host cell – parasite interface, opening research avenues to understand how the parasite connects to and controls its host cell.

ACADEMIC APPOINTMENTS

- Assistant Professor, Microbiology and Immunology
- Assistant Professor, Bioengineering
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)

HONORS AND AWARDS

- Jagdeep & Roshni Singh Faculty Fellow, Stanford University (2022-2024)
- Recognition of scientific excellence, American Society of Tropical Medicine and Hygiene (2019)
- Ph.D. Fellowship - Curie International Ph.D. Program, Insitut Curie, Paris, France (2010-2014)

LINKS

- Lab website: https://sites.google.com/stanford.edu/mglab/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

With a creative, collaborative, biophysical mindset, we aim to understand the ability non-model organisms to interface with environment to a point at which we can exploit the mechanisms finding cures against diseases and use the mechanisms as tools that we can use to engineer the environment. By developing approaches that allow a quantitative understanding and manipulation of molecular transport our research makes non-model organisms accessible to researchers and engineers.

Specifically, we are studying how the malaria parasite takes control over red blood cells. By learning the biophysical principles of transport in between the host and the parasite we can design ways to kill the parasite or exploit it to reengineer red blood cells. The transport we study is broadly encompassing everything from ions to lipids and proteins. We use variations of quantitative microscopy and electrophysiology to gain insight into the unique strategies the parasite evolved to survive.

Teaching

COURSES

2025-26

- Molecular and Cellular Bioengineering: BIOE 300A (Win)

2024-25

- Advanced Seminar in Microbial Biology: BIO 346, CSB 346, GENE 346 (Aut, Spr)
- Molecular and Cellular Bioengineering: BIOE 300A (Win)

2022-23

- Physical Biology: BIOE 42 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Aidan Cabral

Postdoctoral Faculty Sponsor

Liat Adler, Pakeeza Azizpor, Ananya Ray

Doctoral Dissertation Advisor (AC)

Elizabeth Karas, Rowan Karr, Kyle McLelland

Doctoral (Program)

Jingru Che, Jenny Ji, Mohini Misra, Anru Tian

Publications

PUBLICATIONS

- **Structured to conquer: transport across the Plasmodium parasitophorous vacuole** *CURRENT OPINION IN MICROBIOLOGY*
  Garten, M., Beck, J. R.
  2021; 63: 181-188
- **Contacting domains segregate a lipid transporter from a solute transporter in the malarial host-parasite interface** *NATURE COMMUNICATIONS*

Garten, M., Beck, J. R., Roth, R., Tenkova-Heuser, T., Heuser, J., Istvan, E. S., Bleck, C. K. E., Goldberg, D. E., Zimmerberg, J.
2020; 11 (1): 3825

- **EXP1 is critical for nutrient uptake across the parasitophorous vacuole membrane of malaria parasites** *PLOS BIOLOGY*
  Mesen-Ramirez, P., Bergmann, B., Thuy Tuyen Tran, Garten, M., Staecker, J., Naranjo-Prado, I., Hoehn, K., Zimmerberg, J., Spielmann, T.
  2019; 17 (9): e3000473
- **EXP2 is a nutrient-permeable channel in the vacuolar membrane of Plasmodium and is essential for protein export via PTEX** *NATURE MICROBIOLOGY*
  Garten, M., Nasamu, A. S., Niles, J. C., Zimmerberg, J., Goldberg, D. E., Beck, J. R.
  2018; 3 (10): 1090-+
- **Rounding precedes rupture and breakdown of vacuolar membranes minutes before malaria parasite egress from erythrocytes.** *Cellular microbiology*
  Glushakova, S., Beck, J. R., Garten, M., Busse, B. L., Nasamu, A. S., Tenkova-Heuser, T., Heuser, J., Goldberg, D. E., Zimmerberg, J.
  2018; 20 (10): e12868
- **Exploitation of a newly-identified entry pathway into the malaria parasite-infected erythrocyte to inhibit parasite egress** *SCIENTIFIC REPORTS*
  Glushakova, S., Busse, B. L., Garten, M., Beck, J. R., Fairhurst, R. M., Goldberg, D. E., Zimmerberg, J.
  2017; 7: 12250
- **Whole-GUV patch-clamping** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Garten, M., Mosgaard, L. D., Bornschloegl, T., Dieudonne, S., Bassereau, P., Toombes, G. E. S.
  2017; 114 (2): 328-333
- **Absence of the ER Cation Channel TMEM38B/TRIC-B Disrupts Intracellular Calcium Homeostasis and Dysregulates Collagen Synthesis in Recessive Osteogenesis Imperfecta** *PLOS GENETICS*
  Cabral, W. A., Ishikawa, M., Garten, M., Makareeva, E. N., Sargent, B. M., Weis, M., Barnes, A. M., Webb, E. A., Shaw, N. J., Ala-Kokko, L., Lacbawan, F. L., Hogler, W., Leikin, et al
  2016; 12 (7): e1006156
- **Reconstitution of a transmembrane protein, the voltage-gated ion channel, KvAP, into giant unilamellar vesicles for microscopy and patch clamp studies.** *Journal of visualized experiments : JoVE*
  Garten, M., Aimon, S., Bassereau, P., Toombes, G. E.
  2015: 52281
- **Methyl-branched lipids promote the membrane adsorption of alpha-synuclein by enhancing shallow lipid-packing defects** *PHYSICAL CHEMISTRY CHEMICAL PHYSICS*
  Garten, M., Prevost, C., Cadart, C., Gautier, R., Bousset, L., Melki, R., Bassereau, P., Vanni, S.
  2015; 17 (24): 15589-15597