Stanford

Karoline Marie Bornemann

Postdoctoral Scholar, Cardiology

Curriculum Vitae available Online

Bio

BIO

Karoline-Marie Bornemann, PhD, is a biomedical engineer interested in cardiovascular flows, specifically the computational modeling of heart valves using fluid-structure interaction simulations. Her current postdoctoral research in the Marsden lab at Stanford University focuses on the simulation of congenital valve pathologies and valve repair in pediatrics working with Alexander D. Kaiser, Alison Marsden and Michael Ma. She obtained her PhD in Biomedical Engineering from the University of Bern where she investigated instability mechanisms leading to laminar-turbulent transition past bioprosthetic aortic valves with Dominik Obrist and Peter Schmid. During her PhD, she performed a secondment at KTH Royal Institute of Technology collaborating with Ardeshir Hanifi and Dan Henningson assessing the stability of flow fields past valve prostheses. Visualizations of her PhD research were showcased in a winning entry of the Gallery of Fluid Motion 2024 and her PhD thesis won the GCB Best PhD Thesis 2024 Award.

INSTITUTE AFFILIATIONS

- Member, Maternal & Child Health Research Institute (MCHRI)

HONORS AND AWARDS

- GCB Best PhD Thesis 2024, GCB, University of Bern (06/2025)
- Winner of the Gallery of Fluid Motion, American Physical Society (APS), Division of Fluid Dynamics (11/2024)
- UniBE Short Travel Grant for (Post)Docs, University of Bern (04/2024)
- Best poster award in the category 'Pathology, Mechanisms and Outcomes', Heart Valve Society (HVS) (02/2024)
- PROMOS International Scholarship, German Academic Exchange Service (DAAD) (04/2019)

PROFESSIONAL EDUCATION

- Doctor of Philosophy, University of Bern (Bern, Switzerland) , Biomedical Engineering (2024)
- Diplom (Master of Science), Technische Universität Dresden (Dresden, Germany) , Aerospace Engineering (2020)

STANFORD ADVISORS

- Alexander Kaiser, Postdoctoral Research Mentor
- Alison Marsden, Postdoctoral Faculty Sponsor

LINKS

- Personal website: https://www.karoline-m-bornemann.com

Publications

PUBLICATIONS

- **Simulations Predict Improved Valve Performance Without Direct Leaflet Intervention After Neonatal Truncus Arteriosus Repair.** *The Journal of thoracic and cardiovascular surgery*
  Bornemann, K. M., Choi, P. S., Huber, J., Reed, A. K., Sharir, A., Maskatia, S. A., Marsden, A. L., Ma, M. R., Kaiser, A. D.
  2026
- **Optimal three-dimensional perturbations in fluttering and non-fluttering bioprosthetic aortic valves** *JOURNAL OF FLUID MECHANICS*
  Bornemann, K., Moniripiri, M., Henningson, D. S., Obrist, D., Schmid, P. J., Hanifi, A.
  2026; 1031
- **Transition to turbulence past bioprosthetic aortic valves** *PHYSICAL REVIEW FLUIDS*
  Bornemann, K., Obrist, D.
  2025; 10 (11)
- **Leaflet fluttering changes laminar-turbulent transition mechanisms past bioprosthetic aortic valves** *PHYSICS OF FLUIDS*
  Bornemann, K., Obrist, D.
  2025; 37 (5)
- **The relation between aortic morphology and transcatheter aortic heart valve thrombosis: Particle tracing and platelet activation in larger aortic roots with and without neo-sinus.** *Computers in biology and medicine*
  Bornemann, K. M., Jahren, S. E., Obrist, D.
  2024; 179: 108828
- **Instability mechanisms initiating laminar-turbulent transition past bioprosthetic aortic valves** *JOURNAL OF FLUID MECHANICS*
  Bornemann, K., Obrist, D.
  2024; 985
- **Modes of Leaflet Fluttering: Quantitative Characterization of a Bovine Bioprosthetic Heart Valve.** *Annals of biomedical engineering*
  Jahren, S. E., Vennemann, B., Bornemann, K. M., Rösgen, T., Obrist, D.
  2025
- **Altered blood flow due to larger aortic diameters in patients with transcatheter heart valve thrombosis.** *APL bioengineering*
  Jahren, S. E., Demirel, C., Bornemann, K. M., Corso, P., Stortecky, S., Obrist, D.
  2023; 7 (4): 046120