



## Education

### Harvard University

PhD and MS in Computer Science, Advisor: Prof. Radhika Nagpal  
Thesis: Blueswarm — 3D Self-organization in a Fish-inspired Robot Swarm

Cambridge, USA  
2021

### ETH Zurich

MS in Mechanical Engineering, Advisor: Prof. Bradley Nelson  
Thesis: A Low-Cost, Highly Maneuverable, Miniature Underwater Robot  
Intended for Collective Behaviors

Zurich, CHE  
2016

### ETH Zurich

BS in Mechanical Engineering, Advisor: Prof. Roland Siegwart  
Thesis: Obstacle Climbing Control for an Inspection Robot with Magnetic Wheels

Zurich, CHE  
2013

## Fellowships & Awards

Finalist Paper, International Conference on Robotics and Automation	2021
Financial Support, David B. Heller Innovation Fund	2019
Certificate of Distinction in Teaching, Harvard University Bok Center	2018
Best Paper Finalist, International Conference on Robotics and Automation	2018
PhD Scholarship, Harvard University	2017 – 2021
Fellowship, Janggen-Pöhn Foundation	2017
Fellowship, Werner Siemens Foundation	2016
Scholarship, Swiss Study Foundation	2015
Best Innovator Award, Bühler Group	2013
Fellowship, Swiss Study Foundation	2011 – 2020
Graduation Award for First in Class, Wil High School	2010
Sustainability Award for Best Matura Paper, Employer's Association Wil	2010

## Research

### Harvard University, Self-Organizing Systems Research Group

Prof. Radhika Nagpal

Cambridge, USA  
2015 – present

- Designed and fabricated a miniature underwater robot with 3D fin-propelled locomotion and 3D visual perception suitable for collective behaviors
- Developed bio-inspired algorithms for 3D collective behaviors in simulation and with a physical robot swarm
- Contributed to the acquisitions of a \$567k ONR and a \$225k Amazon grant

### Harvard University, Microrobotics Laboratory

Prof. Robert Wood

Cambridge, USA  
2017 – 2020

- Applied custom-made dielectric elastomer actuators (DEAs) in soft robotics
- Demonstrated an autonomous DEA-driven underwater robot and a bending beam DEA for multi-modal locomotion (crawling, hopping, jumping, rolling)

## Harvard University, Lauder Laboratory

Prof. George Lauder

Cambridge, USA

2018 – 2020

- Designed a biomimetic fish-like underwater robot suitable as an experimental platform for addressing open questions in aquatic locomotion
- Replicated three key characteristics of fish swimming: linear speed-frequency relationship, U-shaped cost of transport, reverse Kármán wakes
- Used the robot to validate a thrust enhancement hypothesis for energy savings in fish schooling
- Developed a novel schooling-inspired propulsor for energy efficient underwater vehicles

## ETH Zurich, Multi-Scale Robotics Lab

Prof. Bradley Nelson

Zurich, CHE

2014

- Designed a miniscule force sensing catheter capable of measuring contact forces at its distal end during cardiac ablation
- Demonstrated tissue sampling (texture and flexibility) for diagnostic purposes

## Bühler Group, Innovation Lab at R&D Food Processing

Calvin Grieder, chairman and former CEO

Bangalore, IND

2013 – 2014

- Managed a \$30k budget to conduct industrial research including the conception, design, and validation of food processing machines that are sold for profit
- Designed the framework and motor suspension for a novel and now commercially available single screw extruder
- Visited customers in Northern India to test prototypes for controlled and cost-effective oil spraying of pulses on site

## ETH Zurich, Autonomous Systems Lab

Prof. Roland Siegwart

Zurich, CHE

2012 – 2013

- Designed Ship Inspection Robot, a robust, cheap, and easy to operate inspection tool for the maritime transport sector intended to reduce costly inspection time in dry docks
- Contributed to an innovative overlapping wheel configuration (patented!) for overcoming a broad variety of obstacles encountered in cargo ships including I-shaped stiffeners
- Led the research team of ten interdisciplinary undergraduate students, oversaw the \$15k budget, negotiated with manufacturers and suppliers, reported to investors and experts

## Teaching & Mentoring

### Harvard University

Graduate student mentor for a visiting masters student from ETH Zurich

Cambridge, USA

2020

- Supervised a 6-month-long master's thesis on "Evasive Maneuvers in a Bioinspired Underwater Robot Collective"

Undergraduate student co-supervisor for CS91r: Supervised Reading and Research

2020

- Supervised a semester-long research project on "Collective Mapping and Visual Odometry with Miniature Underwater Robots"

Guest lecturer and project advisor in CS289: Biologically-Inspired Multi-Agent Systems 2019  
 ◦ Lectured in class and supervised two final projects

Research student co-advisor for several graduate and undergraduate students 2018 – 2021

Teaching fellow in CS189: Autonomous Robot Systems 2018  
 ◦ Held sections and office hours, advised and graded students, won teaching award

**ETH Zurich** Zurich, CHE  
 Teaching staff in Innovation Process 2013

- Coached three undergraduate engineering teams during their “Innovation Process” course
- Supported the students in conceptualizing and realizing a mechatronic system with several sensors and actuators to master a prespecified project challenge

## Leadership & Service

**RESE.us**, Co-founder, RESE lets you invest in real estate just like in stocks 2021 – present  
**reatch.ch**, member of the reatch-team for artificial intelligence, wrote an article on AI and robotics 2017 – 2018  
**ETH Alumni New England Chapter**, board member, organized talks with ETH professors 2016 – present  
**Wiler Forum for Sustainability Issues (WIFONA)**, board member and vice president, organized forums with Swiss Federal Councilors for several hundred participants 2010 – 2016

## Publications

**F. Berlinger**, M. Gauci, R. Nagpal, Implicit coordination for 3D underwater collective behaviors in a fish-inspired robot swarm. *Sci Robot.* 6, eabd8668 (2021). — **Cover Article**

**F. Berlinger**, P. Wulkop, R. Nagpal, Radhika, Self-Organized Evasive Fountain Maneuvers with a Bioinspired Underwater Robot Collective. *IEEE International Conference on Robotics and Automation (ICRA)*, (2021). — **Finalist Paper in Multi-Robot Systems**

**F. Berlinger**, M. Saadat, H. Haj-Hariri, G.V. Lauder, R. Nagpal, Fish-like three-dimensional swimming with an autonomous, multi-fin, and biomimetic robot. *Bioinspir. Biomim.*, 16(2):026018 (2021).

M. Saadat, **F. Berlinger**, A. Sheshmani, R. Nagpal, G.V. Lauder, H. Haj-Hariri, Hydrodynamic advantages of in-line schooling. *Bioinspir. Biomim.*, 16(4):046002 (2021).

M. Duduta, **F. Berlinger**, R. Nagpal, D. Clarke, R. Wood, F.Z. Temel, Tunable Multi-Modal Locomotion in Soft Dielectric Elastomer Robots. *IEEE Robotics and Automation Letters*, vol. 5, no. 3, pp. 3868–3875 (2020).

M. Duduta, **F.C.J. Berlinger**, R. Nagpal, D.R. Clarke, R.J. Wood, F.Z. Temel, Electrically-latched compliant jumping mechanism based on a dielectric elastomer actuator. *Smart Materials and Structures*, 28(9), p.09LT01 (2019).

**F. Berlinger**, M. Duduta, H. Gloria, D. Clarke, R. Nagpal, R. Wood, A Modular Dielectric Elastomer Actuator to Drive Miniature Autonomous Underwater Vehicles. *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3429-3435 (2018). — **Finalist for two Best Paper Awards**

K. Soltan, J. O'Brien, **F. Berlinger**, R. Nagpal, J. Dusek, Biomimetic actuation method for a miniature, low-cost multi-jointed robotic fish. *MTS/IEEE OCEANS Charleston*, pp. 1-9 (2018).

**F. Berlinger**, J. Dusek, M. Gauci, R. Nagpal, Robust maneuverability of a miniature, low-cost underwater robot using multiple fin actuation. *IEEE Robotics and Automation Letters* 3, 140-147 (2017).

G. Chatzipirpiridis, S. Gervasoni, **F. Berlinger**, O. Ergeneman, S. Pané, B.J. Nelson, B.J., Miniaturized magnetic force sensor on a catheter tip. *IEEE International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS)*, pp. 1727-1730 (2015).

## Patents

**F.C.J. Berlinger**, C.M. Clausen, Y. Detrekoe, J. Eichenberger, M.A. Eppenberger, M.S. Fisler, A. Mueller, S.M. Schmid, W. Fischer, Carriage cart with obstacle overcoming. *General Electric Technology GmbH, U.S.* Patent Application 15/041,652 (2016).

## Presentations

Self-organized Evasive Fountain Maneuvers with a Bioinspired Underwater Robot Collective  
*Award talk, IEEE ICRA, Xi'an, China (June 2021)*

Blueswarm: 3D Self-organization in a Fish-inspired Robot Swarm  
*Guest lecture, Olin College of Engineering, Needham, USA (April 2021)*

Blueswarm: A Platform for Biomimicry and the Investigation of Collective Behaviors  
*Guest lecture, Harvard University – CS289, Cambridge, USA (Sep 2019)*

A Bio-inspired Underwater Robot Collective for Distributed Search and Sampling  
*Invited talk, HUBweek, Boston, USA (Oct 2018)*

A Modular Dielectric Elastomer Actuator to Drive Miniature Autonomous Underwater Vehicles  
*Award talk, IEEE ICRA, Brisbane, Australia (May 2018)*

The Role of Robots  
*Invited talk, Swiss Study Foundation, Zurich, Switzerland (Jun 2017)*

The Ship Inspection Robot - SIR  
*Invited talk, Marine Maintenance World Expo and Conference, Amsterdam, Netherlands (Jun 2016)*

## Skills

Areas of Expertise	Artificial intelligence, robotics, systems engineering, software design, product development, project management
Programming	Python, MATLAB, C/C++, HTML/CSS, Git, LaTeX
Fabrication	Computer-Aided Design, PCB design, 3D printing, laser cutting, milling, molding and casting, soldering
Languages	English (fluent), German (mother tongue), French (conversational), Spanish (basic)

## Relevant Coursework

Computer Science	Data Structures and Algorithms, Probabilistic Analysis and Algorithms, Machine Learning, Computer Vision, Distributed Systems, Biologically-Inspired Multi-Agent Systems
Engineering	Mechanics, Technical Dynamics, Electrical Engineering, Control Systems, System Modelling, System Identification, Recursive Estimation, Dynamic Programming and Optimal Control, Autonomous Mobile Robots, Microrobotics
Mathematics	Multivariable Calculus, Linear Algebra, Numerical Analysis

## Activities & Interests

Sport	Ski, mountain biking, tennis, soccer, golf
Music	Guitar, piano, enthusiastic listener of classical concerts and operas
Other	Hiking, cooking, art exhibitions