

## Faculty - Roman Stocker

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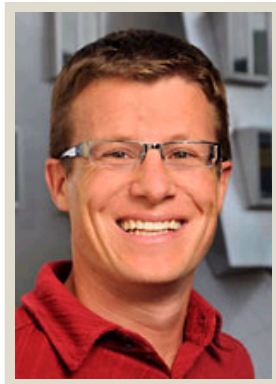
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### Roman Stocker

Associate Professor

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### Education

- B.S. Civil Engineering, University of Padova
- M.S. Civil Engineering, University of Padova
- Ph.D. University of Padova

### Research Interests

My research focuses on the physical ecology of microorganisms and on microscale transport phenomena. With specific expertise in fluid mechanics, I use carefully controlled microfluidic experiments to understand how physical forces and chemical signals shape the behavior of microorganisms, particularly in the ocean. My vision is that understanding microscale biophysical mechanisms is paramount to predicting ecosystem-level dynamics.

### Teaching Interests

- The physical ecology and fluid mechanics of microorganisms.
- Life at low Reynolds numbers. Continuum dynamics and mathematical modeling.
- Engineering Mechanics II: Fluid mechanics for Civil and Environmental Engineers.

### Awards and Honors

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|------------|---|
| 1998       | Paolo Sarpi gold medal for the best School of Engineering student, University of Padova |
| 2005– 2007 | Winslow Career Development Chair  |
| 2007– 2012 | NSF CAREER grant (Biological Oceanography)  |
| 2007– 2009 | Doherty Professorship of Ocean Utilization  |
| 2010       | ASLO Lindeman Award for outstanding paper in aquatic sciences under age 35              |

2011	Milton Van Dyke Award from Division of Fluid Dynamics, American Physical Society
2012	Maseeh Award for Teaching, Massachusetts Institute of Technology
2013-2018	Marine Microbial Initiative Investigator Award, Moore Foundation

### Selected Publications

1. Stocker R., Seymour J.R., Samadani A., Hunt D.E. & Polz M.F., 2008, " Rapid chemotactic response enables marine bacteria to exploit ephemeral microscale nutrient patches" , PNAS, 105, 4209-4214.
2. Durham W.M., Kessler J.O. & Stocker R., 2009, " Disruption of vertical motility by shear triggers formation of thin phytoplankton layers" , Science, 323, 1067-1070.
3. Marcos, Fu H., Powers T.R. & Stocker R., 2009, " Separation of microscale chiral objects by flow" , Physical Review Letters, 102, 158103.
4. Sutherland K.R., Madin L.P. & Stocker R., 2010, " Filtration of submicrometer particles by pelagic tunicates" , PNAS, 107, 15129-15134.
5. Ardekani A.M. & Stocker R., 2010, " Stratlets: Low Reynolds number point-force solutions in a stratified fluid" , Physical Review Letters, 105, 084502.
6. Kindler K., Khalili A. & Stocker R., 2010, " Diffusion-limited retention of porous particles at density interfaces" , PNAS, 107, 22163-22168.
7. Reis P.M., Jung S., Aristoff J.M. & Stocker R., 2010, " How cats lap: Water uptake by *Felis catus*" , Science, 330, 1231-1234 (Featured on the cover).
8. Marcos, Seymour J.R., Luhar M., Durham W.M., Mitchell J.G., Macke A. & Stocker R., 2011, " Microbial alignment in flow changes ocean light climate" , PNAS, 108, 3860-3864.
9. Durham W.M., Climent E. & Stocker R., 2011, " Gyrotaxis in a steady vortical flow" , Physical Review Letters, 106, 238102.
10. Guasto J.S., Rusconi R. & Stocker R., 2012, " Fluid mechanics of planktonic microorganisms" , Annual Review of Fluid Mechanics, 44, 373-400.
11. Guasto J.S., Rusconi R. & Stocker R., 2012, " Fluid mechanics of planktonic microorganisms" , Annual Review of Fluid Mechanics, 44, 373-400.
12. Marcos, Fu H.C., Powers T.R. & Stocker R., 2012, " Bacterial rheotaxis" , PNAS, 109, 4780-4785.
13. Stocker R. & Seymour J.R., 2012, " Ecology and physics of bacterial chemotaxis in the ocean" , Microbiology and Molecular Biology Reviews, 76, 792-812 (Featured on the cover).-offs of chemotactic foraging in turbulent water" , Science, 338, 675-679.
14. Taylor J.R. & Stocker R., 2012, " Trade-offs of chemotactic foraging in turbulent water" , Science, 338, 675-679.
15. Stocker R., 2012, " Marine microbes see a sea of gradients" , Science, 338, 628-633.
16. Garren M.S., Son K., Raina J.B., Rusconi R., Menolascina F., Shapiro O.H., Tout J., Bourne D.G., Seymour J.R. & Stocker R., 2013 " A bacteria pathogen uses dimethylsulfoniopropionate as a cue to target heat-stressed corals" , ISME Journal, doi: 10.1038/ismej.2013.210.
17. Son K., Guasto J.S. & Stocker R., 2013, " Bacteria can exploit a

flagellar buckling instability to change direction" , Nature Physics, 9, 494-498.

18. Durham W.M., Climent E., Barry M., De Lillo F., Boffetta G., Cencini M. & Stocker R., 2013, " Turbulence drives microscale patches of motile phytoplankton " , Nature Communications, 4, 2148.
19. Yang R., Jang H., Stocker R. & Gleason K., 2013, " Synergistic prevention of biofouling in seawater desalination by zwitterionic surfaces and low-level chlorination " , Advanced Materials, DOI: 10.1002/adma.201304386.
20. Rusconi R., Guasto J.S. & Stocker R., 2014, " Bacterial transport is suppressed by fluid shear " , Nature Physics, 10, 212-217.
21. Rusconi R., Garren M.S. & Stocker R., 2014, " Microfluidics expanding the frontiers of microbial ecology " , Annual Review of Biophysics, in press.

### Current Service



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