

Vivek N. Prakash, Ph.D.

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Education

- **Postdoc, Biomechanics**, Stanford University (2014 - present)
- **Ph.D. Applied Physics**, University of Twente, The Netherlands (2013)
- **M.S. Engineering Mechanics**, JNCASR, Bangalore, India (2009)
- **B.E. Mechanical Engineering**, R.V. College of Engineering, Bangalore, India (2007)

Research Interests

- Biological fluid mechanics – low and intermediate Re swimming & feeding in marine invertebrates
- Biomechanics – tissue to organism scale: cell rearrangements, morphogenesis, development
- Fluid mechanics – high Re turbulent particle-laden flows, mantle convection

Research Experience

- **Postdoctoral Researcher** (Jan 2014 – present)
Department of Bioengineering, Stanford University
Advisor: Prof. Manu Prakash
Project 1: Quantitative cellular mapping of large-scale morphogenetic fields in a basal metazoan
Project 2: Hydrodynamics of swimming and feeding in starfish larvae
Project 3: Mapping morphogenetic fields in chick embryos
Collaborators: L. Maya-Ramos, T. Mikawa (University of California, San Francisco)
- **Ph.D. Candidate** (2009 – 2013)
Physics of Fluids group, University of Twente, The Netherlands
Advisors: Prof. Detlef Lohse and Prof. Chao Sun
Ph.D. Thesis: "Light particles in turbulence" [[web link](#)]
Committee: M. Bourgoin (ENS de Lyon), F. Toschi (TU Eindhoven), L. van Wijngaarden (Twente)
Collaborators: Y. Tagawa (TUAT, Tokyo), E. Calzavarini (Univ. Lille), J. M. Mercado (NTU Singapore)
- **M.S. Research Scholar** (2007 – 2009)
Engineering Mechanics Unit,
Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India
Advisors: Prof. K. R. Sreenivas and Prof. Jaywant H. Arakeri (IISc)
M.S. Thesis: "An experimental study of mantle convection"
- **Summer Undergraduate Research Fellow** (2005 – 2006)
Engineering Mechanics Unit, JNCASR, Bangalore, India
Advisors: Prof. K. R. Sreenivas and Prof. Jaywant H. Arakeri (IISc)
Project: The role of viscosity contrast on plume structures in mantle convection

Publications

Postdoctoral Research: Organismal Biomechanics

10. W. Gilpin, **Vivek N. Prakash**, and M. Prakash
Dynamic vortex arrays created by starfish larvae
Physical Review Fluids, 2, 090501(2017)
9. W. Gilpin, **Vivek N. Prakash**, and M. Prakash
Flowtrace: a simple visualization tool for biological fluid flows
Journal of Experimental Biology, 220, 3411-3418 (2017)
- Cover of Journal of Experimental Biology (Volume 220, 2017)
8. W. Gilpin, **Vivek N. Prakash**, and M. Prakash
Vortex arrays and ciliary tangles underlie the feeding-swimming tradeoff in starfish larvae
Nature Physics, 13, 380-386 (2017)
Highlights and media attention:
- Highlighted in a **Nature Physics News & Views** article:
V. I. Fernandez & R. Stocker, Hydrodynamics: Modus vivendi, *Nature Physics*, 13, 326-327 (2017)
- Highlighted in a **Nature Physics Editorial** article: A ton for Thompson's tome, *Nature Physics* 13, 315 (2017)
- Featured in Principles of Systems Biology, No.15, **Cell Systems**, 4, 252-254 (2017)
- Featured in **Physics Today** Magazine: 'Biological eigenstrokes', *Physics Today* 70, 3, 84 (2017)
- APS/DFD 'Milton van Dyke Award' (Video) - 2016
- 'First place', Nikon Small World in Motion Competition - 2016
- 'Image of distinction', Nikon Small World Photomicrography Competition - 2016
- 'Expert's Choice award', NSF "Vizzies" Visualization challenge - 2017
- Featured in New York Times, Nature, CBS News, Scientific American, Popular Science and others - 2016, 2017.
Also, see correspondence:
W. Gilpin, Vivek N. Prakash, and M. Prakash
Reply to 'Boundary effects on currents around ciliated larvae', *Nature Physics*, 13, 521-522 (2017)

Doctoral Research: Particle-laden Turbulent flows

7. **Vivek N. Prakash**, J. M. Mercado, L. van Wijngaarden, E. Mancilla, Y. Tagawa, D. Lohse, and C. Sun
Energy spectra in turbulent bubbly flows
Journal of Fluid Mechanics, 791, 174-190 (2016)
6. V. Mathai, **Vivek N. Prakash**, J. Brons, C. Sun and D. Lohse
Wake-driven dynamics of finite-sized buoyant spheres in turbulence
Physical Review Letters, 115, 124501 (2015)
5. Y. Tagawa, I. Roghair, **Vivek N. Prakash**, M. van Sint Annaland, H. Kuipers, C. Sun, and D. Lohse
The clustering morphology of freely rising deformable bubbles
Journal of Fluid Mechanics, 721, R2 (2013)
4. **Vivek N. Prakash**, Y. Tagawa, E. Calzavarini, J. M. Mercado, F. Toschi, D. Lohse, and C. Sun
How gravity and size affect the acceleration statistics of bubbles in turbulence
New Journal of Physics, 14, 105017, (2012)
(co-corresponding author)
- Featured in New Journal of Physics 'Research Highlights' collection - 2012, 2013
- Part of New Journal of Physics focus issue on 'Dynamics of Particles in Turbulence' - 2013
- New Journal of Physics Video Abstract Prize - 2013

3. J. M. Mercado, **Vivek N. Prakash**, Y. Tagawa, C. Sun, and D. Lohse
Lagrangian statistics of light particles in Turbulence
Physics of Fluids, 24, 055106 (2012)
(co-corresponding author)
2. Y. Tagawa, J. M. Mercado, **Vivek N. Prakash**, E. Calzavarini, C. Sun, and D. Lohse
Three-dimensional Lagrangian Voronoi analysis for clustering of particles and bubbles in turbulence
Journal of Fluid Mechanics, 693, 201-215 (2012)

Master's Research: Mantle convection

1. **Vivek N. Prakash**, K. R. Sreenivas, and J. H. Arakeri
The role of viscosity contrast on plume structure in laboratory modeling of mantle convection
Chemical Engineering Science, 158, 245-256 (2017)

Publications under preparation:

1. **Vivek N. Prakash**, and M. Prakash
Mechanics-based morphogenesis in an early diverging metazoan (2018)
2. **Vivek N. Prakash**, and M. Prakash
Quantitative techniques for cellular mapping of large-scale morphogenetic fields (2018)

Honors & Awards

- 2017 — Expert's Choice award, NSF 'Vizzies' Visualization Challenge for Photography
- 2016 — Milton van Dyke Award, American Physical Society, Division of Fluid Dynamics
- 2016 — First place, Nikon Small World in Motion Competition
- 2016 — Image of distinction, Nikon Small World Photomicrography Competition
- 2015 — Honorable mention, Nikon Small World in Motion Competition
- 2013 — New Journal of Physics 'Video Abstract Prize' (based on world-wide public voting)
- 2012, 2013 — New Journal of Physics 'Research Highlights' (Prakash, et al., New J. Phys, 2012)
- 2012 — Jury's Choice Poster Award, Hands-On Research in Complex Systems School, China
- 2008 — Marie Curie Scholarship (EU) award to attend Euromech Fluid Mechanics Conference, UK
- 2007-2009 — JNCASR graduate scholarship, Department of Science & Technology, Govt. of India
- 2007 — Attended the International Astronautical Congress (IAC) (ISRO National student selection)
- 2007 — Best Outgoing Student award in ME, RVCE (Cognizant Technology Solutions)
- 2006 — LG electronics scholarship, 'potential manager award' for the best student in ME, RVCE
- 2005, 2006 — JNCASR Summer Research Fellowship (Undergraduate)
- 2005 — Diploma in Space Sciences (Honors Course), Indian Space Research Organization (ISRO)
- 2003 — Youth Leadership Award, Global Young Leaders Conference, Washington D.C. & NY, USA

Advanced Research Training Schools & Professional Courses

- 2015 – *Developmental Biology in the Ocean*, Hopkins Marine Station of Stanford University (3 weeks)
- 2015 – *Preparing for Faculty Careers*, Stanford University (2 weeks)
- 2012 – *Hands-On Research in Complex Systems Advanced Study Institute*, Shanghai, China (2 weeks)
- 2012 – *New Challenges in Turbulence Research II*, Ecole de Physique, Les Houches, France (1 week)
- 2010 – *Tutorial School on Fluid Dynamics: Topics in Turbulence*, University of Maryland (2 weeks)
- 2009, 2010 – *J.M.B.C. courses: Experimental Techniques* (UTwente), *PIV* (TUDelft), Netherlands (1 week)

Talks & Seminars

Invited Seminars:

- 2013 — JMBC Multi-phase flow group meeting, TATA Steel Europe, The Netherlands
- 2013 — FOM-DROP Meeting, TU Delft, The Netherlands
- 2012 — Stanford University, Department of Bioengineering
- 2012 — University of California, Berkeley, Fluid Mechanics Seminar
- 2012 — University of California, San Diego, Department of Physics
- 2011 — JMBC Turbulence group meeting, TU Eindhoven, The Netherlands

Selected Conference Talks and Posters:

- 2018 — *SICB Annual Meeting (poster)*, San Francisco, USA
- 2015 — *Pan-American Society for Evolutionary Developmental Biology Meeting (poster)*, UC Berkeley, USA
- 2014 — *American Physical Society, 67th Annual Meeting - DFD*, San Francisco, USA
- 2014 — *Active Fluids: Bridging Complex Fluids and Biofluids (poster)*, Aspen, USA
- 2013 — *European Turbulence Conference (ETC) 14*, Lyon, France
- 2013 — *Particles in Turbulence Conference*, Eindhoven, The Netherlands
- 2012 — *American Physical Society, 65th Annual Meeting - DFD*, San Diego, USA
- 2012 — *9th Euromech Fluid Mechanics Conference*, University of Rome, Tor Vergata, Italy
- 2012 — *Particles in Turbulence workshop*, Lorentz Center, Leiden, The Netherlands
- 2011 — *American Physical Society, 64th Annual Meeting - DFD*, Baltimore, USA
- 2011 — *Particles in Turbulence Conference*, University of Potsdam, Germany
- 2010 — *American Physical Society, 63rd Annual Meeting - DFD*, Long Beach, USA
- 2010-2013 — *Physics@FOM Meeting (poster)*, Veldhoven, The Netherlands
- 2010-2013 — *JMBC Burgersdag (poster)*, The Netherlands
- 2008 — *7th Euromech Fluid Mechanics Conference*, Manchester, UK

Teaching Experience

- Postdoc Teaching Certificate program, Stanford University (in progress)
- Teaching assistant, University of Twente (2011 – 2013)
Experimental Techniques in Physics of Fluids (graduate course)
Instructor: Prof. Chao Sun
Duties: Supervised 1-week lab assignment projects, totally 9 students over three years. Occasionally delivered class lectures and conducted lab demonstrations.
- Teaching assistant, University of Twente (2010)
Physics of Fluids (undergraduate course)
Instructor: Prof. Jacco Snoeijer
Duties: Prepared and graded weekly assignment problem sets, and conducted class tutorials.

Mentoring Experience

Mentoring Ph.D. students

- William Gilpin (at Stanford University) (Sep 2015 - present)
- Varghese Mathai (at University of Twente) (June - Dec 2013)
- Ernesto Mancilla (at University of Twente) (visitor from UNAM, Mexico) (July - Dec 2012)

Mentoring MSc. students (at University of Twente)

- Jon Brons (Aug - Dec 2013)
- Tobias Foertsch (Aug 2012 - Aug 2013)
- Huanshu Tan (visitor from Shanghai University) (Jan - Apr 2013)

Service

- Peer-review — Referee for:
Journal of Fluid Mechanics, Physics of Fluids, International Journal of Multiphase Flow, European Journal of Mechanics / B Fluids, & Journal of Theoretical Biology
- Outreach — Numerous lab demonstrations for a wide variety of audiences
- Volunteering — Student volunteer for *APS-DFD Meeting*, San Francisco, USA (2014)
- Judging — Judge for student presentations in the Division of Invertebrate Zoology (DIZ) at SICB Annual Meeting, San Francisco, USA (2018)
- Organization — Friday afternoon Shriram center basement seminar series - 'Happy to talk science hour' at Stanford University, funded by a VPGE SPICE grant (2014 - 2016)

Professional Memberships

- American Physical Society (APS) - Division of Fluid Dynamics (DFD) & Topical group on Soft Matter
- Society of Integrative and Comparative Biology (SICB)
- Biophysical Society (BPS), Mechanobiology subgroup
- Society for Developmental Biology (SDB)

Media coverage

- **March 2017** — ‘Expert’s Choice award’, NSF “Vizzies” Visualization challenge [web link]
 - **Popular Science:** “The 10 best science images, videos, and visualizations of the year” [web link]
 - Stanford Medicine: “Stanford team’s image of starfish larva wins top honor” [web link]
 - Science Node: “The winner takes it all” [web link]
- **Dec 2016** — Nature Physics publication [web link]
 - **New York Times:** “The Beauty of a Starfish Larva at Lunch ” [web link]
 - **Nature News:** “Swimming starfish, a departing dinosaur, and a lot of ice” [web link]
 - **Stanford News:** “Starfish larvae create complex water whorls to eat and run” [web link]
 - **Scientific American:** “The Mesmerizing Motions of Starfish Larvae [Video]” [web link]
 - Stanford Magazine: “A Striking Look at Starfish Larvae” [web link]
 - Phys.org: “Starfish larvae create complex water whorls to eat and run” [web link]
 - Live Science: “Starfish Larvae Churn Whirlpools With 100,000 Tiny Hairs” [web link]
 - Science Daily: “Starfish larvae create complex water whorls to eat and run” [web link]
 - Bay Nature: “The Efficient Beauty of Starfish Larvae” [web link]
 - EurekAlert: “Starfish larvae create complex water whorls to eat and run” [web link]
 - Futurity: “Why baby starfish make these pretty whorls in water” [web link]
 - EarthSky: “The water whorls of baby starfish” [web link]
 - ACSH: “Revealing The Wonders Of How Starfish Survive And Grow” [web link]
 - SciGuru: “Starfish larvae create complex water whorls to eat and run” [web link]
- **Dec 2016** — First place, Nikon Small World in Motion Competition [video link]
 - Nikon: “Time-lapse revealing water patterns of starfish larva wins Nikon Small World in Motion Competition” [web link]
 - Popular Science: “The year’s best videos starring really, really small things” [web link]
 - Business Insider: “These are the best videos recorded through a microscope this year, according to Nikon” [web link]
 - Daily mail: “Nikon reveals the best videos shot through a microscope” [web link]
 - CBS News: “Small world in motion: Nikon contest winners” [web link]
 - Smithsonian: “Prize-Winning Videos Capture Mesmerizing, Microscopic World” [web link]
 - Live Science: “Tiny Starfish Larva Mesmerizes in Award-Winning Video” [web link]
 - Seeker: “Hunting Starfish Larva Takes the Top Prize in Micro Video Competition” [web link]
 - BBC Focus Magazine: “Nikon Small World in Motion brings photomicrography to life” [web link]
- **Dec 2016** — APS/DFD Milton van Dyke Award (Video) [video link]
 - APS News: “Gallery of Fluid Motion Winners from the 2016 APS Division of Fluid Dynamics Meeting” [web link]
 - Vox: “This is how a baby starfish eats. It involves vortexes of doom.” [web link]
 - FYFD: “Starfish larvae create beautiful vortices to help themselves catch food.” [web link]
- **Dec 2015** — Honorable mention, Nikon Small World in Motion Competition [video link]
 - Huffington Post: “18 Award-Winning Videos: Hidden micro realm is beautiful” [web link]
 - The Atlantic Video: “Incredible Video Taken Through a Microscope” [web link]
- **Aug 2013** — New Journal of Physics ‘Video Abstract Prize’ [video link]
 - Featured on the front pages of New Journal of Physics and University of Twente
 - News coverage: University of Twente: “UT Researchers win NJP video competition” [web link]
 - Dutch media: RTV-OOST NL, Tubantia NL

References

Prof. Manu Prakash (Postdoc advisor)
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California, USA
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Prof. Detlef Lohse (PhD advisor)
Professor and Chair, Physics of Fluids group
University of Twente, The Netherlands
& Director, Twente Max-Planck-Center for Fluid Dynamics
E-mail: d.lohse@utwente.nl

Prof. Chao Sun (PhD advisor)
Professor, Center for Combustion Energy & Department of Thermal Engineering
Tsinghua University, Beijing, China
& Part-time Professor, University of Twente, The Netherlands
E-mail: chaosun@tsinghua.edu.cn

Dr. Mickael Bourgoïn (PhD committee member)
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