# Vivek N. Prakash, Ph.D.

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Google scholar: http://goo.gl/3DTmqp


## 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

- Biomechanics – tissue to organism scale: cell rearrangements, morphogenesis, development
- Biological fluid mechanics – low Reynolds number (*Re*) swimming & feeding in marine invertebrates
- Fluid mechanics, particle-laden flows, turbulent flows, and soft active matter.

## Research Experience & Employment

- **Postdoctoral Research Fellow** (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
  *Collaborator:* Prof. Takashi Mikawa (University of California, San Francisco)

- **Ph.D. Candidate** (2009 – 2013)
  Physics of Fluids group, University of Twente, The Netherlands
  *Advisors:* Prof. Detlef Lohse & Prof. Chao Sun
  *Ph.D. Thesis:* "Light particles in turbulence" [web link]
  *Committee:* Dr. Mickael Bourgoin (ENS de Lyon, France), Prof. Federico Toschi (TU Eindhoven, Netherlands), Prof. Leen van Wijngaarden (University of Twente)
  *Collaborators:* Prof. Yoshiyuki Tagawa (TUAT, Tokyo, Japan), Prof. Enrico Calzavarini (University of Lille, France), Dr. J. M. Mercado (NTU, Singapore)

- **M.S. Research Scholar** (2007 – 2009)
  **Summer Undergraduate Research Fellow** (2005 – 2006)
  Engineering Mechanics Unit
  Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India
  *Advisors:* Prof. K. R. Sreenivas & Prof. Jaywant H. Arakeri (Indian Institute of Science)
  *M.S. Thesis:* "An experimental study of mantle convection"

# Publications

Total publications in leading peer-reviewed journals in different fields: 10
**Physics:** Nature Physics - 1, Physical Review Letters - 1, New Journal of Physics - 1
**Mechanics:** Journal of Fluid Mechanics- 3, Physics of Fluids - 1, Physical Review Fluids - 1
**Engineering:** Chemical Engineering Science - 1
**Biology:** Journal of Experimental Biology - 1

## Postdoctoral Research: Organismal Biomechanics

12. **Vivek N. Prakash**, M. S. Bull and M. Prakash
*Epithelial tissue fracture dynamics govern extreme plastic shape changes in Trichoplax adhaerens* (2018)
(preprint available on request)

11. W. Gilpin, **Vivek N. Prakash**, and M. Prakash
*Rapid behavioral transitions produce chaotic mixing by a planktonic microswimmer* (2018)
(under review) (arXiv preprint: https://arxiv.org/abs/1804.08773)

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)

## Graduate Research: Experimental Fluid Mechanics

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)

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**, L. Maya-Ramos, R. Asai, T. Mikawa and M. Prakash
*Quantitative techniques for cellular mapping of large-scale morphogenetic fields* (2018)

2. R. Asai, **Vivek N. Prakash**, M. Prakash, and T. Mikawa
*Oriented cell division drives the spatial organization of heart field precursors within developing primary primitive streak* (2018)

3. M. S. Bull*, **Vivek N. Prakash***, and M. Prakash
*Tissue mixing and size dependent behavior in T. adhaerens* (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

- 2018 – *Cilia in Evolution, Development and Human Health*, Stanford University (1 week)
- 2015 – *Developmental Biology in the Ocean*, Hopkins Marine Station, 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:

- 2018 — Shriram center basement labs seminar, Prakash Lab, Stanford University, USA
- 2018 — Chan Zuckerberg Biohub Inter-lab Confab #3 (lightning talk, poster), UC San Francisco, USA
- 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 Talks and Posters (contributed):

Upcoming conferences and meetings:

- 2019 — *American Physical Society, March Meeting (talk)*, Baltimore, USA
- 2019 — *Society of Integrative & Comparative Biology (SICB) Annual Meeting*, Tampa, USA
- 2018 — *American Society of Cell Biology (ASCB) - EMBO Meeting (talk)*, San Diego, USA

- 2018 — *American Physical Society, DFD Meeting (talk)*, Atlanta, USA

Past conferences and meetings:

- 2018 — *Santa Cruz Developmental Biology Meeting (poster)*, Santa Cruz, USA
- 2018 — *American Physical Society, March Meeting (talk)*, Los Angeles, USA
- 2018 — *Mechanics of Morphogenesis Meeting (poster)*, Princeton University, USA
- 2018 — *Biophysical Society (BPS), 62nd Annual Meeting (poster)*, San Francisco, USA
- 2018 — *Society of Integrative & Comparative Biology (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 workshop for postdocs*
  – *Mentoring in research workshop*
- 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

- Matthew Bull (at Stanford University) (Sep 2014 - present)
- 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 best student presentation awards 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
- European Mechanics Society (Euromech)
- Society of Integrative and Comparative Biology (SICB)
- Biophysical Society (BPS), Mechanobiology subgroup
- Society for Developmental Biology (SDB)
- American Society of Cell Biology (ASCB)

## Media coverage

- **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]

- **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]

- **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]

- **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]

- **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]

- **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

**1. Prof. Manu Prakash** (Postdoc advisor)
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**2. Prof. Takashi Mikawa** (Collaborator during postdoc)
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**3. Prof. Detlef Lohse** (PhD advisor)
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**4. Prof. Chao Sun** (PhD advisor)
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**5. Dr. Mickael Bourgoin** (PhD committee member)
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