

Jyot Antani, PhD

jyot.antani@yale.edu • Twitter: [@AntaniJo](https://twitter.com/AntaniJo)

Expertise: Microscopy, Single Particle Tracking, Microbial Biophysics,
Phage-Bacteria Interactions, Phage Therapy, Phage Technology

Experience & Education

- Jun 2021-
Now | Postdoctoral Research Associate, Yale University (US)
[Center for Phage Biology & Therapy](#), Yale University
[Quantitative Biology Institute](#), Yale University
[Paul Turner Lab](#), Department of Ecology and Evolutionary Biology
In collaboration with [Thierry Emonet Lab](#), Molecular, Cellular, and Developmental Biology
- Aug 2016-
May 2021 | PhD, [Pushkar Lele Lab](#), Department of Chemical Engineering, Texas A&M University (US)
Dissertation title: Sensory Functions of the Bacterial Flagellar Motor
- Jul 2012-
May 2016 | Bachelor of Technology with Honours in Chemical Engineering
Indian Institute of Technology Bombay (IIT Bombay), Mumbai (India)

Advanced Microscopy Training: [Optical Microscopy & Imaging in the Biomedical Sciences \(OMIBS\)](#)
Marine Biological Laboratory, Woods Hole Massachusetts (US)

- Aug 2023 | Research Facilitator (Teaching Assistant)
Aug 2022 | Course Participant

- Basic principles of microscopy from academic and industrial microscope builders and inventors including...
 - Light path, image formation, and detection
 - Dynamic Imaging Techniques (FRET, FLIM, FCS)
 - Multiphoton & Light Sheet Microscopy; Adaptive Optics
 - Photophysics of fluorescence, dyes, and fluorescent proteins
 - Point Spread Functions, Deconvolution, & Confocal Microscopy
 - Super-resolution Techniques: STED, STORM, SIM
- Hands-on practice with over 40 microscopes including the following modalities...
 - Phase-contrast Microscopy
 - Epifluorescence
 - Confocal Microscopy
 - Multiphoton Microscopy
 - Differential Interference Contrast (DIC)
 - Forster Resonance Energy Transfer
 - Total Internal Reflection Fluorescence
 - Light Sheet Microscopy
 - Polarized Light Microscopy
 - Fluorescence Lifetime Imaging
 - Deconvolution
 - Super-resolution: STED, STORM, SIM

Publications

[Google Scholar Link](#)

* indicates equal contribution

Oromí-Bosch A*, [Antani JD*](#), Turner PE (2023) Developing Phage Therapy That Overcomes the Evolution of Bacterial Resistance. *Annu Rev Virology*. doi: [10.1146/annurev-virology-012423-110530](https://doi.org/10.1146/annurev-virology-012423-110530)

[Antani JD](#), Gupta R, Lee AH, Rhee KY, Manson MD, Lele PP (2021) Mechanosensitive recruitment of stator units promotes binding of the response regulator CheY-P to the flagellar motor. *Nature Communications*. doi: [10.1038/s41467-021-25774-2](https://doi.org/10.1038/s41467-021-25774-2)

[Antani JD](#), Sumali AX, Lele TP, Lele PP (2021) Asymmetric random walks reveal that the chemotaxis network modulates flagellar rotational bias in *Helicobacter pylori*. *eLife*. doi:[10.7554/eLife.63936](https://doi.org/10.7554/eLife.63936)
This work helped secure an R01 research grant totaling over \$1.3 million from the National Institute of General Medical Sciences, National Institute of Health. <https://www.eurekalert.org/news-releases/945164>

Katiyar A*, [Antani JD*](#), McKee BP, Gupta R, Lele PP, Lele TP (2021) A method for direct imaging of x-z cross-sections of fluorescent samples. *Journal of Microscopy*. doi:[10.1111/jmi.12965](https://doi.org/10.1111/jmi.12965) (*equal contribution)

Wong GCL, [Antani JD](#), et al. (2021) Roadmap on emerging concepts in the physical biology of bacterial biofilms: from surface sensing to community formation. *Physical Biology*. doi:[10.1088/1478-3975/abdc0e](https://doi.org/10.1088/1478-3975/abdc0e)

[Antani JD](#), Shaji A, Gupta R, Lele PP. Reassessing the Standard Chemotaxis Framework for Understanding Biased Migration in *Helicobacter pylori*. In print at *Annu Rev Chem Biomol Eng*.

Ford KM, [Antani JD](#), Nagarajan A, Johnson MM, Lele PP (2018) Switching and torque generation in swarming cells of *E. coli*. *Frontiers in Microbiology*, 9, 2197. doi:10.3389/fmicb.2018.02197

Katiyar A, Zhang J, [Antani JD](#), Yu Y, Lele PP, Reinhart-King CA, Sniadecki NJ, Roux KJ, Dickinson RB, Lele TP (2022) The Nucleus Bypasses Obstacles by Deforming Like a Drop with Surface Tension Mediated by Lamin A/C. *Advanced Science*. doi: 10.1002/advs.202201248

Publications in preparation

[Antani JD](#), Ward T, Emonet T, Turner PE. A general method to quantify adsorption of single viruses to bacterial cells.

[Antani JD](#), Theroux A, Emonet T, Turner PE. Evolutionary consequences of evolution of motile bacteria against a flagellum-binding virus. [Media mention of this work in the ASM Microcosm magazine \(link\)](#)

Peer Reviews (Independent)

[Publons / WebOfScience Link](#)

<i>Microbiology Spectrum</i> (18)	<i>Physical Biology</i> (4)	<i>Applied & Environmental Microbiology</i> (1)
<i>Archives of Microbiology</i> (11)	<i>PeerJ</i> (10)	<i>STAR Protocols</i> (2)
<i>Frontiers in Microbiology</i> (2)	<i>Biosystems</i> (2)	<i>Frontiers in Toxicology</i> (1)
<i>European Biophysics Journal</i> (1)	<i>PLoS One</i> (2)	<i>APL Bioengineering</i> (3)
<i>Cancer Reports</i> (1)		

Technical Skills

Perfusion & Thermal Control Experiments	Prototyping & 3D-printing	Optical Microscopy: advanced expertise
Bacteria & Phage Culturing, Cloning	Microfluidics Experiments	Image Analysis Automation
Genome Analysis/Bioinformatics	Assay Development	Single Particle Tracking

Computer Proficiency / Computational Skills

Image Processing & Analysis:	MATLAB, Python, ImageJ – {Highlight: particle-tracking algorithms}
Genetic Analysis:	Molecular Biology {SnapGene, Benchling}, Bioinformatics
Design & Development:	SolidWorks, AutoCAD, LabVIEW,
Simulation Packages:	ANSYS Fluent, Aspen Plus, OpenFOAM, COMSOL, CHARMM, VMD
Programming:	MATLAB, Python, C, C++, Fortran, HTML

Special mention: **Yale Biotech Club Datathon 2022**

- Performed analysis on single-cell RNAseq data from patients of Colorectal Cancer and Inflammatory Bowel Disease
- Used [scanpy](#) to study the variability in expression of various genes and identify marker genes associated with the two diseases

Honors & Awards

2023	Top Reviewer 2023, <i>Microbiology Spectrum</i> – an American Society for Microbiology (ASM) Journal
2023	Best Poster Presentation Award, Yale Postdoctoral Association Annual Symposium 2023 , Yale University
2022	BioImaging North America (BINA) Professional Development Award - Chan Zuckerberg Initiative
2022	Histochemical Society (HCS) Travel Award
2020	CIRTL Associate Certificate, Center for the Integration of Research, Teaching, and Learning
2015	Best Poster Award, <i>AMAT</i> seminar, IIT Bombay
2015	Undergraduate Research Award URA01, IIT Bombay
2008	National Talent Search Scholarship, NCERT, India

Invited Talks

Mar 2023	Physics of phage adsorption to bacterial surface. HHMI EPI Meeting, University of California San Diego (US)
Oct 2021	Force-regulation of CheY-P-binding to the bacterial flagellar motor. Howard Berg Lab, Harvard University (US)

Conference Presentations

[Antani JD](#), Ward TJ, Emonet T, Turner PE. Quantitative biology of bacterial virus attachment to host surfaces.

May 2023	Yale Postdoctoral Association Symposium, Yale University, New Haven (US)
Sep 2022	Annual Microbiology Retreat, Yale University, New Haven (US)

Jun 2022 | *Microbe*- Annual meeting of the American Society for Microbiology, Washington, D.C. (US)
May 2022 | Yale Postdoctoral Association Symposium, Yale University, New Haven (US)

Antani JD, Theroux A, Emonet T, Turner PE. Bacterial Evolution Of Resistance To A Flagellotropic Phage.

Sep 2023 | Annual Microbiology Retreat, Yale University, New Haven (US)
Jun 2023 | *Microbe*- Annual meeting of the American Society for Microbiology, Houston (US)

Antani JD, Lele PP. Modulation of chemotactic signaling in bacteria by mechanical forces.

Mar 2019 | ChEGSA Annual Symposium, Texas A&M University, College Station (US)
Oct 2018 | American Institute of Chemical Engineers (AIChE) Annual Meeting, Pittsburgh (US)
Dec 2017 | Texas Branch of American Society for Microbiology, 2017 Fall Meeting, College Station (US).

Antani JD, Lele PP. Asymmetric Swimming and Chemotaxis in *Helicobacter pylori*.

Jan 2021 | Bacterial Locomotion And Signal Transduction (BLAST) XVI Meeting, Zoom (online)
Feb 2020 | Biophysical Society (BPS) Annual Meeting, San Diego (US).
Jan 2019 | Bacterial Locomotion And Signal Transduction (BLAST) XV Meeting, New Orleans (US)

Antani JD, Venkatesh KV. Analysis of Glucose Homeostasis in Humans.

Nov 2015 | Futuristic Approach for Alternatives to Animal Testing CEFIPRA seminar, Mumbai (India)

Current and Doctoral Research

May 2021- Now	<p>Postdoctoral Research: Host-virus Interaction Biophysics in Microbes <i>Evolution of target search by bacteriophages on host bacterial surfaces</i></p> <ul style="list-style-type: none">Established a protocol for labeling phages (the viruses of bacteria) with a lysine-binding fluorescent dyeVisualizing labeled phage (bacterial virus) particles attaching to host cells, through epifluorescence and HILO microscopySet up MATLAB-based statistical analysis of single phage trajectories to quantify attachment dynamicsEmploying Bayesian inference to estimate the diffusive states of phage particles from single trajectoriesDeveloping a quick high-throughput assay to quantify phage adsorption, applicable for emergency phage therapyComparing the attachment dynamics of ancestral and coevolved phage-host pairs <p><i>Evolution of resistance in E. coli against a flagellotropic phage</i></p> <ul style="list-style-type: none">Evolved mutants resistant against phage χ, a virus that uses rotating bacterial flagella as receptorsTrained an undergraduate to carry out the experimental evolution protocol, mentored them in writing a successful fellowship application about this projectCharacterizing the genotype and phenotype of the evolved mutants to determine the evolutionary consequences <p><i>Grant-Writing</i></p> <ul style="list-style-type: none">Wrote several fellowship and grant applications to fund the original research projects
Aug 2016- May 2021	<p>Doctoral Thesis: Sensory Functions of the Bacterial Flagellar Motor <i>Molecular mechanisms of host substrate sensing by bacterial flagellar motors</i></p> <ul style="list-style-type: none">Determined the effect of mechanical forces on chemotactic output of the bacterial flagellar motor, with phase microscopy, optical tweezers, and TIRF imagingDeveloped a biophysical model for the regulation of allosteric interactions by mechanical force <p><i>Motility, chemotaxis, and random spread of Helicobacter pylori, the carcinogenic pathogen</i></p> <ul style="list-style-type: none">Devised a microscopy-based technique to experimentally determine the chemotactic activity of <i>H. pylori</i>Studied the biophysical principles governing chemotactic migration by this bacterial species which employs run-reversal motility – different from the traditionally studied <i>E. coli</i> <p><i>Design and development of experimental and analytical framework</i></p> <ul style="list-style-type: none">Designed 3D-printed imaging chambers for requirements in microscopy experiments, e.g., perfusion, imaging side-viewsWrote MATLAB-based image analysis codes for tracking motile bacteria, mammalian cell-nuclei, and fluorophores

Additional Research Experience

Jul 2015- Feb 2016	<p>Machine Learning Classification of Glucose Homeostasis in Diabetic and Healthy Individuals <i>Venkatesh Lab, Chemical Engineering, IIT Bombay</i></p> <ul style="list-style-type: none">Formulated a Hill function-based empirical biochemical model of body glucose concentration following a fixed food-intake, obtained least-squares fits to data acquired from 150+ individualsConstructed a classification tree based on fit-parameters using machine learning in MATLAB; established a statistical grouping among Diabetic and Healthy individuals
May-Jul 2015	<p>A Novel Protocol for Coating Lipid Bilayers onto Silver Nanocubes <i>Hung-Jen Wu Lab, Texas A&M University</i></p>

	<ul style="list-style-type: none"> Established a tip-sonication protocol to make small unilamellar vesicles of lipids Coated the unilamellar vesicles as supported lipid bilayers onto Silver nanocubes Employed a Localized Surface Plasmon Resonance-based nanocube sensor to monitor protein binding on lipid bilayers Analyzed binding kinetics of GM1 ganglioside with Cholera Toxin Subunit B
May 2014- Apr 2015	<p>Simulation-Design of a Chemical Vapor Deposition Reactor <i>Mahesh Tirumkudulu Lab, IIT Bombay</i></p> <ul style="list-style-type: none"> Simulated fluid flow around a disk, successfully obtained the pressure coefficients observed experimentally in literature. Proposed an unconventional design for uniform coating of parylene polymer onto silicon micro-wafers in a micro-scale Chemical Vapor Deposition reactor. Modeled Parylene flow using ANSYS Fluent, enhanced the proposed design.
Jun 2013	<p>Process Improvement and Technology in Jaggery-Making <i>Sanjay Mahajani Lab, IIT Bombay</i></p> <ul style="list-style-type: none"> Examined units under development for continuous production as well as recuperation in manufacturing Jaggery, the traditional non-centrifugal cane sugar Analyzed Jaggery samples for acidity, moisture content, water activity, density, sugar content and structure (XRD, ESEM)
Key Course Projects	<p>Determining Diffusion Coefficient of Microparticles using Particle-Tracking Algorithms <i>Course: Colloidal Applications and Biomolecular Interactions in Life Science (Spring 2018)</i></p> <ul style="list-style-type: none"> Employed particle-tracking algorithms in MATLAB to track the Brownian diffusion of submicron-sized particles recorded using phase-contrast microscopy Determined the diffusion coefficient of particles by calculating the average mean-squared displacement of an ensemble <p>Proposal: Evolution of Bacterial Flagellum <i>Course: Evolutionary Bioinformatics (Spring 2017)</i></p> <ul style="list-style-type: none"> Proposed a study involving the comparison of flagellar genome across multiple bacterial species which has potential to aid in obstruction of pathogenic motility Carried out BLAST alignment analysis for nucleotide and protein sequences of flagellin (flagellar filament) gene as preliminary results <p>Review: How Deep a Cell Can Sense <i>Course: Cell Mechanics (Spring 2016)</i></p> <ul style="list-style-type: none"> Carried out a literature survey and reported theoretical, in-vitro, and in-silico studies on quantified investigations about the range of mechanical signaling <p>On-line Estimation of Concentrations in a Bio-Reactor <i>Course: State Estimation (Fall 2015)</i></p> <ul style="list-style-type: none"> Generated true states from a model based on substrate uptake, phosphorus repression and effect of seed culture on glyco-peptide antibiotic production Implemented the Simple, Extended, and Unscented versions of the Kalman Filter to estimate the concentrations

Teaching & Mentoring Experience

Fall 2019 | A hands-on workshop for image processing and single particle tracking in MATLAB
Pushkar Lele Lab, Texas A&M University

Undergraduate students mentored

Sep 2022- Now	<p>Timothy Ward, Undergraduate Researcher, Yale University Attachment of bacteriophages to bacterial cells: the classical adsorption assays Best Poster Award winner at Yale Undergraduate Research Symposium, March, 2023</p>
Oct 2021- Oct 2022	<p>Austin Theroux, STARS II Science & Quantitative Reasoning Education Scholar, Yale University Evolution of motile bacteria against a bacteriophage that attaches through the flagellum Presented a poster about this work at <i>Microbe</i> ASM meeting at Washington DC in June, 2022</p>
Dec 2019- Jan 2021	<p>Anita Sumali, Gathright Scholar, Biomedical Engineering, Texas A&M University MATLAB-based quantitative analysis of the run-reversal motility of <i>H. pylori</i>; co-author on Antani et al., eLife, 2021 Currently enrolled in EnMed (MEng/MD dual degree program) at Texas Medical Center, Houston (US)</p>
Apr 2017- Apr 2018	<p>AggiE_Challenge – Undergraduate Mentoring, Texas A&M University Graduate-mentor to a multidisciplinary team of eight undergraduate students employing 3D-printing technology to design scaled-up bacterial models, in order to study the hydrodynamic effects of cell morphology on motility</p>

Teaching Assistant at Texas A&M Chemical Engineering

Spring 2019	Heat Transfer Operations
Spring 2017	Bioprocess Engineering
Fall 2016	Bioprocess Engineering

Teaching, Mentoring, & Management Training

- Sep 2021-
Dec 2021 | Auburn University's Preparing Future Faculty Workshop
Interactive workshops consisting panel discussions from faculty and university administrators
- Sep 2021 | [Fundamentals of Inclusive Teaching](#)
Poorvu Center: Graduate and Postdoctoral Teaching Development, Yale University
A 4-part workshop on creating a respectful, supportive, equitable, and transparent classroom environment
- Aug 2018-
Dec 2019 | [Academy for Future Faculty \(AFF\)](#), Center for Teaching Excellence, Texas A&M University
Faculty Mentor: Dr. Micah Green, Texas A&M University
A program designed for training graduate students as future faculty members, featuring weekly seminars and workshops, and anchored by faculty mentorship
- Jul-
Aug 2019 | An Introduction to Evidence-Based Undergraduate STEM Teaching
Multi-university Massive Open Online Course from the NSF-founded CIRTl network
Eight-week online course on [edX.org](#) catering introduction to effective teaching strategies and the research that supports them. Attended local learning community meetings for the course at Texas A&M University.
- Oct 2019 | Improving Research Mentoring Relationships – Introduction to Effective Mentorship
Center for the Improvement of Mentored Experiences in Research (CIMER)
1-day workshop at Texas A&M University, conducted by CIMER from University of Wisconsin-Madison

Leadership & Management Experience

- Jan 2022-
Now | Communications Committee Manager and Coordinator, [Yale Postdoctoral Association \(YPA\)](#)
• Leading a team of volunteers to manage website, social media, and weekly + monthly newsletters for the YPA
- Jun 2021 | [People Management Skills](#) – Course, Chartered Institute of Personnel and Development, UK
- Oct 2018-
Aug 2020 | [Secretary \(2018-19\) & Chair \(2019-20\)](#), [Chemical Engineering Graduate Student Advisory Council](#)
Artie McFerrin Department of Chemical Engineering, Texas A&M University
• Designed the council by-laws as a founding member
• Set up channels of communication through surveys and anonymous feedback mechanisms, between grad students and administration in the department
• Addressed grad student welfare issues including salary, benefits, mental well-being, work-life balance, student-advisor relationships, facilities, career events, and social events
- Apr 2014-
Mar 2015 | Competitions Manager, AZeotropy 2015
IIT Bombay's Intercollegiate Chemical Engineering Symposium
• Pioneered a new model-making competition *ChemETimer* based on time-precision
• Designed a presentation-based competition *Swaasthya* on engineering-applications to healthcare
• Designed *Cipher*, the online cryptic hunt which received a participation of 400+
• Actualized unconventional chemical engineering quizzing for *Chem-O-Philia*, national level quiz

Science Outreach Volunteering Experience

- Mar 2023 | [Tiny World for Little Humans: Teaching Quantitative Microscopy to Underserved Youth](#)
• Taught quantitative microscopy through the use of paper microscopes ([foldscope.com](#)) to middle school students at Fair Haven School, New Haven, Connecticut
• Outreach project funded by the [MBL ROCS- Marine Biological Laboratory Regional Outreach and Communication in STEM](#)
- Feb 2022-
Sep 2022 | [Associate Writer & Editor, LabLeaks](#)
A biweekly mailing list summarizing recent noteworthy scientific articles to the general audience.
- Feb 2022 | [Exploring Science for Middle School Students](#)
Presented doctoral research topic to middle school children in the New Haven County, Connecticut
- Jul 2020 | [Coronasurveys: Monitoring the Incidence of COVID-19 via Open Surveys](#)
Volunteered services as the primary translator of the survey to the Gujarati language.