

DEVAKI BHAYA (FEBRUARY 2024)

PERSONAL INFORMATION

Work (650) 739 4282 **Cell** (408) 505 8370

Email dbhaya@stanford.edu, dbhaya@carnegiescience.edu, bhaya.devaki@gmail.com

Website <https://www.bhayalab.org/>

POSITIONS

Senior Staff Scientist, Carnegie Institution for Science, Department of Plant Biology, 260 Panama Street, Stanford, CA 94305 (2020-Current)

Research Staff Scientist, Carnegie Institution for Science, Department of Plant Biology, 260 Panama Street, Stanford, CA 94305 (2001-2020)

Program Director, Systems and Synthetic Biology, Molecular and Cellular Biosciences, National Science Foundation, Alexandria, VA (Fulltime: Sept 2016-Dec 2018; Halftime: Jan 2019- Jan 2020)

Professor (by courtesy), Department of Biology, Stanford University (2015-Current)

Research Fellow, Carnegie Institution for Science, Department of Plant Biology, 260 Panama Street, Stanford, CA 94305 (1995-2001)

Associate Professor, Center for Biotechnology, Nehru University, Delhi, India (1991-1995)

Rockefeller Foundation Fellow, Carnegie Institution, Stanford, CA 94305 (Summer 1988-1990)

Assistant Professor, Center for Biotechnology, Nehru University, New Delhi, India (1986-1990)

Postdoctoral Fellow, (with Paul Castelfranco), University of California (1983-1985)

Ph.D., (with André Jagendorf), Department of Plant Biology, Cornell University (1979-1983)

HONORS

2022-2024 Hypothesis Fund "Scout" <https://www.hypothesisfund.org/>

2023 Keynote address at Stanford Research Conference, organized by Stanford Undergraduates

2018 Fellow of the California Academy of Sciences, San Francisco (elected)

SERVICES

2022 Academic member of the **Engineering Biology Research Consortium**

2021 Member of "**Diversity, Equity and Inclusion**" committee, Carnegie Institution for Science

2020 Organizer of EMBO workshop "**Engineering meets Evolution**" focus on Synthetic Biology, Chennai, India

2019-2021 Chair, "**Climate and Working Environment at the Carnegie Institution for Science**", in collaboration with NORC, U Chicago.

2018- 2019, 2023 Teaching at **SCELSE, Summer school, Nanyang Technical University, Singapore** (2020 till 2022 workshops were canceled)

2018 International Scientific Committee (ISC) of the **International Symposium on Phototrophic Prokaryotes (ISPP)**, Vancouver, Canada.

2018 External co-organizer of the first "**Symposium on Viral EcoGenomics and Applications**" at the DOE-Joint Genome Institution, Walnut Creek.

2017 Co-organizer of **Environmental Microbiomes** (with K. Peay, A. Grossman and A. Bhatt), Bioinformatics Symposium at Stanford University, September 2017

2016-2019 Steering Committee, **NSF Research Coordination Network project**, PlaNNet, <http://plannet-rcn.org/about/>

2016-2018 Selection committee for the Paul & Daisy Soros Fellowships for New Americans

2016 NASA Panel for Planetary Science and Technology through Analog Research: panelist
2014 Organizer, **US-UK Joint Nitrogen Ideas lab Kickoff meeting** (NSF-BBSRC), San Francisco
2016 Selection committee for CEHG Fellowships, Genetics, Stanford
2013-2014 Editor, Volume “**Cyanobacteria and Photosynthesis**”, in ‘Photosynthesis Research’
2013 Co-organizer, Symposium in honor of Winslow Briggs, November 2013
2012 Chapter for “Photobiology Online” on Photoperception in Cyanobacteria (with A. Grossman)
2011 ongoing Associate Editor “Frontiers in Aquatic Microbiology”
2010 Advisory Committee “Optogenetics Innovation Laboratory” at BioX, Stanford University
2010 External reviewer for Huang Lab, Dept. of Bioengineering, Stanford University
2010 Advisory Board of Metacyc database, SRI Menlo Park
2009-2011 Member, Sophomore Mentoring Program, Stanford University
2009 Contributor to the World Science Festival, Lincoln Center, NYC.
2009 Advisor to the School of Biological Sciences, Indian Institute of Technology Delhi, India.
2008 NASA Exobiology, Panel meeting member
2008 Organizer at NASA workshop, Ames “**Cyanobacteria in the Lunar Environment**”
2008 Organizer Briggs symposium with Arthur Grossman and Zhiyong Wang
2004-2008 NSF-FIBR workshop co-organizer, “Do species matter in microbial communities?”
2006 Guest Editor for Annual Reviews of Plant Biology
2004-2010 ASM Minority Mentoring Program
2004-2005 Frontiers in Integrative Biology, NSF panel meeting
2004-2005 Organizer Seminar series at the Carnegie Institution
2000 -2001 Consultant to Exelixis Inc., South San Francisco
2000-2001 Board of Directors, Children’s Center of the Stanford Community

FELLOWSHIPS

1988-1990 Rockefeller Biotechnology Career Fellowship
1988 Award, Botanical Society of India, Ranked first in the Graduating class.
1987 Young Scientist Fellowship, Department of Science and Technology (India)
1980-1981 Knudson Graduate Fellowship, Cornell University
1979-1980 Sage Graduate Fellowship, Cornell University
1977 Gold medalist, Ranked First in the First Class, B.Sc. (Botany), University of Calcutta
1974-1977 National Talent Science Fellowship, India

CURRENT & RECENT FUNDING

- **Photosynthesis at high temperatures: genetic and phenotypic underpinnings of thermotolerance in cyanobacteria (2022)** JGI Community Science Program, New Investigator program, with Postdoc Freddy Bunbury (no direct funding but JGI covers all sequencing costs and basic analysis)
- **Diel dynamics and physical interactions of phototrophic isolates from a hot spring microbial mat (2022)** Exploratory EMSL grant
- **Elucidating the Rules of Cooperation and Resiliency in Microbial Communities through Stochastic Graph Grammars (2021-2026)** NSF program “Understanding the Rules of Life” with Todd Treangen, Santiago Segarra and Luay Nakhleh at Rice University
- **Viruses in natural environments: an invisible arms race (2021)** Carnegie Canada with Sid Goyal, University of Toronto
- **Collaborative Research: Focusing a quantitative lens on Synthetic Phototrophic Communities (2019-2022)** NSF-BBSRC with Arthur Grossman, Seppe Kuehn, Alison Smith and Chris Howe

- **'Cyanophages and Cyanobacteria in Extreme Environments'** JGI Community Science Program (no direct funding but JGI covers all sequencing costs and basic analysis)
- **"Nitroplast: a synthetic nitrogen fixing organelle"**, 2013-2018, NSF/BBSRC "Improving on Nature"
- **"Building Genetic Tools to Engineer Cyanobacteria"**, 2012-2014, Stanford BIOX Interdisciplinary Initiatives Program (with Jim Swartz & Julie Theriot, Bioengineering, Stanford)
- **"Precise design of synthetic multicellular communities using optical control"**, 2011-2013, Stanford BIOX Interdisciplinary Initiatives Program (with KC Huang, Bioengineering, Stanford)
- **"Measuring whole gene expression, cell by cell: bistability in *Vibrio cholerae*"**, 2010-2011, NIH/ARRA project (with Gary Schoolnik, Stanford School of Medicine)
- **"Optically controlled, spatially structured, motile community using cyanobacteria"**, 2010-2011, NAFKI seed grant from the Keck Foundation (with K.C Huang, Bioengineering, Stanford University)
- **"Novel Aspects of Phosphorus Metabolism in Thermophilic Cyanobacteria"**, 2010-2014, National Science Foundation, Molecular and Cellular Biosciences Division
- **"Do species matter in Microbial communities?"**, 2004-2010, National Science Foundation, Frontiers in Integrative Biology (co-PI)
- **"Social Dynamics, Signaling, and Surface Motility in Cyanobacteria: Integrating Models and Experiments"**, 2008-2013 (with Doron Levy, Dept. of Mathematics, University of Maryland) Joint DMS, NSF/NIGMS Solicitation on Mathematical Biology)
- **"Quantitating Low-Copy-Number Proteins in Individual Cells Using Microfluidics and Single Molecule Counting,"** 2006-2008 SGER-National Science Foundation (with Richard Zare, Department of Chemistry, Stanford University)

PROGRAM DIRECTOR AT NATIONAL SCIENCE FOUNDATION (2016-2019): HIGHLIGHTS

I joined NSF (Division of Molecular and Cellular Biosciences) in September 2016 as a Program Director. In addition to my regular responsibilities of running panels and managing budgets, I represented NSF at several national meetings. I made presentations at conferences/workshops highlighting the major areas of interest to NSF in the area of Synthetic Biology. I was on review panels for DARPA, ONR, DOE etc. I was a member of working groups to promote interdisciplinary research across Directorates as part of the new "Rules of Life" initiative at NSF. My immediate supervisors were Dr. Theresa Good (Deputy Division Director) and Dr. Basil Nikolau (Division Director).

REVIEWER (ONGOING) for several journals including Journal of the Royal Society, London, Applied Environmental Microbiology, Environmental Microbiology, Frontiers in Microbiology, Geobiology, ISME Journal, J. Bacteriology, Molecular Microbiology, Molecular Plant, Microbiology, Nature, Nature Communications, Plant Cell, Plant Physiology, Proceeding of the National Academy of Sciences, USA, PLoS Biology, Science.

SELECTED INVITED SEMINARS/CONFERENCES (2015-2024)

2024

- *November 2024*, Co-organizer with Dr. A. Shelton: Workshop on "Hot spring Microbial Mats: " with ~30 attendees in person or virtual attendance
- *June*, Invited Keynote speaker at "14th Cyanobacterial Workshop", Michigan State University
- *February*, Invited speaker in John Lawrence series at Berkeley Lab Environmental Genomics and Systems Biology Division.

2023

2022

- *September*, Virtual talk at Telluride workshop on Emergent Simplicity in Bacterial Dynamics.
- *September*, Co-organizer with Dr. A. Shelton: Workshop on “Hot spring Microbial Mats: ” with ~30 attendees in person or virtual attendance
- *June*, Invited Keynote speaker at “14th Cyanobacterial Workshop”, Michigan State University
- *February*, Invited speaker in John Lawrence series at Berkeley Lab Environmental Genomics and Systems Biology Division.

2021

- *August*, “The Ecology and Evolution of Microbial Communities” Workshop, Kavli Institute for Theoretical Physics, Santa Barbara (originally planned 2020)

2020

- *September*, Invited seminar, University of Nebraska, Lincoln (virtual)
- *April*, Virtual seminar on “Viruses” at Carnegie Institution for Science
- *February*, Invited talk at EMBO workshop “Engineering meets Evolution”, Chennai, India

2019

- *October*, Plenary talk at International Congress on Nitrogen Fixation, Wuhan, China
- *September*, *Synthetic Biology in action: filling the gap between the natural and the non-natural* EMBL, Heidelberg, Germany.
- *July*, Invited seminar, Plant Research Labs, Michigan State University
- *May*, Invited seminar, Danforth Center, St. Louis, MI
- *March*, Invited seminar at American Physical Society, Boston, MA

2018

- *December*, Revolutionizing Agriculture with Synthetic Biology, Banbury Center, Cold Spring Harbor Laboratory.
- *November*, International Workshop on the Bioeconomy, Ottawa Canada (NSF representative)
- *November*, Attended Microbiome Engineering Workshop, Boston MA
- *July*, Mammalian Synthetic Biology workshop, Panel Discussion. Boston MA
- *August*, Plenary talk at “International Photosynthetic Prokaryotes, Vancouver, Canada
- *March*, Invited talk, Photosensory Receptors, Gordon Research Conference in Tuscany
- *February*, Oklahoma State University

2017

- *December*, City University of New York, Graduate Center
- *November*, Invited seminar Jawaharlal Nehru University
- *October*, Plenary Talk, Bose Institute, Kolkata, 100th anniversary celebrations
- *July*, Plant Metabolic Engineering, Gordon Conference
- *July*, Invited talk, Photosynthesis, Gordon Conference
- *May*, Invited talk, Department of Embryology, Carnegie Institution for Science
- *April*, IMET, University of Maryland, Invited talk

2016

- *December*, Keynote talk, 26th Western Photosynthesis Conference, Marconi Center
- *June*, Invited talk at First Systems Biology Retreat, Stanford
- *May*, Plenary talk, 12th Workshop on Cyanobacteria, Arizona State University
- *April*, Invited speaker in the Stanford Earth System Science Seminar Series

2015

- *December*, Speaker at Science and Technology series, Joint Genome Center, DOE
- *October*, Speaker at ‘Origins of Life’ workshop, Carnegie Institution, Washington DC
- *October*, Invited speaker at 19th International Meeting on Nitrogen Fixation, Asilomar

- *September*, Tackling the Nitrogen Crisis, Symposium at Oxford University
- *September*, Midway meeting/workshop, co-sponsored by NSF-BBSRC, London
- *June*, Invited speaker, Gordon Research conference on Photosynthesis.
- *April*, Invited speaker, "Genetics and Society Symposium", CEHG, Stanford.
- *January*, Invited speaker, 24th Western Photosynthesis Conference, Asilomar. CA

PUBLIC LECTURES/ENGAGEMENT

- Interview with Times of India September(2022)
<https://timesofindia.indiatimes.com/microbes-enable-all-life-and-they-adapt-constantly/articleshow/93957300.cms?fbclid=IwAR30sосуBOJLylx9tFceNZH01fo-eXUDRaaduyjfQyEi rT7FzVG9LbeLgA>
- Living Histories interview (2022) <https://www.youtube.com/watch?v=TjtQAlqAeZQ>
- Women in Science public talk at the California Academy of Sciences, Nightlife series (March 3, 2022)
- Lecture at Kavli Institute of Theoretical Physics Program "The Ecology and Evolution of Microbial Communities" (*August 2021*) "Diversity, Dynamics and Defense in Microbial Communities"
<https://online.kitp.ucsb.edu/online/ecoevo21/bhaya/rm/jwvideo.html>
- Podcast for the Joint Genome institute "Genome Insider" series (Episode 7) "Decoding Yellowstone Microbial Mats" (*September 9, 2020*)
<https://jgi.doe.gov/genome-insider-episode-7-decoding-yellowstone-microbial-mats/>
- Conversation with Andrew Steele (EPL) in the Carnegie Science Digital Conversations Series: "Viruses: to be or not to be life" (*May 2020*)
<https://carnegiescience.edu/events/lectures/virtual-conversation-devaki-bhaya-and-andrew-steele>
- Carnegie Origins: Earth's Journey Towards Life: Science & Society project; a discussion forum on the origins of life and related questions (*April 2018*)
[HTTPS://VIDEOS.CARNEGIESCIENCE.EDU/2019/01/07/ORIGINS-EARTHS-JOURNEY-TOWARD-LIFE/](https://VIDEOS.CARNEGIESCIENCE.EDU/2019/01/07/ORIGINS-EARTHS-JOURNEY-TOWARD-LIFE/)

TEACHING

- 2021-2022 (Spring) "Partner with Trees" Introductory seminars
<https://exploreintrosems.stanford.edu/sophomore/partner-trees>
- 2021 (Summer) taught a class on Secondary metabolism in Introductory seminars "Indigo taught by Hideo Mabuchi, Applied Physics, Stanford University
- 2015 (Winter quarter) "Party with Trees" Freshman seminar designed to explore trees at Stanford using modern technologies and insights.
- 2011-2014 Freshman Advisor at Stanford University
- 2007-2013 Hopkins Microbiology Microbial Diversity course at the Hopkins Marine Station, Stanford University, organized by Alfred Spormann and Chris Francis
- 2010 "Facebug: the social life of microbes" Introductory Freshman seminar course to explore genomic tools in the context of microbial diversity in the environment
- 2008, "Microbes, Mysteries and Metagenomics" 3 credit Introductory Freshman seminar course to introduce the uses of genomics and metagenomics to probe microbial diversity.
- 2008-2020 Invited lectures in Geomicrobiology class, taught by Chris Francis, Department of Environmental Earth System Science, Stanford
- 2004-2006 "Lights, Pigments, Organisms" (with Richard Zare and Arthur Grossman) 3 credit laboratory and lecture course: concepts of photosynthesis and fluorescence

- 1986-1995 Taught and developed several graduate level courses (Microbiology and Molecular Biology, laboratory and lectures) at the Center for Biotechnology, Nehru University, Delhi India

POSTDOCTORAL FELLOWS

- Dr. Brian Feiqiao Yu (now Scientist at CZ Biohub Stanford; moved to ARC Institute 2023)
- Dr. Amanda Shelton, current
- Dr. Freddy St. Pierre de Bunbury, current
- Dr. Vickie Calatrava (co-mentored with Arthur Grossman)
- Dr. Gabriel Birzu (co-mentored with Daniel Fisher)
- Dr. Michelle Davison, moved to Senior Scientist position, at GAULT, South San Francisco; currently at SEED HEALTH
- Dr. Haojie Jin, moved to College of Forestry, Beijing Forestry University China
- Dr. Anchal Chandra, moved to Welcome Burroughs fellow, Cambridge, U.K.
- Dr. Megan Bergkessel, moved to Diane Newman lab, Caltech, CA
- Dr. Susanne Wisen, CA.
- Dr. Rosario Gomez, moved to Faculty, Loyola University, Spain
- Dr. Claire Simpson, New Zealand
- Dr. Oliver Kilian, moved to Senior scientist, Aurora Biofuels, CA
- Dr. Anne Soisig Steunou, Faculty, CNRS, Paris France
- Dr. Wing On (Jacky) Ng, moved to Relman Lab, Stanford

STUDENTS

- Ayooluwateso Coker (started Fall 2022) joint advisor with Scott Fendorf, Earth Systems
- Michelle Davison (2013) Ph.D. Biology, Stanford University
- Emma Sedivy, (June 2012) Honors thesis, Biology, Stanford University, ***Firestone Award for Excellence in Undergraduate Research***
- Sheetal Gosrani (May 2012) Master's thesis Computer Sciences, San Jose State University. Moved to Apple Computer
- Melissa Adams (2009) Master's thesis, Biology Stanford University, USA. Moved to Harvard PhD program.
- Matthew Burriesci (June 2009) Undergraduate Honors thesis, Biology, Stanford University, ***Firestone Award for Excellence in Undergraduate Research***
- Julianna Ross (Dec 2007) Master's Thesis, Department of Microbiology & Immunology, Stanford University
- Madhulika Srivastava (2006) Ph.D. National Institute of Immunology, India.

THESIS COMMITTEE /JOINT ADVISORY ROLE

- Alana Papula (Applied Physics, Daniel Fisher)
- Linta Reji (Earth Systems, Francis lab, Earth Systems Stanford); currently postdoc at Princeton University.
- Sukrit Silas (Systems Biology, Fire lab, Genetics Stanford); currently postdoc UCSF.
- Scott Dobbins (Genetics & Biochemistry, Theriot lab, Stanford)
- Rick Zuzow (Genetics & Biochemistry, Stanford, Theriot lab), Green Logic, Startup SFO
- Brian Yu (Applied Physics, Stanford, Steve Quake); currently Investigator at CZ Hub Stanford
- Jessica Lee (Earth Sciences, Stanford, Fendorf and Francis lab); currently at a non-profit organization, SFO.
- Kunal Mehta (Chemical Engineering, Stanford, Swartz lab); currently at Zymergen. startup
- Rosanna Chau (Bioengineering, Stanford, Huang lab), currently at a startup in SFO
- Michael Rosen (Physics, Fisher group); currently at a start-up (Karius, Menlo Park)

- George Asimenos (Computer Science, Batzoglou group); currently at DNAnexus startup
- Eric Hall (Chemistry, Zare lab), moved to SRI, Stanford.
- Bo Huang (Chemistry, Zare lab), Professor, Pharmaceutical Chemistry, UCSF

UNDERGRADUATE STUDENTS

Trained over 40 students in the laboratory over the last 15 years; most have gone on to graduate school. Students applied from various schools (locally, other US States or Internationally). Carnegie runs an internship program, from which we select students. I have also accepted students from Stanford's RISE program and have had a long and successful collaboration with the Bioinformatics program in the Computer Science Department at San Jose University. Students from this program typically worked over the summer on projects.

PUBLICATIONS

1. Neri U, Yuri I, Wolf, Roux S, Camargo AP, Lee B, Kazlauskas D, Chen M, Ivanova N, Allen L, David Paez-Espino D, Bryant D, Bhaya D, RNA Virus Discovery Consortium, Krupovic M, Dolja VV, Kyrpides NC, Koonin EV, Gophna U (2022) Five-fold expansion of the global RNA virome reveals multiple new clades of RNA bacteriophages, *provisionally accepted Cell*
2. Fremin BJ, Bhatt AS, Kyrpides NC; Global Phage Small Open Reading Frame (GP-SmORF) Consortium. (2022) Thousands of small, novel genes predicted in global phage genomes. **Cell Rep.**1;39(12):110984.
3. Bunbury F, Rivas C, Calatrava V, Shelton A.N., Grossman A.R., Bhaya D. (2022) Differential phototactic behavior of closely related cyanobacterial isolates from Yellowstone hot spring biofilms **Appl Env Microbiol.** **88(10):e0019622**.
4. Calatrava V, Stephens T, Arwa Gabr, Bhaya D, Bhattacharya D, Grossman A.R. Retrotransposition Facilitated the Origin [VC1] of a Primary Plastid in the Heterotrophic Amoeba *Paulinella* **PNAS** **119(23):e2121241119**. doi: 10.1073/pnas.2121241119
5. Menon S, Varuni P, Bunbury F, Bhaya D, Menon G. (2021) Phototaxis in cyanobacteria: From mutants to models of collective behavior **mBio.**;12(6):e0239821
6. Jin H, Wang Y, Fu Y, Bhaya D (2021) The role of three tandem Pho Boxes in the control of the C-P lyase operon in a thermophilic cyanobacterium **Environ Microbiol** **23(11):6433-6449**.
7. Sanz-Luque E, Bhaya D, Grossman AR (2020) Polyphosphate: A multifunctional metabolite in Cyanobacteria and Algae Metabolism" **Frontiers in Plant Sci.** 2020 11:938. doi: 10.3389/fpls.2020.00938. PMID: 32670331
8. Jin H, Kim R, Bhaya D. (2020) Deciphering proteolysis pathways for the error-prone DNA polymerase in cyanobacteria. **Environ Microbiol.** doi: 10.1111/1462-2920.14911
9. Jin H, Lindblad P, Bhaya D (2019) Building an Inducible T7 RNA Polymerase/T7 Promoter Circuit in *Synechocystis* sp. PCC6803. **ACS Synth Biol.** 19;8(4):655-660.
10. Rosen M, Davison M, Fisher D and Bhaya D (2018) Characterizing fine-scale diversity in thermophilic *Synechococcus* population **PLoS One.** 2018 Nov 14;13(11):e0205396.
11. Jin H, Wang Y, Idoine A, Bhaya D (2018) Construction of a shuttle vector for the model cyanobacterium *Synechocystis* sp. PCC6803 **Frontiers in Microbiol.**;9:1662
12. Chandra A, Joubert, L-M and Bhaya D (2017) cAMP regulates a novel Chaperone-Usher system and phenotypic plasticity of Type IV pili in *Synechocystis* sp. **Bioarchives**
13. Silas S, Makarova KS, Shmakov S, Páez-Espino D, Mohr G, Liu Y, Davison M, Roux S, Krishnamurthy SR, Fu BXH, Hansen LL, Wang D, Sullivan MB, Millard A, Clokie MR, Bhaya D, Lambowitz AM, Kyrpides NC, Koonin EV, Fire AZ. (2017) On the Origin of Reverse Transcriptase-Using CRISPR-Cas Systems and Their Hyperdiverse, Enigmatic Spacer Repertoires. **MBio.** 2017 Jul 11;8(4). pii: e00897-17.

14. Chau R, [Bhaya D](#). Huang K C (2017) Emergent phototactic responses of cyanobacteria under complex light regimes. **Mbio**;8(2). pii: e02330-16. (*featured in Commentary section: Kim*)
15. Yu FB, Willis L, Chau RM, Zambon A, Horowitz M, [Bhaya D](#), Huang KC, Quake SR. (2017)
16. Long-term microfluidic tracking of coccoid cyanobacterial cells reveals robust control of division timing. **BMC Biol.**; 15 (1):11.
17. Davison M, Treangen TJ, Koren S, Pop M, [Bhaya D](#). (2016) Diversity in a Polymicrobial Community Revealed by Analysis of Viromes, Endolysins and CRISPR Spacers. **PLoS One**. Sep 9;11(9):e0160574.
18. Silas S, Mohr G, Sidote DJ, Markham LM, Sanchez- Amat A, [Bhaya D](#), Lambowitz AM, Fire AZ (2016) Direct CRISPR spacer acquisition from RNA by a natural reverse-transcriptase-Cas1 fusion protein **Science** 351(6276):4234.
19. Bhaya D. (2016) In the Limelight: Photoreceptors in Cyanobacteria. **MBio**.7(3). pii: e00741-16. (Invited Commentary)
20. Rosen M, Davison M, Fisher D and [Bhaya D](#) (2015) A quasi-sexual bacterial population occupying a broad niche *Science* 348(6238):1019-23 (*featured in the "Comments Section": Desai & Walczak*)
21. Chau RM, Ursell T, Wang S, Huang KC , and [Bhaya D](#) (2015) Rapid motility bias adaptation during cyanobacterial phototaxis. **Biophys J** doi:10.1016/j.bpj.2015.01.042
22. Davison D. and [Bhaya D](#). (2015): "Creation and analysis of a virome: using CRISPR spacers" in "CRISPR: Methods and Protocols" eds Fineran P, Lundgren M and E. Charpentier p 307-316
23. Davison M, Hall E, Zare RN, [Bhaya D](#) (2014) Challenges of metagenomics and single-cell genomics approaches for exploring cyanobacterial diversity. **Photosyn Res** Dec 17
24. Gomez R, Fazeli F and [Bhaya D](#) (2013) The role of polyphosphate accumulation in *Synechococcus* sp. **J. Bacteriol.** **195(15):3309-19**
25. Ursell T, Chau R, Wisen S, [Bhaya D](#), Huang KC (2013) Motility enhancement through surface modification is sufficient for cyanobacterial community organization during phototaxis **PLoS Comp. Biol** 9(9): e1003205
26. Nelson W, [Bhaya D](#), and Heidelberg J (2012) Novel miniature transposable elements in thermophilic *Synechococcus* and their impact on an environmental population. **J Bacteriol** **194** (14):3636-42
27. Galante A, Wisen S, [Bhaya D](#), Levy D (2012) Modeling local Interactions during the motion of Cyanobacteria. **J Theor Biol** **309**:147-58.
28. [Bhaya D](#), Davison, M. and Barrangou R (2011) CRISPR/Cas systems in bacteria and archaea: versatile small RNAs for defense and regulation **Annual Rev Genet** 45:273-97
29. Klatt CJ, Wood JM, Rusch DB, Bateson MM, Hamamura N, Heidelberg JF, Grossman AR, [Bhaya D](#), Cohan FM, Kühl M, Bryant D, and Ward, DM (2011) Community Ecology of Hot Spring Cyanobacterial Mats: Predominant Populations and their Functional Potential **ISME J** **5**(8):1262-78
30. Nelson W., Wollerman L, [Bhaya D](#), and Heidelberg J (2011) Surviving high insertion sequence abundances in populations of thermophilic cyanobacteria **Appl Environ Microbiol** **77** (15):5458-66
31. Chueh B, Li C, Wu, H, Davison M, Wei H, [Bhaya D](#), Zare RN (2011) An Integrated microfluidic Device for whole gene amplification and protein separation from a small number of cyanobacterial cells **Anal Biochem** **411** (1):64-70
32. Gomez-Garcia MR, M. Davison, Hartnung MB, Grossman AR, [D Bhaya](#) (2011) Alternative Pathways for Phosphonate Metabolism in Thermophilic Cyanobacteria from Microbial Mats **ISME J** **5**(1):141-9

33. Jensen S, Steunou, A-S, Bhaya D, Kühl M, Grossman AR (2011) *In situ* Dynamics of O₂, pH and cyanobacterial transcripts associated with inorganic carbon concentration, photosynthesis and detoxification of reactive oxygen species in hot spring microbial mats **ISME J** 5(2):317-28
34. Heidelberg JF, Nelson WC, Schoenfeld T and Bhaya D (2009) Germ warfare in a microbial mat community: CRISPRs provide insights into the co-evolution of host and viral genomes. **PLoS ONE** 4(1):e4169 [Commentary in Faculty of 1000 Biology](#)
35. Adams M, Gomez R, Grossman AR and D. Bhaya (2008) Responses of thermophilic *Synechococcus* sp. to phosphate deprivation and growth on phosphonate. **J Bacteriol** 190 (24):8171-84
36. Ulijasz AT, Cornilescu G, von Stetten D, Kaminsky S, Mroginski MA, Zhang J, Bhaya D, Hildebrandt P, and Vierstra RD (2008) Characterization of two thermostable cyanobacterial phytochromes reveal global movements in the chromophore-binding domain during photoconversion. **J Biol Chem** 283(30):21251-66
37. Burriesci M and Bhaya D (2008) Tracking phototactic responses and modeling motility of *Synechocystis* sp. strain PCC6803 **J Photochem Photobiol** 91(2-3):77-86
38. Steunou A-S, Jensen S, Brecht E, Becraft ED, Bateson M, Kilian O, Bhaya D, Ward DM, Peters JW, Grossman AR, Kühl M (2008) Regulation of *nif* Gene Expression and the Energetics of N₂ Fixation over the Diel Cycle in a Hot Spring Microbial Mat **ISME J** 2(4):364-78
39. Kilian O, Steunou A-S, Grossman AR, Bhaya D (2008) A novel two domain-fusion protein in cyanobacteria with similarity to the CAB/ELIP/HLIP superfamily: Evolutionary implications and regulation **Molecular Plant** 1:155-166
40. Bhaya D, Levy, D, Requeijo, T (2008) Group Dynamics of Phototaxis: Interacting Stochastic Many-Particles Systems and their Continuum Limit, in S. Benzoni-Gavage and D. Serre (Eds.), "Hyperbolic Problems: Theory, Numerics, Applications", Proceedings of the Eleventh International Conference on Hyperbolic Problems, Lyon. Springer-Verlag, Berlin, pp.145-159.
41. Bhaya D, Grossman, AR, Steunou AS, Khuri N, Cohan FM, Hamamura N, Melendrez, MC, Bateson M, Ward DM, Heidelberg JF (2007) Genomic, metagenomic and functional analyses of cyanobacteria from hot-spring microbial mats reveal an unexpected diversity in nutrient utilization strategies **ISME J** 1(8):703-13 [Commentary in Faculty of 1000 Biology](#)
42. Kilian O, Steunou A-S, Fazeli F, Bailey S, Bhaya D, Grossman AR (2007) Light Responses of Thermophilic *Synechococcus* isolates from the Microbial Mats of Octopus Spring **Appl Environ Microbiol** 73: 4268-4278
43. Ward DM, Cohan FM, Bhaya D, Heidelberg JF, Kühl M, and Grossman AR (2007) Genomics, Environmental Genomics and the Issue of Microbial Species. **Heredity** 100(2):207-19
44. Huang B, Wu H, Bhaya D, Grossman A R, Granier, S, Kobilka BK and Zare R N (2007) Counting low-copy number proteins in a single cell. **Science** 315: 81-84 [Commentary in Faculty of 1000 Biology](#)
45. Labiosa, RG, Arrigo, KR Tu CJ, Bhaya D, Bay S, Grossman AR, and Shrager J (2006) Examination of diel changes in global transcript accumulation in *Synechocystis* sp. Strain PCC6803: A study in photo-acclimation. **J Phycol** 42:622-636
46. Kapell AD, Bhaya D, van Waasbergen LG (2006) Negative control of the high light-inducible *hliA* gene and implications for the activities of the NblS sensor kinase in the cyanobacterium *Synechococcus elongatus* strain PCC 7942. **Arch Microbiol** 186:403-413
47. Bhaya D, Fazeli F, Nakasugi KN, and Burriesci M, (2006) Phototaxis and impaired motility in adenyl cyclase and cyclase receptor protein mutants of *Synechocystis* sp. Strain PCC6803 **J Bacteriol** 188: 7306-7610
48. Steunou AS, Bhaya D, Bateson M, Melendrez M, Ward D, Brecht E, Peters JW, Kühl M, Grossman AR (2006) *In situ* analysis of nitrogen fixation and metabolic switching in

- unicellular thermophilic cyanobacteria inhabiting a hot-spring microbial mat **Proc Natl Acad Sci USA** 103:2398-2407 [Commentary in Faculty of 1000 Biology](#)
49. [Bhaya D](#) (2004) Light matters: Phototaxis and signal transduction in unicellular cyanobacteria **Mol Microbiol.** 53:745-754
 50. Ng W-O, Grossman AR and [Bhaya D](#) (2003) Multiple light inputs control phototaxis in *Synechocystis* sp. Strain PCC6803 **J Bacteriol** 185:1599-607
 51. [Bhaya D](#), Dufresne A, Vaultot D. and Grossman AR (2002) Analysis of the *hli* gene family in marine and freshwater cyanobacteria **FEMS Microbiol Letters** 215:209-219
 52. [Bhaya D](#), Takahashi A, Shahi P, and Grossman AR (2001) Novel motility mutants from *Synechocystis* PCC6803 generated by *in vitro* transposon mutagenesis. **J Bacteriol** 183:6140-6143
 53. [Bhaya D](#), Takahashi A and Grossman AR (2001) Light regulation of TypeIV pilus-dependent motility by chemosensor-like elements in *Synechocystis* PCC 6803. **Proc Natl Acad Sci. USA** 98:7540-7545
 54. Grossman AR, [Bhaya D](#) and He Q (2001) Tracking the light environment by cyanobacteria and the dynamic nature of light harvesting. **J Biol Chem** 276:11449-52
 55. Mrázek J, [Bhaya D](#), Grossman AR and Karlin S (2001) Highly expressed and alien genes of the *Synechocystis* genome. **Nucleic Acids Res** 29:1590-601
 56. Huala E, et al. The Arabidopsis Information Resource (TAIR) (2001): A comprehensive database and web-based information retrieval, analysis, and visualization system for a model plant. **Nucleic Acids Res** 29:102-105
 57. [Bhaya D](#), Bianco NR, Bryant D and Grossman AR (2000) Type IV pilus biogenesis and motility in the cyanobacterium *Synechocystis* sp. PCC6803. **Mol Microbiol** 37: 941-951
 58. [Bhaya D](#), Vaultot D, Amin P, Takahashi AW and Grossman AR (2000) Isolation of regulated genes of the unicellular cyanobacterium *Synechocystis* sp. strain PCC6803 by differential display. **J Bacteriol** 182:5692-5699.
 59. [Bhaya D](#). and A.R. Grossman (1999) The role of an alternative sigma factor in motility and pilus formation in the cyanobacterium *Synechocystis* sp. strain PCC6803 **Proc Natl Acad Sci USA** 96: 3188-3193
 60. [Bhaya D](#) (1996) Molecular responses of cyanobacteria to nutrient stress. **Journal of Industrial Research** 55: 630-637
 61. Grossman, AR, [Bhaya D](#), Apt KE and Kehoe DM (1995) Light harvesting in photosynthetic organisms: Regulation and evolution. **Annual Rev Genet** 29: 231-288
 62. Dolganov N, [Bhaya D](#) and Grossman AR (1995) Cyanobacterial protein with homology to the chlorophyll *a/b* binding proteins of plants: Evolution and regulation. **Proc Natl Acad Sci USA** 92: 636-640
 63. Srivastava M, [Bhaya D](#), Mohanty P and Bose S (1994) Changes in the antenna size of photosystem I and photosystem II in *Synechococcus* PCC 7942 in the presence of Sandoz 9785, a photosystem II inhibitor. **Photosyn Res** 41: 303-313
 64. Apt KE, [Bhaya D](#) and Grossman AR (1994) Characterization of the genes encoding the light-harvesting proteins in diatoms: the biogenesis of the fucoxanthin-chlorophyll *a/c* protein complex. **Journal of Applied Phycol** 6:225-230
 65. [Bhaya D](#) and Grossman AR (1993) Characterization of gene clusters encoding the fucoxanthin chlorophyll protein of the diatom *Phaeodactylum tricornutum*. **Nucleic Acids Res** 21: 4458-4466
 66. [Bhaya D](#) and A.R. Grossman (1991) A new route for targeting proteins into plastids; evidence from diatoms. **Molec Gen Genet** 229: 400-404.

67. Ray, J., D. Bhaya M. Block and A.R. Grossman (1991) An atypical alkaline phosphatase from *Synechococcus* sp. strain PCC 7942; gene isolation, transcription and inactivation **J Bacteriol** 173: 4297-4309
68. Bhaya D and Castelfranco PA (1986) Regulation of chlorophyll and cytochrome in isolated developing plastids. **Plant Physiol** 82: 960-964
69. Bhaya D and Castelfranco PA (1986) In vitro synthesis of chlorophyll and assembly of chlorophyll protein complexes in developing plastids of cucumber and peas. **Proc Natl Acad Sci USA** 82: 5370-5374
70. Bhaya D and Jagendorf AT (1985) Alpha and beta subunits of CF1 are synthesized on the thylakoid-bound ribosomes of pea chloroplasts. **Arch Biochim Biophys** 234: 273-278
71. Bhaya D and Jagendorf AT (1984) Synthesis of subunit III of the CF_o on thylakoid-bound polysomes from pea chloroplasts. **Plant Mol. Biol.** 3:273-280
72. Bhaya D and Jagendorf AT (1984) Optimal conditions for the translation of thylakoid-bound ribosomes from pea chloroplasts. **Plant Physiol.** 75: 832-838

BOOK CHAPTERS (REVIEWED)

1. Bhaya D and Brahamsha B (2014) "Motility and the regulation of phototaxis in cyanobacteria" in "**The Cell Biology of Cyanobacteria**" Editors: E. Flores & A. Herrero, Caister Academic Press (2014)
2. Held N, Childs LM; Davison M, Weitz JS; Whitaker RJ and Bhaya D (2013) "CRISPR-cas systems to probe ecological diversity and host-viral interactions" in **CRISPR Biology** Editors R. Barrangou and J. van der Oost, Springer
3. Bhaya D (2012) "Meta- and functional genomic analysis of oxygenic phototrophy in the hot springs" In "**Functional Genomics and Evolution of Photosynthetic Systems**", ADVANCES IN PHOTOSYNTHESIS AND RESPIRATION Series on Photosynthesis, Springer
4. Bhaya D (2011) "Approaches to understanding population level functional diversity in a microbial community" Invited chapter in "**Handbook of Molecular Microbial Ecology II; Metagenomics in Different Habitats**", Wiley/Blackwell
5. Bhaya D, Schwarz R and Grossman AR (2000) "Molecular responses to environmental stresses" in "**Ecology of Cyanobacteria: Their diversity in time and space**" Ed. B. A. Whitton and M. Potts, Kluwer Academic Publishers Ltd. pp 397-442
6. Grossman AR, Schwarz R, Bhaya D and Dolganov N (1998) Phycobilisome degradation and responses of cyanobacteria to nutrient limitation and high light. **Proceedings of the XIth Intl Congress on Photosynthesis**. Eds. G. Gareb and J. Pusztai, Kluwer Academic Publishers Ltd
7. Grossman AR, Bhaya D and Collier JL (1994) Specific and general responses of cyanobacteria to macronutrient deprivation. In **Cellular and Molecular Biology of Phosphate and Phosphorylated Compounds in Microorganisms**. Eds. Torriani-Gorini, Yagil and Silver, ASM Press, Washington DC, USA. pp. 112-118
8. Bhaya D, and Castelfranco PA (1986) Synthesis of chlorophyll and assembly of chlorophyll protein complexes in developing plastids. In G. Akoyunoglou (Ed.). **Chloroplast Development**.

INVITED ARTICLES/PUBLIC MEDIA (for a general audience):

- [Interview in Times of India "Evolve" September 2022](#)
- Interview: Living Histories project: <https://www.youtube.com/watch?v=TjtQAlqAeZQ>
- Article in Stanford Report highlighting the "Partner with Trees" course
<https://news.stanford.edu/report/2022/09/27/course-trees-fostered-curiosity/>

- R. McCarty and Bhaya D (2022): A.T. Jagendorf: A Biographical Memoir <http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/jagendorf-and-dr-t.pdf>
- Bhaya D, (2015) Party with Trees: The dramatic and marvelous trees of Stanford. Essay in **Pacific Horticulture** Fall issue <http://www.pacifichorticulture.org/articles/party-with-trees/>
- Bhaya D, Lindblad P. (2015) Emerging technologies illuminate facets of photosynthesis in cyanobacteria. Introduction to Special issue in Photosynthesis Research. **Photosynth Res.** Sep 22
- Govindjee, Grossman AR, Bhaya D. (2015) Gordon Research Conference on the dynamics and regulation of photosynthesis: from the origin of bio-catalysis to innovative solar conversion. Meeting review **Photosynth Res.** 2015 Sep 4.
- Bhaya D and Grossman A.R, Chapter for “**Photobiology Online**” on Photoperception in Cyanobacteria (with A. Grossman)

IN PREPARATION/SUBMITTED

- Yu et al. (2022) Diversity in Extremophile environments: a multifaceted view, *in preparation*
- Birzu G, et al. (2022) Analysis of Single Amplified genomes from thermophilic *Synechococcus* sp. *in preparation*
- Bhaya *et al* (2023) invited review in Environmental Microbiology
- Bhaya et al (2023) Invited review in Annual Reviews of Microbiology

PATENTS FILED

- *UT ref. 6877 LAM; Stanford ref. S16-071; CIW ref. 5108 N&V Ref.: 6146-174; PH ref. UTSB.P1108US*
U.S. Patent Application No. 15/440,315, entitled “Direct CRISPR Spacer Acquisition From RNA By A Reverse-Transcriptase-CAS1 Fusion Protein,” by Sukrit Silas et al. April 2020