

# Dipti Dinkar Nayak

Carl R. Woese Institute for Genomic Biology  
University of Illinois, Urbana-Champaign  
1206 W Gregory Dr, Urbana, IL 61801

E-mail: [dnayak@illinois.edu](mailto:dnayak@illinois.edu)  
Website: <https://diptinayak.github.io/>

- Positions Held*
- ◇ **University of Illinois**, Urbana, IL, USA  
Life Sciences Research Foundation Postdoctoral Fellow, August 2015—present  
Carl R. Woese Institute for Genomic Biology Postdoctoral Fellow, January 2015—present  
Advisor: William W. Metcalf
  - ◇ **University of Idaho**, Moscow, ID, USA  
Postdoctoral Scholar, September 2014–December 2014  
Advisor: Christopher J. Marx
- Education*
- ◇ **Harvard University**, Cambridge, MA, USA  
Ph.D. in Organismic and Evolutionary Biology. August 2009—September 2014  
Advisor: Christopher J. Marx.
  - ◇ **Stanford University**, Stanford, CA, USA  
M.S. in Environmental Engineering and Science. September 2007—June 2009
  - ◇ **Delhi College of Engineering, Delhi University**, Delhi, India  
B.E. in Environmental Engineering. August 2003—May 2007
- Broad Interests*
- Microbial Physiology, Microbial Evolution, Metabolism, Archaeal Genetics, Bacterial Genetics
- Honors and Awards*
- ◇ **Best Poster Award**, for my poster, titled “*Post-translational thioamidation of methyl-coenzyme M reductase: a key enzyme in methanogenic and methanotrophic Archaea*” at the Gordon Research Conference on Applied and Environmental Microbiology. Awarded to 1 out of ~100 posters, 2017.
  - ◇ **Best Poster Award**, for my poster, titled “*Cas9 mediated genome editing of the methanogenic archaeon Methanosarcina acetivorans C2A*” at the Gordon Research Conference on the Molecular Basis of Microbial One-Carbon Metabolism. Awarded to 3 out of ~100 posters. 2016.
  - ◇ **Life Sciences Research Foundation Fellowship**. Awarded nationally to 30 from over 1000 candidates across a spectrum of fields in life sciences. Funded by the *Simons Foundation*: [www.simonsfoundation.org/life-sciences/simons-postdoctoral-fellowships-in-life-sciences/](http://www.simonsfoundation.org/life-sciences/simons-postdoctoral-fellowships-in-life-sciences/). 2015.
  - ◇ **Carl R. Woese Institute for Genomic Biology Postdoctoral Fellowship**, under the Biocomplexity theme. Between one and three fellows are awarded each year. 2015.
  - ◇ **Certificate of Distinction in Teaching**, for the course **Microbial Evolution**, Harvard University, 2013.
  - ◇ **Young Investigator Oral Abstract Presentation**, American Society of Microbiology (ASM) General Meeting, 2013.
  - ◇ Awarded the **Sigma Xi GIAR** (Grants in Aid-of-Research), 2012
  - ◇ **Graduate School of Arts and Sciences Fellowship**, Harvard University, 2009.
  - ◇ **John F. P. Braitz School of Engineering Graduate Fellowship**, Stanford University, 2007.
  - ◇ **Civil and Environmental Engineering Department Fellowship**, Stanford University, 2007.

## Publications

- ◇ **D.D. Nayak**, N. Mahanta, D.A. Mitchell, W.W. Metcalf, Post-translational thioamidation of methyl-coenzyme M reductase, a key enzyme in methanogenic and methanotrophic Archaea *eLife*, doi:10.7554/eLife.29218, 2017.
- ◇ **D.D. Nayak**, W.W. Metcalf, Cas9-mediated genome editing in the methanogenic archaeon *Methanosarcina acetivorans*, *Proceedings of the National Academy of Sciences (PNAS)*, doi: 10.1073/pnas.1618596114, 2017. Press and Other Mentions:
  - “Finally, Archaea Get Their CRISPR-Cas Toolbox”, spotlight article in Trends in Microbiology, Volume 25, Issue 6, June 2017, Pages 430-432.
  - “A New Tool for Genetically Engineering the Oldest Branch of Life”, article by Institute of Genomic Biology, covered by Department of Energy (DOE) University Research News, Phys.org, Science Daily, article: [igb.illinois.edu/news/new-tool-genetically-engineering-oldest-branch-life](http://igb.illinois.edu/news/new-tool-genetically-engineering-oldest-branch-life)
- ◇ **D.D. Nayak**, D. Agashe, M-C Lee, C.J. Marx, Selection Maintains Apparently Degenerate Metabolic Pathways due to Tradeoffs in Using Methylamine for Carbon versus Nitrogen, *Current Biology*, Cell Press, Volume 26, Issue 11, pp 1416–1426, doi: 10.1016/j.cub.2016.04.029, 2016. Press Mentions:
  - “Evolving an Explanation”, article by the University of Idaho Press. article: <http://www.uidaho.edu/sci/biology/news/features/2016/evolving-an-explanation>.
- ◇ **D.D. Nayak**, C.J. Marx, Experimental horizontal gene transfer of methylamine dehydrogenase mimics prevalent exchange in nature and overcomes the methylamine growth constraints posed by the sub-optimal N-methylglutamate pathway, *Microorganisms*, Volume 3, Issue 1, pp 60–79, doi: 10.3390/microorganisms3010060, 2015
- ◇ **D.D. Nayak**, C.J. Marx, Methylamine utilization via the N-methylglutamate pathway in *Methylobacterium extorquens* PA1 involves a novel flow of carbon through C1 assimilation and dissimilation pathways, *J. Bacteriology*, Volume 196, Issue 23, pp 4130–4139, doi: 10.1128/JB.02026-14, 2014
- ◇ **D.D. Nayak**, C.J. Marx, Genotypic and phenotypic comparison of methylotrophy between *Methylobacterium* strains AM1 and PA1, *PloS One*, 9(9): e107887, doi: 10.1371/journal.pone.0107887, 2014
- ◇ B. Boonchayaanant, **D. Nayak**, D. Xin, C. Criddle, Uranium Reduction and Resistance to Reoxidation under Iron-reducing and Sulfate-reducing Conditions, *Water Research*, Volume 43, Issue 18, pp 4652–4664, doi: 10.1016/j.watres.2009.07.013, 2009

## Papers in Preparation

- ◇ **D.D. Nayak**, W.W. Metcalf, Methylamine-specific methyltransferase paralogs in *Methanosarcina* are functionally distinct despite frequent gene conversion, In preparation for *PLoS Biology*.
- ◇ **D.D. Nayak**, M. Davlieva, T. Ticak, J.V. Bazurto, J.L. Johnson, F. Marty Ytreberg, Y. Shamoo, and C.J. Marx EfgA halts bacterial translation in response to intracellular formaldehyde, In preparation for *Cell*.

## Patents

- ◇ **D.D. Nayak** and C.J. Marx. *Genetically modified bacteria CA 2905265 A1*, This patent describes a scheme for enhancing growth yields of methylotrophic microorganisms. Publication date: Oct 2, 2014.

## Service

- ◇ **Chair**, Gordon Research Seminar on the Molecular Basis of One-Carbon Metabolism, titled “From Enzyme Mechanisms to Multispecies Interactions: Understanding Biological One-Carbon Conversions to Address Future Challenges”, 2016. url: <https://www.grc.org/programs.aspx?id=15360>. Assembled a program with one keynote, and eleven talks across two days; Introduced a mentorship component for the first time, with panel titled “Scientific Careers Beyond the PhD and Postdoc”; Assisted with acquiring funding from the NSF, KnipBio, NASA Astrobiology, LanzaTech, and FEMS.
- ◇ **Vice Chair**, Gordon Research Seminar on the Molecular Basis of One-Carbon Metabolism, 2014. url: <https://www.grc.org/programs.aspx?id=15359>. Assisted with acquiring funding from the DOE, MOGene, and the Agouron Institute. Assisted with assembling a program with one keynote, and thirteen talks across two days.

- Posters and Talks*
- ◇ Poster titled “*Post-translational thioamidation of methyl-coenzyme M reductase: a key enzyme in methanogenic and methanotrophic Archaea*” at the Gordon Research Conference on Applied and Environmental Microbiology at Mount Holyoke College, South Hadley, Massachusetts in July 2017.
  - ◇ Contributed Talk titled “*Cas9-Mediated Genome Editing in the Methanogenic Archaeon Methanosarcina acetivorans*” at the Gordon Research Seminar on Applied and Environmental Microbiology at Mount Holyoke College, South Hadley, Massachusetts in July 2017.
  - ◇ Invited Talk titled “*Cas9-Mediated Genome Editing in the Methanogenic Archaeon Methanosarcina acetivorans*” at the Carl R. Woese Institute for Genomic Biology Fellows Symposium at the University of Illinois, Urbana in May 2017.
  - ◇ Poster titled “*Cas9-Mediated Genome Editing in the Methanogenic Archaeon Methanosarcina acetivorans*” at the Gordon Research Conference on Molecular Basis of Microbial One-Carbon Metabolism at Waterville Valley, New Hampshire in August 2016.
  - ◇ Poster titled “*Experimental Evolution of Methylobacterium to Grow on Formaldehyde*” at the Gordon Research Conference on the Molecular Basis of Microbial One-Carbon Metabolism at Mount Holyoke College, South Hadley, Massachusetts in August 2014.
  - ◇ Invited talk titled “*Growth on Formaldehyde: A Metabolic Paradox*” at the Microbial Sciences Initiative (MSI) Chalk Talk, Cambridge MA in February 2014.
  - ◇ Contributed talk titled “*A Molecular Mechanism for Formaldehyde Detoxification and Growth in Methylobacterium*” at Boston Bacterial Meeting, Cambridge MA in June 2013.
  - ◇ Invited talk titled “*Using Experimental Evolution to Uncover Novel Metabolic Genes*” at National Center for Biological Sciences (NCBS), Bangalore, India in September 2012
  - ◇ Contributed Talk titled “*Genetic Basis of Aldehyde Resistance in Methylobacterium*” at the Gordon Research Seminar on Molecular Basis of Microbial One-Carbon Metabolism in Lewiston, Maine in August 2012
  - ◇ Poster titled “*Experimental Evolution of Methylobacterium to Grow on Formaldehyde*” at the Gordon Research Conference on the Molecular Basis of Microbial One-Carbon Metabolism at Lewiston, Maine in August 2012
  - ◇ Invited talk titled “*Hops Resistance in Bacteria*” at the MSI Graduate Student Workshop at Harvard University in January 2012
  - ◇ Poster titled “*Experimental Evolution of Methylobacterium to Grow on Formaldehyde*” at the Gordon Research Conference on Microbial Population Biology in Andover, NH in July 2011
  - ◇ Contributed Talk titled “*The Genetic Basis of Resistance to Aldehydes in Methylobacterium*” at the ASM General Meeting in San Francisco, USA in June 2012
  - ◇ Poster titled “*Experimental Evolution of Methylobacterium to Grow on Formaldehyde*” at the Gordon Research Conference on Molecular Basis of Microbial One-Carbon Metabolism in Lewiston, ME in August 2010
  - ◇ Poster titled “*Experimental Evolution of Methylobacterium to Grow on Formaldehyde*” at the International Society of Microbial Ecology Meeting in Seattle, WA in August 2010
- Teaching Experience*
- ◇ Guest Lecturer for an Undergraduate-level **Microbiology** Course taught by Prof. William Metcalf and Steven Blanke at the University of Illinois, Urbana-Champaign. Fall 2015.
  - ◇ Teaching Fellow for an Undergraduate/Graduate-level **Microbial Evolution** Course taught by Prof. Christopher Marx at Harvard University. Awarded the **Certificate of Distinction in Teaching**. Fall 2013.
  - ◇ Teaching Fellow for an Undergraduate/Graduate-level **Statistics for Biology** Course taught by Prof. John Wakeley at Harvard University. Fall 2011.
  - ◇ Teaching Fellow for an Undergraduate Lab Course titled “**Evolution in Action**” taught by Prof. Christopher Marx at Harvard University. Spring 2011.
  - ◇ Teaching Fellow for an Undergraduate/Graduate-level **Advanced Aquatic Chemistry Lab** Course taught by Dr. Sandy Roberston at Stanford University. Winter 2008.

- ◊ Teaching Fellow for a Graduate level **Aquatic Chemistry** Course taught by Prof. James Leckie at Stanford University. Fall 2007.

*Outreach*

- ◊ Interviewed for “How to Pick a Post-doc Position” by the Careers Component of the American Society of Microbiology Blog, January 2017.
- ◊ Designed an interactive activity for kids in grades K-4, titled “Microbes in Extreme Environments”. The activity was a part of the Genome Day organized by the Carl R. Woese Institute for Genomic Biology in November 2015 and 2016.
- ◊ Participated in a Panel Discussion, titled “Writing Effective Grant Proposals for Postdocs in STEM”, organized by the University of Illinois Graduate College in May 2016.
- ◊ Presented a science talk meant for the general public titled “Living Foods: The Microbiology of Food and Drink” at various venues, including:
  - ◊ Chabana Science Cafe, Flying Machine Coffee, Urbana, Illinois, December 2015.
  - ◊ Beacon Hill Seminars, March 2014.
  - ◊ Science in the News Lecture Series, Harvard Medical School, November 2012.
- ◊ Member of GradWagon, a Life Sciences Outreach Program at Harvard University, 2012–2014.
- ◊ Initiated and Organized the Harvard Microbial Sciences Initiative (MSI) Journal Club for its first two sessions in Summer 2012–2013. The Journal Club has been active every summer since then. Summer 2012–2013.
- ◊ Cambridge Science Festival Organizer, “The Science of Food”, April 2013.
- ◊ Science Blogs author from November 2010–May 2011. (<http://scienceblogs.com/webeasties/author/dnayak/>). My article, titled “The Microscopic Workforce in the Gulf of Mexico” appeared in the Science Section of the New York Times, November 2010.

*Travel Awards*

- ◊ Awarded the MSI (Microbial Sciences Initiative) Travel Grant in 2010
- ◊ Awarded the ASM (American Society of Microbiology) General Meeting Travel Grant in 2012

*Society**Membership*

- ◊ Member of the American Society of Microbiology since January 2012
- ◊ Nominated Associate Member of Sigma Xi since May 2012

*Summer Courses*

- ◊ Hopkins Microbiology Course, Hopkins Marine Station, Stanford University 2007