Frank O. Aylward, PhD

Curriculum vitae

Assistant Professor
Department of Biological Sciences
Virginia Tech
Blacksburg, VA

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EDUCATION

2008-2013	PhD in *Microbiology*, Microbiology Doctoral Training Program, **University of Wisconsin-Madison**, Madison, WI. Awarded in August 2013.
2004-2008	B.Sc., double-major in *Biochemistry and Molecular Biophysics* and *Molecular and Cellular Biology*, **University of Arizona**, Tucson, Arizona.

ACADEMIC POSITIONS & RESEARCH EXPERIENCE

2017-	**Assistant Professor.** Department of Biological Sciences, Virginia Tech, Blacksburg, VA.
2014-2017	**Postdoctoral Researcher**. Advisor: Edward F. DeLong, Center for Microbial Oceanography Research and Education, **University of Hawai'i at Mānoa**, Honolulu, HI.
2013-2014	**Postdoctoral Researcher**. Advisor: Edward F. DeLong, Department of Civil and Environmental Engineering, **Massachusetts Institute of Technology**, Cambridge, MA.
2008-2013	**PhD Candidate**. Advisor: Cameron Currie, Department of Bacteriology & Great Lakes Bioenergy Research Center (GLBRC), **University of Wisconsin-Madison**, Madison, WI.
2006-2008	**Undergraduate Researcher**. Advisor: Howard Ochman, Department of Biochemistry and Molecular Biophysics, **University of Arizona**, Tucson, AZ.
2005-2006	**Undergraduate Researcher**. Advisor: Rick Michod, Department of Ecology and Evolutionary Biology, **University of Arizona**, Tucson, AZ.

ACADEMIC HONORS, AWARDS, & SCHOLARSHIPS

2022	NIH R35 ESI-MIRA
2022	National Science Foundation CAREER award
2020	Outstanding Teaching Award, Department of Biological Sciences, Virginia Tech
2019	Luther and Alice Hamlett Endowed Junior Faculty Fellowship
2019	Outstanding Research Award, Department of Biological Sciences, Virginia Tech
2019	Simons Foundation Early Career Award in Marine Microbial Ecology and Evolution
2018	Alfred P. Sloan Research Fellowship in Ocean Sciences
2012	International Society for Microbial Ecology Travel Grant (Copenhagen, DK)
2012	Wisconsin Distinguished Graduate Fellowship, University of Wisconsin-Madison
2011	Hopkins Microbiology Course Fellowship (Pacific Grove, CA)
2009	Honorable mention, Graduate Research Fellowship Program, NSF
2007	Van de Velde Undergraduate Research Scholarship, University of Arizona
2006	Galileo Circle Undergraduate Research Scholarship, University of Arizona

PUBLICATIONS

Full publication information can also be found on PubMed

** Co-first author; # Graduate or Undergraduate mentee; ± Corresponding author.*

Peer-reviewed original research articles

1. CA Martinez-Gutierrez[#], **FO Aylward**. Genome size distributions in bacteria and archaea are strongly linked to phylogeny at broad phylogenetic scales. ***PLoS Genetics***, 18(5):e1010220.
2. AR Weinheimer[#], **FO Aylward**. Infection strategy and biogeography distinguish cosmopolitan groups of jumbo bacteriophages. ***The ISME Journal***, **16**: 1657–1667.
3. BH Khairunisa, D Susanti, U Loganathan, CD Teutsch, BT Campbell, D Fiske, CA Wilkinson, **FO Aylward**, B Mukhopadhyay. Dominant Remodeling of Cattle Rumen Microbiome by *Schedonorus arundinaceus* (Tall Fescue) KY-31 Carrying a Fungal Endophyte. 2022. ***Access Microbiology***, 4(2).
4. D Muratore, AK Boysen, MJ Harke, KW Becker, JR Casey, SN Coesel, DR Mende, ST Wilson, **FO Aylward**, JM Eppley, A Vislova, S Peng, RA Rodriguez-Gonzalez, SJ Beckett, EV Armbrust, EF DeLong, DM Karl, AE White, JP Zehr, BAS Van Mooy, ST Dyhrman, AE Ingalls, JS Weitz. 2021. Complex marine microbial communities partition metabolism of scarce resources over the diel cycle. ***Nature Ecology and Evolution***, 6, 218–229.
5. **FO Aylward[±]**, M Moniruzzaman, AD Ha, EV Koonin. A phylogenomic framework for charting the diversity and evolution of giant viruses. ***PLOS Biology***, 2021, 19(10).
6. ED Osburn, BD Badgley, BD Strahm, **FO Aylward**, JE Barrett. Emergent properties of microbial communities drive accelerated biogeochemical cycling in disturbed temperate forests. ***Ecology***, 2021, 102(12).
7. ED Osburn, **FO Aylward**, JE Barrett. Historical land use has long-term effects on microbial community assembly processes in forest soils. ***ISME Communications***. 2021, 1(48).
8. CA Martinez-Gutierrez[#] & **FO Aylward[±]**. Phylogenetic signal, congruence, and uncertainty across bacteria and archaea. ***Molecular Biology and Evolution***, 2021, 38(12).
9. ED Osburn, BD Badgley, **FO Aylward**, JE Barrett. Historical forest disturbance mediates soil microbial community responses to drought. ***Environmental Microbiology***, 2021, 23(7).
10. AD Ha, M Moniruzzaman, **FO Aylward[±]**. High transcriptional activity and diverse functional repertoires of hundreds of fiant viruses in a coastal marine system. ***mSystems***, 2021, 6(4).
11. AK Boysen, LT Carlson, BP Durham, RD Groussman, **FO Aylward**, F Ribalet, KR Heal, AE White, EF DeLong, EV Armbrust, AE Ingalls. Particulate metabolites and transcripts reflect diel oscillations of microbial activity in the surface ocean. ***mSystems***, 2021, 6(3).
12. S Karki[#], M Moniruzzaman, **FO Aylward[±]**. Comparative genomics and environmental distribution of large dsDNA viruses in the family *Asfarviridae*. ***Frontiers in Microbiology***, 2021, 12:657471.
13. **FO Aylward[±]**, M Moniruzzaman. ViralRecall—a flexible command-line tool for the detection of giant virus signatures in 'omic data. ***Viruses***, 2021, 13(2):150.
14. M Moniruzzaman, AR Weinheimer[#], CA Martinez-Gutierrez[#], **FO Aylward[±]**. Widespread endogenization of giant viruses shapes green algal genomes. ***Nature***, 2020, 58:141-145.

***** Winner of the 2022 Lindeman Award for Best Paper, American Society of Limnology and Oceanography***

15. AR Weinheimer[#] & **FO Aylward**[±]. A distinct lineage of *Caudovirales* that encodes a deeply-branching multi-subunit RNA Polymerase. ***Nature Communications***, 2020, 11(1): 1-9.

16. **FO Aylward**[±] & AE Santoro AE[±]. Heterotrophic thaumarchaea with small genomes are widespread in the dark ocean. ***mSystems***, 2020, 5:e00415-20.

17. M Moniruzzaman, CA Martinez-Gutierrez[#], AR Weinheimer[#], **FO Aylward**[±]. Dynamic genome evolution and complex virocell metabolism of globally-distributed giant viruses. ***Nature Communications***, 2020, 11(1): 1-11.

18. AM Linz, **FO Aylward**, S Bertilsson, KM McMahon. Time-series metatranscriptomes reveal conserved patterns between phototrophic and heterotrophic microbes in diverse freshwater systems. ***Limnology and Oceanography***, 2020, 65:101-112.

19. ED Osburn, SG McBride, **FO Aylward**, BD Badgley, BD Strahm, JD Knoepp, JE Barrett. Soil bacterial and fungal communities exhibit distinct long-term responses to disturbance in temperate forests. ***Frontiers in Microbiology***, 2019, 10:2872.

20. CA Martinez-Gutierrez[#] & **FO Aylward**[±]. Strong purifying selection is associated with genome streamlining in epipelagic *Marinimicrobia*. ***Genome Biology and Evolution***, 2019, 11 (10), 2887-2894.

21. BC Kolody, JP McCrow, L Zeigler Allen, **FO Aylward**, KM Fontanez, A Moustafa, M Moniruzzaman, FP Chavez, CA Scholin, EE Allen, AZ Worden, EF Delong, AE Allen. Diel transcriptional response of a California Current plankton microbiome to light, low iron, and enduring viral infection. ***The ISME Journal,*** 2019, 13(11): 2817-2833.

22. MJ Harke, FR Frischkorn, ST Haley, **FO Aylward**, JP Zehr, ST Dyhrman. Periodic and coordinated gene expression between a diazotroph and its diatom host. ***The ISME Journal,*** 2019, 13(1):118-131.

23. EW Getz, SS Tithi, L Zhang, **FO Aylward**[±]. Parallel evolution of genome streamlining and cellular bioenergetics across the marine radiation of a bacterial phylum. ***mBio,*** 2018, 9(5).

24. SS Tithi**, FO Aylward**, RJ Jensen, L Zhang. FastViromeExplorer: a pipeline for virus and phage identification and abundance profiling in metagenomics data. ***PeerJ,*** 2018, 12;6:e4227.

25. Luo E, **FO Aylward**, DR Mende, EF DeLong. Bacteriophage distributions and temporal variability in the ocean's interior. ***mBio***, 2017, 8(6):e01903-17.

26. **FO Aylward**, D Boeuf, DR Mende, EM Wood-Charlson, A Vislova, JM Eppley, AE Romano, EF DeLong. Diel cycling and long-term persistence of viruses in the ocean's euphotic zone. ***Proceedings of the National Academy of Sciences, USA,*** 2017, 114(43): 11446-11451.

27. DR Mende*, J Bryant*, **FO Aylward***, JM Eppley, TN Nielsen, DM Karl, EF DeLong. Environmental drivers of a microbial genomic transition zone in the ocean's interior. ***Nature Microbiology***, 2017, 2(10): 1367.

28. ST Wilson*, **FO Aylward***, F Ribalet, B Barone, JR Casey, PE Connell, JM Eppley, S Ferrón, JN Fitzsimmons, CT Hayes, AE Romano, KA Turk-Kubo, A Vislova, EV Armbrust, DA Caron, MJ Church, JP Zehr, DM Karl, EF DeLong. Coordinated regulation of growth, activity and transcription in natural populations of the unicellular nitrogen-fixing cyanobacterium *Crocosphaera*. ***Nature Microbiology***, 2017, 2(9): 118.

29. EA Gontang, **FO Aylward**, C Carlos, TG del Rio, M Chovatia, A Fern, C-C Lo, SA Malfatti, SG Tringe, CR Currie, R Kolter. Major changes in microbial diversity and community composition across gut sections of a juvenile *Panchlora* cockroach. ***PLOS ONE***, 2017, 12(5): e0177189.

30. DR Mende*, **FO Aylward***, JM Eppley, TN Nielsen, EF DeLong. Improving environmental genomes via integration of metagenomic and single-cell assemblies. ***Frontiers in Microbiology,*** 2016, 7:e143.

31. JA Bryant, **FO Aylward**, JM Eppley, DM Karl, MJ Church, EF DeLong. The influence of wind and solar radiation on microbial community diversity in the North Pacific Subtropical Gyre. ***The ISME Journal***, 2016, 10(6):1308-1322.

32. **FO Aylward**, JM Eppley, JM Smith, FP Chavez, CA Scholin, EF DeLong. Microbial community transcriptional network dynamics are conserved across all three domains of life at ocean basin scales. ***Proceedings of the National Academy of Sciences, USA***, 2015; 112(17): 5443-5448.

33. MA Spero, **FO Aylward**, CR Currie, TJ Donohue. Phylogenomic analysis and predicted physiological role of the proton-translocating NADH:quinone oxidoreductase (complex I) across Bacteria. ***mBio***, 2015; 5(6): e02077-14.

34. **FO Aylward**[±], L Khadempour, DM Tremmel[#], BR McDonald, CD Nicora, S Wu, RJ Moore, DJ Orton, ME Monroe, PD Piehowski, SO Purvine, RD Smith, MS Lipton, KE Burnum-Johnson, CR Currie. Enrichment and broad representation of plant biomass-degrading enzymes in the specialized hyphal swellings of *Leucoagaricus gongylophorus*, the fungal symbiont of leaf-cutter ants. ***PLOS ONE***, 2015; 10(8): e0134752.

35. **FO Aylward**[±], G Suen, PHW Biedermann, AS Adams, JJ Scott, SA Malfatti, T Glavina del Rio, SG Tringe, M Poulsen, KF Raffa, KD Klepzig, CR Currie. Convergent bacterial microbiotas in the fungal agricultural systems of insects. ***mBio***, 2014; 5(6): e02077-14.

36. EL Huang*, **FO Aylward***, Y-M Kim, B-JM Webb-Robertson, CD Nicora, Z Hu, T Metz, MS Lipton, RD Smith, CR Currie, KE Burnum-Johnson. The fungus gardens of leaf-cutter ants undergo a distinct physiological transition during biomass degradation. ***Environmental Microbiology Reports,*** 2014; 6(4): 389-395.

37. **FO Aylward**, KE Burnum, SG Tringe, C Teiling, DM Tremmel[#], J Moeller, JJ Scott, KW Barry, CD Nicora, PD Piehowski, S Malfatti, SO Purvine, LA Goodwin, RD Smith, GM Weinstock, NM Gerardo, G Suen, MS Lipton, CR Currie. *Leucoagaricus gongylophorus* produces diverse lignocellulases for the degradation of recalcitrant plant polymers in the fungus gardens of leaf-cutter ants. ***Applied and Environmental Microbiology,*** 2013; 79(12): 3770-3778.

38. **FO Aylward**, BR McDonald, SM Adams, A Valenzuela, RA Schmidt, LA Goodwin, T Woyke, CR Currie, G Suen, M Poulsen. Comparison of 26 sphingomonad genomes reveals diverse environmental adaptations and biodegradative capabilities. ***Applied and Environmental Microbiology,*** 2013; 79(12): 3724-3733.

39. AS Adams*, **FO Aylward*,** SM Adams, N Erbilgin, BH Aukema, CR Currie, G Suen, and KF Raffa. Mountain pine beetles colonizing historical, transitional, and naïve host trees are associated with a community of terpenoid-degrading bacteria. ***Applied and Environmental Microbiology,*** 2013; 79(11): 3468-3475.

40. MR Christopherson, G Suen, S Bramhacharya, KA Jewell, **FO Aylward**, D Mead, PJ Brumm. The genome sequences of *Cellulomonas fimi* and "*Cellvibrio gilvus"* reveal the cellulolytic strategies of two facultative anaerobes, transfer of "*Cellvibrio gilvus*" to the genus *Cellulomonas*, and proposal of *Cellulomonas gilvus* sp. nov. ***PLOS ONE***, 2013; 8(1): e53954.

41. **FO Aylward**, KE Burnum, JJ Scott, G Suen, SG Tringe, SM Adams, GJ Starrett[#], KJ Berry, LA Goodwin, MS Lipton, CR Currie. Metagenomic and proteomic insights into the fungus gardens of leaf-cutter ants. ***The ISME Journal***, 2012; 6(9): 1688-1702.

42. G Suen, PJ Weimer, DM Stevenson, **FO Aylward**, J Boyum, J Deneke, C Drinkwater, NN Ivanova, N Mikhailova, O Chertkov, LA Goodwin, CR Currie, D Mead, PJ Brumm. The complete genome sequence of the *Fibrobacter succinogenes* S85 reveals a cellulolytic and metabolic specialist. ***PLOS ONE***, 2011; 6(4): e18814.

43. G Suen, JJ Scott, **FO Aylward**, SM Adams, SG Tringe, A Pinto-Tomás, CE Foster, M Pauly, PJ Weimer, K Barry, LA Goodwin, P Bouffard, L Li, J Osterberger, TT Harkins, SC Slater, TJ Donohue, CR Currie. An insect herbivore microbiome with high plant biomass-degrading capacity. ***PLOS Genetics***, 2010; 6(9): e1001129.

44. MD Herron, JD Hackett, **FO Aylward**, RE Michod. Triassic origin and early radiation of multicellular volvocine algae. ***Proceedings of the National Academy Sciences, USA***, 2009; 106(9): 3254-8.

Peer-reviewed review articles

1. **FO Aylward** & M Moniruzzaman. Viral Complexity. ***Biomolecules***. 12(8), 1061.

2. **FO Aylward**. The coevolutionary history of the microbial planet. Invited Crystal Ball review for ***Environmental Microbiology Reports***, 2020.

3. **FO Aylward**, CR Currie, G Suen. The evolutionary innovation of nutritional symbioses in fungus-growing ants. ***Insects***, 2012; 3(1): 41-61.

Genome announcements (editorial review only)

1. **FO Aylward**, DM Tremmel[#], GJ Starrett[#], DC Bruce, P Chain, A Chen, KW Davenport, C Detter, CS Han, J Han, M Huntemann, NN Ivanova, NC Kyrpides, V Markowitz, K Mavrommatis, M Nolan, I Pagani, A Pati, S Pitluck, C-L Wei, LA Goodwin, T Woyke, CR Currie. Complete genome of *Serratia* sp. strain FGI 57, a strain associated with leaf-cutter ant fungus gardens. ***Genome Announcements***, 2013; 1(2): e00239-12.

2. **FO Aylward**, DM Tremmel[#], DC Bruce, P Chain, A Chen, KW Davenport, C Detter, CS Han, J Han, M Huntemann, NN Ivanova, NC Kyrpides, V Markowitz, K Mavrommatis, M Nolan, I Pagani, A Pati, S Pitluck, C-L Wei, LA Goodwin, T Woyke, CR Currie. Complete genome of *Enterobacteriaceae* bacterium strain FGI 57, a strain associated with leaf-cutter ant fungus gardens. ***Genome Announcements***, 2013; 1(1): e00238-12.

Book chapters

1. CA Martinez-Gutierrez & **FO Aylward**. Evolutionary Genomics of Marine Bacteria and Archaea. In: **The Marine Microbiome**, edited by LJ Stal and MS Cretoiu. 2022. Springer, New York, NY.

2. **FO Aylward**. Identifying virus-like regions in microbial genomes using Hidden Markov Models. In: **Case Studies in Systems Biology**, 2021, pp. 263-270. Springer, New York, NY.

3. G Suen, JJ Scott, **FO Aylward**, CR Currie. The Microbiome of Leaf-cutter Ant Fungus Gardens. In: de Bruin, F.J. ed., ***Handbook of Molecular Microbial Ecology, Volume 2: Metagenomics in Different Habitats***, 2011, pp. 367-380. John Wiley and Sons, Inc., Hoboken, NJ, USA.

4. G Suen, **FO Aylward**, SC Slater, BS Goldman. From Genetics to Genomics. In: Maloy, S., Hughes, K.T., Casadesus, J. eds., ***The Lure of Bacterial Genetics: A Tribute to John Roth***, 2010, pp. 257-266. American Society for Microbiology Press, Washington, D.C., USA.

Articles with mentees published in non-refereed undergraduate research compilations

1. DP Declet[#], **FO Aylward**, CR Currie. Interactions Between Actinobacteria and Other Microorganisms Present in the Fungus Gardens of Leaf-cutter Ants. Integrated Biological Sciences Summer Research Program (IBS-SRP) Research Journal, 2010

2. JA Montalvo[#], **FO Aylward**, G Suen, A Valenzuela, CR Currie. Characterizing Lignocellulose-Degrading Microbes from the Fungus Gardens of Leaf-Cutting Ants. Integrated Biological Sciences Summer Research Program (IBS-SRP) Research Journal, 2009.

GRANTS, CONTRACTS, & RESEARCH FELLOWSHIPS

Reverse chronological order

2022-2027 PI, **NIH R35, Early Stage Investigator MIRA** ($1,861,244). "Coevolutionary Dynamics and Gene Exchange Between Nucleo-Cytoplasmic Large DNA Viruses and Eukaryotes".

2022-2027 PI, **National Science Foundation CAREER Award** ($988,984). "Bioinformatic Resources for Promoting Research and Education of Giant Viruses".

2021-2022 Co-PI, **CALS Strategic Plan Advancement 2021 Integrated Internal Competitive Grants Program**, with Biswarup Mukhopadhyay (PI), and co-PIs Reza Ovissipour and Scott Lowman ($59,800). "Efficient anaerobic digestion of food waste to methane".

2020-2022 Co-PI, **John Lee Pratt Animal Nutrition Program**, with Michael Persia (PI), John Mauer, and Eric Wong ($125,000). "Nutritional modulation of the microbiome as a strategy for antibiotic-free poultry production using a smart farm approach."

2019-2022 PI, **Luther and Alice Hamlett Endowed Junior Faculty Fellowship** ($30,000)

2019-2022 PI, **NSF Infrastructure Innovation for Biological Research**, with co-I Liqing Zhang ($555,496). "Innovative Software and Databases to Leverage RNA Polymerase as a Phylogenetic Marker in Metagenomic Data".

2019-2022 PI, **Simons Foundation Early Career Award in Marine Microbial Ecology and Evolution** ($624,000). "Revealing the Tempo and Mode of Prokaryotic Genome Evolution in the Ocean".

2018-2020 PI, **Alfred P. Sloan Research Fellowship in Ocean Sciences** ($65,000)

2018-2020 PI, **Virginia Tech ICTAS Junior Faculty Award**, with co-I Liqing Zhang ($80,000). "Leveraging Metagenomic 'Big Data' for the Discovery of Novel Microbial Diversity in the Biosphere".

Total: $4,389,524

SERVICE

Service at the International Committee for the Taxonomy of Viruses (ICTV)

2021-Present Study group chair, *Imitervirales*

Ad Hoc Academic Reviewing

Journals: *Applied and Environmental Microbiology, Applied Microbiology and Biotechnology, Archives of Virology, Bioinformatics, BMC Genomics, Cell Reports, Communications Biology, Current Opinion in Virology, Diversity, Ecological Entomology, Environmental Microbiology, Epigenetics & Chromatin, Frontiers in Microbiology, Genome Biology, Genome Biology and Evolution, Gut Microbes, The ISME Journal, Journal of Agricultural and Food Chemistry, Journal of Genetic Engineering and Biotechnology, Limnology and Oceanography Methods, mBio, Microbial Ecology, Microbiome, Microorganisms, Molecular Biology and Evolution, Molecular Ecology, mSystems, Nature, Nature Communications, Nature Methods, Nature Reviews Microbiology, Phage: Therapy, Applications, and Research, PLOS*

Computational Biology, *PLOS ONE*, *Proceedings of the National Academy of Sciences USA*, *Science Bulletin*, *Scientific Reports*, *Virus Evolution*, *Water Science and Technology*.

Funding Agencies: Austrian Science Fund; French National Research Agency; Czech Science Foundation; German Research Foundation; Israel Science Foundation; Kansas EPSCOR (NSF); National Science Foundation of China; Natural Sciences and Engineering Research Council (Canada); Nature Environment Research Council (UK); Singapore National Research Foundation; Stazione Zoologica Anton Dohrn (Italy); Villum foundation (Denmark); United States Army Research Office; USDA Agriculture and Food Research Initiative; US Department of Energy Graduate Student Research Program; US National Science Foundation, Division of Environmental Biology; US National Science Foundation, Biological Oceanography Program.

Editorial Service

Editorial Board Member, *Applied and Environmental Microbiology* (2022-), *Environmental Microbiology & Environmental Microbiology Reports* (2018-), *International Society of Microbial Ecology Journal (ISMEJ)* (2021-)

Ad hoc Editor: *mBio, Frontiers in Microbiology*

Associate Editor: *Frontiers in Microbiology*- Viral Evolution and Diversification specialty section.

Conference Organization

Flash talk coordinator, ASM Microbe, 2018.

Graduate Student Coordinator: Great Lakes Bioenergy Research Center annual retreat planning committee (May 2011).

University Service at Virginia Tech

2021-2022	Committee member, Biological Sciences Executive Committee
2021	Committee member, for the review of Academy of Integrated Science Collegiate Faculty.
2020	Reviewer, Institute for Critical Technology and Applied Science (ICTAS) Junior Faculty Award Program (13 4-page grants)
2019	Committee chair, Global Change Center Seed Grant Program (4 2-page grants)
2019	Committee member, Luther and Alice Hamlett College of Science Fellowship review committee (14 applications)
2019	Outreach presentations at Blacksburg Community High School to promote the Systems Biology program at Virginia Tech
2018	Oral presentation judge for Virginia Tech Research Day
2018	Guest Presenter, Biological Sciences Alumni Advisory Board Meeting
2018-Present	Systems Biology Curriculum Committee member

PRESENTATIONS

External seminars are bolded

February 22nd, 2022	**Viruses of Microbes 2022 webinar series [Virtual Presentation]**
October 21st, 2021	**ASM Ambassadors Early Career Program, keynote speaker [Virtual Presentation].**
February 24th, 2021	Genetics, Bioinformatics, and Computational Biology seminar series, Virginia Tech [Virtual Presentation].
February 12th, 2021	Virginia Tech Life Sciences Seminar Series [Virtual Presentation].
January 15th, 2021	**Metagenomics Forum [Virtual Presentation], hosted by Francisco Rodriguez-Velera, Universidad Miguel Hernandez, Spain.**

November 4th, 2019	**Department of Microbiology seminar series, University of Tennessee at Knoxville**
October 2nd, 2019	**Department of Biological Sciences seminar series, University of North Carolina-Greensboro**
September 24th, 2019	**Department of Biological Sciences seminar series, University of Virginia.**
July 18th, 2018	**Computer and Information Sciences Research Colloquium, Virginia Military Academy.**
November 28th, 2017	Microbiology Seminar series, Virginia Tech.
November 13th, 2017	Biochemistry Department seminar series, Virginia Tech.
March 3rd, 2017	**American Society for Limnology and Oceanography (ASLO), Honolulu, HI.**
December 1st, 2016	Department of Biological Sciences, Virginia Tech.
September 12th, 2016	**Agricultural and Biosystems Engineering, University of Arizona.**
June 18th, 2016	**ASM Microbe, Boston, MA.**
April 20th, 2016	**Ecosystem Genomics Initiative, University of Arizona.**
April 6th, 2016	**Molecular, Cellular, and Biomedical Sciences, University of New Hampshire.**
March 3rd, 2016	Department of Oceanography, University of Hawaii at Manoa.
February 9th, 2016	**Biology Department, Utah State University.**
January 12th, 2016	**Marine, Earth, and Atmospheric Sciences, NC State University.**
August 19th, 2012	**International Society for Microbial Ecology meeting, Copenhagen, Denmark.**
May 17th, 2011	Great Lakes Bioenergy Research Center annual retreat, South Bend, IN.

TEACHING

University Courses Taught at Virginia Tech

As primary instructor

Systems Biology 2025, Introduction to Systems Biology I (3 CR)	Fall 2017
Systems Biology 3035, Systems Biology of Genes and Proteins I (4 CR)	Fall 2019
Systems Biology 3036, Systems Biology of Genes and Proteins II (4 CR)	Spring 2018, 2019, 2020, 2022

As co-instructor

Microbial Community Analysis GRAD6895, Analysis of Microbiome Data	Spring 2019
Systems Biology 2025, Introduction to Systems Biology I	Fall 2018, 2019
Systems Biology 2026, Introduction to Systems Biology II	Spring 2019, 2020

Workshops

2016 *Instructor,* Oceanography and Geobiology Environmental 'Omics workshop sponsored by the NSF-funded EarthCube program. Topic: Introduction to metagenome assembly and analysis. Hosted by the University of Hawaii at Manoa.

Guest lectures

2018	Population Genomics, FREC 5164. Topic: Microbial Genomics.
2017	Quantitative Ecology, BIOL 6004. Topic: Microbial Ecology.
2016	Oceanography 750. Topic: Marine Microbiology. UH Manoa.
2011	Microbiology 551. Topic: Ecological genomics. UW-Madison.
2010	Agronomy 375. Topic: Microbial genomics. UW-Madison.

Teaching Assistantships

2010-11, '13 *Teaching Assistant*. Microbiology 450, UW-Madison
2009 *Teaching Assistant*. Microbiology 301 Laboratory, UW-Madison

STUDENTS, POSTDOCS, AND PERSONNEL ADVISED

Postdocs

Uri Sheyn	2022-Present
Anh D Ha	2020-Present
Mohammad Moniruzzaman	2018-2022

Graduate Students (PhD unless otherwise noted)

Alaina Weinheimer	2018-Present
Carolina Martinez-Gutierrez	2018-Present
Sangita Karki	2020-Present
Paula Erazo-Garcia	2022-Present
Roxanna Farzad (MS)	2021-Present
Claudia Perez (MS)	2021-2022
Nitin Nair (MS)	2018-2020

Undergraduate Students	***Major***
Gillian Murphy	Systems Bioloy, '24
Tiffany McCoy	Biology, '23
Josh Stanton	Biology, '23
Nick Anderson	Systems Biology, '22
Riley Wilson	Systems Biology, '22
Meagan Todd	Systems Biology, '20
Ashleen Harris	Systems Biology, '20
Gavin Mucker	Systems Biology, '20
Eric Getz	Biological Sciences, '18

OTHER OUTREACH & MENTORSHIP

Mentorship

2010-2013 Mentor to three undergraduate Microbiology majors (Daniel Tremmel, Gabriel Starrett, and Austin Lynch), as well as a visiting MS student (Thiruvenkadam Shanmugam). Several of these students subsequently appeared as co-authors on peer-reviewed journal articles.

2009, 2010 Mentor for David Pagan-Declet and Jorge Montalvo ('09 and '10, respectively), students in the Integrated Biological Science Summer Research Program (IBS-SRP), Great Lakes Bioenergy Research Center. Both students were undergraduates at the University of Puerto Rico and subsequently published their work in undergraduate research journals (*see Publications section*).

2009 Mentor to a participant in the Research Experience for Teachers Program hosted by the Great Lakes Bioenergy Research Center. This program provided research experience to elementary school teachers in the greater Madison area. I assisted in developing a bioenergy-related research project and the design of curricula for middle-school science classes.

2007, 2008 Peer Mentors Program, Department of Biochemistry, University of Arizona, Tucson, Arizona. In this program I mentored freshmen Biochemistry majors for one year.

Outreach

2018 Guest speaker at the Blacksburg High School College Research event. Topic: The Systems Biology program at Virginia Tech.

2017- Open-access bioinformatics tutorials available on the Protocols.IO.
Link: https://www.protocols.io/researchers/frank-aylward

2010 Speaker for the Monona Grove Energy Fair, UW-Madison People Program, UW-Madison Microbiology Club, and the UW-Madison Biological Sciences Preview Weekend, which are all programs focused on broadening participation in biological sciences from high school or undergraduate students.

2006-2008 Ambassadors program, Department of Biochemistry, University of Arizona, Tucson, Arizona. In this program I participated in outreach activities spreading awareness of scientific careers and opportunities to high school students.

SOFTWARE AND COMPUTATIONAL RESOURCES

ViralRecall Tool for identifying signatures of giant viruses in genomic data
https://github.com/faylward/viralrecall

ncldv_markersearch Tool for generating multi-locus phylogenies of giant viruses
https://github.com/faylward/ncldv_markersearch

Giant Virus Database Database with genomic, phylogenetic, and taxonomic resources for giant viruses
https://faylward.github.io/GVDB/

markerfinder Tool for identifying phylogenetic marker genes and producing multi-locus phylogenies of bacteria and archaea
https://github.com/faylward/markerfinder