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<https://astrobiomike.github.io/research/>

#### **(a) Summary**

My formal educational background is in biology and microbial ecology, and my professional experience has been spent applying bioinformatics to questions about microbial ecology and evolution in various microbial systems ranging from deep-sea basalts up to the International Space Station. I have extensive first-hand experience in many common approaches (e.g., marker-gene analysis, genomics, metagenomics, metatranscriptomics, comparative genomics, phylogenomics, pangenomics). I am an adept coder in the programming languages of bash, python, and R, enabling me to not only access and utilize available tools and data for processing and analysis, but to also adjust and/or build things as needed for any given project.

I personally know how little guidance there currently is for biologists who suddenly need to be able to use bioinformatics regularly in their work, and how difficult of a path that can be for some of us at the start. I am therefore very passionate about helping other biologists through that initial steep learning curve and spend a lot of my free time on building and maintaining a website designed to help biologists learn bioinformatics, in addition to the other activities discussed in the Educational/Outreach section below.

#### **(b) Appointments**

2018–Current: NASA Space Biology Postdoctoral Fellow; Exobiology, NASA Ames Research Center, Mountain View, CA 94035

2018–Current: JCVI Research Fellow; J. Craig Venter Institute, La Jolla, CA 92037

2015–2018: USC SeaGrant Fellow; Biological Oceanography, University of Southern California, Los Angeles, CA 90089

2013–2015: USC Dornsife Merit Fellow; Biological Oceanography, University of Southern California, Los Angeles, CA 90089

9/2012–12/2012: NASA Undergraduate Student Research Program (USRP) Intern; NASA Ames Research Center, Mountain View, CA 94035

6/2011–8/2011: NASA USRP Intern; NASA Kennedy Space Center, Merritt Island, FL 32899

#### **(c) Educational/Outreach activities**

- I build and maintain a freely available, open-source website designed to help biologists develop bioinformatics skills to aid in their research: <https://astrobiomike.github.io/>
- I am a certified Data and Software Carpentries Instructor. [The Carpentries](#) is a community of volunteer instructors dedicated to teaching foundational coding and data science skills to researchers worldwide.
- I am heavily involved in organizing and teaching at yearly bioinformatics workshops including the [STAMPS](#) course at the Marine Biological Laboratory in Woods Hole, MA, USA and the [DIBSI](#) course at UC Davis in Davis, CA, USA. And I personally occasionally lead smaller workshops covering the foundations of working at the command line using the materials I've developed and have available at <https://astrobiomike.github.io/unix/>, among other things on that site.

#### **(d) Publications**

Lee, M.D. (2019). GToTree: a user-friendly workflow for phylogenomics. *Bioinformatics*. <https://doi.org/10.1093/bioinformatics/btz188>

- Lee, M.D. (2019). Applications and considerations of GToTree: a user-friendly workflow for phylogenomics. *Evolutionary Bioinformatics*. <https://doi.org/10.1177/1176934319862245>
- Lee, M.D. (2019). Happy Belly Bioinformatics: an open-source resource dedicated to helping biologists utilize bioinformatics. *The Journal of Open-Source Education*. <https://doi.org/10.21105/jose.00053>
- Lee, M.D., Ahlgren, N.A., Kling, J. D., Walworth, N.G., Rocap, G., Saito, M.A., Hutchins, D.A., and Webb, E.A. (2019). Marine *Synechococcus* isolates representing globally abundant genomic lineages demonstrate a unique evolutionary path of genome reduction without a decrease in GC content. *Environmental Microbiology*. <https://doi.org/10.1111/1462-2920.14552>
- Lee, M.D., Walworth, N.G., McParland, E.L., Fu, F.-X., Mincer, T.J., Levine, N.M., Hutchins, D.A., and Webb, E.A. (2017). The *Trichodesmium* consortium: conserved heterotrophic co-occurrence and genomic signatures of potential interactions. *ISMEJ*. <https://doi.org/10.1038/ismej.2017.49>
- Lee, M.D., Webb, E.A., Walworth, N.G., Fu, F.-X., Held, N.A., Saito, M.A., and Hutchins, D.A. (2017). Transcriptional activities of the microbial consortium living with the marine nitrogen-fixing cyanobacterium *Trichodesmium* reveal potential roles in community-level nitrogen cycling. *Applied and Environmental Microbiology*. <https://doi.org/10.1128/AEM.02026-17>
- Lee, M.D., Walworth, N.G., Sylvan, J.B., Edwards, K.J., and Orcutt, B.N. (2015). Microbial communities on seafloor basalts at Dorado Outcrop reflect level of alteration and highlight global lithic clades. *Frontiers in Microbiology*. <https://doi.org/10.3389/fmicb.2015.01470>
- Lee, M.D., Kling, J.D., Araya, R., and Ceh, J. (2018). Jellyfish life stages shape associated microbial communities, while a core microbiome is maintained across all. *Frontiers in Microbiology*. <https://doi.org/10.3389/fmicb.2018.01534>
- Walworth, N.G. and Lee, M.D., Suffridge, C., Qu, P., Fu, F.-X., Saito, M.A., Webb, E.A., Sañudo-Wilhemly, S.A., And Hutchings, D.A. (2017). Functional genomics and phylogenetic evidence suggest genus-wide cobalamin production by the globally distributed marine nitrogen fixer *Trichodesmium*. *Frontiers in Microbiology*. <https://doi.org/10.3389/fmicb.2018.00189>
- O'Rourke, A.O., Zoumplis, A., Wilburn, P., Lee, M.D., Lee, Z., Vecina, M., and Mercader, K. (2020). Following the Astrobiology roadmap: origins, habitability, and future exploration. Book chapter in *Astrobiology: current, evolving, and emerging perspectives* by Caister Academic. <https://doi.org/10.21775/9781912530304>
- Ahlgren, N.A., Belisle, B.S., and Lee, M.D. (2019). Genomic mosaicism underlies the adaptation of marine *Synechococcus* ecotypes to distinct oceanic iron niches. *Environmental Microbiology*. <https://doi.org/10.1111/1462-2920.14893>
- Kling, J.D., Lee, M.D., Fu, F.-X., Phan, M.D., Wang, X., Qu, P., and Hutchins, D.A. (2019). Transient exposure to unusually high temperatures reshapes coastal phytoplankton communities. *ISMEJ*. <https://doi.org/10.1038/s41396-019-0525-6>
- Sharma, I. and Lee, M.D. (2019). Draft Genome Sequence of *Cyclobacterium marinum* Strain Atlantic-IS, Isolated from the Atlantic Slope off the Coast of Virginia, USA. *Microbiology Resource Announcements*. <https://doi.org/10.1128/MRA.01089-19>
- Walworth, N.G., Fu, F.-X., Lee, M.D., Cai, X., Saito, M.A., Webb, E.A., and Hutchins, D.A. (2017). Nutrient co-limited *Trichodesmium* as nitrogen source or sink in a future ocean. *Applied and Environmental Microbiology*. <https://doi.org/10.1128/AEM.02137-17>
- Hutchins, D.A., Fu, F.-X., Walworth, N.G., Lee, M.D., Saito, M.A., and Webb, E.A. (2017). Comment on “The complex effects of ocean acidification on the prominent N<sub>2</sub>-fixing cyanobacterium *Trichodesmium*”. *Science*. <https://doi.org/10.1126/science.aao0067>
- Walworth, N.G., Hutchins, D.A., Dolzhenko, E., Lee, M.D., Fu, F.-X., Smith, A.D., and Webb, E.A. (2017). Biogeographic conservation of the cytosine epigenome in the globally important marine, nitrogen-fixing cyanobacterium *Trichodesmium*. *Environmental Microbiology*. <https://doi.org/10.1111/1462-2920.13934>
- Momper, L.M., Jungbluth, S.P., Lee, M.D., and Amend, J.P. (2017). Energy and carbon metabolisms in a deep terrestrial subsurface fluid microbial community. *ISMEJ*. <https://doi.org/10.1038/ismej.2017.94>
- Ramirez, G.A., Hoffman, C.L., Lee, M.D., Lesniewski, R.A., Barco, R., Garber, A., Toner, B.M., Wheat, C.G., Edwards, K.J., Orcutt, B.N. (2016). Assessing marine microbial induced corrosion monitored in Santa Catalina Island, California. *Frontiers in Microbiology*. <https://doi.org/10.3389/fmicb.2016.01679>
- Walworth, N.G., Lee, M.D., Fu, F.-X., Hutchins, D.A., and Webb, E.A. (2016). Molecular and physiological evidence of genetic assimilation to high CO<sub>2</sub> in the marine nitrogen fixer *Trichodesmium*. *PNAS*. <https://doi.org/10.1073/pnas.1605202113>
- Walworth, N.G., Fu, F.-X., Webb, E.A., Saito, M.A., Moran, D., McIlvin, M.R., Lee, M.D., and Hutchins, D.A. (2016). Mechanisms of increased *Trichodesmium* fitness under iron and phosphorus co-limitation in the present and future ocean. *Nature Communications*. <https://doi.org/10.1038/ncomms12081>