

Bryan D. Merrill

PhD Candidate, Sonnenburg Lab

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EDUCATION

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|----------------------------|---|--------------------------|--------------|
| 2015 – 2022 (<i>Aug</i>) | Ph.D. Microbiology and Immunology | Stanford University | Stanford, CA |
| 2014 – 2015 | M.S. Microbiology and Molecular Biology | Brigham Young University | Provo, UT |
| 2011 – 2014 | B.S. Molecular Biology (<i>Magna Cum Laude</i>) | Brigham Young University | Provo, UT |

TECHNICAL SKILLS

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| Programming | R/RStudio, Python/Jupyter, Bash |
| HPC/Cloud | AWS (S3/EC2), Docker, Snakemake, SLURM, Linux systems administration |
| Bioinformatics | Workflow management: GNU Parallel, Snakemake, Github Read QC and alignment: FASTQC, BBTools suite, Bowtie2, SAMtools, Metagenome assembly and binning: MEGAHIT, metaSPAdes, metaBAT2, anvi'o Genome ID/taxonomy/quality: QUAST, CheckM, GTDB-TK, dRep, CheckV, VirSorter Sample profiling: Kraken, MetaPhlan, MIDAS, IGGsearch, inStrain Gene function: Prodigal, Prokka, InterProScan, DIAMOND, HMMER, MMseqs2 |
| Wet Lab | DNA purification, PCR, gel electrophoresis, library preparation, anaerobic chamber, bacteria and phage isolation and culture |

RESEARCH EXPERIENCE

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| 2015-present | Doctoral researcher – Stanford University – Justin L. Sonnenburg, Ph.D <ul style="list-style-type: none">Lead developer for terabase-scale shotgun metagenomics pipeline and bacterial isolate assembly pipeline (Github/Docker-based, deployed on AWS).Expertise in improving performance of existing tools + scaling bioinformatics analyses for the cloud (programming or consulting for VirSorter, anvi'o, dRep, inStrain)Designed, built, and managed Windows and Linux-based lab servers and backups <i>Main project summaries</i> <ul style="list-style-type: none">Identification of >90,000 prokaryote, eukaryote, and viral genomes from Hadza hunter-gatherer and rural Nepali gut metagenomes, comprising thousands of novel species.Isolation and characterization of <i>B. theta</i> bacteriophages with capsule-dependent tropism |
| 2012-2015 | Undergraduate/graduate researcher – Brigham Young University – Sandra Hope, Ph.D. <ul style="list-style-type: none">Lead student for honeybee pathogen phage therapy research program. Gathered samples from local beekeepers for phage/pathogen isolation, performed in-lab characterization, and tested of phage therapy candidates on lab-owned beehives and infected hives in the community |
| 2013 | iGEM Team – Brigham Young University – Julianne Grose, Ph.D. <ul style="list-style-type: none">Conducted research to modify capsid size of <i>Enterobacteria</i> phage T4 as part of an iGEM (International Genetically Engineered Machine) team |
| 2011-2012 | HHMI SEA-PHAGES (Phage Hunters) researcher – Brigham Young University <ul style="list-style-type: none">Isolation, sequencing, and annotation of <i>Mycobacterium smegmatis</i> bacteriophages |

TEACHING EXPERIENCE

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| 2020, 2021 | Guest Lecturer – Stanford University <ul style="list-style-type: none">MI 215: Principles of Biological Techniques with Peter Sarnow, Ph.D. |
| 2017 | Teaching Assistant – Stanford University <ul style="list-style-type: none">MI 221: Gut Microbiota in Health and Disease with Ami Bhatt, M.D. Ph.D.; Justin Sonnenburg, Ph.D. |
| 2012-2015 | Teaching Assistant – Brigham Young University <ul style="list-style-type: none">MMBIO 194: Phage Hunters, Discovery and MMBIO 195: Phage Hunters, Comparative Genomics with Don Breakwell, Ph.D.; Julianne Grose, Ph.D.; Sandra Hope, Ph.D. |

SELECTED JOURNAL PUBLICATIONS

Merrill BD*, Carter MM*, Olm MR*, Dahan D, Yu FB, Jain S, Neff NF, Jha AR, Sonnenburg ED, Sonnenburg JL. Ultra-deep Sequencing of Hadza Hunter-Gatherers Recovers Vanishing Microbes. (2022) *bioRxiv* 2022.03.30.486478. <https://doi.org/10.1101/2022.03.30.486478>

Olm MR*, Dahan D*, Carter MM, **Merrill BD**, Yu FB, Jain S, Meng XD, Tripathi S, Wastyk HC, Neff NF, Holmes S, Sonnenburg ED, Jha AR, Sonnenburg JL. (2022) Robust variation of the infant gut microbiome across a spectrum of lifestyles. *Jun*;376(6598):1220-1223. <https://dx.doi.org/10.1126/science.abj2972>

Lynch JB, Bennett BD, **Merrill BD**, Ruby EG, Hryckowian AJ. (2022) Independent host- and bacterium-based determinants protect a model symbiosis from phage predation. *Cell Rep* Feb;38(7):110376. <https://dx.doi.org/10.1016/j.celrep.2022.110376>

Wastyk HC, Fragiadakis GK, Perelman D, Dahan D, **Merrill BD**, Yu FB, Topf M, Gonzalez CG, Van Treuren W, Han S, Robinson JL, Elias JE, Sonnenburg ED, Gardner CD, Sonnenburg JL. (2021) Gut-microbiota-targeted diets modulate human immune status. *Cell* 184(16):4137-4153.e14. <https://doi.org/10.1016/j.cell.2021.06.019>

Han S*, Van Treuren W*, Fischer CR, **Merrill BD**, DeFelice BC, Sanchez JM, Higginbottom SK, Guthrie L, Fall LA, Dodd D, Fischbach MA, Sonnenburg JL. (2021) A metabolomics pipeline enables mechanistic interrogation of the gut microbiome. *Nature* 595, 415-420. <https://doi.org/10.1038/s41586-021-03707-9>

Hryckowian AJ*, **Merrill BD***, Porter NT, Van Treuren W, Nelson EJ, Garlena RA, Russell DA, Martens EC, Sonnenburg JL. (2020) *Bacteroides thetaiotaomicron*-infecting bacteriophage isolates inform sequence-based host range predictions. *Cell Host & Microbe* 28(3):371.379.e5. <https://doi.org/10.1016/j.chom.2020.06.011>

Tropini C, Moss EL, **Merrill BD**, Ng KM, Higginbottom SK, Casavant EP, Gonzalez CG, Fremin B, Bouley DM, Elias JE, Bhatt AS, Huang KC, Sonnenburg JL. (2018) Transient osmotic perturbation causes long-term alteration to the gut microbiota. *Cell* 173(7):1742-1754.e17. <https://dx.doi.org/10.1016/j.cell.2018.05.008>

Merrill BD, Ward AT, Grose JH, Burnett SH. (2016) Software-based analysis of bacteriophage genomes, physical ends, and packaging strategies. *BMC Genomics* 17:679. <https://doi.org/10.1186/s12864-016-3018-2>

* Equal contribution

Direct involvement in isolation, sequencing, assembly, annotation, and publication of 86 bacteriophages in NCBI GenBank (as of June 2022). <https://tinyurl.com/bmerrillNCBIphages>

HONORS, AWARDS, RESEARCH SUPPORT

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| 2015 | National Science Foundation Graduate Research Fellowship |
| 2014 (Fall) | BYU College of Life Sciences Dean's List |
| 2014 | BYU Office of Research and Creative Activities (ORCA) grant recipient |
| 2013 | BYU Office of Research and Creative Activities (ORCA) grant recipient |
| 2013 | Gold Medal, iGEM North American Regional Jamboree |
| 2011-2014 | Four year full tuition Heritage Scholarship – Brigham Young University |

SELECTED PRESENTATIONS

Hunter-gatherers across geography share conserved gut bacterial species absent in industrialized societies. **Bryan Merrill**. Department of Microbiology and Immunology Seminar, Stanford University. Stanford, CA. April 24, 2019. (Oral presentation)

Novel bacterial genomes from the Hadza hunter-gatherer gut microbiota. **Bryan Merrill**, Gabriela K. Fragiadakis, Samuel A. Smits, Erica D. Sonnenburg, Justin L. Sonnenburg. The Third Annual Stanford Microbiome Summit. Stanford, CA. October 20, 2017. (Poster)

Functional and genomic characterization of phages infecting a prominent member of the human gut microbiota. **Bryan Merrill** and Drew Hryckowian. The California Microbiome Initiative Meeting. San Diego, CA. August 12-14, 2016. (Oral presentation)

Discovery and Characterization of Novel Paenibacillus larvae Bacteriophages. **Bryan Merrill**, Sandra Hope, et al. Howard Hughes Medical Institute, Fifth Annual SEA-PHAGES Symposium, Ashburn, VA. June 7-9, 2013. (Poster, honorable mention)