
Jake Dearborn

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Burlington, VT – 05401, United States

Objective

Computational biologist and PhD candidate specializing in machine learning for regulatory genomics and immunology. Experienced in building and fine-tuning large-scale transformer models (Borzoï, custom architectures), developing reproducible ML pipelines, and leading multi-omics analyses across bulk, single-cell, and CRISPR platforms. Seeking roles in biotech/AI-driven therapeutics where I can apply sequence modeling, splicing analysis, and immune-focused computational methods to accelerate target discovery and therapeutic design.

Technical Skills

- **Programming Languages and Tools:** Python, R, Bash, Nextflow, Anaconda, and Common Genomics Analysis Tools (e.g. Samtools, Bedtools, STAR, SALMON, etc.)
- **NGS Data Analysis:** Sequence Alignment, Gene Annotation, RNA-seq, scRNA-seq, ChIP-seq, CRISPR screening, multi-omics integration, GSEA, Network Analysis
- **Software:** Cell Ranger, Seurat, DESeq2, ggplot2, TensorFlow, PyTorch, MACS2, Mageck
- **Pipeline Development:** Automated Analysis Pipelines (Nextflow), Custom Script Development
- **Statistical & Mathematical Modeling:** Regression & Classification Analysis, Hypothesis Testing, ANOVA & T-test
- **Machine Learning & Data Science:** Supervised/Unsupervised Learning, Fine-tuning, Dimensionality Reduction, Feature Selection, UMAP, PCA, K-Means
- **Cloud Computing & HPC:** AWS, SBATCH, SLURM, Distributed Computing ML Training
- **Version Control & Collaboration:** Git, GitHub, GitLab, Docker
- **Wet Lab Techniques:** Cell Culture, ELISA, Flow Cytometry, PCR, DNA/RNA Isolation and Purification, Microscopy, Protein Purification, Western Blotting, rodent models, LNP production and delivery, GLP/GXP protocols
- **Research Skills:** Project Management, Experimental Design, Data Visualization, Statistical Analysis, Data Presentation, Scientific Writing

Academic and Industry Work Experience

PhD Researcher

University of Vermont – Molecular Biology and Immunology Lab (September 2021 – Present)

- Conduct bioinformatics analyses of single-cell and bulk RNA sequencing datasets to uncover immune signaling pathways.
- Develop machine learning pipelines for genotype-phenotype modeling and immune response prediction.
- Publish findings in high-impact, peer-reviewed journals in collaboration with interdisciplinary teams.

QC Specialist

Haematech Biopharma Services - Prolytix (September 2018 – August 2021)

- Executed GXP-compliant assay development and protocol optimization.
- Managed equipment calibration and preventive maintenance.
- Authored and resolved deviation and CAPA reports.

Lab Manager

Weiss Lab, University of Vermont (September 2015 – September 2018)

- Led stem cell therapy and tissue regeneration research using advanced biochemical and immunological techniques.
- Supervised new hires and ensured GLP compliance in experimental protocols.
- Authored and contributed to multiple peer-reviewed publications on scaffold engineering and stem cell therapies.

Undergraduate Research Assistant

Falls Lab, UVM (January 2013 – June 2014)

- Investigated anxiolytic effects of exercise in brain tissue using murine models and protein analysis techniques.

Publications

- **Dearborn JS**, Frankiw L, Limoge DS, Burns CH, Vlach L, Milletich P, Kirch T, Miller ZD, Dowell W, Languon S, Garcia-Flores Y, Cockrell RC, Baltimore D, Majumdar D. (2025) **Programmed delayed splicing: A mechanism for timed inflammatory gene expression** *bioRxiv* [Preprint]. doi: 10.1101/443796
- Snoke DB, van der Velden JL, Bellafleur ER, **Dearborn JS**, Lenahan SM, Beal AE, Aboushousha R, Heininger SCJ, Ather JL, Mank MM, Sarausky H, Stephenson D, Reisz JA, D'Alessandro A, Majumdar D, Ahern TP, Xu K, Sandler KL, Landman BA, Janssen-Heininger YMW, Poynter ME, Seward DJ, Toth MJ. (2025) **Early adipose tissue wasting in a novel preclinical model of human lung cancer cachexia**. *Cell Reports* doi: 10.1016/j.celrep.2025.116278
- Dowell W, **Dearborn J**, Languon S, Miller Z, Kirch T, Paige S, Garvin O, Kjendal L, Harby E, Zuchowski AB, Clark E, Lescieur-Garcia C, Vix J, Schumer A, Mistri SK, Snoke DB, Doiron AL, Freeman K, Toth MJ, Poynter ME, Boyson JE, Majumdar D. (2024) **Distinct inflammatory programs underlie the intramuscular lipid nanoparticle response**. *ACS Nano*. doi: 10.1021/acsnano.4c08490
- Gasek N, **Dearborn J**, Enes SR, Pouliot R, Louie J, Phillips Z, Wrenn S, Uhl FE, Riveron A, Bianchi J, Commins SP, Delance N, Taatjes DJ, Boyson JE, Guthrie K, Petersen TH, Weiss DJ. (2021) **Comparative immunogenicity of decellularized wild type and alpha 1,3 galactosyltransferase knockout pig lungs**. *Biomaterials*. doi: 10.1016/j.biomaterials.2021.121029.
- Gasek N, Park HE, Uriarte JJ, Uhl FE, Pouliot RA, Riveron A, Moss T, Phillips Z, Louie J, Sharma I, Mohammed B, **Dearborn J**, Lee PC, Jensen T, Garner J, Finck C, Weiss DJ (2021). **Development of alginate and gelatin-based pleural and tracheal sealants**. *Acta Biomaterialia* doi: 10.1016/j.actbio.2021.06.048
- Abreu SC, Hampton TH, Hoffman E, **Dearborn J**, Ashare A, Singh Sidhu K, Matthews DE, McKenna DH, Amiel E, Barua J, Krasnodembskaya A, English K, Mahon B, Dos Santos C, Cruz FF, Chambers DC, Liu KD, Matthay MA, Cramer RA, Stanton BA, Rocco PRM, Wargo MJ, Weiss DJ, Rolandsson Enes S. (2020) **Differential effects of the cystic fibrosis lung inflammatory environment on mesenchymal stromal cells**. *American Journal of Physiology: Lung Cellular and Molecular Physiology*. doi: 10.1152/ajplung.00218.2020.
- Abreu SC, Rolandsson Enes S, **Dearborn J**, Goodwin M, Coffey A, Borg ZD, Dos Santos CC, Wargo MJ, Cruz FF, Loi R, DeSarno M, Ashikaga T, Antunes MA, Rocco PRM, Liu KD, Lee JW, Matthay MA, McKenna DH, Weiss DJ. (2019) **Lung inflammatory environments differentially alter mesenchymal stromal cell behavior**. *American Journal of Physiology: Lung Cellular and Molecular Physiology*. doi: 10.1152/ajplung.00263.2019.

- Wrenn SM, Griswold ED, Uhl FE, Uriarte JJ, Park HE, Coffey AL, **Dearborn JS**, Ahlers BA, Deng B, Lam YW, Huston DR, Lee PC, Wagner DE, Weiss DJ. (2018) **Avian lungs: A novel scaffold for lung bioengineering**. doi: 10.1371/journal.pone.0198956.

Working Papers

- **Dearborn JS**, Miller ZM, Kirch T, Languon S, Dowell W, Majumdar D. Decoding Regulatory programs of Immune Cell Type-Specific Alternative Splicing. (2025) *Manuscript in preparation*.
 - Miller Z, **Dearborn JS**, Barrantes-Reynolds R, Honson D, Sha J, Deng W, Kirch TG, Dowell W, Languon S, Freeman K, Wohlschlegel J, Majumdar D. PABPC1 Modulates PA Site Choice through Direct Interaction with Immunoglobulin pre-mRNA. (2025) *Manuscript in preparation*.
 - Kirch TG, Miller Z, **Dearborn JS**, Dowell W, Languon S, Paculova H, Cleary J, Garvin O, Freitze S, Majumdar D. Genome-wide CRISPRi Screen Reveals the Multifaceted Role of XPO5 in Maintaining B Cell Homeostasis. (2025) *Manuscript in preparation*.
 - Languon S, Sha J, Miller Z, **Dearborn JS**, Dowell W, Kirch T, Sorensen M, Wohlschlegel J, Majumdar D. Proximity Proteomics Identifies IFI16 as a Host Factor of Human Coronavirus Infection. (2025) *Manuscript in preparation*.
 - Kjendal L, Whelihan C, Garvin O, Ben W, Lee I, Miller Z, Dowell W, **Dearborn JS**, Languon S, Kirch TG, Miller ZR, Roy S, Edwards O, Majumdar D. Systematic Optimization of Phage Immunoprecipitation Sequencing (PhIP-seq) Reveals Strategies to Enhance Signal-to-Noise and Improve Antibody Epitope Characterization. (2025) *Manuscript in preparation*.
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Presentations

- **Research in Progress Seminar: Uncovering Splice Regulator Landscapes with Genomics Modeling Approaches** (2025) *Vermont Collaborative for Immunity and Host-Microbe Interactions*
- **Guest Lecture: Implementing and Interpreting Transformer Models in Genomics** (2025) *Deep learning in Biology (Graduate Course)*
- **Conference Poster: Programmed Delayed Splicing: A Mechanism for Timed Inflammatory Gene Expression** (2025) *Keystone: AI in Molecular Biology*
- **Research in Progress Seminar: Understanding Features Regulating Intron Retention In Inflammatory Genes** (2025) *Cell and Molecular Biomedical Sciences Weekly Seminar*
- **Research in Progress Seminar: Using Foundational Genomics Models to Infer RNA Splicing Regulators** (2025) *SCRAPS (CSDS Graduate Student Group)*
- **Research in Progress Seminar: Leveraging Foundational Genomics Modeling to Identify Putative mRNA Splice Regulators** (2024) *Vermont Center for Immunobiology and Infectious Disease*
- **Research in Progress Seminar: Exploring CD45 Alternative Splice Regulation using Deep Learning** (2024) *The Translational Global Infectious Diseases Research Center*
- **Guest Lecture: The Mechanics and Utility of Transformer Models in Genomics** (2024) *Deep learning in Biomedical Engineering (Undergraduate Course)*
- **Research in Progress Seminar: Exploring the Functional Consequences of B Cell Receptor Expression Heterogeneity** (2024) *Cell and Molecular Biomedical Sciences Weekly Seminar*
- **Elevator Pitch Competition: Beyond the Horizon: Exceeding Technological Boundaries in Immune Repertoire Analysis** (2024) *Three Minute Thesis*
- **Research in Progress Seminar: Refining Resolution: Enhancing Single-Cell Transcriptomics with Selective RNA Depletion** (2023) *Cell and Molecular Biomedical Sciences Weekly Seminar*
- **Methodology Overview: Drop-seq Open-Source Single-Cell RNA sequencing** (2022) *Vermont Center for Immunobiology and Infectious Disease*
- **Technology Overview: Lessons from Self-Amplifying RNA Vaccines** (2022) *The Translational Global Infectious Diseases Research Center*

Leadership Experience

- Assisted graduate students with training, debugging, and code review in a deep learning in biology course; developed and maintained the course codebase
- Current President of Career Mobility Committee, a graduate student club focused on acquainting PhD students with career opportunities outside of academia
- Sitting Student Representative of The UVM Cell and Molecular Biomedical Sciences PhD program Education Committee
- Managed lab resources and implemented GLP workflows in Weiss Lab.
- Mentored students in the DREAM Program, organizing weekly educational activities for underserved youth.

Education – University of Vermont

- **PhD Candidate, Molecular Biology** (*Expected: [June, 2026]*)
Research focus: Immunology, single-cell RNA sequencing, and bioinformatics; leveraging machine learning to elucidate mechanisms of immune regulation.
- **Bachelor of Science**, Neuroscience (*May 2014*)
- **Bachelor of Arts**, Psychology (*May 2014*)

Additional Information

Interests: Computational immunology, protein sequence modeling, generative AI in therapeutics, peptide design, exploring immune evasion mechanisms in disease, science communication, fishing, motorcycling.

References are available upon request