Thomas Murphy

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EDUCATION

Oregon State University: B.S. Biology | March 2022

Major & Option: Biology with Genetics, GPA: 3.68
Minor: Chemistry, GPA: 3.82
Capstone Project: “Phosphorylation on residue serine-88 of DYNLL1 plays central role in functional regulation”

RESEARCH EXPERIENCE

Oregon Health & Science University: Div. of Infectious Diseases | Jun. 2024 - Present

Research Assistant & Lab Manager

- Helped design, execute, and troubleshoot complex methodologies to investigate *Pseudomonas aeruginosa* heteroresistance, including:
  - Serial passaging evolution experiments
  - Population analysis profiling with area under the curve calculations
  - Custom efflux pump activity assays
- Spearheaded the operational setup of a new BSL2 laboratory, writing all EHS-required compliance manuals (BSL2-lab specific, SDS, PSDS) and 15+ standard operating protocols.
- Mastered common microbiological techniques, including bacterial culturing, aseptic manipulation, and species isolation from diverse clinical samples.
- Managed all laboratory operations, including equipment maintenance, purchasing, and inventory control.
- Designed and implemented a centralized database for experimental results and laboratory management, improving team-wide data accessibility.
- Assisted adjacent studies on Gram-negative antimicrobial resistance, novel bacterium characterization, and transplant-related infections.

Oregon State University: Department of Statistics | Jan. 2022 - March 2022

Graduate Class Project: RNA-Seq Statistical Analysis

- Coordinated with senior faculty to define project goals and objectives.
- Acquired, cleaned, and pre-processed raw sequencing data from the NCBI Sequence Read Archive (SRA) to prepare a dataset for downstream analysis.

- Analyzed and visualized differential gene expression data using a combination of Linux Shell scripting, the open-source Galaxy suite, and R/Python programming.
- Examined the biological and statistical backgrounds of ribonucleic acid sequencing.

Oregon State University: Dept. of Biochem. and Biophysics | Sep. 2021 - Jan. 2022
Senior Capstone Project

- Designed and co-led a collaborative study to investigate the effects of DYNLL1 phosphorylation on cellular regulation and transportation.
- Identified key amino acid residues as phosphorylation targets and engineered novel recombinant DYNLL1 proteins using non-canonical amino acid insertion techniques in *E. coli* TOP10ΔserB cell lines.
- Purified and verified successful phosphoserine incorporation in recombinant $DYNLL1_{pSer\text{-}88}$ using Immobilized Metal Affinity Chromatography (IMAC), Discontinuous Native PAGE, and Phos-Tag™ PAGE.
- Analyzed protein conformational signatures and binding affinity by performing Circular Dichroism (CD) Spectroscopy to confirm the structural impact of phosphorylation.

PUBLICATIONS & PRESENTATIONS

Egge, **Murphy**, Strasfeld, Lewis, Lu, dePaula Baptisita, Miller, Hakki "Mechanisms and adaptive resistance in dual cefepime tazobactam heteroresistant *Pseudomonas aeruginosa* bacteremias in hematologic malignancy patients" (Manuscript in preparation; anticipated submission Dec. 2025)

Egge, **Murphy**, van der Zee, Stuckey, Strasfeld, Lewis, Lu, dePaula Baptisita, Miller, Hakki "Clinical impact and genomic features of β-lactam heteroresistance among hematologic malignancy patients with *Pseudomonas aeruginosa* bacteremia" (Jan. 2026) Interdisciplinary Meeting on Antimicrobial Resistance and Innovation 2026, Las Vegas NV

Thomas P. Murphy, Lynne Strasfeld MD, William R. Miller MD, Morgan Hakki MD, Rodrigo de Baptista PhD, Stephanie L. Egge MD "Efflux activity drives cefepime heteroresistance in *Pseudomonas aeruginosa* from hematologic malignancy patients" (Nov. 2025) American Society for Microbiology Northwest Branch Meeting 2025, Portland OR, Poster and Presentation

Stephanie L Egge, **Thomas P Murphy**, William R Miller, James S Lewis, Morgan Hakki "Prevalence and clinical features of cefepime heteroresistance among bloodstream isolates of *Pseudomonas aeruginosa* in patients with hematologic malignancy" (Sept. 2024) OHSU Department of Medicine Research Retreat, Portland OR, Poster

TECHNICAL SKILLS

Bioinformatics

- **Programming & Command Line**: Unix/Linux Command Line | Python (Biopython) | R
- **Analysis Suites & Platforms**: Galaxy-suite | Geneious Prime | SnapGene | NCBI/BLAST | UCSC Genome Browser | Illumina Basespace | BV-BRC | PANTHER | Ensembl
- **Genomic & Transcriptomic Analysis**:
  - *Workflows:* read processing | genome assembly | gene prediction | read mapping | sequence alignment | motif finding | GO enrichment analysis | functional annotation.
  - *Databases:* GenBank/RefSeq (NCBI) | GEO | ENCODE | REACTOME
  - *Data Types:* BAM | SAM | FASTA/Q | BED | CSV
- **Protein Structure & Systems Modeling:**
  - *Prediction & Interaction:* AlphaFold | EMBL-EBI | STRING | DOMINE
  - *Structural Visualization***:** PyMOL | UCSF Chimera
  - *Systems Modeling:* COPASI
- **Data Management & Collaboration:**
  - *Version Control***:** Git/GitHub
  - *Database:* SQL

Statistical Analysis

- **Experimental Design & Theory:** experimental & sampling design | power & confidence analysis | control considerations (negative/positive) | error management (Type I/II, FDR, FWER)
- **Statistical Modeling & Analysis:**
  - *Regression:* single/multivariate regression | Poisson regression | regression trees | variable selection (Ridge, Lasso)
  - *Classification & Testing:* T-testing | ANOVA | model selection (AIC/BIC) | multiple comparison corrections (Bonferroni, Benjamini–Hochberg)
  - *Multivariate/ML Methods:* principal component analysis (PCA) | principal component regression (PCR) | cluster analysis (Partitional, Hierarchical) | finite mixture models (FMMs)
- **Data Visualization (R & Python):** ggplot | matplotlib | seaborn | plotly

LEADERSHIP EXPERIENCE

Oregon Health & Science University: Div. of Infectious Diseases | Jun. 2024 - Present
Research Assistant & Lab Manager

- Trained and mentored a summer undergraduate intern in advanced microbiological techniques, experimental design, and data analysis.
- Help supervise their 10-week research project from protocol development to final data presentation.

Doernbecher Children's Hospital: Assistive Technology Clinic | May. 2025 - Present
Volunteer Liaison

- Established and cultivated relationships with community partners to build broader patient outreach networks for the clinic.
- Participated in meetings with government officials, educating them on the clinic's mission and available services.
- Helped guide and support patient families by informing them of assistive technology resources and helping them navigate clinic services.

Murphy and Co. Painting | Jun. 2016 - Jun. 2024
Owner

- Built strong relationships with clients with practiced interpersonal communication skills.
- Led and supervised painting crews, delegating tasks and managing project schedules to ensure adherence to timelines and quality standards
- Fostered a collaborative work environment and directed all client communications, resulting in high team productivity and strong client retention.

RELEVANT COURSEWORK

Molecular Biology:

Cell and Molecular Biology (BB 314) | General Microbiology + Laboratory (MB 302,303) | Molecular Biology Laboratory (BB 315) | Bacterial Molecular Genetics (MB 310) | Embryology and Development (Z 425) | Functional Genomics (BOT 460) | Comparative Genomics (BOT 475) | Advanced Molecular Genetics (BB 486) | Microbial Biotechnology (MB 456)

Chemistry:

General Chemistry Series + Laboratory (CH 231,232,233) | Organic Chemistry Series + Laboratory (CH 331,332,337) | Biochemistry Series + Advanced Biochemistry Laboratory (BB 450,451,494) | Environmental Chemistry (CH 390)

Ecology:

Ecology (BI 370) | Evolution (BI 445) | Invertebrate Biology + Laboratory (Z 361,362) | Population Biology (BI 483)

Bioinformatics:

Introduction to Sequence Analysis (BB 345) | Introduction to Genome Biology (BDS 474) | Applied Bioinformatics (BB 485)

Mathematics:

Differential + Integral Calculus (MTH 251, 252) | Infinite Series and Sequences (MTH 253) | Calculus through Data & Modeling: Vector Calculus (Coursera; John Hopkins University) | Linear Algebra from Elementary to Advanced Specialization (Coursera; John Hopkins University)

Statistics:

Introduction to Statistical Methods (ST 351) | Methods of Data Analysis Series (ST411,412,413) | Statistical Genomics (ST 592)

AWARDS & HONORS

Best Poster Award, American Society for Microbiology Northwest Branch Meeting 2025

Abstract Selected for Oral Presentation, American Society for Microbiology Northwest Branch Meeting 2025