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Notable Projects

Independent Design | Computational Protein Engineering

Calgary, AB

Microplastic-clearing Enzymes for PET Plastic Breakdown inside Human Cells

February 2026 - Present

- Designed a 766-residue mammalian-expressible terephthalate biosensor (2,307 nt, 55.2% GC, 8/8 automated sequence checks) and showed compartment choice holds across the full plausible pKa range.
- Measured a two-state blind spot in AI structure prediction: ESMFold reproduced a protein's ligand-free conformation to 0.92–1.09 Å across 6 chains but missed a ligand-bound state by 4.014 Å, with model confidence (mean pLDDT 91) giving no warning ($r = -0.26$).
- Built and published a 20-script reproducible pipeline (Python, Biopython, AutoDock Vina, FoldX, ESMFold) validated to 0.28 Å redocking accuracy.
- Quantified a failure mode in structure-based design using a published 61-compound experimental panel: 6 of 6 known non-binders scored as credible binders, with 15–38% of a 4.61 kcal/mol affinity range recovered across 4 protein conformers and confirmed against a second scoring function.

Independent Design | Biofouling Control for Reverse Osmosis

Toronto, ON

Enzyme Coatings to slow Biofilm Growth in Water Desalination

September 2026 - Present

- Screened 7 published quorum-quenching lactonases across 4 orders of magnitude of catalytic efficiency, identifying two viable candidates and correcting a prevailing selection rule by showing the most thermostable enzymes were up to 300× slower than the fastest.
- Built three interactive techno-economic models (27 documented, source-cited parameters) linking enzyme kinetics to plant-level economics, quantifying the addressable value of biofouling control at roughly \$0.02/m³ against fouling's 24% share of RO operating cost.
- Conducted an independent technical and economic feasibility review of biological approaches to water scarcity, synthesizing 59 peer-reviewed and industry sources into a 6,500-word analysis that narrowed a broad landscape to a single tractable target.

Independent Design | Therapeutic Architecture Analysis

Calgary, AB

Logic-Gated CAR-Macrophage for Microplastic Clearance

September 2024 - February 2026

- Specified a two-input receptor architecture across ligand recognition, signal transduction and cell-type selection, using a designed chemical receptor as the sensing domain.
- Retired the architecture on 4 independent findings from the primary literature, spanning polymer chemistry, receptor clustering requirements, and existing macrophage uptake biology.

Social Media

Photography

Calgary, AB

Mobile Photographer

July 2025 - Present

- Earned 1 editorial award, 19 community and contest awards across 13 ViewBug (@dobald) photo contests with a 30-image mobile portfolio, shot and edited entirely on iPhone.
- Generated 4000+ views and reached 600+ unique accounts in 90 days on Instagram (@photodobald), with 60% of views coming from non-followers

EDUCATION

University of Toronto

Mississauga, ON

BS in CS, Mathematics and Statistics - Bioinformatics

Graduation Date: May 2029

SKILLS & INTERESTS

Skills: Java | Python | HTML | CSS | AlphaFold | ESMFold | FoldX

Interests: Networking (Canada's First Longevity Conference, Energy Disruptors, Inventures), Hackathons (Top 3 in Microsoft's Energy Hackathon), Varsity Volleyball, Piano (Royal Conservator First Class Honors)