

Dana Goerzen

Physiology, Biophysics, and Systems Biology Program

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EDUCATION

Hons.B.S. in Neuroscience, Minor Mathematics (GPA: 3.91/4.00) McGill University, Quebec, Canada	2016–2020
Ph.D. candidate in Physiology, Biophysics, and Systems Biology Weill Cornell Graduate School, New York, NY	2021–Present

HONORS AND AWARDS

Canadian Institutes of Health Research Doctoral Foreign Study Award (\$35 000 annual)	2024-2026
General Atlantic Doctoral Fellowship (\$52 500 annual)	2024,2025
Weill Cornell Entrance Scholarship (\$80 000 annual)	2020-2026
Undergraduate Graduation with First Class Honours (top 5% of class).	2020
Summer Research Award, Natural Sciences and Engineering Research Council of Canada (\$8 000)	2019
Emily Ross Crawford Scholarship (\$2 000)	2018
Dean's Honor List (top 5% of class), McGill University	2016, 2018
Faculty of Science Scholarship, McGill University (\$2 000)	2016

RESEARCH EXPERIENCE

Doctoral Student at Cancer Nanomedicine Laboratory April 2022–Present
Advisor: Dr. Daniel Heller, Memorial Sloan Kettering Cancer Center

- Thesis: Development of a platform technology to detect whole disease fingerprints from patient biofluids to improve diagnosis, screening, and biomarker discovery processes for neurological cancer. My research involves leveraging the optical properties and bio-sensing capabilities of carbon nanotubes in conjunction with advanced data analytics to develop a machine-learning-based strategy to detect and triage neurological cancers from blood plasma samples.
- Other leading projects include development of a regulatory framework to promote safe and environmentally friendly usage of carbon nanotubes in industry and in scientific R&D settings. This project has culminated in a first authorship review paper in Nature Reviews Materials, and two first author conference presentations.

Undergraduate Research Assistant Jan 2018 – Aug 2021
Advisor: Dr. Jamie Near, McGill University

- Quantitative analysis of MRI data in a rat model of Alzheimer's Disease.
Contribution: I developed a 60 μ m isotropic MRI atlas of the Fischer 344 brain as a resource to statistically analyze structural volumes of brain regions of relevance to Alzheimer's Disease and other pre-clinical MRI analyses. I also helped implement a lifespan analysis of MRI images in Fischer 344 rats in both healthy wild-type animals and two different treatment paradigms of a transgenic rat model of Alzheimer's Disease.
- MRI spectroscopy measures of glutamate and glutamine in the human brain using an MRI scanner.

Contribution: My roles included ethics submissions, participant recruitment and data collection at the Montreal Neurological Institute, basis set simulation in MATLAB, and data analysis. Later work involved writing MRS pre-processing code for streamlined data processing.

Undergraduate Honours Thesis

Sept 2018 – May 2019

Advisor: Dr. Nahum Sonenberg, McGill University

- Investigating the role of the initiation factor of translation protein (eIF2- α) in the onset and progression of acute depression. My roles included collection and analysis of behavioural data, and implementation of several biochemical assays to correlate behavioural phenotypes of genetically altered mice with observed eIF2- α levels.

PUBLICATION (* DENOTES EQUAL CONTRIBUTION)

1. **Goerzen D**, Fowler C, Devenyi GA, Germann J, Madularu D, Chakravarty MM, Near J. An MRI-Derived Neuroanatomical Atlas of the Fischer 344 Rat Brain. *Scientific Reports* (2020).
<https://www.nature.com/articles/s41598-020-63965-x>
2. Kim M*, **Goerzen D***, Jena P, Zeng E, Pasquali M, Meidl RA, Heller D. Human and environmental safety of carbon nanotubes across their life cycle. *Nature Reviews Materials*. 2023, 9(1):63-81.
<https://www.nature.com/articles/s41578-023-00611-8>
3. Fowler C*, **Goerzen D***, Madularu D, Devenyi GA, Chakravarty MM, Near J. Longitudinal Characterization of Neuroanatomical Changes in the Fischer 344 Rat Brain During Normal Aging and Between Sexes *Neurobiology of Aging* (2021)
<https://www.sciencedirect.com/science/article/pii/S0197458021003146>
4. Fowler C, **Goerzen D**, Devenyi GA, Madularu D, Cruickshank K, Pham A, Ellerbeck K, Drudik K, Chakravarty MM, Near J. Neurochemical and Cognitive Changes Precede Structural Abnormalities in the TGF344-AD Rat Model *Brain Communications* (2022)
<https://academic.oup.com/braincomms/article/4/2/fcac072/6554209>
5. Antman-Passig M, Yaari Z, **Goerzen D**, Parikh R, Chatman S, Komer L, Chen C, Grabarnik E, Mathieu M, Haimovitz-Friedman A, Heller D. Nanoreporter Identifies Lysosomal Storage Disease Lipid Accumulation Intracranially. *Nano Letters*. 2023, 23(23):10687-10695.
<https://pubs.acs.org/doi/full/10.1021/acs.nanolett.3c02502>
6. Kim M*, Chen C*, Yaari ZA, Frederiksen R, Randall E, Cupo C, Wu X, Shah J, Worroll DW, Lagenbacher R, **Goerzen D**, Li Y, An H, Wang Y, Heller DA. Nanosensor Monitors Autophagy-Associated Lysosomal Hyperacidification Dynamics In Vivo *Nature Chemical Biology* (2022)
<https://www.nature.com/articles/s41589-023-01364-9>
7. McLarney B, Sonay A, Apfelbaum E, Mostafa N, Monette S, **Goerzen D**, Aguirre N, Isaac E, Phung N, Skubal M, Kim M, Ogirala A, Veach D, Heller DA, Grimm J. A pan-cancer agent for screening, resection and wound monitoring via NIR and SWIR imaging. (Preprint). 2024
<https://www.researchsquare.com/article/rs-3879635/v1>
8. Baker J, Toth R, Deli A, Zamora M, Fleming JE, Benjaber M, **Goerzen D**, Ryou JW, Purpura KP, Schiff ND, Denison T, Regulation of Arousal and Performance of a Healthy Non-Human Primate Using Closed-Loop Central Thalamic Deep Brain Stimulation, 2023 *11th International IEEE/EMBS Conference on Neural Engineering (NER)* <https://doi.org/10.1109/NER52421.2023.10123754>
9. Kim M*, Bortoletto P*, Gywnne D, **Goerzen D**, Randall E, Cupo C, James D, Heller DA. Machine Perception Nanosensor Array Captures Euploid Pregnancy Loss Fingerprint from Serum In Preparation.

CONFERENCE PRESENTATIONS

1. **Goerzen D**, Kim M, Wollowitz J, Schroff C, Galbraith K, Snuderl M, Ordureau A, Heller DA. Liquid-Biopsy Platform Sensitively Detects Intracranial Tumors and Facilitates Biomarker Discovery. Electrochemical Society 245rd Annual Meeting, 2024 San Francisco, CA, USA
2. **Goerzen D**, Kim M, Zheng M, Heller DA. Guanine Functionalization for Improved ssDNA-Nanotube Colloidal Stability. Electrochemical Society 243rd Annual Meeting, 2023, Boston, MA, USA
3. **Goerzen D***, Kim M*, Zeng E, Jena P, Meidl RA, Heller DA. Human and environmental safety of carbon nanotubes across their life cycle. Carbon Hub Annual Meeting, 2023, Houston, TX, USA
4. Fowler C, **Goerzen D**, Devenyi GA, Madularu D, Cruickshank K, Pham A, Ellerbeck K, Drudik K, Chakravarty MM, Near J. Neurochemical and Cognitive Changes Precede Structural Abnormalities in the TGF344-AD Rat Model International Society for Magnetic Resonance in Medicine (ISMRM) 30th Annual Conference *June 2022*
5. **Goerzen D**, Bell T, Near J, Harris AD. Assessing the agreement between 3T and 7T MRS measures of in-vivo neurochemistry International Society for Magnetic Resonance in Medicine (ISMRM) 29th Annual Conference Montreal QC Canada *May 10-16 2021*
6. **Goerzen D***, Fowler C*, Madularu D, Devenyi GA, Chakravarty MM, Near J. Longitudinal Characterization of Neuroanatomical Changes in the Fischer 344 Rat Brain During Normal Aging and Between Sexes International Society for Magnetic Resonance in Medicine (ISMRM) 29th Annual Conference Montreal QC Canada *May 10-16 2021* (* denotes equal contribution)
7. **Goerzen D**, Fowler C, Devenyi GA, Germann J, Madularu D, Chakravarty MM, Near J. An MRI-Derived Neuroanatomical Atlas of the Fischer 344 Rat Brain Organization for Human Brain Mapping 2020 (OHBM) Montreal QC Canada *June 23-July 1 2020*
8. **Goerzen D**, Fowler C, Devenyi GA, Germann J, Madularu D, Chakravarty MM, Near J. An MRI-Derived Neuroanatomical Atlas of the Fischer 344 Rat Brain International Society for Magnetic Resonance in Medicine (ISMRM) 27th Annual Conference Montreal QC Canada *May 10-16 2019*
9. Bell T, **Goerzen D**, Near J, Harris AD. Examination of Methods to Optimize Glutamate-Glutamine Separation at 3T International Society for Magnetic Resonance in Medicine (ISMRM) 28th Annual Conference *August 8-14 2020*
10. Bell T, **Goerzen D**, Dehghani M, Near J, Harris AD. A comparison of human brain GABA levels measured at 3T and 7T International Society for Magnetic Resonance in Medicine (ISMRM) 30th Annual Conference London United Kingdom *May 07-12 2022*

SKILLS

- Proficient in Python, R, MATLAB, and Java
- Knowledge of machine learning concepts and implementation. Successfully completed Coursera Deep Learning Specialization, 5 university level computer science courses including a graduate computer science course in model optimization and Bayesian statistical analysis.
- Excellent literature review skills and a demonstrated ability to independently write and present high-quality scientific work.
- Characterization of carbon nanotubes via near-infrared fluorescence microscopy; hyperspectral microscopy; absorption spectroscopy; dynamic light scattering; and zeta potential analysis.
- Purification and chemical functionalization of carbon nanotubes via two-phase aqueous chirality enrichment; diazonium chemistry; photosensitization functionalization.

EXTRACURRICULAR ACTIVITIES

Teaching Assistant for Quantitative Understanding in Biology I Sep 2023 — Dec 2023

Graduate teaching assistant for Weill Cornell graduate class in statistics. Roles included attending all classes, leading office hours, grading assignments, providing conceptual help.

Heller Lab Science Outreach at MESA Charter High School May 2022 — Present

Involved in science outreach at the Brooklyn Math, Engineering and Science Academy (MESA) charter high school through the Heller Lab. The school has a minority enrollment of 99% and 81% of students are economically disadvantaged. Outreach roles include education about the roles and careers of scientists and the pathways to be involved in post-secondary research. Additional roles include leading a demo on nanoparticle drug encapsulation and delivery.

Mentorship of Engineering Summer Program Student at MSKCC May 2022 — Aug 2022

Took on role of graduate student mentor for a visiting summer undergraduate researcher from Colgate University. Roles included direct supervision of day-to-day experimental work; critical discussion of relevant literature; supervision and guidance for experimental planning; mentoring on carbon nanotube synthesis, suspension, purification, functionalization, and analysis. Project culminated with student presentation at the MSK Engineering Summer Program Research Day.

Year Representative and CEO of the Neuroscience Undergraduate Society Sep 2017 — May 2020

Leader of a team of undergraduate students who ran social and academic events directed for undergraduate students in the neuroscience program at McGill University. Part of a team that organized social events such as a formal for over 300 students and organized academic workshops of relevance to students wishing to pursue careers in research. I have developed my abilities to work as a teammate and collaborate on event planning, and as a leader by running and delegating events to other members of the council.

Undergraduate TA for Introductory Physics and Chemistry Classes Sep 2017 — May 2018

Undergraduate TA for Phys 101 and Chem 110 in which I ran group-based tutorials and held open review sessions where students could come for conceptual and homework help. Awarded on the basis of high academic merit in course.