

Dr. Nirosha J. Murugan, Ph.D.

Curriculum Vitae

July 2024

PERSONAL BACKGROUND

Address: 75 University Ave W, Waterloo, ON N2L 3C5, Canada
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Academic Affiliation: Dept of Health Science at Wilfrid Laurier U. ([Assistant Professor](#))
School of Public Health Sciences at U. of Waterloo ([Adjunct Professor](#))

Research Group: Allen Discovery Institute at Tufts University ([Affiliate Staff Scientist](#))

EDUCATION

Ph.D. - Biomolecular Science Laurentian University, Sudbury, ON	2013-2017
M.Sc. - Biology conc. Neuroscience Laurentian University, Sudbury, ON	2011-2013
B.Sc. - Behavioural Neuroscience Laurentian University, Sudbury, ON	2007-2011

RECOGNITIONS

SCHOLARSHIPS, AWARDS & FELLOWSHIPS

Minister of Colleges & Universities Award of Excellence - Rising Star Award <i>Government of Ontario</i>	2022
Young Professional Visionary Award – Health Science Category <i>Sault Ste Marie Chamber of Commerce - STRIVE</i>	2022
NSERC Science Exposed Jury Prize Winner - \$2000 <i>Natural Sciences and Engineering Research Council of Canada (NSERC)</i>	2021
Justice, Equity, Diversity, and Inclusion (JEDI) Award - \$6000 <i>Life Science Editors Foundation, Boston, MA</i>	2020
Visiting Scholar Fellowship - \$18,000 <i>University of Toulouse & Agence Nationale de la Recherche (ANR)</i>	2018

Beckman Scholar Mentorship Award - \$25,800 <i>Tufts University, Medford, MA</i>	2018
Postgraduate Scholarship, Doctoral (PGS D) - \$42,000 <i>Natural Sciences and Engineering Research Council of Canada (NSERC)</i>	2015-2017
Graduate Scholarships (Masters and Doctoral) - \$62,000 <i>Laurentian University, Sudbury, ON</i>	2011-2016
Marita I. Mallory Cancer Research Scholarship - \$4,000 <i>Laurentian University, Sudbury, ON</i>	2015
Ontario Graduate Scholarship (OGS-D), Doctoral - \$15,000 <i>Government of Ontario</i>	2014
Ontario Graduate Scholarship (OGS-M), Masters - \$15,000 <i>Government of Ontario</i>	2013
Young Scholar Undergraduate Scholarship - \$1,500 <i>Vale Limited</i>	2010
Laurentian University Entrance Scholarship - Undergraduate - \$2,500 <i>Laurentian University, Sudbury, ON</i>	2007

RESEARCHER PROFILE

I am an early-career interdisciplinary scientist, Distinguished Research Chair and an Assistant Professor with a strong passion for research and teaching. From a **top-down approach**, *my lab combines principles and state-of-the-art approaches from neuroscience, regenerative medicine, and cancer biology, to investigate how cancer cell fate can be reprogrammed into healthy cells using regenerative microenvironments, and in turn, how cancer microenvironments can modulate the function of distant organ systems such as the brain to induce cancer-related cognitive and neurological impairments.* My expertise in biomedical engineering and biophysics have allowed me to secure highly competitive research funding to develop new and innovative technologies.

EMPLOYMENT HISTORY

Distinguished Laurier Research Chair & Assistant Professor 2023- present
Department of Health Sciences
Wilfrid Laurier University, Waterloo, Ontario

- Recognized as a leader in research through a competitive Distinguished Laurier Research Chair position & awarded CFI-JELF for infrastructure towards developing biophysics/quantum based anti-cancer therapies

- Primary research program's goal is to understand how biophysical signals are used for cellular communication and to develop tools and technologies toward early detection and treatment of pathological conditions.
 - Quantum-based information processing in cellular communication & disease formation (CFI-JELF Funded for critical infrastructure)
 - Tissue plasticity and cellular reprogramming using biophysical and bioengineering approaches. (NSERC Funded)
 - Biophysical approaches to early detection of cancer and cancer related diseases (NFRF-Exploration Funded)
- Primary research program fosters mentees across all interdisciplinary and academic levels towards critical thinking and scholarship

Canada Research Chair (Tier II) & Assistant Professor

2020- 2023

Department of Biology

Algoma University, Sault Ste. Marie, Ontario, Canada

- Recognized as an exceptional emerging researcher & acknowledged at a National level as having the potential to lead in my field through a competitive awarding of Canada Research Chair (CRC) – Tier 2 in Tissue Biophysics
- Received Federal/grants & awards towards establishing a research program to develop biophysical approaches to control tissue patterning and develop novel technology for early diagnosis of disease.
- Established a funded platform (Global Skills Opportunity) to allow trainees to gain unique experiential learning and research opportunities through international partners in USA and Belgium, and through industry partnerships (i.e. Sanofi)

Teaching Fellow

2018-2019

Harvard University, Cambridge, MA

- Developed original course materials, including innovative pedagogical techniques such as gaming modules integrated with learning outcomes, and delivered lectures for MCB80 - Neurobiology of Behaviour.

Postdoctoral Research Scholar

2017-2019

Department of Biology and Biomedical Engineering

The Allen Discovery Center at Tufts University, Medford, MA

- Bioengineered drug delivery silk-hydrogel device for limb regeneration using patented electroceuticals in regenerative and non-regenerative animals.
 - Co-founded start-up biotech. company, Morphoceuticals Inc. based on the success of this project.

- Information processing, storage, and transfer in non-neural systems as a model for complex cognitive function; funding award by Defense Advanced Research Projects Agency (DARPA)
- Principle Investigators: Dr. Michael Levin & Dr. David Kaplan

Clinical Research Associate

2016-2017

Department of Psychiatry

Health Sciences North Research Institute, Sudbury, ON

- Grant-writer for Pfizer, Health Sciences North Research Institute and Northern Ontario Academic Medical Association.
- Grant topics: Suicidality, post-traumatic stress disorder (PTSD), treatment-resistant schizophrenia, Integrative Medicine-Approaches in Psychiatry

Biostatistician

2015-2017

Vale Limited & Laurentian University,

Sudbury, ON

- Collaborated with mining engineers, ecologist and veterinarians to prepare data analysis plans, statistical reports, and final integrated statistical reports.
- Created and validated analysis datasets; worked cooperatively with complex data mining.
- Conducted statistical analyses including, but not limited to, multivariate analysis, mixed modeling, regression and survival analysis as well as power and sample size estimation.
- Reviewed protocols, checking for the appropriate use of statistical methods and analyses, wrote the statistical section of manuscripts.

Research Associate

2013-2016

Bosarge Foundation

MD Anderson Cancer Center and Northeast Cancer Center Sudbury, ON

- Co-created, developed and conducted all primary research of targeted treatment of breast, skin cancer with electromagnetic fields devices.
- Co-created a novel detection tool for the early diagnosis of glioblastoma, breast and skin cancers.
- Performed all preclinical trials (*in vitro/in vivo*) for the novel therapy and diagnostic tools, conducted data analysis and prepared research manuscripts and research presentations.
- Collaborated with key stakeholders within the corporate and health care sector to pipeline and key product differentiators in terms of technical and clinical applications of our treatment.
- Principal Investigators: Dr. Michael Persinger and Dr. Ed Bosarge

Laboratory Technician 2011-2013
Medicor Research Inc. Sudbury, ON

- Researcher for the national 5-year clinical research study – Maternal-Infant Research on Environmental Chemicals (MIREC): A National Profile of in Utero and Lactational Exposure to Environmental Contaminants.
- Supervisor: Dr. Barb Ward

Laboratory Technician 2010-2011
Dr. Siemann Laboratory Laurentian University, Sudbury, ON

- Investigated the effects of different inorganic materials (i.e. Cu, Fe, and Zn) on the activity of the lethal factor protein found in anthrax bacteria.
- Used various microbiological techniques to grow bacteria and obtain the necessary proteins to analyze the behaviour of the deadly infectious disease.
- Principal Investigator: Dr. Stefan Siemann

RESEARCH FUNDING HISTORY

To date, *I have secured ~\$2.2M in Canadian research funds* to support research staff, trainees and acquire critical infrastructure to ensure the success of my research program.

New Frontiers in Research Fund (NFRF)- Exploration Grant 2024-2026
Grant title: Building modular circuits with bioengineered neural tissues to design brain-inspired artificial intelligences
Dr. Nicolas Rouleau, PI (\$233,750)
Role: Co-Applicant

Algoma University Academic Strategic Initiatives (ASI) Fund 2024-2026
Grant title: A Virtual Care Navigator for a Healthier Community
Drs. Teryn Bruni, Nirosha Murugan, Randy Lin, PI (\$291,812)
Role: Co-Principal Investigator

Optica Foundation Challenge Award 2023-2024
Grant title: Capturing Cancer in its Early Glow: Pioneering Early Detection Strategies using Light Based Biomarkers
Dr. Nirosha Murugan, PI (\$130,000)
Role: Principal Investigator

Laurier Distinguished Research Chair – Tier 2 2023-2027
Grant title: Reprogramming Cancer using Biophysics
Dr. Nirosha Murugan, PI (\$100,000)
Role: Principal Investigator

Sloan Foundation “Matter to Life” 2023-2028
Grant title: Goal-Directed Behaviour in Aneural Systems

Drs. Philip Kurian, Michael Levin, PI (\$1,400,000)

Role: Co-Applicant

Canada Foundation for Innovation (CFI) - JELF

2023-2027

Grant title: Bioelectric Control of Cell Fate and Tissue Plasticity

Dr. Nirosha Murugan, PI (\$175,000)

Role: Principal Investigator

Wilfrid Laurier University Start-up

2023

Dr. Nirosha Murugan, PI (\$100,000)

Role: Principal Investigator

Canada Research Chair – Tier 2

2022-2027

Tissue Biophysics

Dr. Nirosha Murugan, PI (\$600,000)

Role: Principal Investigator

Canada Foundation for Innovation (CFI)

2022-2024

John R. Evans Leaders Fund (JELF)

Grant Title: Tissue Biophysics

Dr. Nirosha Murugan, PI (\$75,000)

Role: Principal Investigator

NOHFC – People and Talent Workforce Development

2021-2023

Grant title: Biophotonics in Neuroimaging

Dr. Nirosha Murugan, PI (\$45,000)

Role: Principal Investigator

NSERC Discovery Grant

2021-2026

Grant title: Biophysical Control of Cellular Programming And Tissue Patterning

Dr. Nirosha Murugan, PI (\$150,000)

Role: Principal Investigator

NSERC Discovery Grant – Early Career Researcher Supplement

2021-2022

Grant title: Biophysical Control of Cellular Programming and Tissue Patterning

Dr. Nirosha Murugan, PI (\$12,500)

Role: Principal Investigator

New Frontiers in Research Fund (NFRF)- Exploration Grant

2021-2023

Grant title: Enhancing Brain Health After Cancer Therapy: Countering Chemo-Brain using Novel, Early Detection Tools

Dr. Nirosha Murugan, PI (\$187,935)

Role: Principal Investigator

Sault Ste. Marie. Academic Medical Association Grant

2021-2022

Grant Title: Assessing Post - Surgery Wound Healing & Return to Emergency

Department Risk

Dr. Nirosha Murugan & Dr. Joseph Reich (\$22,000)

Role: Co-Principal Investigator

Algoma University Teaching and Learning Fund

2021

Grant title: The Use of Gaming in Digital Pedagogy

Dr. Nirosha Murugan, PI (\$10,000)

Role: Principal Investigator

Canada Research Continuity Emergency Fund

2020-2021

Grant title: Non-invasive Cancer Detection Using Hematological Panels

Dr. Nirosha Murugan, PI (\$15,000)

Role: Principal Investigator

Algoma University Research Fund

2020

Grant title: Non-invasive Cancer Detection Using Hematological Panels

Dr. Nirosha Murugan, PI (\$5000)

Role: Principal Investigator

Algoma University Start-Up Research Fund

2020

Dr. Nirosha Murugan, PI (\$75,000)

Role: Principal Investigator

Janssen Pharmaceuticals Inc.

2016-2018

Grant title: Identifying Factors which Contribute to Discontinuation of Long-Acting

Injectable Antipsychotics in Schizophrenia

Dr. Kuppaswami Shivakumar, PI (\$18,000)

Role: Grant writer & Co-applicant

RESEARCH ACTIVITIES

SUPERVISORY EXPERIENCE

Note: Asterisk (*) indicates trainees who have been co-supervised

To date, I have directly mentored 70 trainees and research staff, and supported their career development.

Department of Health Science, Wilfrid Laurier University				
Name	Date	Degree	Project Title	Current Status
Post-doctoral fellows & Research Associates				
Thulasi Madan	2024-	PDF	Reprogramming cancer using applied biophysical signals	Ongoing

Victoria Hossack	2023-	PDF	Biophysical mapping and control of chemobrain & cancer regulation	Ongoing
Aviva Lucas-Demott	2023-	RA	Testing the limits of aneural cognition in non-neural systems	Ongoing
Graduate Students				
Emma Genautis	2024-	MSc. Health Sciences	Effects of patterned magnetic fields as anti-cancer therapy	Ongoing
Vanessa OKoree	2024-	MSc. Health Sciences	Neuroprotective role of melanin in wound healing	Ongoing
Sawith Abey	2024-	MSc. Health Sciences	Neuroprotective role of β -Amyloid in viral infections <i>*Awarded of OGS Scholarship</i>	Ongoing
Emre Cicek	2024-	MSc. Health Sciences	Bioelectric and photonic communication in 3D cancer organoids	Ongoing
Andrew Golding	2024-	MSc. Health Sciences	Applied biophysical signals in muscle stem cell differentiations	Ongoing
* Danielle Brandow	2023-	Ph.D. Public Health (U Waterloo)	Neural correlates of risk perception in public health communication	Ongoing
Makenna Weibe	2023-	MSc. Health Sciences	Brain plasticity after limb regeneration <i>*Awarded WLU Prestige Award</i>	Ongoing
Cooper Kansala	2023-	MSc. Health Sciences	Magnetic field stimulation on long-term memory formation	Ongoing
Samuel Peters	2023-	MSc. Health Sciences	Immunostimulation using silk nanoparticle delivery for glioblastoma therapy	Ongoing
Jordan Meikle	2023-	MSc. Health Sciences	Early detection of brainfog induced using light based biomarkers <i>*Recipient of NSERC PGS-M & NSERC USRA</i>	Ongoing
Undergraduate Students				
Thesis (T), Directed Study (DS), Internship (I)				
Nina Wulff	2024-	(DS/T) BSc Health Sciences	Modulation of Human Stem Cell Differentiation using Natural Products	Ongoing

Hannah Kusznirowicz	2024-	(DS/T) BSc Health Sciences	Modulation of Human Stem Cell Differentiation using Natural Products	Ongoing
Vanessa Vashishth	2024-	(DS/T) BSc Health Sciences	Bioelectric regulation and detection in cancer reprogramming	Ongoing
Mariam Hailu	2024-	(DS) BSc Health Sciences	Mapping magnetic signatures of differentiating neural tissues <i>*Awarded Laurier Scholar</i>	Ongoing
Karen Zaki	2023-	(DS/T) BSc Health Sciences	Effects of photobiomodulation in animal memory formation	Ongoing
Arfan Sivarooban	2023-	(DS) BSc Health Sciences	Developing functional arrays of photonic sensors	Ongoing
Emre Cicek	2023 - 2024	(I) BSc Biotechnology (Thomas More, Belgium)	β -Amyloid as neuroprotective agents against viral infection	Molecular Medicine MSc student (WLU)
Nore Wouters	2023 - 2024	(I) BSc Biotechnology (Thomas More, Belgium)	β -Amyloid as neuroprotective agents against viral infection	Biotechnology MSc student (KU Leuven)
Andrew Golding	2023 -2024	(T) BSc Health Sciences	Role of neuromodulators in tumor microenvironment communication	Molecular Medicine MSc student (WLU)
Brigette Brown	2023-2024	(T) BSc Health Sciences	Reprogramming cancer using biophysics <i>*Awarded 3rd Place Prize at Ontario Biology Day</i>	Biochemistry MSc. Student (U of T)
Ryleigh Taylor	2023-2024	(DS) BSc Health Sciences	Biophotonic signatures of racial differences in skin composition and wound healing outcomes	Medical Student, (Ottawa U) <i>*Accepted in 3rd year</i>
Alicia Balgobin	2023-2024	(DS) BSc Health Sciences	Complex patterns of EMF in primary cortical neurons physiology	Biological Sciences MSc. Student (U of T)

Muhad Shahid	2023-2024	(DS) BSc Health Sciences	Mapping biophotonic & synchronic EEG signatures of brain activity	4th year BSc (<i>WLU</i>)
High School Internship Students				
Kaitlyn Torack	2023-2024	Cor Jesu Academy, Missouri, USA	Spatial navigation and processing in slime molds	BSc Student, (<i>Yale U</i>)

Department of Biology (Health and Environmental Sciences) <i>Algoma University</i>				
Name	Date	Degree	Project Title	Current Status
Post-Doctoral Fellows & Research Associates				
Lucas Tessaro	2022-2023	PDF	Bioelectrical control of stem cell physiology	Data analyst (<i>U Montreal</i>)
Arshad Rafiq	2021-2023	PDF	Photobiomodulation in metastatic control	Lecturer (<i>Algoma U</i>)
Graduate Students				
* Stephanie Sissons	2022-2024	MSc. Biology (<i>Laurentian U</i>)	Validation of optical tools for high-throughput screening of disease states	Behavioural Neuroscience PhD Student (<i>Trent U</i>)
Undergraduate Students Thesis (T), Research Assistant (RA), Internship (I)				
Tyler Petteuzzo Patton	2021-2024	(I) BSc Psychology	Using VPS13C as biomarker for Parkinsons	Clinical Psychology PhD Student (<i>U Ottawa</i>)
Isabella DiBerardino	2022-2024	(RA/T) BSc Psychology	Label-free detection of COVID-fog using low-level light <i>*Recipient of NSERC USRA</i>	Cognitive Neuroscience PhD Student (<i>UBC</i>)
Alexis Needs	2022-2024	(RA/T) BSc Biology	Validation of optical tools for high-throughput screening of disease states	Clinical Psychology PhD Student (<i>U Ottawa</i>)

Malay Patel	2022-2023	(T) BSc Biology	Bioelectrical control of stem cell physiology	Research Coordinator (SSMIC)
Tayler Greco	2021-2023	(T) BSc Biology	COVID Fog clinical study: Cognitive impairments due to long-COVID <i>*Awarded Governor General Bronze Medal</i>	Medical Student, (Ottawa U) <i>*Accepted in 3rd year</i>
Hayley Casey	2021-2023	(I/T) BSc Psychology	Validation of optical tools for high-throughput screening of disease states <i>*Recipient of NSERC USRA</i>	Clinical Psych PhD Student (U Vic)
Megan Neal	2021-2022	(T) BSc Biology	Biophoton emissions profile of auditory processing	Veterinary Assistant (Northland Animal Hospital)
Jasmine Kaur	2021-2022	(T) BSc Biology	Discrimination of microbial load using label-free photonics	Research Assistant (Corteva Agriscience)
Aanal Patel	2021-2022	(T) BSc Biology	Tracking brain activity associated with short term memory	Pharmacy student (U Waterloo)
Danielle Bernardo	2020 – 2022	(T) BSc Biology	Peripheral blood as a biomarker of immunotherapy efficacy in Breast Cancer Patients: clinical Study <i>*Recipient of NSERC USRA</i>	Pathology Assistant Student (U of T)
Celeste Mathieu	2020 – 2021	(T) BSc Biology	The Role of Geomagnetic Activity on Temporal Lobe Epilepsy: An EEG Study	Optometry student (Farris State)
Nicolas Fera	2020 – 2021	(T) BSc Biology	Retrospective Study on Vitamin D effectiveness on Immunotherapy in Breast Cancer Patients	PhD Candidate (Queen's U)
Sawith Abey	2020 – 2021	(T) BSc Biology	Next-gen sequencing assessment of brain plasticity in limb regeneration	Clinical Research Coordinator (Mount Sinai)

Department of Biology, Tufts University				
Name	Degree /Role	Dates	Project Title	Current Status
Research Technicians				
Kelsie Miller	Animal Technician	2018-2020	Acute delivery of multi-drug cocktail in limb regeneration	Clinical Coordinator (Sanofi)
Undergraduate Students Thesis (T), Research Assistant (RA)				
Melanie Chien	(RA/T) B.Sc. Biology w/ Minor in Community Health	2018 – 2021	Modulation of Human Stem Cell Differentiation using Natural Products	Research Associate, <i>Axial Therapeutics</i>
Frances DeFreitas	(RA/T) B.Sc. Biology & Computer Science	2018 – 2021	Classical Conditioning in Non-neural Systems	Research Associate, <i>Boston Children's Hospital</i>
Hannah Vigran	(RA/T) B.Sc. Biology and Art Studies	2017 – 2021	Brain Remodeling During Amphibian Limb Regeneration <i>*Awarded Beckman Scholar</i>	Medical Student, <i>U. Michigan</i>
Nathan Mitchel	(RA/T) B.Sc. Biology	2018 – 2020	Biostasis of embryonic development using natural extracts	Medical Student, <i>Tufts U.</i>
Jeremy Schiller	(RA/T) B.Sc. Biology	2018 – 2020	Non-Neural Habituation in <i>Physarum Polycephalum</i>	Medical Student, <i>John Hopkins</i>
Sajani Clerk	(RA/T) B.Sc. Biology	2018 – 2020	The effect of fungal extract on <i>Xenopus Laevis</i> development	Medical Student, <i>Tufts U.</i>
Lauren Clore	(RA/T) B.Sc. Biology	2017 – 2019	Modulating patterning of limb regeneration using Bioelectric modulators	Medical Student, <i>Florida State U.</i>
Daniel Kaltman	(RA/T) B.Sc. Biology w/ Minor in Law Studies	2017 – 2018	Long range decision making in aneural systems <i>*1st Place Winner of Allen Center Undergraduate Symposium</i>	Law Student, <i>Emory U</i>

Hayley Carabello	(T) B.Sc. Biology	2017 – 2019	Modulating Repatterning of Limb Regeneration w/ Neurotrophic Factors	Medical Student, <i>New York U</i>
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Department of Biology, <i>Laurentian University</i>				
Name	Degree	Dates	Project Title	Current Status
Graduate Students				
* Victoria Hossack	M.Sc. Biology	2015 – 2018	Effects of Natural Magnetic Fields on Biological Systems	PDF (WLU)
* William Mekers	M.Sc. Biology	2014 – 2017	Influence of Varying Geomagnetic Fields on Flatworm Regeneration	Research coordinator, <i>Compass</i>
Undergraduate Students Thesis (T), Research Assistant (RA)				
Michayla Lizzi	(T) B.Sc. Biology, Neuroscience	2016 – 2017	Synergistic Effects of Electromagnetic Fields, Light and Chemotherapy on Melanoma Proliferation	Biomolecular Science Ph.D. student, <i>Laurentian U.</i>
Jesse St. Jean	(T) B.Sc. Biology, Neuroscience	2016 – 2017	Elucidating the Role of the Nicotinic Acetylcholine Receptor in the Synergistic Effects of Nicotine and Ethanol	PDF (U Waterloo)
Matthew Parotta	(T) B.Sc. Biology, Neuroscience	2016 – 2017	Using a Novel in Silico Model to Analyze Structure and Predict Possible Ligand-protein Binding Sites <i>*Winner of Undergraduate Thesis Award</i>	PDF (U Waterloo)
Billy Yearington	(T) B.Sc. Behavioural Neuroscience	2015 – 2017	Effects of Lithium on Stem Cell Proliferation & Differentiation in Flatworms	Research Associate, (<i>Ottawa Hospital</i>)
Quinn Bloskie	(T) B.Sc. Behavioural Neuroscience	2015 – 2016	Exposure to Low-intensity, Patterned Electromagnetic Field Alters Aging Processes <i>C. elegans</i>	Medical Student, (<i>NOSM</i>)

Jesse Fontaine	(T) B.Sc. Biology, Biomedical Science	2015 – 2016	GFP Dependent Stem Cell Differentiation in Planaria	Family Doctor, (NOSM)
James Ross	(T) B.Sc. Biology, Biomedical Science	2014 – 2015	The Effects of Cordycepin Extract on Wound Healing and Regeneration of Planarian Flatworms	Research Assistant (U. Calgary)
Kamilah Francis	(T) B.Sc. Behavioural Neuroscience	2014 – 2015	Synergistic Effects of Nicotine and Ethanol on Cognitive Performance of <i>D. tigrina</i>	Research Coordinator (Ontario March of Dimes)
Jeffrey Jeyachandran	(T) B.Sc. Behavioural Neuroscience	2014 – 2015	Investigation into the Developmental Effects of EMF on <i>X. laevis</i> Tadpoles	Solutions Architect, Blackberry
Joshua Vandermost	(T) B.Sc. Biology, Biomedical Science	2014 – 2015	Infrared and UV Effects on Wound Healing and Tissue Regeneration	Software Developer, (Sunwire Inc.)
Zach Mullin	(RA) B.Sc. Biology, Biomedical Science	2014 – 2015	An Investigation into RNAi as a Potential Substrate for Planaria Memory Transfer	PhD student (Ottawa U)
Dylan Galloway	(T) B.Sc. Behavioural Neuroscience	2014 – 2015	Effects of Temporally Patterned Photostimulation on Planarian Behaviour and Learning <i>*Winner of Undergraduate Thesis Award</i>	PhD student (Memorial U)
April Kindrat	(T) B.Sc. Behavioural Neuroscience	2013 – 2014	The Assessment of Siberian Pine Nut oil in Induction of an Anxiety Response in Wistar Rats	Medical resident, (Queens U)
Meghan Jelen	(T) B.Sc. Behavioural Neuroscience	2013 – 2014	Nitric Oxide and cGMP Activation in Memory Consolidation in Wistar Rats	Ph.D. student (UBC)

EDITORIAL ACTIVITIES

Role	Organization	Date
Associate Editor	CSBJ: Quantum Biology and Biophotonics	2023 - present
Primary External Reviewer	Swiss 3R Competence Centre	2022 - 2024
External Reviewer (NFRF – E program)	Social Sciences and Humanities Research Council of Canada (SSHRC)	2021 - present
Multidisciplinary Panel Member (NFRF – E program)		2021 - present
Topic Editor and Guest Editor	<ul style="list-style-type: none"> • Frontiers Neuroscience • Frontiers Integrative Neuroscience • Frontiers Neural Engineering 	2021 - present
Referee for submissions for peer-reviewed journals	<ul style="list-style-type: none"> • Nanomedicine • Sensors • ACS Biomaterials Science & Engineering • Cancer Letters • Cancer Science and Therapy • Journal of Optics 	2017 - present
Guest Editor and Contributor	Knowing Neurons	2015 - 2023
Scientific Judge	Tufts University - <i>Undergraduate seminar series</i>	2018-2019
Scientific Judge	Science North - <i>Sudbury Regional Science Fair</i>	2015-2016

INTERNATIONAL & NATIONAL COLLABORATIONS

Project Title & Objective	Team	Dates
<p><u>Brain-inspired Artificial intelligence:</u> Develop next generation of AI using biological principles.</p> <p><i>*NFRF-E Funded – PI: Dr. Rouleau</i></p> <p>My role: Co-applicant to develop behavioural assays for validation of AI systems</p>	<ul style="list-style-type: none"> • Dr. Nicolas Rouleau (WLU, Canada) • Dr. Rodney OConnor (U Montreal, Canada) • Dr. Steve Potter (Georgia Tech., USA) 	2024-present

<p><u>Goal-directed behaviour in Aneural systems</u>: Understand the limits of cognition and cognitive principles in non-neural systems</p> <p><i>*Sloan Foundation Funded – PI: Dr. Kurian</i></p> <p>My role: Co-applicant & primary lead for molecular validation of cognitive processes, aneural model assessment and <i>in vitro</i> assay development</p>	<ul style="list-style-type: none"> • Dr. Philip Kurian (Howard U, USA) • Dr. Michael Levin (Tufts U, USA) • Dr. Masashi Aono (Keio U, Japan) 	<p>2023-present</p>
<p>Applied Biophysical Signals for Muscle Regeneration: Develop wearable technology for muscle repair and regeneration</p> <p><i>*NSERC Funded –PI: Dr. Murugan</i></p> <p>My Role: Primary Investigator</p>	<ul style="list-style-type: none"> • Dr. Fabrisia Ambrosio (Spaulding Rehabilitation Hospital, Harvard U, USA) 	<p>2023-present</p>
<p><u>3D Tissue Bioprinting for Melanoma Models</u>:</p> <p>My role: Co-Primary Investigator to bio-print and 3D models of melanoma for EMF applications of anti-cancer therapy.</p>	<ul style="list-style-type: none"> • Dr. Mark Ferrer (National Institute of Health (NIH), USA) • Dr. Paige Derr (National Institute of Health (NIH), USA) 	<p>2022-present</p>
<p><u>Time-multiplexed dual atomic magnetometry</u>: Evaluate the potential application of AM to acquire biologically relevant magnetic signals</p> <p>My role: Primary Investigator</p>	<ul style="list-style-type: none"> • Dr. John Butters (Near Field Atomics/U Washington, USA) 	<p>2022-present</p>
<p><u>Quantum systems for Biological Applications</u>: Develop sensors and equipment that allow quantum technology to interface with biological systems.</p> <p><i>*NFRF-E Funded –PI: Dr. Murugan</i></p> <p>My role: Primary Investigator</p>	<ul style="list-style-type: none"> • Dr. Sead Doric (Doric Lenses Inc.) • Dr. Jean-Philippe Bourgoin (Single Quantum Systems Inc.) • Dr. Michael Reimer (Single Quantum Systems Inc.) 	<p>2022-present</p>

<p><u>Morphochemicals in Tissue Patterning:</u> Evaluate the role of bioelectricity in tissue morphogenesis</p> <p><i>*NSERC Funded –PI: Dr. Murugan</i> My role: Primary Investigator</p>	<ul style="list-style-type: none"> • Dr. David Kaplan (Tufts U, USA) • Dr. Michael Levin (Tufts U, USA) • Dr. Jessica Whited (Harvard U, USA) 	<p>2021-present</p>
<p><u>Biophotonics of Chemobrain:</u> Develop novel technology using light to predict brain disease</p> <p><i>*NFRF-E Funded – PI: Dr. Murugan</i> My role: Primary Investigator</p>	<ul style="list-style-type: none"> • Dr. Jeffrey Dunn (U Calgary, Canada) • Dr. Ioannis Voutsadakis (Northern Ontario School of Medicine, Canada) 	<p>2021-present</p>
<p><u>BIOSTASIS Project:</u> Developing novel application of biological materials to extend time following traumatic injury</p> <p><i>*DARPA Funded –PI: Dr. Novak</i> My role: Co-applicant and primary lead to extract active compounds from Physarum polycephalum and evaluate biostasis in developing organisms and cancer tissues</p>	<ul style="list-style-type: none"> • Dr. Richard Novak (Wyss Institute of Harvard U, USA) • Dr. Don Ingber. (Wyss Institute of Harvard U, USA) 	<p>2019-present</p>
<p><u>SMARTCELL:</u> Investigate the intelligence in non-neural systems</p> <p><i>*Agence Nationale de la recherche Funded – PI: Dr. Dussutour</i> My role: Co-applicant to evaluate through <i>in vitro</i> assessments the abilities of non-neural systems to solve complex problems.</p>	<ul style="list-style-type: none"> • Dr. Audrey Dussutour (Université de Toulouse, France) • Dr. Martin Grube (U of Graz, Austria) 	<p>2018-2020</p>
<p><u>QUANTUM NEURO Project:</u> Develop novel Electromagnetic devices to detect and treat cancer</p>	<ul style="list-style-type: none"> • Dr. Lorenzo Cohen (MD Anderson, USA) • Dr. Peiyang Yang (MD Anderson, USA) • Dr. Michael Persinger 	<p>2013-2019</p>

<p><i>*Bosarge foundation funding – PI: Dr. Persinger</i></p> <p>My role: Primary lead for the evaluation <i>in vitro</i> and <i>in vivo</i> of novel EMF-based anti-cancer therapies</p>	<p>(Laurentian U, Canada)</p>	
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COMMITTEE MEMBERSHIPS

<p>Faculty of Science Petitions Committee <i>Department of Health Sciences, representative, Wilfrid Laurier University, Waterloo, ON</i></p>	<p>2024- present</p>
<p>(ELECTED) Committee on Equity, Diversity and Inclusion <i>Natural Science and Engineering Research Council of Canada (NSERC)</i></p>	<p>2023-present</p>
<p>(ELECTED) OCBS Symposium Organizing Committee 2023-present <i>Ontario Cell Biology Society</i></p>	
<p>Tenure and Promotion Committee Department of Health Sciences <i>Wilfrid Laurier University, Waterloo, ON</i></p>	<p>2023- present</p>
<p>Department of Health Sciences Inclusion, Diversity, Equity, Accessibility (IDEA) Committee <i>Wilfrid Laurier University, Waterloo, ON</i></p>	<p>2023- present</p>
<p>Canada Research Chair Equity, Diversity, Inclusion (EDI) Committee <i>Algoma University, Sault Ste. Marie, ON</i></p>	<p>2020- present</p>
<p>Ad Hoc Committee on Online Learning & Academic Integrity <i>Algoma University, Sault Ste. Marie, ON</i></p>	<p>2020-2023</p>
<p>(ELECTED) Research Advisory Committee <i>Algoma University, Sault Ste. Marie, ON</i></p>	<p>2020-2023</p>
<p>(ELECTED) Program Advisory Committee <i>Algoma University, Sault Ste. Marie, ON</i></p>	<p>2020-2023</p>
<p>(ELECTED) Senate Student Appeals Committee <i>Laurentian University, Sudbury, ON</i></p>	<p>2014-2017</p>
<p>(ELECTED) Graduate Student Representative, Biohazard and Safety Committee <i>Laurentian University, Sudbury, ON</i></p>	<p>2014-2017</p>

(ELECTED) Treasurer, Graduate Student Association Executive Council 2013-2015
Laurentian University, Sudbury, ON

PROFESSIONAL MEMBERSHIPS

Biophysical Society	2022-present
Canadian Federation of University Women	2021-present
Optica	2021-present
Alliance for Regenerative Rehabilitation Research and Training	
American Association for Anatomy	2020 - present
Society for Developmental Neuroscience	2020 - present
Society for Developmental Biology	2020-present

CONTRIBUTIONS - PRESENTATIONS

INVITED TALKS AND SEMINARS

Note* Underlined names indicate trainees

1. **Murugan NM** (2024 July) Developing quantum optical tools to map biological processes. Optical Imaging Congress. Toulouse, France – Invited
2. Needs A., **Murugan NM**, Shaw NA. (2024 June) Assessing the Impact of Empowering Individuals with Developmental Disabilities in Community-Based Care: A Neuroimaging and Linguistic Analysis. Northern Health Research Conference. Sudbury, Ontario, Canada
3. **Murugan** (2024 April) The role of applied electromagnetic fields and light in understanding consciousness. 30th Annual the Science of Consciousness. Tucson, AZ, USA – Invited
4. **Murugan NM** (2024 March) Beyond Molecules: Applied Magnetic Stimulation in Skeletal Muscle Repair and Regeneration. 10th Annual International Symposium for Regenerative Rehabilitation. Harvard University. Boston, USA. – Invited
5. Golding, A., **Murugan NM** (2024, March) Impact of peripheral nervous system in the development of the tumor microenvironment in Melanoma. 36th Annual Ontario Biology Day. Toronto, Canada
6. Brown B., **Murugan NM** (2024, March) Effects of Progesterone on Cell

Communication and Behaviour in In Vitro Models of Lung Cancer. 36th Annual Ontario Biology Day. Toronto, Canada *3rd Place Winner of Best Poster

7. **Murugan** (2024 January) We are brighter than we think: Brain-based ultraweak photon emissions and electric fields as novel functional neuroimaging tools. SPIE Photonics West. California, USA
8. **Murugan NM** (2023, November) Photoencephalography: Developing a Novel Neural Imaging Technology. National Institute of Theoretical and Computational Sciences 19th (NITheCS). Annual Biophysics Workshop. Stellenbosch, South Africa - Invited
9. **Murugan NM** (2023, September) Cracking the Magnetic Code of Life. Thinking Beyond Series. Arizona State University, Arizona, USA – Invited (Webinar)
10. **Murugan NM** (2023, August) You are brighter than you think: Brain-based ultraweak photon emissions and electric fields as novel functional neuroimaging tools. Optica Imaging Congress, *Boston, MA, USA* – Invited
11. **Murugan NM** (2023, July) "Beyond Molecules: Harnessing Biophysics and Quantum Mechanics for the Development of Novel Diagnostics and Therapies" National Institute of Health (NIH) QIS Interest Group – Invited Talk Webinar
12. **Murugan NM** (2023, June) Reading and Writing Cellular States using Biophysical Signals. Quantum Effects in Biological Systems, *London, UK* - Invited
13. **Murugan NM** (2023, May) Quantum Applications in Cancer Biology and Neuroscience. GRC Quantum Biology, *Galveston Texas, USA* – Invited
14. **Murugan NM**, Alisha Collins, Will Collins (January 2023) Thinking Without a Brain: Biomaking Exploration with Slime Mold. Biosummit 6.0 (Webinar workshop)
15. **Murugan NJ**. (2022, April) The quest toward understanding information processing in complex systems: A Systems Medicine & Biophysical Approach. Critical Ecologies Seminar. *Central Saint Martins, University of the Arts London*
16. **Murugan NJ**, (2021, November) Transcriptomic changes toward brain remodeling in response to silk-based wearable bioreactor induced hindlimb regeneration in a non-regenerative animal model system. 50th Annual meeting for *Society for Neuroscience, Chicago, IL*
17. **Murugan NJ** (2021, October) Going out on a limb: A tissue engineering approach to functional limb regeneration. Biomedical Engineering Departmental Seminar. *University of Massachusetts Lowell* – Invited.

18. **Murugan NJ** (2021, September) Reprogramming Cancer – using regenerative & biomedical engineering strategies to change the fate of cancer. *Soapbox Science Ottawa – Invited*
19. **Murugan NJ**, Virgin H, Miller K, Levin M (2021, April) Silk-based wearable bioreactor induces long-term limb re-patterning and regeneration in non-regenerative systems. *Experimental Biology- Virtual due to COVID-19*
20. Bernardo D, **Murugan NJ** (2021, January) Observing the vascular environment: Peripheral blood cells as predictive biomarkers of immunotherapy treatment efficacy in breast cancer patients. 10th Annual *National Collegiate Research Conference – Harvard University, Virtual due to COVID- 19*
21. Mathieu CM, **Murugan NJ** (2021, January) The role of environmental magnetic field disturbances on the onset of temporal lobe epileptic seizures. 10th Annual *National Collegiate Research Conference – Harvard University, Virtual due to COVID- 19*
22. **Murugan NJ**, Pham QL, Miller K, Vigran H, Kaplan D, Levin M (2019, July) Delivering pro-regenerative compounds via a wearable silk bioreactor induces patterning and limb regeneration in adult *Xenopus laevis*. *The Society for Developmental Biology 78th Annual Meeting, Boston, USA*
23. **Murugan, NJ**, Pham QL, Miller K, Kaplan D, Levin M (2019, July) Brief exposure to drug-infused wearable bioreactor induces long-term repatterning of the hindlimb in adult *Xenopus Laevis*. *EMBO: Limb Development and Regeneration: New Tools for a Classic Model System, Barcelona, Spain*
24. **Murugan NJ**, Vigran H, Levin M. (2019, July) Brief exposure to drug-infused wearable bioreactor induces long-term re-patterning of the hindlimb in adult *Xenopus laevis*. *EMBO: Limb Development and Regeneration: New Tools for a Classic Model System. Barcelona, Spain*
25. **Murugan NJ**, Kaltman D*, Chien M* (2018 September) Primitive Intelligence: Assessing cognitive and information processing in a non-neural system *Physarum Polycephalum*. 10th Annual Agence Nationale de la Recherche (ANR) Meeting. *Toulouse, France – Invited*
26. **Murugan NJ**, Levin M. (2018, September) The Female Advantage: Delivery of a 5-drug cocktail induces osteogenesis and limb patterning in female than male Adult *Xenopus Laevis*. *EMBO: The Molecular and Cellular Basis of Regeneration and Tissue Repair. Valetta, Malta – Invited*
27. **Murugan NJ**, Persinger MA (2015, August) Inducing Complete Fragmentation in *Planaria* and Malignant Cells Using a Temporally Patterned Electromagnetic. International Symposium of Flatworm Biology. *Oxford, England – Invited.*

28. **Murugan, NJ**, Persinger MA (2014, April) Just Add Water! Recent Advances in Water Dynamics in Biological Systems. Biomolecular Sciences Seminar Series, Health Sciences North. *Sudbury, Ontario, Canada. – Invited*.
29. **Murugan NJ**, Karbowski LM, Persinger MA (2014, October) Electromagnetic Fields and Water: The Potential for Non-Locality. 2nd Annual International Symposium on Electromagnetic Fields and Quantum Phenomena in Biological Systems. *Poznan, Poland*.

POSTER PRESENTATIONS

1. Wouters N., Cicek E., Rouleau N, Poynter S., **Murugan NM** (May 2024) Cortical cell microenvironmental regulators of pathogen-induced Alzheimer's Disease phenotypes. 43rd Annual Southern Ontario Neuroscience Association. Waterloo, Canada
2. Kansala C., Rouleau N, **Murugan NM** (May 2024) Promoting synaptic plasticity through biomimetic magnetic field stimulation. 43rd Annual Southern Ontario Neuroscience Association. Waterloo, Canada
3. Meikle JC, Hossack VL., Rouleau N, **Murugan NM** (May 2024) Developing a novel biophotonic imaging tool to shed light on neural communication : validation studies in auditory perception. 43rd Annual Southern Ontario Neuroscience Association. Waterloo, Canada
4. Casey H, DiBerardino IL, Rouleau N, **Murugan NJ** (2023, May) Multiplexing brain-based ultraweak biophoton emissions and electric fields as a non-invasive and portable functional neuroimaging platform. Gordon Research Conference (GRC) Quantum Biology, *Galveston Texas, USA*
5. Vigran H*, Levin M, **Murugan NJ** (2019 August) BioDome Mediated Limb Regeneration. 22nd Annual Beckman Scholars Colloquium, *Irving, USA*.
6. **Murugan NJ**, Kaltman DH, Novak R, Levin M (2018, November) Morphological Computation: The Physics of Primitive Cognition in Non-Neural Systems. 8th Annual Wyss Institute Retreat, Harvard University, *Cambridge, USA*
7. Karbowski LM, **Murugan NJ** (2015, August) Light-Mediated Regulation of Long-Term Potentiation in Planaria. Poster session presented at International Symposium of Flatworm Biology. *Oxford, England*.
8. **Murugan NJ**, Persinger MA (2013, September). Revealing receptor subtype affinities and non-specific effects to exposures of morphine, naloxone and weak pulsed magnetic field in planaria. 4th Annual Psychology Research Conference. *Sudbury, Ontario, Canada*.

9. **Murugan NJ**, Karbowski LM, Persinger MA (2012, October) The Physiochemical and Spectrofluorescent Analysis of Patterned Magnetically Field Treated Water. Poster session presented at the 7th Annual Conference on the Physics, Chemistry and Biology of Water. *West Dover, Vermont, USA*.

10. **Murugan NJ**, Persinger MA (2012, April) Potential Synergisms of Pulsed Low Frequency Magnetic Fields and Opioids on *Dugesia tigrina* Locomotion. Poster session presented at the Biology Symposium. *Sudbury, Ontario, Canada*.

RESEARCH FEATURED IN MEDIA

Year	Title	Media Type	
1	2024	Harvard Scientists savvy New Research “Sets the Stage” for helping humans regrow lost limbs, The DeBrief	Digital Article
2	2023	What is Biological Intelligence? Secrets of the Forest. TVO	TV Show Episode
3	2023	Wilfrid Laurier researcher studying the role of light in early cancer detection, CTV Kitchener	Digital Article
4	2022	Prof. Nirosha Murugan PhD, Thinking Without a Brain, The Verney Podcast	Podcast Interview
5	2022	Local talks coming on 'unique and unconventional roads to success', The Soo Today	Digital Article
6	2022	Will Humans be able to regrow lost limbs? Regenerative Healthcare. The One's Changing the World Podcast	Podcast Interview
7	2022	Featured in GE's Top 5 Innovation List. General Electric (GE) The Vanguard	Digital Article
8	2022	Frogs Regrow Missing Limbs in Lab Study, Advancing Key Effort of Regenerative Medicine. The Wall Street Journal	Digital Article
9	2022	Frogs Without Legs Regrow Leglike Limbs in New Experiment. The New York Times	Digital Article
10	2022	Five-Drug Cocktail and Wearable Bioreactor Enable Regrowth of Amputated Adult Frog Leg. Genetic Engineering and Biotechnology News	Digital Article
11	2022	Frogs can regrow amputated limbs after being treated with mix of drugs, new research finds CNN	Digital Article
12	2022	Scientists coax frogs' cells into regrowing limbs. AXIOS	Digital Article
13	2022	Scientists Regrow Frog's Lost Leg: Could Human Amputees Someday Do The Same? US News	Digital Article

14	2022	Leap for science as frogs regrow lost legs. The Times of London	Digital Article
15	2022	Frogs Can Regrow Lost Legs in the Lab. Now, Researchers Say Human Limb Regeneration Could Happen “In Our Lifetime”. Smithsonian Magazine	Digital Article
16	2022	Will humans be able to grow lost limbs back? Scientists regrow a frog's lost leg using a five-drug cocktail - and want to test the technique on mammals next Daily Mail	Digital Article
17	2022	Northern Ontario researcher leads team that regrew frog limbs. CTV News	Digital Article
18	2022	A new treatment helped frogs regenerate their amputated legs – Taking science one step closer to helping people regrow their body parts, too. The Conversation	Digital Article
19	2022	Scientists Regrow Frog’s Lost Leg: Could Human Amputees Someday Do The Same? Health Day	Digital Article
20	2022	Drug cocktail regrows frog legs in regenerative medicine breakthrough. New Atlas	Digital Article
21	2022	Regrowing Frog Limbs. European Animal Research Association	Digital Article
22	2022	Frogs Regrow Amputated Limbs After New Multidrug Treatment. American Association for the Advancement of Science (AAAS)	Digital Article
23	2022	Frog regrows amputated leg after drug treatment. The Guardian	Digital Article
24	2022	Limb regeneration a reality: Scientists successfully regrow a frog’s lost leg. Study Finds	Digital Article
25	2022	Scientists Regrow a Frog’s Amputated Leg Using Drug at Wound Site. The Swaddle	Digital Article
26	2022	A new treatment helped frogs regenerate their amputated legs – Taking science one step closer to helping people regrow their body parts, too. Big Think	Digital Article
27	2022	Equilibrium/Sustainability — Scientists regrow frog leg. The Hill	Digital Article
28	2022	US scientists regrow frog’s lost leg, want to test new technique on humans. Hindustan Times	Digital Article
29	2022	Frogs regrow amputated legs after treatment with a chemical cocktail. New Scientist	Digital Article
30	2022	Frogs regrow amputated legs in breakthrough experiment. Live Science	Digital Article
31	2022	Algoma scientists make world headlines after growing new legs on frogs. National World News	Digital Article

32	2022	Scientists regrow frogs' amputated limbs in massive leap for regenerative medicine. Euro News	Digital Article
33	2022	Frog regrows amputated leg after drug treatment. The Guardian	Digital Article
34	2022	Researchers successfully regrow limbs on frogs. They want to do the same thing with humans. ZME Science	Digital Article
35	2022	Can humans regrow limbs? A lab study with frogs offers hope. NBC News	Digital Article
36	2022	Scientists Regrow Frog's Lost Leg With a Five-Drug Cocktail. SciTechDaily	Digital Article
37	2022	Scientists regenerated a functional "almost complete" leg for a frog. Science Focus	Digital Article
38	2022	Scientists were able to regrow frog legs. Will it pave the way for regeneration in people? USA Today	Digital Article
39	2022	Researchers Successfully Regrow African Clawed Frogs Lost Leg. Sci News	Digital Article
40	2022	Ground-breaking discoveries in regenerative medicine. Ontario's Universities	Digital Article
41	2022	Lab Frogs Regrow Limbs, Opening Door for Regeneration Studies. Nerdist	Digital Article
42	2022	Scientists Regrow Frog's Lost Legs. Will Human Limbs be Next? WebMD	Digital Article
43	2022	Achieving a milestone, scientists regrow frog's lost leg. Wyss Institute	Digital Article
44	2022	New treatment helped frogs regenerate their amputated legs, potential for human therapy. Phys.Org	Digital Article
45	2022	Scientists Regrow Frog's Lost Leg. Tufts Now	Digital Article
46	2022	Algoma scientist hops into world spotlight after growing new legs on frogs. Soo Today	Digital Article
47	2022	Scientist Predicts Humans Will Be Able to Regrow Limbs "Within Our Lifetime". Neoscope	Digital Article
48	2021	Enter the Psychosphere with Melanie Challenger. October Episode	Podcast Interview
49	2021	Cogitating about Cognition: Can Slime Molds Think? Harvard Magazine , Oct 2021 Issue (Print/Digital)	Magazine Article
50	2021	NSERC Science Exposed	Science Photography
51	2021	Thinking without a brain: Wyss Institute	Digital Highlight
52	2021	Intelligent Beings Without Brains Are Abundant In Nature—A Growing Scientific Consensus. Forbes Magazine	Digital Article

53	2021	Secret of Slime Mold. PBS NOVA	Documentary Interview
54	2021	Slimy Action at a Distance: Thinking Without a Brain. SciTech Daily	Digital Article
55	2021	How Slime Molds Think Without a Brain. Lab Roots	Digital Article
56	2021	How studying brainless slime mold could help better understand human intelligence. CBC Radio	Radio Interview & Digital Article
57	2021	Scientists Observed a Brainless Blob Thinking and Making Decisions. Motherboard by Vice	Digital Tech Article
58	2021	Brainless slime mold studies reveal that they use physical cues to determine where they grow. Florida News Times	Digital Article
59	2021	Brainless Slime Mold Is Able to Assess Its Environment To Make Decisions. IFL Science	Digital Highlight & Article
60	2021	Brainless slimy mold can cope with difficult tasks – National Geographic Russia	Digital Article
61	2021	“The Blob,” a strangely intelligent slime mold, is going to space. FreeThink	Digital Article
62	2021	No brain? No problem! This mold makes navigation decisions in thinking-like process. ZME Science	Digital Article
63	2021	This Brainless Slime Mold Can Decide Where to Go Without Having Already Been There. ScienceAlert	Digital Article
64	2021	How to Think When You Don’t Have a Brain. Cosmos	Digital Article
65	2021	Slimy Dart at a Distance: Thinking With out a Mind. Science TouchBase	Digital Article
66	2021	Sault Ste. Marie researcher studying how to predict, prevent 'chemo brain'. CBC Radio	Radio Interview & Digital Article
67	2021	AU Researcher wins Cancer Grant. St. Thomas Times	Digital Article
68	2019	The Blob: A Genius without a Brain, BBC	Documentary Interview
69	2019	Over \$300k in funding awarded to Algoma University researchers. The Sault Star & The Soo Today	Digital & Print News Article
70	2017	The Slime Mold Collective	Photography Highlights
71	2017	On a réveill� des cerveaux morts ! Science & Vie Junior	Digital Article
72	2017	Becoming Immortal: The Future of Brain Augmentation and Uploaded Consciousness.	Digital Article

CONTRIBUTIONS – TECHNOLOGY TRANSFER – PATENTS

U.S. Patent : No. 62/944,707—Regenerative multi-drug cocktail and delivery thereof via an apparatus for stimulation of tissue regeneration.

CONTRIBUTIONS – PEER-REVIEWED JOURNAL ARTICLES

Note* Underlined names indicate trainees

SUBMITTED & IN REVIEW

- Biophoton review
 - Biophoton device development paper – Science Reports
 - Voutsadakis Paper - Danielle
1. **Murugan, N. J.**, Cariba, S., Abeygunawardena, S., Rouleau, N., & Payne, S. L. (2024). Biophysical control of plasticity and patterning in regeneration and cancer. *Cellular and Molecular Life Sciences*, 81(1), 9.
 2. Rouleau, N., and **Murugan, N.J.** (2023). Self-similarity and spatial periodicity in cerebral cortical patterning: Structural design notes for neural tissue architects. *Anatomia*. 2(3), 222-23.
 3. Rouleau N, **Murugan NJ**, Kaplan D (2023) Functional bioengineered models of the central nervous system. *Nature Reviews Bioengineering*. 1, 252–270. <https://doi.org/10.1038/s44222-023-00027-7>
 4. Rosso C, Fera N, **Murugan NJ**, Voutsadakis IA. (2022) Vitamin D Levels in Newly Diagnosed Breast Cancer Patients according to Tumor Sub-Types. *Journal of Dietary Supplements*. 14:1-13. doi: 10.1080/19390211.2022.2144582. PMID: 36373265.
 5. **Murugan NJ**, Voutsadakis IA. (2022) Proteasome regulators in pancreatic cancer. *World Journal of Gastrointestinal Oncology*. ;14(1):38-54. doi: 10.4251/wjgo.v14.i1.38.
 6. **Murugan NJ**, Vigran HJ, Miller KA, Golding A, Pham QL, Kane AW, Kaplan DL, Levin M (2022) Acute multi-drug delivery via a wearable bioreactor facilitates long-term limb regeneration and functional recovery in adult *Xenopus laevis*. *Science Advances*. 8(4):eabj2164. doi: 10.1126/sciadv.abj2164
 7. **Murugan NJ**, Kaltman D, Levin M (2021) Mechanosensation dependant Long-Range Decision Making in a Non-neural organism. *Advanced Materials*. 33(34):e2008161. doi: 10.1002/adma.202008161
 8. Rouleau N, **Murugan N**, Kaplan D (2021) Towards Cognition in a Dish. *Trends in*

9. Rouleau N, **Murugan NJ**, Rusk W, Koester C, Kaplan DL. (2020). Matrix deformation with ectopic cells induced by rotational motion in bioengineered neural tissues. *Annals in Biomedical Engineering*. doi: 10.1007/s10439-020-02561-6
10. **Murugan, NJ.**, Persinger, M.A., Karbowski, L.M., Dotta, B.T. (2020) Ultraweak Photon Emissions as a Non-Invasive, Early-Malignancy Detection Tool: An In Vitro and In Vivo Study. *Cancers*. 12, 1001: <https://doi.org/10.3390/cancers12041001>
11. **Murugan NJ**, Rouleau N, Karbowski LM, Persinger MA (2018) Biophotonic Markers of Malignancy: Discriminating Cancers using Wavelength-Specific Biophotons. *Biochemistry and Biophysics Reports*. 13:7-11. doi: 10.1016/j.bbrep.2017.11.001.
12. Rouleau N, **Murugan NJ**, Persinger MA (2017) Right Cerebral Hemispheric Sensitivity to pH and Physiological Ions in Fixed Post-Mortem Wistar Rat Brains. *Cognitive Neurodynamics*. 11: pp 1-10.
13. **Murugan NJ**, Karbowski LM, Persinger MA (2017) Synergistic Interactions Between Temporal Coupling of Complex Light and Magnetic Pulses upon Melanoma Cell Proliferation and Planarian Regeneration. *Electromagnetic Biology and Medicine*. 36(2):141-148. doi: 10.1080/15368378.2016.1202838.
14. **Murugan NJ**, Karbowski LM, Persinger MA (2016) Differentiation of Malignant Compared to Non-Malignant Cells by Their Biophoton Emissions May Only Require a Specific Filter Around 500 nm. *Journal of Cancer Science and Therapy* 8: 168-169. doi:10.4172/1948-5956.1000409.
15. **Murugan NJ**, Rouleau N, Persinger MA (2016) The Third Option for Stopping Cancer: Complex, Temporally Patterned Weak Magnetic Fields- Critical Factors That Influence Their Efficacy and Potential Mechanisms. *World Scientific News* 54: 267-288.
16. Vanderbeck KA, Sibbald RG, **Murugan NJ** (2016) Generational Expression of Muir Torre Syndrome in a Canadian Family: A Case Report. *Case Reports in Dermatological Medicine* Article ID 1712527 <http://dx.doi.org/10.1155/2016/1712527>.
17. Rouleau, N., **Murugan, NJ**, Tessaro, L.W.E. and Persinger, M.A. (2016) When is the Brain Dead? Living-Like Responses to Neurotransmitters and Photon Emissions in Fixed Post-Mortem Human Brains. *PLOS ONE*. 11(12): e0167231.
18. Dotta BT, Karbowski LM, **Murugan NJ**, Vares DAE, Persinger MA (2016) Ultra-weak Photon Emissions Differentiate Malignant Cells from Non-Malignant Cells *In Vitro*. *Archives in Cancer Research* 4(2):85.
19. **Murugan NJ**, Karbowski LM, Persinger MA (2016) Elimination of Frequency Modulated Magnetic Field Suppression of Cell Proliferation by Simultaneous Exposure to a Pattern Associated with Memory in Mammals. *Archives in Cancer Research* 4(2):82.

20. Karbowski LM, **Murugan NJ**, Persinger MA (2016) Experimental Evidence That Specific Photon Energies Are “Stored” in Malignant Cells for an Hour: The Synergism of Weak Magnetic Field- LED Wavelength Pulses. *Biology and Medicine* 8:1.
21. **Murugan NJ**, Rouleau N, Karbowski LM, Lapointe AP, Persinger MA (2015) Reliable Marked Increases in Alpha Power Over the Left Prefrontal Region During Days Following Shift Work: A Case History. *Journal of Sleep Medicine and Disorders*. 1:002.
22. Karbowski LM, Saroka KS, **Murugan NJ**, Persinger MA (2015) LORETA Indicates Frequency- SpecificSuppressions of Current Sources Within the Cerebrums of Blind-Folded Subjects from Patterns of Blue Light Flashes Applied Over the Skull. *Epilepsy and Behaviour* 51: 127-132.
23. **Murugan NJ**, Dotta BT, Karbowski LM, Persinger MA (2015) Conspicuous Burst of Photon Emissions in Malignant Cell Cultures Following Injections of Morphine: Implications for Cancer Treatment. *International Journal of Current Research*. 6:12 10588-10592.
24. **Murugan NJ**, Karbowski LM, Mekers WFT, Persinger MA (2015) Group Planarian Sudden Mortality: Is the Threshold around Global Geomagnetic Activity {greater than or equal to} K6? *Communicative and Integrative Biology*. 8(6):e1095413.
25. Karbowski LM, **Murugan NJ**, Koren SA, Lafrenie RM, Persinger MA. (2015) Seeking the Source of Transience for a Unique Magnetic Field Pattern That Completely Dissolves Cancer Cells in Vitro. *Journal of Biomedical Science and Engineering*. 8(8): 531-543.
26. **Murugan NJ**, Karbowski LM, Persinger MA (2015) Weak Burst-Firing Magnetic Fields that Produce Analgesia Equivalent to Morphine do not Initiate Activation of Proliferation Pathways in Human Breast Cells in Culture. *Integrative Cancer Science and Therapeutics*. 1(3) 47-50.
27. **Murugan NJ**, Karbowski LM, Persinger MA (2015) Cosic’s Resonance Recognition Model for Protein Sequences and Photon Emission Differentiates Lethal and Non-Lethal Ebola Strains: Implications for Treatment. *Open Journal of Biophysics*. 5: 35-43.
28. Karbowski LM, **Murugan NJ**, Persinger MA (2015) Novel Cosic Resonance (Standing Wave) Solutions for Components of the JAK-STAT Cellular Signaling Pathway: A Convergence of Spectral Density Profiles. *FEBS Open Bio* 5: 245-50.
29. Persinger MA, **Murugan NJ**, Karbowski LM (2015) Combined Spectral Resonances of Signaling Proteins’ Amino Acids in the ERK-MAP Pathway Reflect Unique Patterns That Predict Peak Photon Emissions and Universal Energies. *Intl. Letters of Chemistry, Physics and Astronomy* 4: 10-25.

30. Karbowski LM, **Murugan NJ**, Persinger MA (2015) Experimentally Induced Inhibition of Growth in Melanoma Cell Cultures Separated by ~2 Kilometers When Both Share Excess Correlation Magnetic Fields: Macroscopic Evidence of Free-Space Quantum Teleportation? *Journal of Signal and Information Processing*. 6: 39-48.
31. Caswell JM, Carniello TN, **Murugan NJ** (2015) Annual Incidence of Mortality Related to Hypertensive Disease in Canada and Associations with Heliophysical Parameters. *International Journal of Biometeorology*. 60(1): 9-20.
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DISSERTATIONS

1. **Murugan NJ.** (2017) A Spectrum of Influence: The Emission and Application of Patterned Electromagnetic Energy on Biological Systems.
2. **Murugan NJ.** (2013) Physical and Chemical Changes in Planarian and Non-living Aqueous Systems from Exposure to Temporally Patterned Magnetic Fields.
3. **Murugan NJ.** (2011) Assessing Serial vs. Parallel Models of Memory using Histological Correlates of Maze Proficiency and Conditioned Taste Aversion in Seized R. Norvegicus.

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1. Sperry M, **Murugan NJ**, Levin M. (2022) Studying Protista Whole Body Regeneration and Repair using Physarum polycephalum. Whole Body Regeneration: Methods and Protocols. Springer Nature
2. Shivakumar K, Shabir A., Rouleau N., **Murugan N.J.** (2018) Complex Case of Treatment of Treatment-Resistant Schizophrenia. *Complex Clinical Conundrums in Psychiatry (1-15)* New York City, New York: Springer Nature..

CONTRIBUTIONS - ARTISTIC PERFORMANCES/EXHIBITS

1. **NSERC - Science Promoters - Science Exposed**
 - [Selected as Top 20 Finalist](#) (Winners announced Nov 2021)
 - Submitted DSLR macro-scale photograph of the aneural slime mold and it's use in investigating biological computation of intelligence.
2. **Capturing the Beauty of Science Photography Competition - Wyss Institute at Harvard University**
 - Selected Runner- Up (August 15, 2019)
 - Submitted microscope image of the aneural model system to understand the fundamentals of intelligence and cognition.

OUTREACH SERVICE

Sault Ste Marie STEM Society 2020-Present
Founder and Director
 Algoma University and Local Elementary Schools

Biomedical Engineering Outreach Program
Co-Founder and Director 2017-
 2020
 Tufts University and Local High Schools, Medford, MA

NON-ACADEMIC VOLUNTEER SERVICE

Veterinary Assistant – over 560 volunteer hours Walden Animal Hospital, Lively, ON	2014-2016
Brain Injury Rehabilitation Worker – over 1500 volunteer hours Ontario March of Dime, Sudbury, ON	2008-2012