

JESSICA CUNNINGHAM - REYNOLDS

1211 Cedar Orchard Dr. Blacksburg, VA 24060 | Phone: 989.326.2307 | jessica.j.cunningham@gmail.com

INNOVATIVE AND EXPERIENCED THEORETICAL RESEARCH PROFESSIONAL

Translating Sophisticated, Multi-Disciplinary Concepts into Practical Experiments Yielding Measurable Results

Experienced researcher with more than 10 years of proven success translating complex concepts into innovative problem solving frameworks and experiments in fields ranging from oncology research to seismology, digital signal processing, astrophysics, biology, aerospace engineering and more. Equipped with superior analytical skills including mathematical modeling and object oriented algorithm design, with the ability to translate technical terms and granular data into meaningful, translatable, and publishable results.

- Adept at applying a broad perspective to uncover, explore and test novel concepts at the intersection between highly specialized and typically siloed disciplines.
- Able to apply expert-level communication skills in collaborating with a wide range of professionals and students, providing project guidance, mentorship and guidance.
- Managed the organization, editing and development of technical papers, grant applications and presentations for both scientific and business audiences.
- Recognized and valued for proactively planning, coordinating and executing detailed plans and experiments with an emphasis on quickly and efficiently transitioning from broad speculation to specific, accurate, measurable results.

Core Competencies

- Theoretical Problem Solving
- Applied Mathematics & Physics
- Design of Experiments
- Complex Problem Solving
- Presentation & Public Speaking
- Training & Education
- Relationship Management
- Articles & Publications

US Security Clearance: Secret (Inactive)

EDUCATION

PHD IN MATHEMATICAL ONCOLOGY Maastricht University Netherlands – Est. Completion April 2020

Dissertation: *Evolutionary Game Theory and Optimal Control for Integrated Metastatic Management of Prostate Cancer.*

COURSEWORK TOWARDS A MASTER OF SCIENCE IN SPACE SYSTEMS Florida Institute of Technology Melbourne, FL – 2015

MASTER OF SCIENCE IN COMPUTER INFORMATION SYSTEMS Florida Institute of Technology Melbourne, FL – 2011

Thesis: *Comparative Analysis of Language Dependent Serial, Parallel, and GPU Implementations of the N-Body Problem.*

BACHELOR OF SCIENCE IN APPLIED MATHEMATICS Florida Institute of Technology Melbourne, FL – 2008

Thesis: *Variational Inequalities in Hilbert Spaces with Application to Particle Acceleration Phenomena in Plasma Physics.*

CAREER HISTORY

Moffitt Cancer Research Center Tampa, FL | June 2010 – Present

Research Associate III – Integrated Mathematical Oncology

Coordinate all aspects of the collaboration between primary researchers including an MD oncologists, radiologists, and evolutionary ecologists focused on applying ecological and evolutionary principles to cancer therapy research, studying the effects of environmental selection forces, phenotypic cost/benefits and intercellular competition as well as spatial heterogeneity and niche engineering. Conducted research which has included applying principles from nano-fluid dynamics to cell biology by creating a three-dimensional molecular dynamics simulation studying the spatial and temporal aspects of protein pathways, exploring the consequences of an intracellular electric field, pH gradient, and heat dissipation dynamics. Utilized mathematics, physics and computer science to develop computational models and translate speculation into testable, measurable models and frameworks to validate or disprove concepts. Following the completion of series of experiments, translate results into scholarly publications as well as proposals for grants.

- ◆ Designed and developed mathematical models multiple ongoing clinical trials at Moffitt
- ◆ Large contributor to the \$10.4M Physical Sciences – Oncology Center grant successfully awarded to Moffitt in 2015.
- ◆ Mentored students in the High School Internship Program and advised interdisciplinary masters students from the University of South Florida molecular medicine program.

Seattle Gymnastics Academy Seattle, WA | March 2012 – September 2014**Staff Coach**

Providing Junior Olympic level one through five training and instruction for children ages 5 – 16 years old. Managed groups of up to nine girls during practices and assisted in coaching as many as 20 participants during competitions. Broke down complex actions and routines into basic steps.

- ◆ Recognized for consistently enabling children to meet the requirements to advance to their next level.
- ◆ Adjusted coaching techniques and updated lesson plans based on the strengths and weaknesses of athletes.
- ◆ Developed individual athlete action plans for specific skills development.
- ◆ Provided a strong role model for young women by consistently showing respect to students, parents and staff and fostering confidence, compassion, and constructive problem solving in every practice.

Quantum Technology Sciences, Inc. Cocoa Beach, FL | May 2008 – June 2010**Scientific Programmer / Mathematician**

Developed and tested an intrusion detection system sponsored by the Department of Defense (DoD) with a focus on translating seismic data into functional information. Extracted time and frequency data using digital signal processing techniques to characterize sensor data. Utilized techniques including seismic sensor state-of-health algorithms, digital filtering algorithms, one and two-dimensional tracking algorithms and more. Performed detailed statistical analysis to design and implement batch and real-time algorithms using MatLab. Redesigned and updated algorithms following tests. Created MatLab graphic user interfaces (GUIs) to load and display data. Maintained all documentation as well as a seismic signature library and data archive.

- ◆ Successfully achieved all objectives and milestones within projected timelines.
- ◆ Singlehandedly developed as much as 50% of the entire product algorithms.

Melbourne Civic Theater Melbourne, FL | January 2007 – April 2009**Theater Director & Musical Director**

Led groups of up to 20 community cast members in musical performances including rehearsals, recordings and live events. Adapted musical compositions to suit specific casts and vocalists. Planned and scheduled group rehearsals as well as one-on-one lessons to ensure the cast's knowledge and comfort with all musical pieces. Performed on stage as a cast member in speaking and singing roles.

- ◆ Recruited, auditioned, and trained members of the community for two successfully directed full shows, *Company* by Sondheim (2009) and *A Night on Broadway* (2008).
- ◆ Directed a barbershop quartet that was invited to perform the National Anthem at the Astronaut Hall of Fame Induction ceremony (2008).

Delta College Planetarium Bay City, Michigan | Summers 2003 – 2005**Planetarium Show Producer & Live Presenter**

Presented planetarium shows to the public in the planetarium dome and observation deck. Provided live night sky tours including constellations and relevant astronomical news. Produced a planetarium show by successfully adapting the Buhl Planetarium show to run within the Delta College Planetarium facilities.

- ◆ Assisted in all aspects of public science events including developing and conducting week-long summer camps with workshops for grades 1-12.
- ◆ Volunteered as the representative astronomer on the Tall Ship Appledore Schooner as part of the Stargazer Sails series providing live night sky tours aboard the boat.
- ◆ Contributed to the Sunset Astronomical Society by presenting personal research and attending events in community.
- ◆ Expanded role to include training new planetarium show presenters.
- ◆ Managed and maintained sensitive and valuable equipment.

PUBLICATIONS

- **Cunningham JJ.** (2019) A call for Integrated Metastatic Management. *Nature Ecology and Evolution*.
- Howard R., Scheiner A., **Cunningham JJ**, Gatenby RA. (2019) Cytoplasmic convection currents: implications of intracellular temperature gradients. *PLOS Computational Biology*.
- **Cunningham JJ**, Brown JS, Gatenby RA, Stankova K. (2018) Optimal Control to Develop Therapeutic Strategies for Metastatic Castrate Resistant Prostate Cancer. *Journal of Theoretical Biology*.

- Zhang J, **Cunningham JJ**, Brown JS, Gatenby RA. (2017) Integrating evolutionary dynamics into treatment of metastatic castrate resistant prostate cancer. *Nature Communications*.
- You L, Thuijsman F, **Cunningham JJ**, Gatenby RA, Zhang J, Stankova K. (2017) Spatial vs. non-spatial eco-evolutionary dynamics in tumor growth model. *Journal of Theoretical Biology*.
- Brown JS, **Cunningham JJ**, Gatenby RA. (2016) Aggregation Effects and Population-based dynamics as a source of therapy resistance in cancer. *PLOS Computational Biology*.
- Lloyd MC, **Cunningham JJ**, Bui MM, Gillies RJ, Brown JS, Gatenby RA. (2016) Darwinian dynamics of intratumoral heterogeneity: random mutations or variable selection forces? *Cancer Research*.
- Brown JS, **Cunningham JJ**, Gatenby RA. (2015) The Multiple Facets of Peto's Paradox: A Life History Model for the Evolution of Cancer Suppression. *Phil. Trans. R. Soc. B*.
- **Cunningham JJ**, Brown JS, Vincent TL, Gatenby RA. (2015) Divergent and convergent evolution in metastases suggest treatment strategies based on specific metastatic sites. *Evolution, Medicine, and Public Health*.
- Gatenby RA, **Cunningham JJ**, Brown JS. (2014) Evolutionary triage governs fitness in driver and passenger mutations and suggests targeting never mutations. *Nature Communications*.
- Johnston KB, Hutchenson KD, Nyffenegger PA, **Cunningham JJ**, Vollk JM. (2014) Ensemble Sensor Inspection: ANOVA with Several Independent Univariate Tests. *Sensors Journal, IEEE*.
- **Cunningham JJ** et al. (2012) Intracellular electric field and pH optimize protein localization and movement. *PLOS ONE*.
- **Cunningham JJ**, Gatenby RA, Brown JS. (2011) Evolutionary Dynamics in Cancer Therapy. *Molecular Pharmaceutics*.
- Hashim AI, Cornnell HH, Ribeiro ML, Abrahams D, **Cunningham JJ**, Lloyd M, Martinez GV, Gatenby RA, Gillies RJ. (2011). Reduction of metastasis using a non-volatile buffer. *Clinical & Experimental Metastasis*.

PRESENTATIONS & CONFERENCES

- Invited lecturer at Yale Institute for Biospheric Studies "Novel Approaches to Combating Therapeutic Resistance" Workshop
- Invited keynote speaker at Lorentz "Understanding Cancer Through Evolutionary Game Theory" Conference
- Speaker at Gordon Research Conference Physics of Cancer "Evolution Based Therapies."
- Invited participant to Kavli Institute for Theoretical Physics at UCSB for Evolution of Drug Resistance program.
- Speaker at the 4th annual PSOC meeting: "Darwinian Dynamics and Current Concepts of Driver and Passenger Mutations"
- Speaker at Electrical Properties of Cells workshop at ASU Center for Convergence of Physical Science and Cancer Biology
- Visiting scientist at the Institute for Systems Biology (2012-2013)

AWARDS AND HONORS

- Convergent Science Physical Oncology: 2017 Outstanding Reviewer of the Year
- Finalist in the NSF 2013 Visualization Challenge with a collaboration with Dynamoid Apps, Seattle WA. "Getting to the Nuclear Pore: Diffusion vs. Electrodynamics."
- Three-time winner of Best Poster Award at annual meetings for the Physical Sciences in Oncology Program, for work on electrostatics and the application of a Darwinian ecology model.

TECHNICAL SKILLS

- MatLab, Java with Eclipse OO Design, R, XML, CUDA, Latex and Spice Automation for Planetariums
- Windows, Linux and UNIX, Utilizing local and remote clusters for large-scale technical computing
- WinCVS, Tortoise CVS, Git (version control systems), Microsoft Office (Word, PowerPoint, Excel and Visio), Latex, and image editing software (GIMP, and Lightroom)

ADDITIONAL ACTIVITIES, INTERESTS & VOLUNTEERING

- Amateur astronomer and radio astronomer (currently rebuilding a 10" telescope for observation) providing Merit Badge requirements for local Blacksburg, VA Boy Scouts dens.
- Served as a Volunteer Science Interpreter at the Pacific Science Center in Seattle with specialized strength in demonstrating and explaining the workings of the particle aquarium (2012).
- Coach and member of the Florida Institute of Technology Ultimate Frisbee Team (2004 – 2007)
- Crew on the Appledore IV Schooner (Summer 2002 – 2004)