

GABRIELA JARAMILLO

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CONTACT INFORMATION

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EMPLOYMENT & EDUCATION

Associate Professor, University of Houston, TX	2024 - Present
Assistant Professor, University of Houston, TX	2018 - 2024
NSF Mathematical Science Postdoctoral Fellow, The University of Arizona, AZ	2015 - 2018
Ph.D. Mathematics, University of Minnesota, MN	2009 - 2015
M.S. Applied Mathematics, Rochester Institute of Tech., NY	2007 - 2009
B.S. Mechanical Engineering, Rochester Institute of Tech., NY	2003 - 2007

GRANTS

Simons Foundations Travel Support for Mathematicians (\$ 42,000) <i>Numerical Methods for Vegetation Models Involving Nonlocal Spread</i>	2023 - 2028
NSF DMS-2307500 (sole PI, \$ 236,370) <i>Understanding How Nonlocal Diffusion Shapes Patterns in Biological Systems</i>	2023 - 2026
NSF DMS-1911742 (sole PI, \$ 175,783) <i>The Effects of Nonlocal Coupling in Oscillatory Media</i>	2019 - 2022

RESEARCH INTERESTS

Nonlinear Partial Differential Equations, Dynamical Systems, and Integro-differential Equations.

PUBLICATIONS

Authors listed alphabetically, as is convention in the Mathematical Sciences, except when prefaced by “*”, where first author is corresponding author. (legend: IF: impact factor).

- L. Cappanera, **G. Jaramillo**, “*The role of boundary constraints in simulating biological systems with nonlocal dispersal.*” In preparation (2024).
- **G. Jaramillo**, C. Meraz, “*Existence of weak solutions for a nonlocal Klausmeier model.*” In preparation (2024).

- **G. Jaramillo**, “*Existence of spiral waves in oscillatory media with nonlocal coupling.*” Submitted (2024). ArXiv link.
- L. Cappanera, **G. Jaramillo**, C. Ward, “*Analysis and simulation of a nonlocal Gray–Scott model.*” SIAM Journal on Applied Mathematics 84.3 (2024): 856-889. (IF:1.9)
- **G. Jaramillo**, Lidia Mrad, Tracy L. Stepien, “*Dynamics of a linearly-perturbed May–Leonard competition model.*” Chaos: An Interdisciplinary Journal of Nonlinear Science 33.6 (2023). (IF: 2.9)
- **G. Jaramillo**, “*Can large inhomogeneities generate target patterns?*” Zeitschrift für angewandte Mathematik und Physik 74.4 (2023): 134. (IF: 2.0)
- **G. Jaramillo**, “*Rotating spirals in oscillatory media with nonlocal interactions and their normal form.*” Discrete and Continuous Dynamical Systems-S 15.9 (2022): 2513-2551. (IF: 1.8)
- * **G. Jaramillo**, L. Cappanera, C. Ward, “*Numerical methods for a diffusive class of nonlocal operators.*” Journal of Scientific Computing 88.1 (2021): 1-40. (IF: 2.5)
- **G. Jaramillo**, S. Venkataramani, “*A modified Split Bregman algorithm for computing microstructures through Young measures.*” Multiscale Modeling & Simulation 19.2 (2021): 886-920. (IF: 1.9)
- **G. Jaramillo**, A. Scheel, Q. Wu, “*The effect of impurities on striped phases.*” Proc. Roy. Soc. Edinb. 149.1 (2019): 131-168. (IF: 1.3)
- **G. Jaramillo**, S. Venkataramani, “*Target patterns in a 2-d array of oscillators with nonlocal coupling.*” Nonlinearity 31.9 (2018): 4162. (IF: 1.7)
- **G. Jaramillo**, A. Scheel, “*Pacemakers in a large array of oscillators with nonlocal coupling.*” J. Differ. Equations 260.3 (2016): 2060-2090. (IF: 2.4)
- **G. Jaramillo**, “*Inhomogeneities in 3 dimensional oscillatory media.*” Netw. Heterog. Media 10.2 (2015) 387-399. (IF: 1.0)
- **G. Jaramillo**, A. Scheel, “*Deformation of striped patterns by inhomogeneities.*” Math. Meth. Appl. Sci. 38.1 (2015): 51-65. (IF: 2.9)
- **G. Jaramillo**, C. O. Lousto, “*Study of multi-black-hole and ring-singularity apparent horizons.*” Phys. Rev. D 84.10 (2011): 104011.(IF: 5.0)

INVITED TALKS

- 2024** *The role of boundary constraints in simulating biological systems with nonlocal dispersal.* AMS-UMI Joint Meeting, Palermo, Italy, July 23-26, 2024.
- 2024** *Spiral waves in oscillatory media with nonlocal coupling.* Gordon Research Conference, Les Diablerets, Switzerland, July 14-19, 2024.
- 2024** *The role of boundary constraints in simulating biological systems with nonlocal dispersal.* SIAM Conference on Nonlinear Waves and Coherent Structures, Baltimore, MD, June 24-27, 2024.
- 2024** *Can Large Defects Generate target patterns in oscillatory media?* SIAM Conference on Mathematical Aspects of Material Science, Pittsburgh, PA, May 19-23, 2024
- 2024** *Existence of spiral waves in oscillatory media with nonlocal coupling.* Second Joint Alabama–Florida Conference on Differential Equations, Dynamical Systems and Applications, Florida State University, Tallahassee, FL, May 18-19, 2024

- 2024** *The role of boundary constraints in simulating biological systems with nonlocal dispersal.* ICERM Workshop on Nonlocality: Challenges in Modeling and Simulation, Brown University, Providence RI, April 15-19, 2024.
- 2023** *Patterns in oscillatory media with nonlocal coupling.* KSU Colloquium, Kennesaw State University (Zoom), November 10, 2023.
- 2023** *Patterns in oscillatory media with nonlocal coupling.* SIAM TX-LA Sectional Meeting, University of Louisiana, Lafayette, LA, November 3-5, 2023.
- 2023** *Spiral waves and spiral chimeras in nonlocal oscillatory media.* Continuum Mechanics Seminar (CMS), University of Nebraska-Lincoln, Lincoln NE, October 19, 2023.
- 2023** *Spiral waves in nonlocal oscillatory media.* SIAM Conference on Applications of Dynamical Systems, Portland, OR, May 14-18, 2023.
- 2023** *Analysis and simulations for a nonlocal 1-d Gray-Scott model.* SIAM/ Numerical Analysis Seminar, University of Florida, Gainesville, FL, April 7, 2023
- 2023** *Analysis and simulations for a nonlocal 1-d Gray-Scott model.* Second Drexel Waves Workshop, Drexel University, Philadelphia, PA, March 30-31, 2023
- 2023** *Existence of weak solutions and numerical simulations for a nonlocal 1-d Gray-Scott model.* Joint Math Meetings, Boston, US, January 4-7, 2023.
- 2023** *Can large inhomogeneities generate target patterns?* Joint Math Meetings, Boston, US, January 4-7, 2023.
- 2022** *Spiral waves in nonlocal oscillatory media.* SIAM Conference on Nonlinear Waves and Coherent Structures, Bremen, Germany, August 30- September 2, 2022.
- 2022** *Spiral waves in oscillatory media with nonlocal coupling.* SIAM Conference on the Life Sciences, Pittsburgh PA, July 11-July 14, 2022. (Presented online).
- 2022** *Existence of spiral waves in oscillatory media via functional analysis.* 12th Annual IMACS Conference, Athens GA, March 30-April 1, 2022.
- 2022** *Spiral waves in oscillatory media with nonlocal coupling.* UTK-PDE Seminar, Online, March 24, 2022.
- 2022** *Existence of spiral waves in oscillatory media via functional analysis.* ICMC Summer Meeting on Differential Equations, Online, January 31-February 2, 2022.
- 2021** *A numerical method for a diffusive class of nonlocal operators.* Nonlocal Codes, Online via Zoom, December 22021.
- 2021** *A normal form for rotating waves in oscillatory media with nonlocal interactions.* WPI Analysis-PDE Seminar, Online via Zoom, December 1, 2021.
- 2021** *A normal form for rotating waves in oscillatory media with nonlocal interactions.* Dynamic Days XL, Nice, France/ Online, August 23-27, 2021.
- 2021** *A normal form for rotating waves in oscillatory media with nonlocal interactions.* Dynamics of Waves and Patterns, Oberwolfach, Germany/ Online, August 8-14, 2021.
- 2020** *A normal form for rotating waves solutions in oscillatory media with nonlocal coupling.* One World Dynamics Seminar, Online via Zoom, September 2020.

- 2020** *A numerical method for a diffusive class of nonlocal operators.* MU-MST Analysis Seminar via zoom, July 2020.
- 2020** *Some tools for understanding pattern formation in oscillatory media with nonlocal coupling.* Analysis, Dynamics, and Applications Seminar, University of Arizona, AZ, March 2020.
- 2019** *Moving inhomogeneities in oscillating chemical reactions.* SIAM Conference on PDE, La Quinta, CA, December 11-14, 2019.
- 2019** *Moving inhomogeneities in oscillating chemical reactions.* SIAM Conference on PDE TX-LA, Southern Methodist University, Dallas, TX, November 1-3, 2019.
- 2019** *Rotating spirals in oscillatory media with nonlocal coupling.* Equadiff 2019, Leiden, The Netherlands, July 8-12, 2019.
- 2019** *Stationary and moving defects in oscillatory media.* SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 19-23, 2019.
- 2018** *Heterogeneities in oscillatory media.* SIAM Annual Meeting, Portland, OR, July 9-13, 2018.
- 2018** *Moving inhomogeneities in oscillating chemical reactions.* SIAM Conference on Nonlinear Waves and Coherent Structures, Orange, CA, June 11-14, 2018.
- 2017** *Moving inhomogeneities in chemical oscillations.* SIAM Conference on Analysis of Partial Differential Equations, Baltimore, MD, December 9-12, 2017.
- 2017** *Target waves in a 2-d viscous eikonal equation.* SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 21-25, 2017.
- 2016** *Pacemakers in a 2-d array of oscillators with nonlocal coupling.* SIAM Conference on Nonlinear Waves and Coherent Structures, Philadelphia, PA, August 8-14, 2016.
- 2015** *Inhomogeneities in spatially extended pattern forming systems.* SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ, December 7-10, 2015.
- 2015** *Pacemakers in a large array of oscillators with nonlocal coupling.* Conference on PDEs and Free Boundary Problems, University of Pittsburgh, PA, March 11-14, 2015.
- 2014** *Pacemakers in a large array of oscillators with nonlocal coupling.* SIAM Conference on Nonlinear Waves and Coherent Structures, Churchill College, University of Cambridge, UK, August 11-4, 2014.
- 2014** *Defects in chemical oscillations and related phenomena.* School of Mathematics Open House, University of Minnesota, MN, March 31, 2014.

CONTRIBUTED TALKS

- 2020** *A brief introduction to pattern formation.* Graduate Student Seminar, University of Houston, TX, October 2020.
- 2019** AWM Seminar, Department of Mathematics, University of Houston, TX, March 2019.
- 2019** *Pattern formation in oscillatory media.* Networks Seminar, University of Houston, TX, January 2019.

- 2018** *Two methods for approximating microstructures*. PDE Seminar, University of Houston, TX, October 2018.
- 2017** *Ribbons of infinite length and more*. APS March Meeting, New Orleans, LA, March 13-17, 2017.
- 2016** *2-D array of oscillators with nonlocal coupling*. AMS Fall Central Sectional Meeting, University of St. Thomas, Minneapolis, MN, October 28-30, 2016.
- 2015** *The effects of inhomogeneities in spatially extended pattern forming systems*. 3-Min Thesis Session, SIAM Student Chapter University of Minnesota, MN, April 9, 2015.
- 2014** *Patterns and inhomogeneities in spatially extended systems*. Boston University / Keio University Workshop, Boston University, September 15-19, 2014.
- 2013** *Localized perturbations of the complex Ginzburg-Landau equation: recovering Fredholm properties via Kondratiev spaces*. SIAM Conference on Analysis of Partial Differential Equations, Orlando, FL, December 7-10, 2013.

POSTERS & CONFERENCES

- *Modified Split-Bregman iteration for problems in elasticity* (poster). Multiscale Theory and Computation, Minneapolis MN, September 23-25, 2017.
- *Pacemakers in a large array of oscillators with nonlocal coupling* (poster). SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 17-21, 2015.
- *Pacemakers in a large array of oscillators with nonlocal coupling* (poster). KUMU Conference on PDE's, Dynamical Systems and Applications, Lawrence, KS, April 18-19, 2015.
- *Pacemakers in a large array of oscillators with nonlocal coupling* (poster). Algebraic Topology in Dynamics, Differential Equations, and Experimental Data, IMA, Minneapolis MN, February 10-14, 2014.
- *Localized perturbations of striped patterns: recovering Fredholm properties via Kondratiev spaces* (poster). Joint US-Japan Conference for Young Researchers on Interactions among Localized Patterns in Dissipative Systems, IMA, Minneapolis, MN, June 3-7, 2013.
- *Localized perturbations of striped patterns: recovering Fredholm properties via Kondratiev spaces* (poster). First International Conference on Dynamics of Differential Equations, Georgia Tech, Atlanta, GA, March 16-20, 2013.
- Career Options for Women in Mathematical Science, IMA, Minneapolis, MN, March 3-5, 2013.

TRAINING & WORKSHOPS

- *Second Drexel Waves Workshop*, Drexel University, Philadelphia, PA, March 30-31, 2023.
- *Oberwolfach Workshop on Dynamics of Waves and Patterns* (hybrid meeting), Oberwolfach, Germany, August 8-14, 2021.
- *AMS Short Course on Mathematical and Computational Methods for Complex Social Systems*, online, January 3-5, 2021.
- *Nonlocal Codes*, online, December 7, 2021.

- *SIMIODE'S NSF Model Instructors in Differential Equations (MINDE) Workshop*, George Fox University, Newburg, OR, July 22-26, 2019.

AWARDS

- Teaching and Service Prize for non-tenure faculty, U. Arizona (Fall 2016 - Spring 2017).
- SIAM Early Career Travel Award for the *Conference on Applications of Dynamical Systems*, Snowbird, UT, May 21-25, 2017.
- NSF Mathematical Science Postdoctoral Fellowship (2015-2018).
- SIAM Student Travel Award for the *Conference on Applications of Dynamical Systems*, Snowbird, UT, May 17-21, 2015.
- Sigma Xi Graduate Research Award, U. Minnesota (2014).
- Doctoral Dissertation Fellowship Award, U. Minnesota (Fall 2014 - Spring 2015).
- SIAM Student Travel Award for the *Conference on Nonlinear Waves and Coherent Structures*, Cambridge, UK, August 11-14, 2014.

MENTORING

Legend: (*)Indicates student identifies as belonging to a minority group. (F): female, (M): male.

Postdocs

- Cory Ward (M)
Numerical methods for nonlocal operators Fall 2019 - March 2020
(Now at Allstate)

Graduate Students

- Cristian Meraz (*M)
Analysis and simulations of a nonlocal Klausmeier model Fall 2022-Present

Undergraduate Students

- John Salcedo (M)
PURS: Understanding Dispersal in Biological Systems Spring 2024
- Sameel Siddiqi (*M), Kevin Sony (*M)
REU: Localized Target Patterns in Oscillatory Media Summer 2023
- Matthew Nolen (M)
REU: Turing Patterns in a Marsh Ecosystem Spring 2023
- Jared Solomon (M)
REU: Patterns in Oscillatory Media Summer 2022
- Daisy Gomez (*F), Artin Seifzadeh (*M), Michelle Tran (*F)
REU: Spiral Waves in Oscillatory Media Summer 2021
- Shravani Deo (*F) and Ricardo Del Rio (*M)
REU: Nonlocal coupling effects on a network of neurons Summer 2020
(Shravani is now a graduate student at Rice University)

- Shravani Deo (*F) and Ricardo Del Rio (*M)
Spiral waves in cellular automata with nonlocal interactions Fall 2019 - Spring 2020
- Catherine Weibel (F)
Ammonite fossil curves: An exploration of fractal dimension Fall 2018
Honors project for the 'Introduction to Dynamical Systems' course (Math 454) at the University of Arizona.
- Erica Bosset (F) and Jason Dominick (M)
Stability regions for a biologically inspired neural network Fall 2017
Independent Study, University of Arizona.

TEACHING EXPERIENCE

University of Houston

Math 6326: Partial Differential Equations (Graduate Course)

This graduate level course introduces four main types of partial differential equations: parabolic, elliptic, hyperbolic and transport equations. The focus is on existence and uniqueness theory. The course will touch on applications and a brief introduction to numerical methods: finite differences, finite volume, and finite elements.

(Fall 2024: 9 graduate students, Fall 2021: 14 graduate students)

Math 4335: Introduction to PDE I

Method of characteristics, derivation of transport, heat, and wave equation, initial and boundary value problems, Fourier series, and harmonic functions.

(Fall 2023: 15 undergraduates, Spring 2023: 15 undergraduates, Fall 2022: 14 undergraduates, Fall 2019: 27 undergraduates).

Math 3334: Advanced Multivariable Calculus

Basic theory underlying multivariable calculus: a brief overview of the topology of n-space, limits, continuity and differentiation of functions of several variables, Taylor's theorem, the inverse and implicit function theorems, integration.

(Spring 2023: 12 undergraduates, Spring 2022: 15 undergraduates)

Math 2318: Linear Algebra

Solutions of systems of linear equations, matrices, vector spaces, linear transformations, similarity, eigenvalues and eigenvectors.

(Spring 2022: 25 undergraduates)

Math 3363: Introduction to Partial Differential Equations

Partial differential equations and boundary value problems, Fourier series, the heat equation, vibrations of continuous systems, the potential equation, spectral methods.

(Spring 2021: 90 undergraduates).

Math 3331: Differential Equations

Systems of ordinary differential equations; existence, uniqueness and stability of solutions; initial value problems; bifurcation theory; Jordan form; higher order equations; Laplace transforms.

(Spring 2021: 76 undergraduates)

Math 6360: Applicable Analysis

Solvability of finite dimensional, integral, differential, and operator equations, contraction mapping principle, theory of integration, Hilbert and Banach spaces, and calculus of variations.

(Canceled due to low enrollment)

Math 4362: Theory of Diff. Eq. and Nonlinear Dynamics

ODE as models for systems in biology, physics, and elsewhere. Existence and uniqueness of solutions, linear theory, stability of solutions and bifurcations in parameter space.

(Spring 2024: 10 undergraduates, Spring 2020: 20 undergraduates)

Math 1451: Accelerated Calculus II

Fast paced course covering vectors, equations of lines and planes, multivariable calculus, Greens' and Stokes' Theorem, and applications.

(Spring 2019: 22 undergraduates)

Math 1450: Accelerated Calculus I

Fast paced course covering derivatives, integrals, sequences and series, and applications.

(Fall 2018: 37 undergraduates)

The University of Arizona

Advanced ODE:

Spring 2018

General theory of initial value problems, linear systems and phase portraits, linearization of nonlinear systems, stability and bifurcation theory, an introduction to chaotic dynamics.

UTA Seminar:

Fall 2017

The seminar is geared towards undergraduate students who are working as teaching assistants. It consists of a series of workshops designed to provide training in tutoring, grading, and lecturing. It culminates with students presentations on a math subject of their choice.

Applied PDE:

Spring 2017

Sturm-Liouville operators, separation of variables, distributions, Green's functions, Fourier series, Fourier Transform, and the method of characteristics. Applications include wave, diffusion, and Laplace's equation.

Analysis of ODE:

Fall 2016

Linear and nonlinear equations, basic solution techniques, qualitative and numerical methods, systems of equations, applications drawn from physical, biological and social sciences.

University of Minnesota

Advanced Calculus I:

Summer 2014

Axioms for the real numbers. Techniques of proof for limits, continuity, uniform convergence. Rigorous treatment of differential/integral calculus for single-variable functions.

College Algebra:

Summer 2011

Algebra, analytic geometry explored in greater depth than is usually done in three years of high school mathematics.

Teaching Assistant:

Calculus I	Spring 2015
CSE Multivariable Calculus	Fall 2011-Spring 2013
Differential Equations and Linear Algebra	Spring 2011
CSE Calculus II	Fall 2010
Calculus II	Spring 2010
Calculus I	Fall 2009

SERVICE

University of Houston Committees

- Undergraduate Studies Committee Sept 2023- Spring 2024
- Academic Honesty Panel May 2023
- Colloquium committee Fall 2022 - Present
- Applied Math hiring committee Fall 2022-Spring 2023
- Math Bio and Networks Science hiring committee Fall 2021-Spring 2022
- Revamp/Combine Math 3334 and Math 3335 Spring 2020
- Statistics and Data Analytics hiring committee Fall2019- Spring 2020

Other Service Committees

- SIAM Conf. on Applications of Dynamical Systems May 23-27, 2021
- NSF panel Spring 2020

Ph.D. Committee Served On

- Thuyen Trien Dang, Department of Mathematics, University of Houston Spring 2022

Organizer:

- PDE Seminar, U. Houston Fall 2020-Present
- Local committee for SIAM TX-LX Annual Meeting November 4-6, 2022
- Analysis, Dynamics, and Applications Seminar, U. Arizona Fall 2016 - Spring 2018.
- Spectral and Dynamical Stability Seminar, U. Minnesota, Fall 2013- Spring 2014.

Minisymposium Organizer:

- Co-organizer of SIAM minisymposium, *Nonlocal equations: analysis, simulation, and applications*, SIAM TX-LA Annual Meeting, Baylor University, Waco, TX, October 11-13, 2024.
- Co-organizer of SIAM minisymposium, *Pattern formation in biological applications*, SIAM Conference on Nonlinear Waves and Coherent Structures, Baltimore, MD, June 24-27, 2024.
- Co-organizer of Equadiff minisymposium, *Nonlinear waves in reaction diffusion systems*, Equadiff 2024, Karlstads Universitet, Karlstads, Sweden, June 10-14, 2024.

- Co-organizer of SIAM minisymposium, *Discrete and continuous systems with nonlocal interactions*, SIAM Conference on Nonlinear Waves and Coherent Structures, Bremen, Germany, August 30-September 2, 2022.
- Co-organizer of SIAM minisymposium, *Mechanisms underlying dynamical processes in cellular and systems physiology*, SIAM Conference on Applications of Dynamical Systems, Virtual Conference, May 23-27, 2021.
- Co-organizer of SIAM minisymposium, *Discrete and continuous systems with nonlocal interactions*, SIAM Conference on Nonlinear Waves and Coherent Structures, Bremen, Germany, July 27-30, 2020. (Cancelled due to Covid 19).
- Co-organizer of SIAM minisymposium, *Defects and inhomogeneities in spatially extended systems*, SIAM Annual Meeting, Portland, OR, July 9-13, 2018.
- Co-organizer of SIAM minisymposium, *PDE models for pattern forming systems*, SIAM Conference on Analysis of Partial Differential Equations, Baltimore, MD, December 9-12, 2017.
- Co-organizer of SIAM minisymposium, *Nonlocal behavior in biological applications*, SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 21-25, 2017.

Referee:

- Proceedings of the Royal Society A, Nonlinearity, SIAM Review, SIAM Journal on Mathematical Analysis, SIAM Journal on Applied Dynamical Systems, SIAM Journal on Applied Mathematics, Journal of the European Mathematical Society, Physica D.

Outreach:

- Alliance Mentor/ Participant of AGE P STRIDES September 2023-Present.
AGEP: Alliance for Graduate Education and Professional Development
STRIDES: Strengthening Training and Resources for Inclusion in Data Engineering and Sciences
- Faculty adviser for AMS student chapter, U. Houston April 2019-Present
- Organizer of Undergraduate Math Modeling Club Spring 2022 -Present
- Organizer of Houston Math Teachers' Circle Fall 2019-Spring 2020
- Mentor for UH/HISD/COE STEM Summer Camp July 16-17, 2019
- Co-organizer of Math Teacher's Circle, U. Arizona Fall 2016 - Spring 2018

PROFESSIONAL EXPERIENCE

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- Stanley Bostitch, East Greenwich RI* June - November 2006
- Design Engineer (Co-op Assignment)
- Performed stress analysis for nail gun components using software package ANSYS
- Corning Tropel, Fairport NY* March - August 2005
- Design Engineer (Co-op Assignment)
- Created detailed drawings of mechanical assemblies for metrology instruments
 - Contributed in the design of mechanical components for new metrology instruments