

MALIK, TUFAIL MUHAMMAD

McCain Postdoctoral Research Associate, Math & CS, Mount Allison University

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Education

PhD Mathematics (2007) - Arizona State University, Tempe AZ, USA

MS Mathematics with Computer Science option (2002) - Ohio Univ., Athens OH, USA

MSc Mathematics (1994) - Quaid-i-Azam University, Islamabad, Pakistan

Research Interests

Mathematical models in biology using ordinary differential equations, Modelling of non-linear dynamical systems, Models of resource optimization in photosynthesis and photoacclimation in phytoplankton, Models of adaptive microbe growth, Microbial quiescence, Disease latency.

Current Research: Photoacclimation in Unicellular Phytoplankton

I build and analyze ordinary differential equations models of photosynthetic machinery to investigate the evolution and ecology of phytoplankton with different light harvesting and resource allocation strategies aimed at acclimation to changing irradiance levels. The results of this work will be used to predict how marine primary producers (essentially microscopic plants) will respond to changing temperatures and ocean circulation. This is essential to understanding feedbacks between climate change and life on Earth.

Postdoc Supervisors

Dr. Andrew Irwin (Math & CS), Dr. Zoe Finkel (Environmental Science)

PhD Thesis

Title: Microbial Quiescence - A Survival Strategy In Environmental Stress

Supervisor: Dr. Hal Smith

Academic Appointments

Postdoctoral Research Associate, Mount Allison University (July 2007 - June 2009)

Graduate Teaching Associate & Honors Disciplinary Faculty, Arizona State University (Aug.2002 – June 2007)

Graduate Teaching Associate, Ohio University (Aug.1998 – May2002)

Teaching Assistant, GIK Institute of Engineering Sciences and Technology, Pakistan (Aug.1996 – July 1998)

Refereed Publications

T.Malik, H.Smith "A Resource-Based Model of Microbial Quiescence", J. Math. Biol. 2006, 53:2 231-252

T.Malik, H.Smith "Does Dormancy increase Fitness of Bacterial Populations in Time-Varying Environments?", Bul. Math. Biol. 2008, 70:4 1140-1162

T.Malik, A.Irwin, Z.Finkel "A Model of Photoacclimation in Phytoplankton", in preparation

T.Malik, A.Irwin, Z.Finkel "A dynamic model of photoacclimation in unicellular phytoplankton", in preparation

Research Tools Used - A Synopsis

Autonomous and nonautonomous (periodic and random) dynamical systems based on ordinary differential equations, Equilibrium analysis, Stability Theory, Floquet Theory, Perron-Frobenius Theory, Monotone Dynamical Systems, Theory of the Chemostat, Singular Perturbation Theory, Random Dynamical Systems and Dynamic Optimization, Matlab (including ODE solvers and Simulink) and Maple for numerical simulations and symbolic computations.

Research Related Courses (PhD)

Ordinary Differential Equations, Mathematical Biology, Dynamical Systems Methods in Fluid Dynamics, Infinite Dimensional Dynamical Systems, Applied Delay Differential Equations, Mathematical Models of Physiological Systems, Brain Dynamics.

Research Workshops Attended

Mathematical Models in Biology and Medicine, Arizona State University (2006)

Microbial Ecology, Mathematical Biosciences Institute, Ohio State University (2006)

Discrete Dynamical Systems & Their Applications to Population Dynamics, University of Wyoming (2003)

Invited Talks

Invitation to Canadian Mathematical Society Annual Meeting, June 2009
CMS-MITACS Joint Conference Winnipeg, Manitoba, May 31 - June 3, 2007
American Mathematical Society Spring Western Section Meeting, Tucson, AZ, April 21-22, 2007
Joint SIAM-SMB Conference on Life Sciences, Raleigh, NC, July 31-Aug. 4, 2006
SIAM Annual Meeting, Boston, MA, July 10-14 2006
Mathematical Biology Seminar, McMaster University, Hamilton, Canada, March 13th 2006
Institute of Industrial Mathematical Sciences(IIMS) Seminar, University of Manitoba, March 7th 2006
Workshop on Mathematical Models in Biology and Medicine, Arizona State University, Feb. 2006
Arizona Days Conference, Los Alamos NM, Jan. 2006
Canadian Mathematical Society's Annual Meeting, Victoria BC, Dec. 2005
Mathematical Biology Seminar, Arizona State University, Oct.14,2005

Courses Taught

Mount Allison University:

Differential Equations, Multivariable Calculus, CalculusII (Essential Calculus; Early Transcendentals)
Technology Used: Maple, DETools

Arizona State University:

Brief Calculus, Pre-Calculus, CalculusI & III, College Algebra
Technology Used: Maple, WeBWork(online homework system), Graphing Calculator

Ohio University:

Introductory Probability and Statistics, Pre-Calculus, Calculus, College Algebra

Teaching Preference - Undergraduate

Differential Equations, Dynamical Systems, Linear Algebra, Real/Complex Analysis, Numerical Methods, Mathematical Modeling, Mathematical Biology, Calculus, Introductory Probability and Statistics.

Teaching Preference - Graduate

Dynamical Systems, Ordinary & Delay Differential Equations, Mathematical Biology, Numerical Analysis, Mathematical Modeling, Calculus, Special Topics (including Perron-Frobenius Theory, Floquet Theory, Theory of the Chemostat, Monotone Dynamical Systems).

Teaching Training

Purdy Crawford Teaching Centre (PCTC) Workshops, 2008, Mount Allison University
Preparing Future Faculty Program, 2005, ASU
TA Training Workshop, Summer 2002, ASU
Teaching Seminar, Fall 2002, ASU
TA Training Workshop, Summer 1998, Ohio University
Teaching Seminar, Fall 1998, Ohio University

Mentorship Experience

NBIF(New Brunswick Innovation Fund). Research Assistantship Initiative (pending - to supervise an undergraduate student over the summer) \$5000
TA Training Leader, Math TA Training Workshop, Arizona State University (Summer 2005, 2006)
Trained new Teaching Associates by supervising lecture preparation and observing their teaching. Reviewed, evaluated and recommended them to the department for appropriate teaching assignments.
Tutor, Mathematics Tutor Center, Arizona State University (Spring & Fall 2003, Fall 2004)

Research Awards & Honors

Graduate Student Research Award, Arizona State University (2006)

Teaching Awards & Honors

Teaching Excellence Award, Arizona State University (2007)
Outstanding Teaching Assistant Award, Arizona State University (2005)
Outstanding Teaching Assistant Award, Ohio University (2002)
Certificate of Appreciation, Barrett Honors College, Arizona State University (2006-2007)
Wexler Teaching Award nomination, Arizona State University (2004)

Service

Member ASU Mathematics Department's Webpage Committee 2005-2006

On the committee of five members with four from the faculty, I represented over a hundred graduate students of the department in the project to redesign the department's website.

Member Poster Session Judge Committee, Workshop on Mathematical Models in Biology and Medicine, Arizona State University, Feb. 2006

Computer Programming Skills

Matlab[†](including Simulink), Maple[†], C, C++, Visual Basic, HTML

[†]using in research and teaching

Misc. Awards & Honors

Graduate College Award for Tuition (GCAT), Arizona State University (2004)

A one semester special fee waiver awarded by the Director of Graduate Studies, Mathematics Department, based on performance in graduate studies.

References

(Teaching & Research) Dr. Andrew Irwin, Mount Allison University, airwin@mta.ca, 506-364-2536

(Research) Dr. Hal Smith, Arizona State University, halsmith@asu.edu, 480-965-3743

(Research) Dr. Yang Kuang, Arizona State University, kuang@asu.edu, 480-965-6915

(Research) Dr. Carlos Castillo-Chavez, Arizona State University, chavez@math.asu.edu, 480-965-1151

(Teaching) Dr. Katalin Kolossa, Arizona State University, kolossa@math.asu.edu, 480-965-6437

(Teaching) Dr. Don Jones, Arizona State University, dajones@math.asu.edu, 480-965-0083

(Teaching) Dr. Jeff Ollerhead, Dean of Science, Mount Allison, jollerhead@mta.ca, 506-364-2302