BIOGRAPHICAL SKETCH

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NAME: Louis J. Gross

eRA COMMONS USER NAME (credential, e.g., agency login): grosslou

POSITION TITLE: Alvin and Sally Beaman Distinguished Professor of Ecology & Evolutionary Biology and Mathematics

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Drexel University, Philadelphia, PA.	B.S.	06/1974	Mathematics
Cornell University, Ithaca, NY.	Ph.D.	07/1979	Applied Mathematics

A. Personal Statement

I have been a leader in the application of mathematical modeling in various areas of biology. Methods applied cover the breadth of applied mathematics, with particular expertise in dynamical systems, stochastic processes, agent-based modeling and parallel computation. Over the past three decades I have directed and organized many short courses and workshops devoted to enhancing the quantitative training of life scientists, and as Director of the National Institute for Mathematical and Biological Synthesis I oversee one of the leading international centers for research and education at the interface of mathematics and biology. My role in this project will be to provide advice to the key faculty involved from several different University units, to direct the efforts of the two staff members acting as project manager and as project evaluation facilitator, and to link this effort to the variety of ones I am involved with around the US that are focused on enhancing the quantitative education of biologists.

B. Positions and Honors

Positions and Employment

1979-1985 Assistant Professor, Department of Mathematics and Graduate Program in Ecology, University of Tennessee, Knoxville, TN
1982 (Fall) Visiting Biomathematics Researcher, Grassland Research Institute, Berkshire, UK
1982-1984 Faculty Research Participant (Summers), Atmospheric Turbulence and Diffusion Lab, NOAA
1986 (Summer) Visiting Biomathematician and Distinguished Visitor, Botany and
1987 (Summer) Mathematics Departments, University of California, Davis, California
1985-1992 Associate Professor, Department of Mathematics and Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee
1992- 1997 Professor, Department of Mathematics and Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee
1997- Professor, Departments of Ecology and Evolutionary Biology and Mathematics, University of Tennessee, Knoxville, TN

1998 - Director, The Institute for Environmental Modeling, University of Tennessee
2008 - 2011 James R. Cox Distinguished Professor of Ecology and Evolutionary Biology and Mathematics
2008- 2015 Director, National Institute for Mathematical and Biological Synthesis
2010- Alvin and Sally Beaman Distinguished Professor of Ecology & Evolutionary Biology and Mathematics
2015-2017 Director Emeritus, National Institute for Mathematical and Biological Synthesis
2017- Director, National Institute for Mathematical and Biological Synthesis

Other Experience

2000-2001 Vice Chair, Ecological Society of America, Theoretical Ecology Section
2000-2002 National Research Council: Mathematics and Computer Science Panel Member, Bio2010 Committee on Undergraduate Preparation for Future Biology Researchers
2001-2002 Chair, Ecological Society of America, Theoretical Ecology Section
2002-2003 President-Elect, Society for Mathematical Biology
2002-2003 National Research Council: Chair, Committee on Education in Biocomplexity Research
2003-2005 President, Society for Mathematical Biology
2004-2005 National Research Council, Committee on Environmental Decision Making: Principles and Criteria for Models
2004-2005 Chair, Board of Governors, Mathematical Biosciences Institute (Ohio State University)
2008 Annual Meeting Program Chair and Committee co-Chair, Ecological Society of America
2008-2014 Board on Life Sciences Member, National Academies and National Research Council
2009-2012 Treasurer, American Institute of Biological Sciences
2014 Director, National Science Foundation IDEAS Lab in Biology Education
2015-present Advisory Board, Quantitative Undergraduate Biology Education and Synthesis (QUBESHub.org)
2016-2017 National Academies, Committee on Envisioning the Data Science Discipline: the Undergraduate Perspective

Honors

1992-2001 Science Alliance Center of Excellence Award, University of Tennessee
1999 Chancellor's Research Scholar, University of Tennessee
2004 Top 10 Tennessee Scientists, Tennessee Business Magazine
2006 Distinguished Scientist Award, American Institute of Biological Sciences
2009 Elected Fellow, Biological Sciences Section, American Association for the Advancement of Science
2017 Elected Fellow, Society for Mathematical Biology
2018 Southeastern Conference Faculty Achievement Award

C. Contributions to Science

1. My initial research endeavors focused on developing new models and methods to analyze the dynamics of perhaps the single most important biological process on our planet – photosynthesis. This involved collaborations with several experimental and field biologists and developed the earliest papers that have fostered an entire enterprise of plant research association with dynamics of responses of physiological processes.

a. Gross, L. J. and B. F. Chabot. 1979. Time course of photosynthetic response to changes in incident light energy. *Plant Physiology* **63**:1033-1038.
b. Gross, L. J. 1981. On the dynamics of internal leaf carbon dioxide uptake. *Journal of Mathematical Biology* **11**:181-191.
c. Gross, L. J. 1982. Photosynthetic dynamics in varying light environments: A model and its application to whole leaf carbon gain. *Ecology* **63**:84-93
d. Gross, L. J., M. U. F. Kirschbaum, and R. W. Pearcy. 1991. A dynamic model of photosynthesis in varying light taking account of stomatal conductance, C3-cycle intermediates, photorespiration, and Rubisco activation. *Plant, Cell and Environment* **14**:881-893.

2. Over a period of approximately 20 years I was the co-leader of a team that developed one of the most

extensive ecological modeling projects ever attempted, the Across Trophic Level Systems Simulation (ATLSS). This provided essentially the only detailed input to the Everglades restoration project focused on potential impacts of changes in management of hydrology on the biota of south Florida freshwater systems. This also involved extensive development of novel computational methods for spatially-explicit ecological models operating at multiple time scales.

a. Abbott, C. A., M. W. Berry, E. J. Comiskey, L. J. Gross and H.-K. Luh. 1997. Computational models of white-tailed deer in the Florida Everglades. *IEEE Computational Science and Engineering* **4**:60-72.
b. DeAngelis, D. L., L. J. Gross, M. A. Huston, W. F. Wolff, D. M. Fleming, E. J. Comiskey, and S. M. Sylvester. 1998. Landscape modeling for Everglades ecosystem restoration". *Ecosystems* **1**:64-75.
c. Curnutt, J. L., E.J. Comiskey, M. P. Nott and L. J. Gross. 2000. Landscape-based spatially explicit species index models for Everglades restoration. *Ecological Applications* **10**:1849-1860.
d. Fuller, M. M., L. J. Gross, S. M. Duke-Sylvester and M. Palmer. 2008. Testing the robustness of management decisions to uncertainty: Everglades restoration scenarios. *Ecological Applications.* **18**:711-723.

3. Over the course of two decades, with support from a variety of funding agencies, I have led the development of new mathematical and computational methods for spatial control – what to do, where to do it, when to do it, and how to assess the resulting solutions – for problems in epidemiology, invasive species management and conservation biology. This included the first paper to develop optimal control methods for an agent-based model.

a. Salinas, R. A., S. Lenhart and L. J. Gross. 2005. Control of a metapopulation harvesting model for black bears. *Natural Resource Modeling* **18**:307-321
b. Whittle, A. J., S. Lenhart and L. J. Gross. 2007. Optimal control for management of an invasive plant species". *Mathematical Biosciences and Engineering* **4**:101-112.
c. Asano, E. L. J. Gross, S. Lenhart and L. A. Real. 2008. Optimal control of vaccine distribution in a rabies metapopulation model. *Mathematical Biosciences and Engineering* **5**:219-238
d. Federico, P., L. J. Gross, S. Lenhart, and D. Ryan. 2013. Optimal control in individual-based models: implications from aggregated methods. *American Naturalist* **181**: 64-77

4. In a collaboration with several plant biologists I have developed and evaluated a collection of models in vegetation science to provide a theory for the distribution and maintenance of savannas, which compose approximately 20% of the vegetated land area of the planet. These efforts were closely connected to analysis of large spatial datasets for plant system distribution.

a. Beckage, B., W. J. Platt and L. J. Gross. 2009. Vegetation, fire, and feedbacks: a disturbance-mediated model of savannas. *American Naturalist* **174**: 805-818
b. Beckage, B., L. J Gross and W. J. Platt. 2011. Grass feedbacks on fire stabilize savannas. *Ecological Modelling* **222**: 2227-2233
c. Beckage, B., L. J. Gross, W. J. Platt, W. Godsoe and D. Simberloff. 2012. Individual variation and weak neutrality as determinants of forest diversity. *Frontiers of Biogeography* **3**:145-154.
d. Bucini, G., B. Beckage, and L. J. Gross. 2017. Climate seasonality, fire and global patterns of tree cover. *Frontiers of Biogeography* **9**(2): 1-15

5. Over my career I have devoted significant effort to enhancing the quantitative training of life science students and researchers across all levels of the educational hierarchy. I developed a course sequence in mathematics for entering students in the life sciences which has been offered for over 20 years, taught by a diverse group of faculty, lecturers and graduate students, taken by over 2000 students and acknowledged by the National Academy of Sciences in a major report on undergraduate biology education (BIO2010) as one of the best developed examples of interdisciplinary training in biology. These educational efforts led to a textbook co-authored with a former graduate student, and the major handbook for graduate students interested in theoretical ecology.

a. Gross, L. J. 2000. Education for a biocomplex future. *Science* **288**:807.
b. Brewer, C. A. and L. J. Gross. 2003. Training ecologists to think with uncertainty in mind. *Ecology* **84**:1412-1414

c. Hastings, A. and L. J Gross (editors). ***Encyclopedia of Theoretical Ecology.*** University of California Press (2012).
d. Bodine, E., S. Lenhart and L. J. Gross. ***Mathematics for the Life Sciences.*** Princeton University Press (2014).

D. Additional Information: Research Support and/or Scholastic Performance

ONGOING

Cooperative Agreement EF-0832858 9/1/08-8/31/14 and DBI-1300426 9/1/13-8/31/18
National Science Foundation Role: PI
National Institute for Mathematical and Biological Synthesis
This is a Synthesis Center at the interface of mathematics and biology sponsored by the NSF, Department of Homeland Security and the Department of Agriculture. I am the Director.

Award HRD-155039 9/1/16-8/31/18
National Science Foundation Role: PI
DCL: NSF INCLUDES Conference on Multi-Scale Evaluation in STEM Education
This effort has involved the development of a set of webinars, tutorials and a conference on evaluation methods for projects operating at multiple scales involving broadening participation in STEM.

Contract 4000110008 9/1/2011-8/31/2018
US Department of Energy, UT-Battelle, ORNL Role: PI
EPA Risk - Environment Assessment and Decision Analysis
This effort has involved the development of a collection of web-based tools utilizing an array of chemical risk models to serve stakeholder needs from across the US related to human health risks and ecological system risks arising from toxicant exposure.

COMPLETED

IIS-0427471 8/1/04-9/1/07
National Science Foundation
ITR: Grid Computing for Ecological Modeling and Spatial Control
Role: PI
This project developed a collection of high-performance computing methods for a variety of ecological modeling and resource management problems.

IIS-0427471 Gross (PI) 9/1/04-8/31/07
National Science Foundation
ITR: Grid Computing for Ecological Modeling and Spatial Control
Role: PI
This focuses on the development of grid computing methods to assist natural resource managers in spatial aspects of natural system management and the development of a curriculum in computational science for natural resource management.

Cooperative Agreement 04IIQAG0125, Subagreement #04125IIS001 9/1/05-12/31/14
U.S. Geological Survey
Development of an Across Trophic-level Systems Simulation (ATLSS) for the wetland ecosystems of South Florida
Role: PI
The major goal of this project is to develop and apply a set of mathematical and computer models to aid the planning of long-term water management in South Florida associated with the restoration of the Everglades.