

# PAOLA VERA-LICONA, PH.D.

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## EDUCATION

- Ph.D., Mathematics, Virginia Polytechnic Institute and State University** **June 2007**  
Mathematics Department and the Virginia Bioinformatics Institute. Virginia, USA  
Thesis: Algorithms for the modeling and simulation of biological systems; applications to gene regulatory networks  
Advisor: Dr. Reinhard Laubenbacher.
- Master of Science, Mathematics, Virginia Polytechnic Institute and State University** **May 2003**  
Mathematics Department and the Virginia Bioinformatics Institute. Virginia, USA.
- B.S. in Mathematics, Universidad Nacional Autonoma de Mexico (UNAM)** **July 2001**  
Mathematics Department, Sciences School. Mexico City, Mexico  
Thesis: The Mystic Hexagram: A Combinatorial Approach  
Advisor: Dr. Rodolfo San Agustin Chi.

## EMPLOYMENT AND ACADEMIC POSITIONS

- Assistant Professor** **January 2014-Present**  
Center for Quantitative Medicine  
University of Connecticut Health Center
- Postdoctoral Research Fellow** **July 2009-October 2013**  
Institute Curie, "Bioinformatics and Computational Systems Biology of Cancer"  
UNIT 900 INSERM -Mines Paris Tech. Paris, France  
Project: Research collaboration between Institute Curie and the French pharmaceutical company Servier for the discovery and development of triple negative breast cancer targeted therapies.  
Objective: Development of algorithms and software for the identification of targeted therapies and their combinations for the treatment of triple negative breast cancer.
- Postdoctoral Research Fellow** **July 2007-July 2009**  
The Center for Discrete Mathematics and Theoretical Computer Science (DIMACS),  
The Biology at the Interface with the Mathematical and Physical Sciences (BioMaPS)  
Institute and the Mathematics Department, Rutgers University. New Jersey, USA  
Project: Development and application of algorithms for the reverse-engineering of biological networks.
- Graduate Research Associate** **May 2004-June 2007**  
Virginia Bioinformatics Institute, Virginia USA  
Projects: 1) Phase Space Structure of Linear Dynamical Systems. 2) Development of algorithms and software for the reverse-engineering of biological networks.

## OTHER APPOINTMENTS AND AFFILIATIONS

- Faculty Member:** Cell Biology Department, University of Connecticut Health (UConn Health)  
**Faculty Member:** The Institute for Systems Genomics (ISG), University of Connecticut.  
**Affiliate Faculty Member:** Richard D. Berlin Center for Cell Analysis & Modeling, UConn Health

**ACADEMIC HONORS AND AWARDS**

- Honorable Mention on Competition of Reverse Engineering Methods,  
2nd place, Challenge 4, Category *In-silico*** **November 2010**  
The DREAM 5 (Dialogue for Reverse Engineering Assessments and Methods) Challenge. New York, USA.
- Scholarship to pursue master's degree in Mathematics at Virginia Tech** **August 2001- May 2003**  
National Council for Science and Technology (CONACYT), Mexico.
- B.S. in Mathematics with Honors** **July 2001**  
Universidad Nacional Autonoma de Mexico (UNAM), Mexico.
- Scholarship for the completion of undergraduate thesis project** **August 2000-July 2001**  
General Directorate for Affairs of Academic Personnel, UNAM, Mexico.
- Scholarship to pursue undergraduate teaching** **January 2001-July 2001**  
Sciences School, UNAM, Mexico.
- Scholarship for research internship at the Mathematics Institute -Morelia, UNAM** **Summer 1998**  
Program "Summer with a Scientist" sponsored by the Mexican Academy of Sciences and CONACYT.
- Recognition for high academic achievement at the 1996-1997 Awards Ceremony** **September 1997**  
Universidad Nacional Autonoma de Mexico (UNAM), Mexico.
- Scholarship for research internship at the School of Marine Sciences and  
Limnology, Mazatlan, UNAM** **Summer 1996**  
Program "Youths Towards Research" sponsored by the Scientific Research Coordination, UNAM.
- Nationwide honor award for outstanding pre-college performance** **November 1996**  
Universidad Nacional Autonoma de Mexico -Incorporated System, Mexico.
- Scholarship for a research internship at the Chemistry School, UNAM** **Summer 1995**  
Program "Youths Towards Research" sponsored by the Scientific Research Coordination, UNAM.

**RESEARCH INTERESTS****Mathematics**

Mathematical Modeling  
Finite Dynamical Systems  
Polynomial Dynamical Systems  
Combinatorics  
Graph Theory  
Computational Algebra

**Mathematical and Computational Biology**

Computational Systems Biology of Cancer  
Reverse-engineering of biological networks  
Network Theory  
Development and application of algorithms for mathematical modeling, analysis and control of biological networks  
Discovery and development of combinations of targeted therapies

**CURRENT EXTRAMURAL GRANT SUPPORT**

- NSF DMS-140967** **Vera-Licona (Co-PI)** **06/01/15-08/01/17**  
*REU Site: Modeling and Simulation in Systems*
- NSF DMS-1503562** **Vera-Licona (PI)** **05/15/15-05/15/16**  
*ACSB 2015: A Conference on Algebraic and Combinatorial Approaches in Systems Biology*

**PEER-REVIEWED PUBLICATIONS** (\* Denotes equal contribution)

Thibodeau A, Marquez E, Luo O, Ruan Y, Menghi F, Shin D, Stitzel M, **Vera-Licona P**, Ucar D (2016) QuIN: Global interrogation and visualization of 3-D chromatin interaction networks. *PLOS Computational Biology*. In print.

Hosny A\*, **Vera-Licona P**\*, Laubenbacher R, Favre T (2016) AlgoRun, a Docker-based packaging system for platform-agnostic implemented algorithms. *Bioinformatics*, doi: 10.1093/bioinformatics/btw120.

**Vera-Licona P**, Jarrah A, Garcia LD, Mcgee J, Laubenbacher R. (2014) An Algebra-Based Method for Inferring Gene Regulatory Networks. *BMC Systems Biology*, **8**:37, (chosen as one of "Editor's Picks").

**Vera-Licona P**, Bonnet E, Barillot E, Zynovyev A. (2013) OCSANA: Optimal Combinations of Interventions from Network Analysis. *Bioinformatics*, **29** (12): 1571-1573.

Martins A\*, **Vera-Licona P**\*, Laubenbacher R. (2013) Computational Systems Biology: Discrete Models of Gene Regulation Networks, Undergraduate Mathematics for the Life Sciences. Ed. Glenn Ledder, Jenna P. Carpenter, and Timothy D. Comar. 1st ed. Washington: Mathematical Association of America, pp. 189-200.

Marbach D, Costello JC, Küffner R, Vega N, Pril RJ, Camacho DM, Allison KR, the DREAM5 Consortium (including **Vera-Licona P**), Kellis M, Collins JJ, Stolovitzky G. (2012) Wisdom of crowds for robust gene network inference. *Nature Methods*, **9**: 796–804.

Haury AC, Mordelet F, **Vera-Licona P**, Vert JP. TIGReSS (2012) Targeted Inference of Gene Regulation using Stability Selection. *BMC Systems Biology*, **6**:145.

DasGupta B, **Vera-Licona P**, Sontag E. (2011) Reverse Engineering of Molecular Networks from a Common Combinatorial Approach in Computational Molecular Biology: Techniques, Approaches and Applications, Mourad Elloumi and Albert Zomaya (editors), John Wiley & Sons, Inc.

Dimitrova E\*, Garcia-Puente LD\*, Hinkelmann F\*, Jarrah AS\*, Laubenbacher R\*, Stigler B\*, Stillman M\*, **Vera-Licona P**.\* (2011) Parameter estimation for Boolean models of biological networks. *Journal of Theoretical Computer Science*, **412**(26).

Dimitrova E, **Vera Licona P**, McGee J, Laubenbacher R. (2010) Discretization of Time Series Data. *Journal of Computational Biology*, **17**(6): 853-868.

Laubenbacher R\*, Jarrah AS\*, Dimitrova E\*, Stigler B\*, **Vera-Licona P**.\* (2009) Systems Identification for discrete polynomial models of gene regulatory networks. 15th IFAC Symposium on System Identification, St. Malo, France.

**Vera-Licona P**, and Laubenbacher R. (2008) Inference of ecological networks. *Annales Zoologici Fennici*, **45**: 459-464.

Martins A, **Vera-Licona P**, Laubenbacher R. (2008) Model your genes the mathematical way: a mathematical biology workshop for secondary school teachers. *Teaching Mathematics and its Applications*, **27**(2): 91-101

Camacho DM, **Vera-Licona P**, Laubenbacher R, Mendes P. (2007) Comparison of Existing Reverse engineering Methods by Use of an *In Silico* System. *Annals of the New York Academy of Sciences* **1115**(1): 73-89.

## OTHER PUBLICATIONS

**Vera-Licona P,** (2007) Algorithms for Modeling and Simulation of Biological Systems; Applications to Gene Regulatory Networks. Thesis Dissertation, Ph.D. in Mathematics. Mathematics Department, Virginia Polytechnic Institute and State University. <http://scholar.lib.vt.edu/theses/available/etd-06182007-222927/>

**Vera Licona P,** (2001) A Geometric-Combinatorial Analysis of Pascal's Mystic Hexagram. Thesis Dissertation Bachelor's Degree in Mathematics. Sciences School, UNAM, <http://bidi.unam.mx/>

## SUMMER RESEARCH EXPERIENCE

**The Institute for Advanced Study/IAS/Park City Mathematics Institute, Utah, USA Summer 2005**

Program: Graduate Summer School in Mathematical Biology.

Project: Nonlinear dynamics of structured populations: Theory and applications of matrix models

Mentor: Dr. Jim Cushing

**Summer research internship at the Mathematics Institute -Morelia, UNAM, Mexico Summer 1998**

Program "Summer with a Scientist" sponsored by the Mexican Academy of Sciences and Conacyt.

Project: Algebraic and combinatorial aspects of Pascal's Mystic Hexagram

Mentors: Dr. Rodolfo San Agustin Chi and Dr. Humberto Cardenas.

**Summer research internship at the School of Marine Sciences and Limnology, Mazatlan, Mexico Summer 1996**

Program "Youths Towards Research" sponsored by the Scientific Research Coordination, UNAM.

Project: Marine physics and phytoplankton studies on shrimp cultivation

Mentor: MSc Arturo Nunez Pasten,

**Summer research internship at the Chemistry School, UNAM, Mexico City, Mexico Summer 1995**

"Program Youths Towards Research" sponsored by the Scientific Research Coordination, UNAM.

Project: Applications of Algebra in Chemistry

Mentor: Dr. Cesar Rincon Orta

## TEACHING AND OUTREACH

**Co-director Cutting Edge Bioresearch Program for high school students Summer 2016-Present**

UConn Health & Farmington High School, Farmington, CT

A 2-week research internship for Farmington High School students at UConn Health

**Mentor at the 2016 NSF Research Experiences for Undergraduates (REU) Program Summer 2016**

Center for Quantitative Medicine, UConn Health, Farmington, CT

Project title: Reverse Engineering Dynamical Functional Brain Networks from fMRI data

Students: Erin Bogges (Simpson College) and Tiffany Jann (University of California, Berkeley)

**Mentor at the 2016 Summer Research Fellowship Program Summer 2016**

Department of Health Career Opportunity, UConn Health, Farmington, CT

Project title: Reconstruction of Signal Transduction Networks from RNA-seq Data

Student: Mark Nwokocha (University of Texas at Dallas)

**Mentor at the 2015 NSF Research Experiences for Undergraduates (REU) Program Summer 2015**

Center for Quantitative Medicine, UConn Health, Farmington, CT

Project title: Inference of Functional Brain Networks

Students: Christopher Tseng (Emory University) and Shichao Wang (University of Pennsylvania)

**Invited Speaker at the Highschool Junior & Senior Doctors Academy Program** Summer 2015  
 Department of Health Career Opportunity, UConn Health, Farmington, CT  
 Applications of Algebra, Combinatorics and Computer Sciences

**Co-advisor, Master's Internship** November 2010-May 2011  
 École Nationale de la Statistique et de l'Administration Économique, Paris, FR  
 Project Title: Methods for Inferring Gene Regulatory Networks  
 Students: Khalid Jebbari, Yann-Edern L'Hour and James Ridgway

**Mentor at the 2008 NSF Research Experiences for Undergraduates (REU) Program** Summer 2008  
 DIMACS/DIMATIA REU Programs, New Jersey, USA  
 Project title: On the Reverse-engineering of Biological Systems  
 Student: Max Shron

**Co-director of the Workshop: Model your genes the mathematical way** June 2006  
 The Institute for Advance Learning and Research (IARL), Danville, VA USA

**President of the SIAM Student Chapter at Virginia Tech** June 2005-June 2007  
 Society for Industrial and Applied Mathematics (SIAM)

**Graduate Teaching Assistant, Mathematics Department, Virginia Tech** 2003-2004  
 Freshman Differential Calculus combined with MatLab computer lessons (Fall 2004)  
 College Discrete Mathematics, Virginia Tech, Virginia (Spring 2004)  
 Calculus for Business and Administration, Virginia Tech, Virginia (Fall 2003)

**Teaching Certification, Mathematics Department, Virginia Tech** May 2003

**Research Collaborator, Mathematics Education Project , UPN** August 1999-December 2000  
 Mi Ayudante, Auxiliar Didáctico de Matemáticas para el Maestro de Educación  
 Primaria: Project for the Improvement of Learning Mathematics in Elementary School  
 Mexican Mathematical Society (MMS) and the National Pedagogical University (UPN)  
 "One of the most visited educational websites in Mexico" (UPN)

**Undergraduate Teaching Assistant, Sciences School, UNAM Mexico** Fall 2000-Spring 2001  
 Algebra I and II. Courses taught (50% of course material shared with professor and  
 responsible for the elaboration of all partial exams)

**Staff Member in the Mathematics Hall, Sciences Museum Universum** Spring 1999-Summer 2000  
 Bureau of Diffusion of Science, UNAM, Mexico City, Mexico.

#### WORKSHOPS AND CONFERENCES ORGANIZED

**Algebraic and Combinatorial Approaches in Systems Biology (ACSB 2015)** May 2015  
 The Center for Quantitative Medicine, UConn Health, Farmington CT

**Workshop on Software Development on Parameter Estimation for Boolean models of biological networks** June 2009  
 The Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), New Jersey, USA

**Workshop: Model your genes the mathematical way** June 2006  
 The Institute for Advance Learning and Research (IARL), VA USA

**REFEREE AND REVIEW ACTIVITIES****Conferences Refereed**

- **18th International Congress of Animal Reproduction: ICAR.** **June 2016**  
**Session "Toward integrative and predictive biology of reproduction"**  
 Vinci International Congress Center, Tours, France
- **12th International Conference on Computational Methods in Systems Biology** **November 2014**  
 University of Manchester, Manchester, England

**Journals Refereed**

- Bioinformatics
- PLOS Computational Biology
- BMC Bioinformatics
- BMC Systems Biology
- IEE/ACM Transactions on Computational Biology and Bioinformatics
- Journal of Mathematical Biology
- Journal of Theoretical Biology
- IET Systems Biology
- Biosystems
- PLOS One

**Granting Agencies Refereed**

- NIH/NIGMS Panel Reviewer, Special Emphasis Panel for NIH/NIGMS for Research Centers in Injury and Perioperative Sciences (P50). **April 2014**

**SELECTED TALKS**

- Discrete Math Day of the Northeast** **April 2016**  
**Smith College, Northampton MA, USA**  
 On the minimal hitting set generation problem and its applications
- Algebraic and Combinatorial Approaches in Systems Biology (ACSB2015)** **May 2015**  
**Center for Quantitative Medicine, UConn Health. Farmington CT, USA**  
 Combinatorial Interventions for Control Tasks in Large-Scale Signaling Networks
- The Winter q-bio Meeting 2015** **January 2015**  
**Maui, Hawaii, USA.**  
 Controllability of large scale networks
- 6th International Moscow Conference on Computational Molecular Biology (MCCMB'13)** **July 2013**  
**Lomonosov Moscow State University. Moscow, Russia.**  
 A Signalling Pathway Rationale for the Design of Combination Therapies for Cancer
- Workshop: Algebraic Methods in Systems and Evolutionary Biology.** **May 2012**  
**The Mathematical Biosciences Institute. Ohio, USA.**  
 An Algebra-Based Method to Infer the Structure and Dynamics of Gene Regulatory Networks.
- 8th European Conference on Mathematical and Theoretical Biology and Annual Meeting of The Society for Mathematical Biology. Krakow, Poland.** **July 2011**

Computational Systems Biology: Discrete Models of Gene Regulatory Networks.

**Journées Ouvertes en Biologie, Informatique et Mathématiques.** **June 2011**  
**Institut Pasteur. Paris, France.**

An Integrative Signalling Pathway Analysis for Determining Master Regulators and Dysregulated Pathways in Her2 Over-Expressed Human Breast Cancer.

**IB-PAS 2010: International Workshop and Summer School on Integrative Pathway Analysis and Simulation. Bielefeld, Germany.** **May 2010**

An Integrative Analysis for Determining Key Molecular Players Involved in Her2+ Human Breast Cancer.

**15th International Federation of Automatic Control (IFAC) Symposium on System Identification. Saint Malo, France.** **July 2009**

System Identification for Discrete Polynomial Models of Gene Regulatory Networks.

**Department of Neurology, Mount Sinai School of Medicine, New York, USA** **February 2009**  
 Inference of Molecular Regulatory Networks.

**Department of Pathology Informatics, Yale School of Medicine, Connecticut, USA** **February 2009**  
 Reverse-Engineering of Molecular Regulatory Networks.

**Department of Mathematical Sciences. University of Delaware, Delaware, USA** **February 2009**  
 On the Inverse Problem for Molecular Regulatory Networks.

**Institut Curie, Paris, France** **January 2009**  
 Inference of Molecular Regulatory Networks Using Evolutionary Computation.

**Minority Biomedical Research Support Seminars, Rutgers University, New Jersey, USA** **May 2008**  
 Inference of Brain Connectivity Networks.

**Mathematical Biosciences Institute (MBI), Ohio State University, Ohio, USA** **March 2008**  
 Reverse-Engineering of Biological Network Models from Noisy Time-Course Data

**Mathematical Biology Seminar, Mathematics Department Rutgers University, New Jersey, USA** **November 2007**  
 Discrete Finite Dynamical Systems for the Reverse-Engineering of Biochemical Networks.

**2nd Research Mixer, Bell Laboratories, New Jersey, USA** **October 2007**  
 Reverse-Engineering of Biological Systems Using Discrete Mathematics.

**Dynamics of Infectious Diseases Meeting. The Statistical and Applied Mathematical Sciences Institute (SAMSI), North Carolina, USA** **March 2007**  
 Reverse-Engineering of Biochemical Networks.

**Gene Network Sciences, Inc. Boston, USA** **February 2007**  
 Algorithms for the Modeling and Simulation of Gene Regulatory Networks.

**Center for Multiscale Analysis of Genetic Networks. Columbia University, NY, USA** **February 2007**  
 Dynamical Modeling of Gene Regulatory Networks.

**Society for Industrial and Applied Mathematics (SIAM) Annual Meeting, Boston, USA** **July 2006**  
 An Evolutionary Algorithm for the Identification of Biochemical networks.

**Park City Math Institute (PCMI) and the Institute of Advanced Studies (IAS) Graduate Summer School in Mathematical Biology, Utah, USA** **August 2005**  
 Nonlinear Dynamics of Structured Populations: Theory and Applications of Matrix Models.

**Mathematics Department, Sciences School, UNAM. Mexico City, Mexico** **July 2001**  
The Mystic Hexagram: A Combinatorial Approach.

**Mathematics Month at the Museum of Sciences “Universum”, Mexico City, Mexico** **March 1999**  
Secrets Among Prime Numbers: An Introduction to Cryptography.

**National Conference for the “Summer with a Scientist” Research Program. Veracruz, Mexico.** **October 1998**  
Pascal’s Mystic Hexagram: Combinatorial and algebraic aspects.

### COMMUNITY SERVICE

**The Lewis Mills Math and Science Career Day, Burlington, CT** **December 2015**  
The Lewis Mills High School  
Career opportunities in mathematical and computational biology

**Harvard University, Cambridge, MA** **November 2008**  
Women in Science: Conversations from a today’s perspective.  
Invited speaker for activity organized for English class.

**Kipps Elementary School, Blacksburg, VA** **July 2006**  
Learning Polyhedra Through Origami: activities developed for 4th graders  
as part of school’s math awareness activities.

**Margaret Beeks Elementary School, Blacksburg, VA** **May 2006**  
Magic Squares: activities developed for 6th graders