

## Costas D. Maranas

Donald B. Broughton Professor  
Department of Chemical Engineering  
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Google Scholar: <http://scholar.google.com/citations?user=l3M1PW0AAAAJ&hl=en&oi=ao>

### EDUCATION

*1990-1995*      **Princeton University**, Princeton, New Jersey  
Ph.D. in Chemical Engineering, May 1995  
M.A. in Chemical Engineering, June 1992

*1985-1990*      **Aristotle University**, Thessaloniki, Greece  
Diploma in Chemical Engineering, June 1990

### PROFESSIONAL HISTORY

*Jun. 2004-present*      **The Pennsylvania State University,**  
**Department of Chemical Engineering**  
Professor

*June 2005-present*      Donald B. Broughton Professor in Chemical Engineering

*May 2005-present*      Director of Graduate Student Recruiting for the Bioinformatics & Genomics  
Option

*Jan. 2012-present*      Member of the Bioengineering Intercollege Graduate Program

*Jan. 2004-present*      Faculty Affiliate of the Center for Supply Chain Research

*Sep. 2001-present*      Member of Faculty of the Intercollege Graduate Degree in Integrative  
Biosciences (Bioinformatics and Genomics & Cell and Developmental Biology  
Options)

*Jun. 2001-June 2004*      **The Pennsylvania State University,**  
**Department of Chemical Engineering**  
Associate Professor

*Sep. 1997-present*      Member of Faculty of the Operations Research Program

*Sep. 1995-Jun. 2001*      **The Pennsylvania State University,**  
**Department of Chemical Engineering**  
Assistant Professor

*Sep. 1994-Aug. 1995*      **Princeton University, Dept. of Chemical Engineering**  
Pre-doctoral Research Assistant

*Feb.-Jun. 1992*      **Princeton University, Dept. of Chemical Engineering**

Assistant in Instruction

*Feb.-Jul. 1990*      **Chemical Process Research Institute (CPERI), Greece**  
Research Assistant

*Jul.-Sep. 1989*      **Koninklijke Shell/Laboratorium in Amsterdam, NL,**  
**Mathematics and Systems Engineering Department**  
Research Assistant

*Jul.-Oct. 1988*      **Greek Fuels and Lubricants (EKO), Thessaloniki, Greece**  
Process Engineer Assistant in Refinery Operations

## **RESEARCH INTERESTS**

Reconstruction, analysis and redesign of metabolic networks, strain optimization, systems and synthetic biology, computational design of proteins, enzymes and antibodies, bioinformatics and computational biology, optimization theory and applications.

## **PROFESSIONAL SOCIETY MEMBERSHIPS**

Fellow of the American Institute for Medical and Biological Engineering (Nov. 2007-present)

Member, American Chemical Society (ACS) (2004-2008)

Member, Biological Systems Engineering (2004-2008)

Member, Society for Biological Engineering (SBE) (2003-present)

Member, Biophysical Society (2000-present)

Member, Computer-Aided Systems Technology (CAST) (1992- present)

Member, American Institute of Chemical Engineers (1992-present)

## **PROFESSIONAL SOCIETY ACTIVITIES**

Conference co-Chair, Biochemical and Molecular Engineering, June 26-30, 2011 (over 200 participants)

Conference Advisory Board member for Metabolic Engineering Meeting (2008-present)

Conference Advisory Board member for Biochemical Engineering Meeting (2009-present)

Conference Committee member for FOCAPO (2008)

Advisory Board Member, Society for Biological Engineering SBE (2008-present)

Steering Committee member for EcoCyc database (2006-present)

PNNL Advisory Committee member for “Microbiomes in Transition” (2015-2020)

PNNL/EMSL Advisory Committee member for “Earth & Biological Sciences Directorate (EBS)” (2015-)

## **JOURNAL EDITORIAL ACTIVITIES**

Editorial Board, IEEE Life Sciences Letters (July 2014-present)

Associate Editor, BMC Systems Biology (Apr. 2011-present)

Associate Editor, PLoS Computational Biology (Feb. 2010-present)

Advisory Board of Biotechnology Journal (Nov. 2009-present)

Associate Editor, Bioprocess and Biosystems Engineering (Aug. 2007-Dec. 2007)

Editorial Board, Biophysical Journal (2005-2011)

Editorial Board, Journal of Global Optimization (2005-2007)

Editorial Board, Computers & Chemical Engineering (2004-2009)

Editorial Board, Metabolic Engineering (2001-present)

## **PROPOSAL REVIEWING ACTIVITIES**

Proposal Reviewer for NSF, DOE, NIH, EPA, Novo Nordisk Foundation, Qatar National Research Fund, European Commission, Swiss National Science Foundation, ARISTEIA Research Program (Greece), Technical University of Denmark.

## **INTERNAL ADMINISTRATIVE SERVICES**

Chair of Associate Dean of Research and Innovation Search Committee (2016-present)

Chair of Chemical Engineering Faculty Search Committee (2016-present)

Member, COE P&T Committee (2013-2015)

Member, COE Dean Search Committee (2013)

Member, Bioengineering Intercollege Graduate Program (2011-present)

Chair of Committee on Faculty Recruiting (2010)

Chair of Departmental P&T Committee (2010-2011)

Member of AD-14 CSE Chair Review Committee (2010-2011)

Member, COE P&T Committee (2008-2010)

Chair, Committee on Bio-Chair Faculty Recruiting (2009)

Member, Network Science Committee (2008-present)

Director of Graduate Student Recruiting for Bioinformatics & Genomics Option (2005-Present)

Member, Homeland Security Initiative (2005)

Faculty Affiliate, Center for Supply Chain Research (2004-Present)

Chair, Sabbatical Review Committee (2004)

Member, Department Head Search Committee (2003)

Chair, Space Committee (2002)

Member, Departmental Awards Committee (2002-2003)

Member, Faculty of the Intercollege Graduate Degree in Integrative Biosciences: CDB and B&G Options. (2001-Present)

Member, Junior Faculty Search Committee (2000)

Member, Undergraduate Curriculum Committee (1999-2001)

Member, ABET Committee (1999)

Member, Department Head Search Committee (1999-2000)

Omega Chi Epsilon Academic Advisor (1998-2002)

Member, Faculty of the Operations Research Program (1997-present)

Member, Graduate Student Admissions Committee (1996-1998)

## **AWARDS AND HONORS**

### **Internal Recognitions**

Penn State Engineering Alumni Society (PSEAS) Premier Research Award, (2016)

Penn State Engineering Alumni Society (PSEAS) Outstanding Research Award, (2012)

### **External Recognitions**

Special Award for your Outstanding Contribution to Tsinghua Forum On Chemical Engineering (No. 12), October 24, 2014.

The Korean Society for Biotechnology and Bioeng. Lectureship at the KSBB Fall Meeting, (2007)

Stratis V. Sotirchos Lectureship at 6<sup>th</sup> Panhellenic Chemical Engineering Conference (2007)

Outstanding Young Investigator Award, AIChE Computing and Systems Technology Division Award (2006)

Allan P. Colburn Award for Excellence in Publications by a Young Member of the Institute, AIChE Institute Award (2002)

NSF CAREER Award (1997)

Du Pont Educational Aid Grant (1996-98)

Wallace Memorial Fellowship in Engineering, Princeton University (1993-94)

Technical Chamber of Greece Award (1988-1990)

National Scholarship Foundation of Greece Award (1987-1990)

## **INVITED LECTURES AND SEMINARS (2000-present)**

### *Universities & Institutes*

Distinguished Lecture Series at the Monk Family Dept. of Chemical Engineering & Materials Science, University of Southern California, Dec. 1, (2016)

The Children's Hospital of Philadelphia (CHOP), Microbiome Program, University of Pennsylvania, May 25, (2016)

Department of Chemical Engineering, University of California Santa Barbara (UCSB), Jan. 14, (2016)

Department of Chemical and Biomolecular Engineering, Rutgers University, Nov. 19, (2015)

Department of Chemical and Biomolecular Engineering, University of Delaware, Oct. 2, (2015)

Institute of Systems Biology, Seattle WA, Sept. 25, (2015)

Bioengineering Department, UC San Diego, May 11, (2015)

School of Chemical and Biomolecular Engineering, Georgia Tech., Feb. 18, (2015)

Department of Chemical and Biomolecular Engineering, University of Colorado Boulder, Dec. 9, (2014)

Biological Engineering Department, Utah State University, Dec. 6, (2014)

Department of Chemical Engineering, Tsinghua University, Beijing, China, Oct. 24, (2014)

J. D. Lindsay Lecture Series, Department of Chemical Engineering, Texas A&M University, Sept. 3, (2014)

Department of Chemistry and Chemical Engineering, CalTech, Apr. 17, (2014)

Department of Chemical and Biomolecular Engineering, John Hopkins University, Apr. 10, (2014)

CEIT Centro de Estudios e Investigaciones Técnicas, Guipuzkoa, Spain, Dec. 18, (2013)

Department of Industrial Engineering, Penn State, Oct. 10, (2013)

School for Engineering of Matter, Transport and Energy, Arizona State University, Jan. 28, (2013)

Department of Chemical and Biomolecular Engineering, Univ. of Illinois at Urbana-Champaign, Oct. 2, (2012)

Ecole polytechnique fédérale de Lausanne, Institut des sciences et ingénierie chimiques, Lausanne, Switzerland, Apr. 25, (2012)

A. L. Bortree/Molecular Toxicology Seminar Series, Dept. of Veterinary and Biomedical Sciences, Penn State, Jan. 25, (2012)

Dept. of Chemical and Biological Engineering, University of Wisconsin, Nov. 8, (2011)

Dept. of Microbiology and Biochemistry, Michigan State University, Apr. 26, (2011)

NSF Engineering Research Center for Biorenewable Chemicals (CBiRC), Feb. 3, (2011)

Dept. of Chemical and Biological Engineering, Rice University, Oct. 28, (2010)

Dept. of Microbiology and Cell Science, Florida Univ., Feb. 22, (2010)

Joint BioEnergy Institute (JBEI), Jan. 29, (2010)

Operations Research Colloquium Seminar, Penn State, Dec. 8, (2009)

Dept. of Chemical, Biological and Environmental Engineering, Washington Univ., Dec. 4, (2009)

Dept. of Chemical Engineering Lindsey Lecture, Texas A&M, Oct. 28, (2009)

Dept. of Chemical and Biomolecular Engineering, Tufts Univ., Mar. 30, (2009)

Ecole polytechnique fédérale de Lausanne, Institut des sciences et ingénierie chimiques, Lausanne, Switzerland, Mar. 8, (2009)

Dept. of Chemical and Biological Engineering, Buffalo University, Feb. 25, (2009)

Dept. of Veterinary & Biomedical Sciences (Center for Molecular Immunology & Infectious Disease), Penn State Univ., Oct. 16, (2008)

Dept. of Industrial Engineering, Penn State Univ., Oct. 9, (2008)

Dept. of Chemical Engineering, Univ. of Maryland, Sept. 30, (2008)

Dept. of Chemical and Biomolecular Engineering, U. Penn, Sept. 24, (2008)

TIGEM Telephon Institute of Genetics and Medicine, Italy, May 23, (2008)

Dept. of Biological Sciences, Korea Advanced Institute of Science and Technology (KAIST), Korea, October 18, (2007).

Dept. of Chemical Engineering, RPI, Sept. 12, (2007).

Department of Biochemistry & Molecular Biology, College of Medicine, Hershey, PA, March 21, (2006).

Depts. of BME/ChemE and ICES, University of Texas, Austin, TX, October 13, (2005).

Sandia National Laboratories, Biological and Energy Science Center, Albuquerque, NM, May 12, (2005).

Dept. of Electrical Engineering, ETH, Switzerland, November 22, (2004).

Center for Process Biotechnology, Department of Biotechnology, Dept. of Biological Engineering, DTU, Denmark, November 19, (2004).

Dept. of Chemical Engineering, University of Connecticut, October 5, (2004).

Dept. of Chemical Engineering, University of Houston, September 3, (2004).

Division of Engineering and Applied Sciences, Harvard University, March 3, (2004).

Dept. of Bioengineering, University of California at San Diego, October 22, (2003).

Dept. of Chemical Engineering, Massachusetts Institute of Technology, October 17, (2003).

Dept. of Chemical Engineering, University of Massachusetts at Amherst, October 16, (2003).

Chemical Process Engineering Research Institute, Thessaloniki Greece, June 13, (2003).

Dept. of Chemical Engineering, Brooklyn Polytechnic University, April 11, (2003).

School of Chemical Engineering, Georgia Institute of Technology, March 19, (2003).

Dept. of Chemical and Biochemical Engineering, Rutgers University, February 27, (2003).

Dept. of Chemical Engineering, Princeton University, February 26, (2003).

Dept. of Chemical Engineering, University of California at Santa Barbara, November 21, (2002).

Dept. of Chemical Engineering, Northwestern University, September 26, (2002).

Dept. of Chemistry, Penn State University, September 19, (2002).

Dept. of Chemical Engineering, Delaware University, February 13, (2002).

Dept. of Chemical Engineering, Carnegie-Mellon University, December 17, (2001).

Dept. of Chemical Engineering, Wisconsin University, November 27, (2001).

Dept. of Chemical Engineering, John Hopkins University, October 25, (2001).

Dept. of Chemical Engineering, University of Virginia, October 18, (2001).

Dept. of Chemical Engineering, University of Pennsylvania, October 15, (2001).

Dept. of Chemical Engineering, Cornell University, September 10, (2001).

Dept. of Chemical Engineering, Imperial College, UK, September 3, (2001).

Dept. of Chemical Engineering, Rice University, February 22, (2001).

Centre for Process Systems Engineering, Imperial College, UK, June 30, (2000).

### ***Corporations***

DuPont CR&D, Wilmington, DE, March 13, (2015).

Genomatica, Inc., San Diego CA, Apr. 18, (2014).

MedImmune, Gaithersburg MD, October 25, (2013).

BASF Corporation, Tarrytown NY, March 13, (2013).

Synthetic Genomics, April 30, (2007).

CACHE Corporation, WebCast, May 12, (2006).

Sigma-Aldrich, December 3, (2004).

Bristol Myers Squibb, April 27, (2004).

Xencor, Inc., Sept. 17, (2003).

Cargill, Inc., Industrial Bioproducts Business, Wayzata, MN, August 22, (2003).

Diversa Corporation, San Diego, CA, August 14, (2003).

DuPont Experimental Station, Wilmington DE, July 25, (2003).

Genencor International, Inc., Palo Alto, CA, July 11, (2002).

Xencor, Inc., April 10, (2002).

IBM Watson Center, Computational Biology Group, February 6, (2002).



Diversa Corporation, San Diego, CA, July 18, (2001).

Genomatica, Inc., March 15, (2001).

Enchira Biotechnology Corporation, January 5, (2001).

Maxygen Corporation, December 20, (2000).

Rutgers Organics, July 12, (2000).

Air Products & Chemicals, March 14, (2000).

### *Conferences, Workshops & Symposia*

Indo-US Workshop on Cell Factories, Mar. 18-20, 2016, Mumbai, India, “Reconstruction, analysis and redesign of metabolism”

Genomics Science Contractors-Grantees Annual Meeting XIV, Mar. 6-9, 2016 Vienna VA, “Constructing predictive kinetic models of metabolism for guiding strain design”

Arpa-E REMOTE Annual Review Meeting, Jan. 20-21, 2016, LaJolla, CA, “Engineering A Methane-to-acetate Pathway For Producing Liquid Biofuels”

NSF Workshop on Designing Principles for Engineering Biology, Tysons Corner, VA, Nov. 10-11, 2015, “Engineering of biomolecular Networks”

CBiRC 7<sup>th</sup> Annual Meeting, Oct. 11-13, 2015 Ames, IA, “Progress in the integrated flux platform design”

4th Conference on Constraint-Based Reconstruction & Analysis (COBRA), Heidelberg, Germany, Sept. 18, 2015, “OptStoic: Designing overall stoichiometric conversions and intervening reactions”

IDEAS Lab Midterm Workshop, London, UK, Sept. 16, 2015, “Designing Nitrogen Fixation in Oxygenic Photosynthetic Cells”

Biochemical and Biomolecular Engineering XIX, Puerto Vallarta, Mexico, July 12-16, 2015, “Computational Tools for Enzyme and Antibody Design”

BioEnergy Science Center (BESC) Annual Retreat, Keynote Speaker, June 16, 2015, “Reconstruction, Analysis and Redesign of Metabolism”

COBRA Workshop on Modelling Microbial Communities, 5<sup>th</sup> International Human Microbiome Congress, Luxembourg, March 30, 2015, “Modeling microbial communities using bilevel programming”

EPFL/Nestle workshop: From single genome to metagenomic metabolic modelling, Lausanne, Switzerland, Jan. 26, 2015, “Reconstruction, Analysis, & Redesign of Metabolic Pathways”

Indo-US NSF Workshop on Synthetic and Systems Biology, JNU New Delhi, India, November 9-12, 2014, “Using computations to reconstruct, analyze and redesign metabolism”

Bioengineering Workshop: Cell factory design from enzyme to metabolic network, Tsinghua University, Beijing, China, October 27, 2014, “Using Computations for Enzyme and Antibody Design”

Metabolic Engineering X, Vancouver BC, June 15-19, 2014, “Integrating Kinetic Models of Metabolism with k-OptForce for Strain Design”

COBRA Conference, Wintergreen VA, May 20-23, 2014, “Using MetRxn for metabolic model reconstruction, flux elucidation and redesign”

DOE BER Contractor-Grantee Annual Meeting, Washington DC, Feb. 9-12, 2014, “Using MetRxn to reconstruct and redesign metabolism”

CBiRC NSF Engineering Research Center for Biorenewable Chemicals Fifth Annual Meeting, Oct. 6-8, Ames, IA, “Progress in the integrated flux platform design”

Biochemical and Molecular Engineering XVIII: Frontiers in Biological Design, Synthetic Biology and Processing East Meets West, Beijing China, June 16-20, 2013, “Computational methods for the rational de novo design of human antibodies”

American Society of Microbiology Annual Meeting, Denver, CO, May 18-22, 2013, “Kinetic modeling of metabolism and computational strain design”

3<sup>rd</sup> Conference on Cell Factories and Biosustainability, Copenhagen Bioscience Conferences, Novo Nordisk Foundation, Denmark, May 5-8, 2013, “Using Computations to Simulate and Assemble Cell Factories”

Cobra 2012 - 2nd International conference on constraint-based reconstruction and analysis, Elsinore, Denmark, Oct. 7-9, 2012, “OptCom: A Multi-Level Optimization Framework for the Metabolic Modeling and Analysis of Microbial Communities”

MARM 2102, Session: Bioenergy/Biofuels for Clean Energy, Baltimore, MD, June 1, 2012, “Integrating Computations with Experiments to Drive Biofuel Overproduction”

ICiS Genomics Driving Modeling in Biology Workshop, Park City, UT, July 24-29, 2011, “Challenges and Opportunities in Reconstructing and Analyzing Genome Scale Models”

1st Conference on Constraint-Based Reconstruction and Analysis, Reykjavik, Iceland, June 24-26, 2011, “Reconstruction of Genome-Scale Metabolic and Isotope Mapping Models”

2011 GTL Contractor-Grantee Workshop: Modeling in a Systems Biology Environment, USDA-DOE Plant Feedstock Genomics for Bioenergy Awardee Workshop, Bethesda, MD, Apr. 10-13, 2011, “Using Computations to Facilitate Metabolic Reconstructions and Guide Strain Optimization”

International Conference on Biomolecular Engineering, San Francisco, CA, January 16-19, 2011, “MetRxn: Reaction/Metabolite Standardization and Congruency across Databases and Genome-Scale Metabolic Models”

Bioinformatics & Genomics Retreat, Penn State University, Sept. 11, 2010, “Using Computations to Reconstruct, Quantify and Redirect Metabolism”

Society of Industrial Microbiology (SIM) Annual Meeting, San Francisco, CA, August 1-5, 2010, "Using computations to reconstruct and redirect metabolism"

Society of Industrial Microbiology (SIM) Annual Meeting, San Francisco, CA, August 1-5, 2010, "Using computations to drive novel enzyme and antibody design"

Metabolic Engineering VIII: Metabolic Engineering for Green Growth, Jeju Island, South Korea, June 13-18, 2010, "Using Computations to Reconstruct, Analyze and Redesign Metabolism"

Mini-Workshop on challenges in experimental data integration within genome-scale metabolic models, Institut Henri Poincare, Paris, France, October 10-11, 2009, "Genome-scale metabolic model reconstruction, curation and redesign"

3<sup>rd</sup> Annual Advances in Biomolecular Engineering: Protein Design Symposium, The New York Academy of Sciences, New York, NY, June 12, 2009, "Using Computations to Redesign Enzymes, Binding Sites and Antibodies"

GTL Contractor-Grantee Workshop VII: Modeling in a Systems Biology Environment, USDA-DOE Plant Feedstock Genomics for Bioenergy Awardee Workshop, Bethesda, MD, Feb. 8-11, 2009, "Using Computations to Reconstruct, Analyze and Redesign Metabolism"

Metabolic Engineering VII: Health and Sustainability, Puerto Vallarta, Mexico, Sept. 14-19, 2008, "Using Computations to Make Sense out of 'Omics Data'"

EMCC5, 5<sup>th</sup> Chemical Engineering Conference for Collaborative Research in Eastern Mediterranean Countries, Cetraro, Italy, May 25-29, 2008, "Systems Engineering Challenges and Opportunities in Biological Networks"

The Korean Society for Biotechnology and Bioengineering Fall Meeting, Daegu, Korea, October 19, 2007, "Computational Protein Engineering"

15th Annual International Conference on Microbial Genomics, University of Maryland College Park Campus, September 16-20, 2007, "Optimization-based Refinement of Metabolic Models"

Biochemical Engineering XV: Engineering Biology from Biomolecules to Complex Systems, Quebec City, July 15-16, 2007, "Metabolic Model Generation and Automated Curation: Mycoplasma genitalium"

Stratis V. Sotirchos Lectureship 2007, 6<sup>th</sup> Panhellenic Chemical Engineering Conference, Athens Greece, May 31- June 3, "Systems Engineering Challenges and Opportunities in Biological Networks"

Microbial Genomes 2007, Hinxton Hall, Cambridge, UK, April 11-14, 2007, "Analysis and Redesign of Microbial Metabolic Pathways"

Institute of Biological Engineering (IBE) 2007 annual meeting, St. Louis, Missouri, March 30-April 1, 2007, Session: Biology Inspired Modeling, "Computational Design of Biological Circuits"

IECA 2006: The International E. Coli Alliance Conference on Systems Biology, Jeju Island, Republic of Korea, October 31-November 4, 2006, "Computational Analysis and Redesign of Biological Pathways"

Metabolic Engineering VI: From recDNA towards Engineering Biological Systems, Noordwijkerhout, The Netherlands, October 1-5, 2006, "Optimal design of recombination and degenerate oligo based protein combinatorial libraries using pairwise residue scoring matrices"

ICCSB – First International Conference on Computational Systems Biology, Shanghai, China, July 20-23, 2006, "Analysis and Redesign of Biological Networks: Metabolic & Signaling Pathways"

ASM2006 - 106<sup>th</sup> General Meeting of the American Society for Microbiology, Orlando, FL, May 21-25, 2006, "Analysis and Redesign of Metabolic Networks"

DIMACS Workshop on Clustering Problems in Biological Networks, Rutgers University, Piscataway, NJ, May 9-11, 2006, "Analysis and Redesign of Biological Networks"

GTL2006 Contractor-Grantee Workshop IV and Metabolic Engineering Working Group Interagency Conference on Metabolic Engineering, Bethesda, MD, Feb. 12-15, 2006, "Development of Experimental and Computational Tools to Evaluate Metabolic Flux"

ICSB 2005 – Sixth International Conference on Systems Biology, Workshop on gene network models and their application: from gene function to drug discovery, Cambridge, MA, October 23, 2005, "Signaling network analysis and redesign"

13<sup>th</sup> Annual International Conference on Microbial Genomes, Madison, WI, September 11-15, 2005, "Computational Tools for the Analysis and Redesign of the E. coli Metabolic Network"

Phage Display for Engineering Protein Therapeutics Conference, Cambridge, MA, May 16-17 2005, "Computational Protein Library Design"

National Science Foundation workshop on Control and Systems Integration of Micro-and Nano-Scale Systems, March 29-30 2004, "Challenges and Opportunities in the Design and Analysis of Biological Systems"

Pacific Symposium on Biocomputing (PSB2004), Big Island HI, January 2004, "A Mixed Integer Linear Programming Framework (MILP) for Inferring Time Delay in Gene Regulatory Networks"

Ninth Annual Symposium on Frontiers of Engineering, National Academy of Engineering (NAE), September 18-20, 2003.

Biochemical Engineering XIII, Boulder CO, July 19-23, 2003, "In Silico Prescreening of Protein Hybrids in Directed Evolution Experiments"

Foundations of Computer-Aided Process Operations (FOCAPO2003), Coral Springs FL, January 2003, "Challenges and Opportunities for Systems Engineering in Computational Biology"

Metabolic Engineering IV, Barga Italy, October 2002, "Inference of Gene Regulatory Networks from DNA microarray experiments"

Metabolic Engineering IV, Barga Italy, October 2002, "In Silico Design of Metabolic Pathways"

Biochemical Engineering XII, Sonoma CA, July 2001, "Probing the Performance Limits of Metabolic Networks and Identifying Regulatory Barriers through Boolean Constraints"

European Symposium of Computer-Aided Process Engineering (ESCAPE11), Denmark, June 2001, "Optimization in Molecular Design and Bioinformatics"

Metabolic Engineering III, Colorado Springs CO, October 2000, "Modeling and Optimization of Directed Evolution Protocols"

## **PUBLICATIONS**

### ***Textbooks***

Costas D. Maranas and Ali R. Zomorodi (2016), "Optimization in Metabolic Networks," John Wiley & Sons.

### ***Journal Publications***

1. Lihan, M., B.C. Goh, T. Li, C.D. Maranas and K. Shulten (2016), "de novo Design and in silico Optimization of Antibody-Like Binders Targeting Ebola Viral Antigen," *Biophysical Journal*, 110(3), 537a.
2. Soo, V., M.J. McNulty, A. Tripathi, F. Zhu, L. Zhang, E. Hatzakis, P.B. Smith, S. Agrawal, H. Nazem-Bokaei, S. Gopalakrishnan, H.M. Salis, J.G. Ferry, C.D. Maranas, A.D. Patterson and T.K. Wood (2016), "Reversing methanogenesis to capture methane for liquid biofuel precursors," *Microbial cell factories*, Vol. 15, Issue 1, DOI: 10.1186/s12934-015-0397-z
3. Nazem-Bokaei, H., S. Gopalakrishnan, J.G. Ferry, T.K. Wood and C.D. Maranas (2016), "Assessing methanotrophy and carbon fixation for biofuel production by *Methanosarcina acetivorans*," *Microbial cell factories*, Vol. 15, Issue 1, DOI: 10.1186/s12934-015-0404-4
4. Dash, S., Y.N. Chiam and C.D. Maranas (2016), "Metabolic modeling of clostridia: current developments and applications," *FEMS Microbiology Letters*, doi: 10.1093/femsle/fnw004
5. Mueller, T.J., E.A. Welsh, H.B. Pakrasi and C.D. Maranas (2015), "Identifying regulatory changes to facilitate nitrogen fixation in the non-diazotroph *Synechocystis* sp. PCC 6803," *ACS Synth. Biol.*, DOI: 10.1021/acssynbio.5b00202.
6. Chowdury, A. and C.D. Maranas (2015), "Designing overall stoichiometric conversions and intervening metabolic reactions," *Scientific Reports NPG*, doi: 10.1038/srep16009.
7. Chowdury, A. and C.D. Maranas (2015), "Personalized Kinetic Models for Predictive Healthcare," *Cell Systems*, Vol. 1, Issue 4, 250-251, doi:10.1016/j.cels.2015.10.008.
8. Berla, B.M., R. Saha, C.D. Maranas and H.B. Pakrasi (2015), "Cyanobacterial Alkanes Modulate Photosynthetic Cyclic Electron Flow to Assist Growth under Cold Stress," *Scientific Reports NPG*, doi: 10.1038/srep14894.
9. Gopalakrishnan, S. and C. D. Maranas (2015), "Achieving Metabolic Flux Analysis for *S. cerevisiae* at a Genome-Scale: Challenges, Requirements, and Considerations," *Metabolites*, Vol. 3, Issue 5, 521-535.

10. Chowdury, R., A. Chowdury and C.D. Maranas (2015), "Using gene essentiality and synthetic lethality information to correct yeast and cho cell genome-scale models," *Metabolites*, Vol. 5, Issue 4, 536-570.
11. Chowdhury, A., A. Khodayari and C.D. Maranas (2015), "Improving prediction fidelity of cellular metabolism with kinetic descriptions," *Current opinion in biotechnology*, Vol. 36, 57-64.
12. Gopalakrishnan, S. and C.D. Maranas (2015), "13C Metabolic Flux Analysis at a Genome-Scale," *Metabolic Engineering*, doi:10.1016/j.ymben.2015.08.006.
13. Ebrahim, A., E. Almaas, E. Bauer, A. Bordbar, A.P. Burgard, R.L. Chang, A. Dräger, I. Famili, A.M. Feist, R. MT Fleming, S.S. Fong, V. Hatzimanikatis, M.J. Herrgård, A. Holder, M. Hucka, D. Hyduke, N. Jamshidi, S.Y. Lee, N. Le Novère, J.A. Lerman, N.E. Lewis, D. Ma, R. Mahadevan, C.D. Maranas, H. Nagarajan, A. Navid, J. Nielsen, L.K. Nielsen, J. Nogales, A. Noronha, C. Pal, B.O. Palsson, J.A. Papin, K.R. Patil, N.D. Price, J.L. Reed, M. Saunders, R.S. Senger, N. Sonnenschein, Y. Suna and I. Thiele (2015), "Do Genome-scale Models Need Exact Solvers or Clearer Standards?," *Molecular Systems Biology*, Nature Publishing Group, <http://hdl.handle.net/10993/21873>.
14. Ng, C.Y., A. Khodayari, A. Chowdhury, C.D. Maranas (2015), "Advances in de novo strain design using integrated systems and synthetic biology tools," *Current opinion in chemical biology*, Vol. 28, 105-114.
15. Fendt, S.-M. and C.D. Maranas (2015), "Editorial overview: Systems biology: Advances in disease understanding and in metabolic engineering," *Current Opinion in Biotechnology*,
16. Ng, C.Y., I. Farasat, C.D. Maranas and H.M. Salis (2015), "Rational design of a synthetic Entner–Doudoroff pathway for improved and controllable NADPH regeneration," *Metabolic Engineering*, Vol. 29, 86-96.
17. Pantazes, R.J., M.J. Grisewood, T. Li, N.P Gifford and C.D. Maranas (2015), "The Iterative Protein Redesign and Optimization (IPRO) suite of programs," *Journal of computational chemistry*, Vol. 36, Issue 4, 251-263. DOI: 10.1002/jcc.23796
18. Chowdhury, A., A.R. Zomorodi and C.D. Maranas (2015), "Bilevel optimization techniques in computational strain design," *Computers and Chemical Engineering*, Vol. 72, 363–372.
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138. Maranas, C.D. and C.A. Floudas (1994b), "A Deterministic Global Optimization Approach for Molecular Structure Determination," *Journal of Chemical Physics*, Vol. 100, No. 2, 1247-1261.
139. Maranas, C.D. and C.A. Floudas (1994a), "Global Minimum Potential Energy Conformations of Small Molecules," *Journal of Global Optimization*, Vol. 4, 135-170.
140. Maranas, C.D. and C.A. Floudas (1993), "Global Optimization for Molecular Conformation Problems," *Annals of Operations Research*, Vol. 42, 85-117.
141. Maranas, C.D. and C.A. Floudas (1992), "A Global Optimization Approach for Lennard-Jones Microclusters," *Journal of Chemical Physics*, Vol. 97, No. 10, 7667-7678.

### ***Refereed Conference Proceedings***

1. Vital-Lopez, F.-G., A. Armaou and C. Maranas (2008), "Hybrid multi-scale modeling of brain tumor progression," *Proceedings of the 18th International symposium on Mathematical Theory of Networks & Systems*, RSBioSystems.2, Blacksburg, VA.
2. Vital-Lopez, F.G., C.D. Maranas and A. Armaou (2006), "Bifurcation analysis of the metabolism of *E. coli* at optimal enzyme levels," *Proceedings of the 2006 American Control Conference*, Minneapolis, MN.

3. Nikolaev, E.V., P. Pharkya, C. D. Maranas, and A. Armaou (2005), "Optimal selection of enzyme levels using large-scale kinetic models," Proceedings of 16th International Federation of Automatic Control World Congress, Prague, Czech Republic, 6 pages.
4. Pharkya, P. and C.D. Maranas (2005), "A hierarchical framework for metabolic pathway discovery and strain design," *FOSBE 2005 Proceedings*, 141-144.
5. Rogers, M. J., M. Ding, and C. D. Maranas (2004), "A Case Study on the Design of Pharmaceutical R&D Licensing Deals," *FOCAPD Conference Proceedings*, 475-479.
6. Dasika, M.S., Gupta, A., and C.D. Maranas (2004), "A Mixed Integer Linear Programming Framework (MILP) for Inferring Time Delay in Gene Regulatory Networks," *Pacific Symposium on Biocomputing, Vol. 9*, 474-485.
7. Maranas, C.D., G.L. Moore, A.P. Burgard and A. Gupta (2003), "Systems Engineering Challenges and Opportunities in Computational Biology," *Proceedings of Foundations of Computer-Aided Process Operations IV*, Coral Springs, FL, January 12-15, 2003, CACHE, 13-26.
8. Rogers, M.J., A. Gupta and C.D. Maranas (2003), "Risk Management in Real Options Based Pharmaceutical Portfolio Planning," *Proceedings of Foundations of Computer-Aided Process Operations IV*, Coral Springs, FL, January 12-15, 2003, CACHE, 241-244.
9. Gupta, A. and C.D. Maranas (2001), "Multiperiod Planning of Multisite Supply Chains Under Demand Uncertainty," *European Symposium on Computer-Aided Process Engineering, Vol. 11*, 871-882.
10. C.D. Maranas (2001), "Optimization in Molecular Design and Bioinformatics," *European Symposium on Computer-Aided Process Engineering, Vol. 11*, 1157-1164.
11. Vaidyaraman, S. and C.D. Maranas (1999b), "Simultaneous Refrigeration Cycle Synthesis and Refrigerant Selection," In proceedings of PRES'99, 2nd Conference on Process Integration, Modeling and Optimisation for Energy Saving and Pollution Reduction, May 31-June 2, Budapest, Hungary.
12. Maranas, C.D., I.P. Androulakis and C.A. Floudas (1995), "A Deterministic Global Optimization Approach for the Protein Folding Problem," *Proc. of DIMACS Series in Discrete Mathematics and Theoretical Computer Science, Vol. 23*, 133-150.
13. Maranas, C.D. and C.A. Floudas, (1993b), "A Global Optimization Method For Weber's Problem With Attraction And Repulsion," *Proc. of Large Scale Optimization: State of the Art Conference*, (February 15-17, 1993, Florida University), Kluwer Academic Publishers B.V., 259-293.
14. Pistikopoulos, E.N., T.A. Mazzuchi, C.D. Maranas and T.V Thomaidis (1991), "Simultaneous Assessment of Flexibility, Reliability and Availability for In-Line Blending Systems: A Unified Framework for Analysis and Retrofit Design," *Proc. of Fourth International Symposium on Process Systems Engineering (PSE 91)*, 1.4.1-1.4.16.

### **Book chapters**



Moore, G.L. and C.D. Maranas (2003), "Modeling and Optimization of Directed Evolution Protocols." *Enzyme Functionality: Design, Engineering, and Screening*, edited by A. Svendsen (pp. 185-212). New York, NY: Marcel Dekker, Inc.

## **PATENTS**

Ferry, J.G., C.D. Maranas and T.K. Wood, "Methane-to-acetate pathway for producing liquid biofuels and biorenewables," Publication number: 20150147791. Filed: Nov. 21, 2014. Publication date: May 28, 2015.

Maranas C.D., A.P. Burgard and P. Pharkya, "Method for determining gene knockouts," US 8,457,941, filed Aug. 16, 2011, and issued Apr. 16, 2013.

Maranas C.D., A.P. Burgard and P. Pharkya, "Method for redesign of microbial production systems," US 8,108,152, filed Oct. 21, 2010, and issued Jan. 1, 2012.

Maranas C.D. and A.P. Burgard, "Method and system for modeling cellular metabolism," US 8,086,414, filed Mar. 15, 2010, and issued Dec. 27, 2011.

Maranas C.D., A.P. Burgard and P. Pharkya, "Method for determining gene knockouts," US 8,027,821, filed Jul. 9, 2003, and issued Sept. 27, 2011.

Maranas C.D., A.P. Burgard and P. Pharkya, "Method for redesign of microbial production systems," US 7,826,975, filed Aug. 26, 2004, and issued Nov. 2, 2010.

Maranas C.D. and A.P. Burgard, "Method and system for modeling cellular metabolism," US 7,711,490, filed Jan. 10, 2002, and issued May 4, 2010.

Maranas C.D. and G. Moore "Modeling framework for predicting the number, type and distribution of crossovers in directed evolution experiments," US 2003/0073092, filed Nov. 9, 2001.

## **Post-Doctoral Research Associates**

1. Dr. Siu Hung (Joshua) Chan, 2015-present. PhD: DTU
2. Dr. Hadi Nazem-Bokaei, 2014-present. PhD: Virginia Tech.
3. Dr. Tong Li, 2013-present. PhD: University of Leuven, Belgium.
4. Dr. Ali Zomorodi, 2012-2013. PhD: Pennsylvania State University  
Current position: Postdoctoral Research Associate, Bioinformatics Program & Biomedical Engineering Department, Boston University.
5. Dr. Patrick Suthers, 2005-2013. PhD: University of Wisconsin-Madison.
6. Dr. Yang Chang, 2007-2008. PhD: University of Illinois at Urbana-Champaign. Current position: Research Associate, Merck Sharp & Dohme Corp.
7. Dr. Evgeni Nikolaev, 2002-2005. PhD: Lobachevsky Nizhegorod State University, Russia. Current position: Instructor of Mathematics, New Jersey State University (Rutgers).

8. Dr. Anshuman Gupta, 2002-2005. PhD: Pennsylvania State University. Current position: Vice President-Analytics, Indicus Analytics, India.
9. Kyle Camarda, 1998-2000. PhD: University of Illinois at Urbana-Champaign. Current position: Associate Professor, Department of Chemical and Petroleum Engineering, University of Kansas.

## **PH.D. THESES SUPERVISED**

1. "Computational design of transport proteins," R. Chowdury, ongoing.
2. "Development of ME models for cyanobacteria," Lin Wang, ongoing.
3. "Bioinformatics Data Platform for Metabolic Engineering," A. Kumar, ongoing.
4. "Computational Methods for Enzyme Redesign," M. Grisewood, ongoing.
5. "Development of computational tools to redirect metabolism," A. Chowdhury, ongoing.
6. "Construction of dynamic metabolic models for metabolic engineering applications," A. Khodayari, ongoing.
7. "Development of synthetic biology tools for microbial metabolic engineering," C. Y. Ng, ongoing.
8. "Application of multi-tissue and multi-organism genome-scale models for analyzing plant metabolism", M. Simons, ongoing.
9. "Development of genome-scale and dynamic models to analyze metabolism in Cyanobacteria," T. Mueller, ongoing.
10. "Genome-scale metabolic flux analysis (MFA), S. Gopalakrishnan, ongoing.
11. "Reconstruction and analysis of genome-scale metabolic models of photosynthetic organisms," R. Saha, June 2014. Current position: Postdoctoral Associate, Department of Biology, Washington University.
12. "Computational methods for the de novo design of antibodies", R. Pantazes, January 2014. Current position: Postdoctoral Research Associate, Department of Chemical Engineering, UC Santa Barbara.
13. "Computational tools for genome-scale synthetic lethality analysis and metabolic modeling of microbial communities", A. R. Zomorodi, August 2012. Current position: Postdoctoral Research Associate, Bioinformatics Program & Biomedical Engineering Department, Boston University.
14. "Using computations to analyze and redesign metabolism", S. Ranganathan, December 2011. Current position: Staff Scientist, Synthetic Biology, Life Technologies.

15. "Development of hybrid intracellular/extracellular models of brain tumor progression and medication strategies", F. Vital-Lopez, 2011. Current position: Research scientist, Biotechnology High Performance Computing Software Applications Institute (BHSAI).
16. "Systems based optimization approaches to analyze and improve metabolic networks", V. S. Kumar, 2010. Current position: Data Scientist, Facebook.
17. "Engineering and analysis of cofactor partitioning for NADPH-dependent xylitol production in Escherichia coli", J. Chin, 2010. Current position: Scientist, Algenol Biofuels.
18. "Computational design and experimental characterization of proteins with novel functions", H. Fazelinia, 2009. Current position: Postdoctoral research fellow, Fox Chase Cancer Center.
19. "Systems engineering based approaches for biological network, inference, analysis and redesign", M. Dasika, August 2007. Current position: Scientist, DuPont.
20. "Development of computational tools for the design and optimization of combinatorial protein libraries", M. Saraf, May 2006. Current position: Vice President, Citigroup.
21. "Modeling and optimization in directed evolution protocols and protein engineering", G. Moore, May 2005. Current position: Senior Scientist, Protein Engineering, Xencor.
22. "Optimization based redesign of microbial production systems", P. Pharkya, December 2005. Current position: Senior Research Scientist II, Genomatica.
23. "Molecular design in chemical and biological systems", A. Lehmann, December 2004. Current position: Postdoctoral Associate, Fox Chase Cancer Center.
24. "Optimization-based frameworks for the analysis and redesign of metabolic networks", A. Burgard, 2004. Current position: Associate Director, Computational Technologies, Genomatica.
25. "Supply chain management under uncertainty", A. Gupta, August 2002. Current position: Vice President-Analytics, Indicus Analytics, India.
26. "Optimization based methodology for refrigeration system synthesis and molecular design", S. Vaidyaraman, August 2001. Current position: Marketing Associate, Eli Lilly and Company.

### **M.S. STUDENT THESES/PROJECTS SUPERVISED**

1. "Computational design of thioesterases", N. Gifford, Oct. 2014.
2. "OptZyme: A Computational Tool for Altering Enzymatic Specificity", M. Grisewood, May 2013. Current position: Doctoral Student, Department of Chemical Engineering, Pennsylvania State University.
3. "MetRxn: a knowledgebase of metabolites and reactions spanning metabolic models and databases", A. Kumar, 2013. Current position: Doctoral student, Department of Bioinformatics and Genomics, Pennsylvania State University.

4. "Optimization-driven design of synthetic genetic circuits using biobricks", A. R. Zomorodi, 2011. Current position: Postdoctoral Research Associate, Bioinformatics Program & Biomedical Engineering Department, Boston University.
5. "Reconstruction of a genome-scale metabolic model of maize metabolism", R. Saha, January 2011. Current position: Doctoral Student, Department of Chemical Engineering, Pennsylvania State University.
6. "Construction of a genome-scale atom mapping model of E.coli for metabolic flux analysis", P. Ravikirthi, 2010. Current position: Bioinformatician, Positive Bioscience, India.
7. "Computational design to switch protein cofactor specificity and create enzymatic activity", G. Khoury, 2010. Current position: Doctoral Student, Department of Chemical and Biological Engineering, Princeton University.
8. "Optimization methods to compare strain design strategies in metabolic networks using different cellular objectives", V. S. Kumar, December 2008. Current position: Data Scientist, Facebook.
9. "Metabolic Engineering and Strain Design procedures for valuable chemical synthesis", S. Ranganathan, 2008. Current position: Staff Scientist, Synthetic Biology, Life Technologies.
10. "Real options based planning of pharmaceutical product pipelines", M. Rogers, May 2004. Current position: Business Development Manager, DuPont.
11. "Development of process design case studies for the capstone design course", M. Kalp, 1999. Current position: Project Engineer, Croda.
12. "Analysis and optimization of chemical process systems under uncertainty", S. Petkov, August 1997. Current position: Director Business Development, Huvepharma, Bulgaria.

## **COURSES TAUGHT**

**Graduate level:** Nonlinear Optimization: Theory and Applications, Optimization in Biological Networks

**Undergraduate level:** Design of Chemical Plants, Design Projects in Chemical Engineering, Process Dynamics, Process Heat Transfer, Mathematical Modeling in Chemical Engineering

## **SHORTCOURSE AND WORKSHOP LECTURE/INSTRUCTOR**

Pan American Program on Process Systems Engineering, Iguazu Falls, Argentina, October 15-25, 2005, "Biological Pathways Analysis and Engineering"