

# Daniel E. Zak

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## OBJECTIVE

I seek a postdoctoral research position in an infectious disease or immunology lab that employs system-wide functional genomic or proteomic techniques to dissect host-pathogen interactions underlying disease. I am particularly interested in the modulation of host pathways and regulatory networks during infection and desire to experimentally monitor these processes myself and to construct mathematical models of the complex interactions that underlie them. Positions where I may work with clinical and/or in vivo samples are especially sought. My long term objective is to acquire the skills and knowledge to become an independent investigator in the systems biology of infectious diseases, employing modeling and experimentation in combination to lead to greater understanding and development of effective drug targets.

## EDUCATION

Ph.D. Chemical Engineering, Expected February 2005

University of Delaware, Newark, DE (GPA: 3.6/4.0)

Structured modeling of mammalian transcription networks: computational and experimental studies

Babatunde A. Ogunnaike & James S. Schwaber, Advisors

M.S. Chemical Engineering, January 2000

University of Illinois, Urbana-Champaign, IL (GPA: 3.5/4.0)

B.S. Chemical Engineering, May 1998

University of Illinois, Urbana-Champaign, IL (GPA: 3.7/4.0)

\*Graduate with Distinction

## RESEARCH EXPERIENCE

University of Delaware (Newark, DE) /Thomas Jefferson University (Philadelphia, PA)

Graduate Research Assistant, Summer 2000 – present.

Computational modeling of the system-wide transcriptional response of mammalian cells to extracellular signals

Experimental Systems: EGFR signaling in rat hepatocytes & rat suprachiasmatic nucleus

Experimental Methods:

-Gene expression: RNA extraction and purification, qRT-PCR, & cDNA microarrays (aRNA amplification, labeling, hybridization, scanning, quantification)

-Mammalian cell culture

Computational methods:

-Development of an integrative modeling framework for mammalian transcription networks

-Statistics & data analysis: microarray data analysis, microarray cluster analysis, qRT-PCR modeling

-Modeling: Biochemical kinetic modeling, system identification

-Model analysis: Sensitivity & identifiability analyses, experimental design, stochastic kinetics

-Bioinformatics: Promoter analysis, literature mining

## PUBLICATIONS

- Zak DE, Vadigepalli R, Gonye GE, Doyle FJ III, Schwaber JS, & Ogunnaike BA. Unconventional systems analysis problems in molecular biology: a case study in gene regulatory network modeling. *Computers and Chemical Engineering* (In press, 2005).
- Zak DE, Stelling J, & Doyle FJ III. Sensitivity analysis of oscillatory (bio)chemical systems. *Computers and Chemical Engineering* (In press, 2005).
- Zak DE, Pearson RK, Vadigepalli R, Gonye GE, Schwaber JS, & Doyle FJ III. Continuous-time identification of gene expression models. *Omics*, 7(4), 373-86, 2003.
- Zak DE, Gonye GE, Schwaber JS, & Doyle FJ III. Importance of input perturbations and stochastic gene expression in the reverse engineering of genetic regulatory networks. *Genome Research*, 13(11), 2396-405, 2003.
- Vadigepalli R, Chakravarthula P, Zak DE, Schwaber JS, & Gonye GE. PAINT: A promoter analysis and interaction network generation tool for genetic regulatory network identification. *Omics*, 7(3), 235-52, 2003.

## PROCEEDINGS

- Zak DE, Doyle FJ, Vlachos DG and Schwaber JS. Stochastic kinetic analysis of transcriptional feedback models for circadian rhythms. *Proceedings of the 40th IEEE Conference on Decision and Control*. 849-854, 2001.
- Zak DE, Doyle FJ, Gonye GE and Schwaber JS. Simulation studies for the identification of genetic networks from cDNA array and regulatory activity data. *Proceedings of the Second International Conference on Systems Biology*. 231-238, 2001.
- Markevich N, Kiyatkin AB, Zak DE, Pastorino JG, Hoek JB, and Kholodenko BN. Four-dimensional organization of cellular signal transduction cascades. *Proceedings of the Second International Conference on Systems Biology*. 141-147, 2001.

## PRESENTATIONS (partial listing)

- Zak DE (speaker), Egan B, Schwaber JS, Ogunnaike BA. "Gene dynamics and transcription networks," presented at the: American Institute of Chemical Engineers Annual Meeting, Austin, 2004.
- Zak DE (speaker). "Structured modeling of transcription networks: computational and experimental applications in mammalian systems biology," poster presented at the: American Institute of Chemical Engineers Annual Meeting, Austin, 2004.
- Zak DE (speaker), Vadigepalli R, Schwaber JS, Gonye GE, Ogunnaike BA. "Integrating multiple genomic data types into structured models of gene regulatory networks," poster presented at: NIH-BISTI Symposium: Digital Biology: The Emerging Paradigm, Bethesda, 2003.
- Zak DE (speaker), Pearson RK, Vadigepalli R, Gonye GE, Schwaber JS, Ogunnaike BA. "Assigning Significance to the Appearance of Regulatory Elements in Experimentally Defined Collections of DNA Sequences Using Empirical Reference Distributions," American Institute of Chemical Engineers Annual Meeting, San Francisco, 2003.
- Zak DE (speaker), Lombardo TG, Kholodenko BN, Su C, Ogunnaike BN. "Modeling the Interaction of Growth Factor and Apoptosis Subsystems in Cancer," American Institute of Chemical Engineers Annual Meeting, San Francisco, 2003.
- Zak DE, Gonye GE, Schwaber JS, Doyle FJ 3rd (speaker). "Systems identification concepts in the reverse engineering of gene networks." Third International Conference on Systems Biology, Stockholm, Sweden, 2002.
- Zak DE (speaker), Doyle FJ 3rd, Pearson RK, Schwaber JS. "Experimental Design in Genetic Regulatory Network Identification: Results From In Silico Studies," American Institute of Chemical Engineers Annual Meeting, Indianapolis, November 2002.
- Zak DE (speaker), Doyle FJ 3rd, Schwaber JS, Pearson RK. "Genetic Regulatory Network Simulations for Data Analysis." DIMACS Workshop on Complexity in Biosystems, Piscataway, April 2002.
- Zak DE (speaker), Doyle FJ 3rd, Vlachos DG and, Schwaber JS. "Stochastic kinetic analysis of transcriptional feedback models for circadian rhythms." 40th IEEE Conference on Decision and Control, Orlando, 2001.

(complete listing of presentations available at: <http://www.che.udel.edu/systems/people/zak/conferences>)

## TEACHING EXPERIENCE

University of Delaware

-Teaching Assistant, Fall 2001: Senior Lab, Composites

-Guest Lecturer, Spring 2000: UD/TJU Short course in computational biology and bioinformatics

University of Illinois

-Teaching Assistant, Fall 1999: Fluid Mechanics

-Teaching Assistant, Spring 1998: Mass Transfer Operations

## ADDITIONAL SKILLS

Programming: MATLAB, R/S+, PERL & HTML (basic)

Grants: Contributed significantly to the development of several NIH proposals.

## ADDITIONAL COURSES

Biomedical: Graduate level Biochemistry, Cell Biology, Molecular Pharmacology  
(courses completed at Thomas Jefferson University, Philadelphia, PA).

Systems engineering: Control System Theory and Design, Nonlinear Dynamics

## INDUSTRIAL EXPERIENCE

Mobil Oil Joliet Refinery, Joliet, IL, Summer 1999

Modeling refinery heat exchangers and performance monitoring.

TECH Semiconductor, SINGAPORE, Spring 1999

Dynamic modeling and experimentation with scaled-down water softener.

US Army Construction Engineering Research Lab, Champaign, IL, Fall 1997/Spring 1998

Toxicological study of fog oil mixtures, cost estimates for a carbon adsorption vapor recovery system.

Zagreb Brewery, Zagreb, CROATIA, Summer 1997

Analytical tests of brews for quality.

Air Products and Chemicals, Allentown, PA, Summer/Fall 1996

Modeling, sensitivity analysis, and design heuristics for distillation sieve trays.

## ADDITIONAL INTERESTS

India: The culture, food, music, and landscape of my wife's homeland are a source of fascination.

Outdoors: Hiking, camping, biking, swimming, etc.

## REFERENCES

Prof. Babatunde A. Ogunnaike, tel. (302)831-4504, e-mail: ogunnaik@che.udel.edu  
University of Delaware Department of Chemical Engineering (Newark, DE 19716)

Prof. James S. Schwaber, tel. (215)503-7823, e-mail: james.schwaber@mail.tju.edu  
Director, Daniel Baugh Institute for Functional Genomics & Computational Biology,  
Thomas Jefferson University (Philadelphia, PA 19107)

Dr. Gregory E. Gonye, tel. (215)955-0580, e-mail: ggonye@mail.dbi.tju.edu  
Daniel Baugh Institute for Functional Genomics & Computational Biology,  
Thomas Jefferson University (Philadelphia, PA 19107)

Academic transcripts and additional references are available upon request