

BIOGRAPHICAL SKETCH: CHRIS WIGGINS

PROFESSIONAL PREPARATION

Columbia College	Math/Physics	B.A. 1993
Princeton University	Theoretical Physics	Ph.D. 1998
Courant Institute, NYU	Biomathematics	1998-2001

APPOINTMENTS

2001-	Assistant Professor, Center for Computational Biology and Bioinformatics and Department of Applied Physics and Applied Mathematics, Columbia University
1998-2001	Assistant Professor/Courant Instructor, Courant Institute, NYU
1998-2001	NSF Mathematical Sciences Foundation Postdoctoral Research Fellow
1998	Visiting Postdoctoral Researcher, Institut Curie, Physico-Chimie Curie, Paris
1993-1998	Graduate student, Princeton physics

EDUCATION ACTIVITIES

Assistant Professor, Columbia	2001- Spring 2003	Introduction to Biophysical Modeling Junior seminar: topics in applied mathematics
	Spring 2003	Senior seminar: problems in applied mathematics
Courant Instructor, NYU	Spring, 2001 Fall, 2000 Spring, 2000 Fall, 1999	Mathematical Neuroscience Chaos and Dynamical Systems Ordinary Differential Equations Linear Algebra

SYNERGISTIC ACTIVITIES

1. Seminars/Colloquia Organized: "Applied Math Lab Seminar," and "Genomics Journal Club" (NYU; 1999-2000); "Colloquium in Applied Mathematics", (Columbia; 2001-)
2. New courses: Mathematical Neuroscience with MATLAB (NYU); Introduction to Biophysical Modeling (Columbia).
3. Nontraditional training: Advised five VIGRE undergraduates in network classification project, with results published and presented at national and international conferences; advised four high school students in the Intel Science Competition, including a coauthor, with results presented at the American Physical Society Division of Fluid Dynamics meeting in November 2002
4. Curricular development: assisting in developing an interdisciplinary biophysics and computational biology major at Columbia University and computational biology PhD via affiliation

with Columbia's Center for Computational Biology and Bioinformatics.

5. Organizer: "The facts of life: data-driven approaches to systems biology" (minisymposium, APS March meeting, 2005); Co-organizer: "Machine Learning Approaches for Understanding Gene Regulation" (DIMACS workshop, 2005); Co-organizer: Eighth Annual Japanese-American Beckman Frontiers of Science Symposium, 2005. (U.S. National Academy of Sciences/JSPS)

SELECTED PUBLICATIONS

1. E. O'Brien, M. Bennett, V. Cherniatin, C. Y. Chi, A. Chikarian, B. Dolgoshein, S. Kumar, D. Lissauer, S. McCorkle, J. T. Mitchell, S. Nagamiya, V. Polychronakos, K. Pope, W. Sippach, H. Takai, M. Toy, D. Wang, Y. F. Wang, C. Wiggins, and W. Willis. A transition radiation detector which features accurate tracking and dE/dx particle identification. *IEEE Transactions on Nuclear Science*, 40, 1993.
2. Chris H. Wiggins and M. Spiegelman. Magma migration and magmatic solitary waves in 3d. *Geophys. Res. Lett.*, 22, 1995.
3. D. Riveline, Chris H. Wiggins, A. Ott, and Raymond E. Goldstein. Elastohydrodynamic study of actin filaments using fluorescence microscopy. *Physical Review E*, 56, 1997, cond-mat/9704225.
4. Raymond E. Goldstein, Thomas R. Powers, and Chris H. Wiggins. The viscous nonlinear dynamics of twist and writhe. *Physical Review Letters*, 80, 1998, cond-mat/9802084.
5. Chris H. Wiggins and Raymond E. Goldstein. Flexive and propulsive dynamics of elastica at low Reynolds numbers. *Physical Review Letters*, 80, 1998, cond-mat/9707346.
6. Chris H. Wiggins, Daniel X. Riveline, Albrecht Ott, and Raymond E. Goldstein. Trapping and wiggling: Elastohydrodynamics of driven microfilaments. *Biophysical Journal*, 74(2), 1998, cond-mat/9703244.
7. T. R. Powers, R. E. Goldstein, and Chris H. Wiggins. Supercoiling bacterial filaments. In H. Frauenfelder, G. Hummer, and R. Garcia, editors, *Biological Physics: Third International Symposium*, 1999.
8. Chris H. Wiggins. Darboux's frame and Schrodinger's equation for biopolymers. In M. Deville and R. Owens, editors, *Sixteenth IMACS World Congress 2000 on Scientific Computation, Applied Mathematics, and Simulation*, 2000.
9. A. L. Belmonte, S. T. Eldakar, M. J. Shelley, and C. H. Wiggins. Dynamic patterns and self-knotting of a driven hanging chain. *Physical Review Letters*, 8711, 2001.
10. Chris H. Wiggins. Biopolymer mechanics: stability, dynamics, and statistics. *Mathematical Methods in the Applied Sciences*, 24, 2001.
11. Ilya Nemenman Chris Wiggins. Process pathway inference via time series analysis. *Journal of Experimental Mechanics*, 43, 2002, physics/0206031.

12. Chris H. Wiggins and Loic Le Goff. Biopolymer dynamics. In A. Deutsch, M. Falcke, J. Howard, and W. Zimmermann, editors, *Function and Regulation of Cellular Systems: Experiments and Models*. Birkhaeuser-Verlag, 2002.
13. J. P. Bennett and C. H. Wiggins. A computational study of mixing microchannel flows. 2003, cond-mat/0307482. Submitted.
14. Chris H. Wiggins, Alberto Montesi, and Matteo Pasquali. The stochastic spectral dynamics of bending and tumbling. 2003, cond-mat/0307551.
15. Etay Ziv, Robin Koytcheff, and Chris Wiggins. Novel systematic discovery of statistically significant network features. *Physical Review E*, 2003, cond-mat/0306610. In press.
16. Y. Bohbot-Raviv, W. Z. Zhao, M. Feingold, Chris H. Wiggins, and R. Granek. Far from equilibrium dynamics of semi-flexible polymers. *Physical Review Letters*, 92, 2004.
17. Adam A. Margolin, Ilya Nemenman, Katia Basso, Ulf Klein, Chris Wiggins, Gustavo Stolovitzky, Riccardo Dalla Favera, and Andrea Califano. ARACNE: An algorithm for the reconstruction of gene regulatory networks in a mammalian cellular context. 2004, q-bio/0410037. Submitted.
18. Adam A. Margolin, Ilya Nemenman, Chris Wiggins, Gustavo Stolovitzky, and Andrea Califano. On the reconstruction of interaction networks with applications to transcriptional regulation. 2004, q-bio/0410036. In press.
19. Manuel Middendorf, Anshul Kundaje, Chris Wiggins, Yoav Freund, and Christina Leslie. Predicting genetic regulatory response using classification. *Bioinformatics*, 20, 2004, q-bio/0411028. Proceedings of the Twelfth International Conference on Intelligent Systems for Molecular Biology (ISMB 2004).
20. Manuel Middendorf, Anshul Kundaje, Chris Wiggins, Yoav Freund, and Christina Leslie. Predicting genetic regulatory response using classification: Yeast stress response. 2004, q-bio/0406016. Proceedings of the First Annual RECOMB Regulation Workshop 2004.
21. Manuel Middendorf, Etay Ziv, Carter Adams, Jen Hom, Robin Koytcheff, Chaya Levovitz, Gregory Woods, Linda Chen, and Chris Wiggins. Discriminative topological features reveal biological network mechanisms. *BMC Bioinformatics*, 5, 2004, q-bio/0402017.
22. Anshul Kundaje, Manuel Middendorf, Chris Wiggins, and Christina Leslie. Combining sequence and time series expression data to learn transcriptional modules. *IEEE Transactions on Computational Biology and Bioinformatics*, 2005. In press.
23. Manuel Middendorf, Anshul Kundaje, Mihir Shah, Yoav Freund, Chris Wiggins, and Christina Leslie. Motif discovery through predictive modeling of gene regulation. 2005. Proceedings of Ninth Annual International Conference on Research in Computational Molecular Biology (RECOMB 2005), special "Lecture notes in Bioinformatics" from Springer-Verlag.
24. Manuel Middendorf, Etay Ziv, and Chris H. Wiggins. From The Cover: Inferring network mechanisms: The *Drosophila melanogaster* protein interaction network. *PNAS*, 102(9), 2005, q-bio/0408010.
25. E. Ziv, M. Middendorf, and C. H. Wiggins. Information-theoretic approach to network modularity. *Phys Rev E Stat Nonlin Soft Matter Phys*, 71(4 Pt 2), Apr 2005, q-bio/0411033.

26. Etay Ziv, Robin Koytcheff, Manuel Middendorf, and Chris Wiggins. Systematic identification of statistically significant network measures. *Physical Review E*, 71, 2005, cond-mat/0306610.

ADVISING: CURRENT STUDENTS

1. Etay Ziv: MD/PhD student; 4 papers authored; first author on 2. Recipient of DOE and DOD (Krell CSGF) Fellowships. Expected PhD 2006. Biological networks.
2. Manuel Middendorf: Physics student; 8 papers authored; first author on 5. Expected PhD 2006. Biological applications of machine learning.
3. Jacob Hofman: Physics student. Expected PhD 2009. Applications of machine learning in microscopy.
4. Robin Kotcheff: FFSEAS student; 2 papers authored. Expected B.S. 2005
5. Lawrence David: FFSEAS student. Recipient of Goldwater Fellowship. Expected B.S. 2005.

CURRENT SUPPORT

Project/Proposal Title: NIGMS: Structure and Assembly of Cytoskeletal Filaments

PI: Mike Sheetz

Source of Support: National Institutes of Health

Total Award Amount: \$ 95,641

Total Award Period Covered: 09/01/03 - 08/31/05

Location of Project: Columbia University

Person-Months Per Year Committed to the Project

Cal: 0.50 Acad: 0.00 Sumr: 0.00

Goals: Develop machine learning methods for high throughput microscopic approaches to problems in cellular biophysics, particularly centered on cellular motility, force generation, and force transduction

Responsibilities: Design and implementation of novel algorithms; analytic and computational modeling of resulting cellular biophysical data

Project/Proposal Title: QSB: optimal information processing in biological networks

PI: Chris Wiggins

Source of Support: National Science Foundation

Total Award Amount: \$ 310,490

Total Award Period Covered: 09/01/04 - 08/31/07

Location of Project: Columbia University
Person-Months Per Year Committed to the Project

Cal: 1.00 Acad: 0.00 Sumr: 0.00

Goals: Theoretical and computational study of the relationships between, and constraints imposed by, the topology of biological networks and their biological functions

Responsibilities: Computational simulation of small genetic networks; discriminative classification of network topologies

PENDING SUPPORT

Project/Proposal Title: MAGNET: a National Center for Biomedical Computation

PI: Barry Honig

Source of Support: National Institutes of Health

Total Award Amount: \$ 25,000,000

Total Award Period Covered: 07/01/06 - 06/30/11

Location of Project: Columbia University

Person-Months Per Year Committed to the Project

Cal: 1.00 Acad: 0.00 Sumr: 0.00

Goals: Develop a national center for biomedical computation, centering on biological networks

Responsibilities: Co-PI