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Curriculum Vitae

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Education

- 1988–1993 Charles University, Prague, Czech Republic, Mgr. in Applied Mathematics
 1993–1999 Rutgers University, Piscataway, NJ.
 M. S., Theoretical Mechanics, May 1995
 Ph. D., Theoretical Mechanics, January 1999 (*Dissertation*: Configurations with Self-Contact in the Theory of the Elastic Rod Model for DNA; advisor Prof. B. D. Coleman)

Primary Appointments

- 1999–2001 Post-doctoral Associate, Department of Mechanics & Materials Science, Rutgers University
 2001–2004 Research Associate, Department of Chemistry, Rutgers University
 2004–2011 Assistant Professor, Department of Mathematics, University of Pittsburgh
 2011– Associate Professor, Department of Mathematics, University of Pittsburgh

Secondary Appointments

- 2002–2004 BioMaPS Institute, Rutgers University
 2006– Department of Computational and Systems Biology, University of Pittsburgh
 2005– Center for Inflammation and Regenerative Modeling, McGowan Institute for Regenerative Medicine, University of Pittsburgh

Awards

- 1997 Fellowship by the Program in Mathematics and Molecular Biology, sponsored by the Burroughs Wellcome Fund Interfaces Program
 1999 Stanley and Francine Mandeles Graduate Research Award for outstanding research contributions to biophysical chemistry
 2006 Alfred P. Sloan Research Fellowship

Publications

- [1] B. D. Coleman, E. Dill, & D. Swigon, On the dynamics of flexure and stretch in the theory of elastic rods, *Arch. Rational Mech. Anal.* **129**, 147–174 (1995).
 Reprinted with commentary in *Localization and Solitary Waves in Solid Mechanics*, A.R. Champneys, G.W. Hunt, and J.M.T. Thompson (eds.), World Scientific, Singapore, 1999.
- [2] B. D. Coleman, I. Tobias, & D. Swigon, Theory of influence of end conditions on self-contact in DNA loops, *J. Chem. Phys.* **103**, 9101–9019 (1995).
- [3] D. Swigon, B. D. Coleman, & I. Tobias, The elastic rod model for DNA and its application to the tertiary structure of DNA minicircles in mononucleosomes, *Biophys. J.* **74**, 2515–2530 (1998).
- [4] I. Tobias, D. Swigon, & B. D. Coleman, Elastic stability of DNA configurations: I. General theory, *Phys. Rev. E* **61**, 747-758 (2000).

- [5] B. D. Coleman, D. Swigon, & I. Tobias, Elastic stability of DNA configurations: II. Supercoiled plasmids with self-contact, *Phys. Rev. E* **61**, 759-770 (2000).
- [6] B. D. Coleman & D. Swigon, Theory of supercoiled elastic rings with self-contact and its application to DNA plasmids, *J. Elasticity*, **60**, 171-221 (2000).
- [7] B. D. Coleman & D. Swigon, Theory of self-contact in DNA molecules modeled as elastic rods, *Nuovi progressi nella fisica matematica dall'eredità di Dario Graffi*, Accademia Nazionale dei Lincei, 281-295 (2001).
- [8] D. Keller, D. Swigon, & C. Bustamante, Relating single molecule measurements to thermodynamics, *Biophys. J.*, **84**, 733-738 (2003).
- [9] B.D. Coleman, W.K. Olson, & D. Swigon, Theory of sequence-dependent DNA elasticity, *J. Chem. Phys.*, **118**, 7127-7140 (2003).
- [10] C.L. Lawson, D. Swigon, K. Murakami, S.A. Darst, H.M. Berman, & R.H. Ebright, Catabolite activator protein (CAP): DNA binding and transcription activation, *Curr. Opin. Struct. Bio.* **14**, 1-11 (2004).
- [11] B.D. Coleman & D. Swigon, Theory of self-contact in Kirchhoff rods with applications to supercoiling of knotted and unknotted DNA plasmids, *Phil. Trans. Roy. Soc. Lond. A*, **362**, 1281-1299 (2004).
- [12] W.K. Olson, D. Swigon, & B.D. Coleman, Implications of the dependence of the elastic properties of DNA on nucleotide sequence, *Phil. Trans. Roy. Soc. Lond. A*, **362**, 1403-1422 (2004).
- [13] D. Swigon, B.D. Coleman, & W.K. Olson, Modeling the Lac repressor-operator assembly: I. The influence of DNA looping on Lac repressor conformation, *Proc. Nat. Acad. Sci. USA*, **103**, 9879-9884 (2006).
- [14] L. Czapla, D. Swigon, & W.K. Olson, Sequence-dependent Effects in the Cyclization of Short DNA, *J. Chem. Theory Comput.*, **2**, 685-695 (2006).
- [15] B. Hancioglu, D. Swigon, & G. Clermont, A Dynamical Model of Human Immune Response to Influenza A Virus Infection, *J. Theor. Biol.*, **246**, 70-86 (2007).
- [16] Y. Biton, B.D. Coleman, & D. Swigon, On bifurcations of equilibria of intrinsically curved, electrically charged, rod-like structures that model DNA molecules in solution, *J. Elasticity*, **87**, 187-210 (2007).
- [17] Q. Mi, D. Swigon, B. Riviere, S. Cetin, Y. Vodovotz, & D. Hackam, One-dimensional elastic continuum model of enterocyte layer migration, *Biophys. J.* **93**, 3745-3752 (2007).
- [18] D. Swigon & W.K. Olson, Mesoscale modeling of multi-protein-DNA assemblies: the role of the catabolic activator protein in Lac repressor-mediated looping, *Int. J. Nonl. Mech.*, **43**, 1082-1093 (2008).
- [19] L. Czapla, D. Swigon, & W.K. Olson, Effects of the nucleoid protein HU on the structure, flexibility, and ring-closure properties of DNA deduced from Monte-Carlo simulations, *J Mol. Biol.* **382**, 353-370 (2008).
- [20] D. Swigon, The Mathematics of DNA Structure, Mechanics, and Dynamics, in *IMA Volumes in Mathematics and Its Applications 150*, Springer Verlag 2009.
- [21] B. Riviere, Y. Epshteyn, D. Swigon, & Y. Vodovotz, A Mathematical Model of Signaling Resulting from the Binding of Lipopolysaccharide with Toll-like Receptors Demonstrates Inherent Preconditioning Behavior, *Math. Biosciences* **217**, 19-26 (2009).
- [22] W.K. Olson, A.R. Srinivasan, A.V. Colasanti, G. Zheng, & D. Swigon, DNA Biomechanics, *Handbook of Molecular Biophysics*, 359-382 (2009).
- [23] S. Lim, Y. Kim, & D. Swigon, Dynamics of an electrostatically charged rod in fluid, *Proc. Roy Soc. A*, **467**, 569-590 (2010).
- [24] J. C. Arciero, Q. Mi, M. F. Branca, D. J. Hackam, and D. Swigon, Continuum model of collective cell migration in wound healing and colony expansion, *Biophys. J.* **100**, 535-543 (2011).

- [25] A. Kocsis and D. Swigon, DNA overstretching modeled at the base pair level: shear instability in elastic linkages, *International Journal of Nonlinear Mechanics* **47**, 639-654 (2011).
- [26] K. Penner, B. Ermentrout, and D. Swigon, Pattern formation in a model of acute inflammation, *SIADS* **11**, 629-660 (2012).
- [27] L. Czapla, M.A. Grosner, D. Swigon, & W.K. Olson, Interplay of protein and DNA structure revealed in simulations of the *lac* operon, *accepted*, (2012).
- [28] D. Swigon, Ensemble Modeling of Biological Systems, *Mathematics and Life Sciences*, Eds. A.V. Antoniouk and R.V.N. Melnik, De Gruyter (2012).
- [29] M. DeSantis, D. Swigon, and G Caginalp, Nonlinear dynamics and stability in a multi-group asset flow model, *SIAM Journal on Applied Dynamical Systems*, **11**, 1114-1148 (2012).
- [30] J.C. Arciero, Q. Mi, M. Branca, D. Hackam, and D. Swigon, Using a continuum model to predict closure times of wounded intestinal epithelial layers, *Wound Repair and Regeneration*, **21**, 256-265, (2013).
- [31] Lukens, S., Miller, D., Ghedin, E., Rosenfeld, R., Clermont, G., and Swigon, D., A computational model of the compartmental human immune response to influenza A virus infection, *under review (PLOS Comp Bio)*
- [32] Arciero, J., & Swigon, D., Equation-Based Models of Wound Healing and Collective Cell Migration, in *Complex Systems and Computational Biology Approaches to Acute Inflammation*, Eds. G. An and Y. Vodovotz.
- [33] Tang, S., Swigon, D., Lee, N. Y.-K., Mi, Q., Clermont, G., & Verdolini-Abbott, K., Mathematical Model of Human Vocal Fold Inflammation: Probabilistic Prediction of Individual Response using Ensemble Modeling, *under review (J. Theor. Biol.)*
- [34] Swigon, D., Lim, S., and Kim, Y., Dynamical simulations of DNA supercoiling and compression, *Biochem. Soc. Trans.*, **41**, 554-558, (2013).
- [35] Olson, W. K., Grosner, M. A., Czapla, L., & Swigon, D., Structural Insights into the Looping of Protein-decorated DNA from Computer Simulations, *Biochem. Soc. Trans.* **41**, 559-564, (2013).

Advising of Postdoctoral Associates

- *Attila Kocsis*, Ph.D. from Budapest University of Technology
Visited DS for 4 months in early 2008, started a project on bifurcation analysis of short DNA segments under tensile and torsional loads. Returned in May 2010 to finish a paper.
- *Julia Arciero*, Ph.D. from ASU. Joined CBSG in September 2008. Worked with DS on a continuum-mechanical model of wound healing. Currently Assistant Professor at IUPUI
- *Yoav Biton*, Ph.D. from Rutgers University. Joined the Department in May 2010. Works with DS on modeling DNA looping *in vivo* and *in vitro*, and the mechanism of insulation by looping in transcription regulation.

Advising of Ph.D. Students

- *Baris Hancioglu*, Ph.D. student in Mathematics Department, supervised since October 2004, research in modeling the host immune response to influenza infection, overview exam passed February 2007, **graduated August 2007**. Continued to post-doc with John Tyson, then postdoc at Rice U.
- *Qi Mi*, Ph.D. student in Mathematics Department, co-supervised since May 2005 with B. Riviere, research on continuum-mechanics modeling of wound healing, overview exam passed December 2006, **graduated August 2007**. Currently Assistant Professor at Pitt School of Rehabilitation Science.
- *Saishuai Tang*, Ph.D. student in Mathematics Department, supervised since September 2005, research on modeling immune response and vocal fold inflammation, overview exam passed December 2009, **graduated August 2010**. Continued on to Masters in Finance at CMU, now working for Citibank.

- *Ian Price*, Ph.D. student in Mathematics Department, supervised since April 2007, research on modeling host immune response to influenza infection, overview exam passed August 2009. **graduated August 2011**. Worked for biotech startup Immunetrix.
- *Daniel Smith*, Ph.D. student in Mathematics Department, co-supervised with Jon Rubin since April 2007, research on numerical methods for enhancing sampling of molecular dynamics trajectories. **graduated August 2012**. Currently postdoc at NIH.
- *Tracy Stepien*, Ph.D. student in Mathematics Department, supervised since May 2009, research on models of cell sheet migration with proliferation. **graduating May 2013**
- *Shelby Stanhope*, Ph.D. student in Mathematics Department, supervised since May 2011, research on parameter estimation in ODE models.

Advisor to Undergraduate Research Students

- *Kristen Pueschel*, AY2008-2009, Mathematics major, did research on automated cell tracing analysis in cell sheet migration. Now graduate student.
- *Marissa Goldrich*, AY2008-10, Mathematics and linguistics major, research on characterization of negative feedbacks in immune response to virus infection.
- *Kevin Penner*, AY2009-10, Mathematics major, directed jointly with Bard Ermentrout to work on spatial model of rash formation in inflammation. Presented a poster at SIAM LS10 conference. Currently graduate student at University of North Carolina.
- *Peter Lund*, Spring 2010- Spring 2011, Mathematics major, directed jointly with Bard Ermentrout to work on dynamics of influenza epidemics and selective predator-prey dynamics. Currently a graduate student at CNBC.
- *Edlyn Levine*, Spring 2010- Spring 2011, Physics major, directed jointly with Anna Vainchtein, works on a discrete model of DNA denaturation. Currently graduate student at Harvard Engineering Physics.
- *Victoria Lang*, AY 2010-11, Mathematics major, Directed jointly with Brent Doiron, works on a stochastic model of gene extinction in a population.
- *Jaime Jeke*, AY 2010-11, Mathematics major, Directed jointly with Brent Doiron, works on a stochastic model of gene extinction in a population.
- *Max Nurnberger*, AY 2011-12, Mathematics major, Directed jointly with Brent Doiron, works on a stochastic model of gene extinction in a population.
- *Harini Chandramouli*, AY 2013-14, Mathematics major, works on modeling of in-host immune response to influenza infection