Robert S. Manning
Department of Mathematics and Statistics
Haverford College
Haverford, PA 19041

Email: rmanning@haverford.edu
Phone: (610) 896-1210
Citizenship: United States
http://www.haverford.edu/math/rmanning.html

Education

Ph. D.	Cornell University, Applied Mathematics, August 1994 (M. S. January 1993). Held National Science Foundation Graduate Fellowship 1989–1992.
B. S.	Yale University, Applied Mathematics, May 1989.

Experience

Jul. 1998—present	Haverford College, Math Department; Professor of Mathematics (2014–present; previously Assoc. Prof. 05–14, Asst. Prof. 98–05); William H. and Johanna A. Harris Chair of Computational Science (2006–present)
Nov. 1997—Jun. 1998	Ecole Polytechnique Fédérale de Lausanne, Département de Mathématiques; Assistant
Jun. 1995—May 1998	University of Maryland at College Park, Institute for Physical Science and Technology; NSF Postdoctoral Research Fellow
Aug. 1994—Jun. 1995	Williams College, Mathematics Department; Visiting Assistant Professor

Grants

• "RUI: Continuum Models of DNA and Protein Coils", National Science Foundation, 8/03–1/08.
• "RUI: Continuum Modeling of DNA Cyclization", National Science Foundation, 8/99–8/03.
• "Protein-Based Biomaterials for Nanotechnology", David and Lucile Packard Foundation, 7/00–7/05 (with K. Akerfeldt, S.A. Kane, J. de Paula, R. Fairman, K. Johnson, W. Smith).

Awards

• Christian R. and Mary F. Lindback Foundation award for teaching, Haverford College, 2005.

Publications (* denotes Haverford undergraduate)

• R. Manning, "Laplace approximation of J factors for rigid base and rigid basepair models of DNA cyclization", Biophys. J. **124** (2025) 40-61.

• R. Manning, K. Hoffman, M. Merkle, L. Fan*, and A. Sharma*, "Energy-minimizing configurations for an elastic rod with self-contact energy close to the inextensible–unshearable and hard-contact limits", Comput. Methods Appl. Mech. Eng. **422** (2024) 116832.

• Y. Tong and R.S. Manning, "Quantifying the impact of simple DNA parameters on the cyclization J-factor for single-basepair-addition families", Scientific Reports **8** (2018) 4882.

• J.S. Mitchell, J. Glowacki, A.E. Grandchamp, R.S. Manning, and J.H. Maddocks, "Sequence-Dependent Persistence Lengths of DNA", J. Chem. Theory Comput. **13** (2017) 1539-1555.

• I.N. Okeke, R.S. Manning, and T. Pfeiffer, "Diagnostic schemes for reducing epidemic size of African viral hemorrhagic fever outbreaks", Journal of Infection in Developing Countries **8** (2014) 1148-1159.

• R. S. Manning, "A catalogue of stable equilibria of planar extensible or inextensible elastic rods for all possible Dirichlet boundary conditions", J. Elast. **115** (2014) 105-130.

• B. P. Tsang*, H. S. Bretscher*, B. Kokona, R. S. Manning, and R. Fairman, "Thermodynamic Analysis of Self-Assembly in Coiled-Coil Biomaterials", Biochemistry **50** (2011) 8548–8558.

• K. M. Peterson* and R. S. Manning, "Ineffective perturbations in a planar elastica", Involve **2** (2009) 557–578.

• K. A. Hoffman and R. S. Manning, "An extended conjugate point theory with application to the planar buckling of an elastic rod subject to a repulsive self-potential", SIAM Journal on Mathematical Analysis **41** (2009) 465–494.

• R. S. Manning, "Conjugate Points Revisited and Neumann-Neumann Problems", SIAM Review **51** (2009) 193–212.

• D. J. Rigotti*, B. Kokona, T. Horne*, E. K. Acton*, C. D. Lederman*, R. S. Manning, S. A. Kane, W. F. Smith, and R. Fairman, "AFM Images Reveal Unusual Filaments formed by the *Acanthamoeba Castellanii* Myosin II Rod Domain", Anal. Biochem. **346** (2005) 189–200.

• R. S. Manning and G. B. Bulman*, "Stability of an elastic rod buckling into a soft wall", Proc. R. Soc. Lon. Ser. A, **461** (2005) 2423–2450.

• K. A. Hoffman, R. S. Manning, and J. H. Maddocks, "Link, Twist, Energy, and the Stability of DNA Minicircles", Biopolymers, **70** (2003) 145–157.

• K. A. Hoffman, R. S. Manning, and Randy C. Paffenroth, "Calculation of the stability index in parameter-dependent calculus of variations problems: Buckling of a twisted elastic strut", SIAM Journal on Applied Dynamical Systems, **1** (2002) 115–145.

• R. S. Manning and K. A. Hoffman, "Stability of n-covered circles for elastic rods with constant planar intrinsic curvature", Journal of Elasticity, **62** (2001) 1–23.

• P. B. Furrer, R. S. Manning, and J. H. Maddocks, "DNA Rings with Multiple Energy Minima", Biophysical Journal, **79** (2000) 116–136.

• R. S. Manning and J. H. Maddocks, "Symmetry Breaking and the Twisted Elastic Ring", Comput. Methods Appl. Mech. Engrg., **170** (1999) 313–330.

• R. S. Manning, K. A. Rogers, and J. H. Maddocks, "Isoperimetric conjugate points with application to the stability of DNA minicircles", Proc. R. Soc. Lon. Ser. A., **454** (1998) 3047.

• J. H. Maddocks, R. S. Manning, R. C. Paffenroth, K. A. Rogers, and J. A. Warner, "Interactive computation, parameter continuation, and visualization", Int. J. of Bif. and Chaos., **7** (1997) 1699.

• R. S. Manning, J. H. Maddocks, and J. D. Kahn, "A Continuum Rod Model of Sequence-Dependent DNA Structure", J. Chem. Phys., **105** (1996) 5626.

• R. S. Manning and G. S. Ezra, "A uniform regularized semiclassical propagator for the x^{-2} potential", Phys. Rev. A., **53** (1996) 661.

• R. S. Manning and G. S. Ezra, "Regularized semiclassical radial propagator for the Coulomb potential", Phys. Rev. A, **50** (1994) 954.

• R. S. Manning and N. De Leon, "Theory of Projected Probabilities on Non-Orthogonal States: Application to Electronic Populations in Molecules", J. Math. Chem., **5** (1990) 323–357.

• Emily Ann Schmalzer, Robert Scott Manning, and Shu Chien, "Filtration of sickle cells: recruitment into a rigid fraction as a function of density and oxygen tension", J. Lab. Clin. Med., **113** (1989) 727–734.

Recent Presentations

• "A computational approach to finding self-contact configurations of elastic filaments", Drexel math colloquium, April 2024.

• "Estimation of the Cyclization J-Factor within the cgDNA rigid-base model of DNA", CECAM conference "Multiscale Modeling of Elastic Filaments, UNIL/EPFL, Lausanne, January 2018.

• "Monte Carlo simulations of DNA cyclization using a rigid-base model and mechanical properties derived from molecular dynamics", 8th European Nonlinear Dynamics Conference (ENOC 2014), Vienna, July 2014.

• "Monte Carlo simulations within a rigid-base model of DNA with comparison to experimental measurements of persistence length", AMS Spring Eastern sectional meeting, University of Maryland Baltimore County, March 2014.

• "Monte Carlo simulations of DNA cyclization using a rigid-base model and mechanical properties derived from molecular dynamics", AMS Fall Eastern sectional meeting, Temple University, October 2013.

• "A generalization of conjugate points for a broader range of elastic rod problems", Applied Math seminar, Temple University, March 2013.

Professional Activities

• Past Editorial Board member, Scientific Reports
• Reviewer for NSF, Mathematical Reviews, Journal of Elasticity, Journal of Chemical Physics, Proceedings of the Royal Society of London Series A, SIAM Review, International Journal of Nonlinear Mechanics, Computer Methods in Applied Mechanics and Engineering, Discrete and Continuous Dynamical Systems, Journal of Fluids and Structures, Taylor & Francis Publishers, American Mathematical Society, Cambridge University Press, Applied Mathematics Letters, ZAMM, Acta Mechanica, Mathematics and Mechanics of Solids, Journal of Dynamical and Control Systems, Nonlinearity, Journal of Computational Physics, International Journal of Structural Stability and Dynamics, Biophysical Journal, SIAM Journal of Applied Mathematics.
• Conference co-organizer ("Multiscale Modeling of Elastic Filaments"), CECAM, UNIL/EPFL, Lausanne, Switzerland, January 2018.
• Special session co-organizer ("Mathematical Biology"), AMS Fall Eastern Sectional Meeting, Temple University, Philadelphia, PA, October 2013.
• Minisymposium co-organizer ("Modeling DNA as an elastic object" and "Elastic Rods and Applications, Parts I and II"), SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, May 2009.

College Service

• Department Chair (Spring 2007, 08-09, 09-10, Spring 2011, 21-22, 22-23)
• Academic Council (07-08, 08-09, 15-16, 22-23)
• Faculty Representative to the Board of Managers (07-08, 08-09)
• Faculty Committee on Academic Excellence (chair) (09-10)

- Ad Hoc Search Committees in Mathematics (06-07, 11-12, 17-18)
- Search Committee in Mathematics at Bryn Mawr (10-11)
- Appeals Committee (10-11)
- Steering Committee for Koshland Integrated Science Center (11-12, 12-13)
- Faculty Affairs and Planning Committee (12-13, 13-14)
- Admissions Committee (13-14)
- IACUC (chair) (14-15, 15-16)
- Director of Faculty Research Grants (16-17)
- Administrative Advisory Committee (chair, 17-20)
- Associate Provost for Faculty Development and Support (17-21)
- Interim Provost (Summer 2020)

Undergraduate research students:

Laura Kasakoff (2005), Ryan Sajac (2005), Joel Kwabi (2005), Kaitlyn Peterson (2006), Phil Zhang (2007, 2008), Luis Mosquera (2007), Will McKerrow (2009, 2011), Andrew Lipstein (2009), Joshua Weiss (2010), Rachel Grimmelmann (2010), Chang Cao (2010), Rengyi (Emily) Xu (2011), Laurie Merrell (2013), David Marsico (2013), Ting Zhou (2015), Tiancheng Liu (2015), Ben Mackay (2017), Matt Scharf (2017), Mujie Wang (2019), Brian Becker (2019), Hanxiao Lu (2019), Paul Soulanille (2020), Nyla Robinson (2020), Jason Ngo (2020), Ben Roodman (2020), Li Fan (2021), Anubhav Sharma (2021), Cameron Gavaler (2021), Thea Schwallie (2023), Mark Hubertus (2023).

Some undergraduate theses advised:

FitzHugh-Nagumo: Measuring Nerve Impulse Transmissions, Perri Donenfeld '06

The Fourier Transform, Mark Maienschein-Cline '07

Copula Functions: Theory & an Application to Financial Data, Rachel Heaton '07 (co-advisor)

Chaos in Dynamical Systems, Emma O'Neill '08

Hidden Markov Models and Bond Default Rates, Will Stafford '08

Weiner Measure, Functional Integration, & Feynman-Kac Representation Theorem, Phil Zhang '08

Langevin Equations: Modeling Particle Motion and Pedestrian Trail Formation, Dena Feldman '08

Simulated Annealing, Sonia Gilbukh '09

Pseudorandom Number Generators: What Makes a Good Generator, Jacob Blanton '09

Neutron Optics: Acceptance Diagrams and Ray Tracing, David Winogradoff '09

Modeling HIV Therapy: Fighting a Virus With Another Virus, Andrew Wei '10

Classifying & Reclassifying Cellular Automata: Paradise Lost & Found in Garden-of-Edens, Andrew Lipstein '10

Measure Theory, Probability, and Martingales, Ryan Fackler '11

Fractal Image Compression, Daphne Paparis '12

Repeated Games in Economics, Theo Feder '12

Pricing Derivatives: Black-Scholes, Joshua Weiss '12

The Adiabatic Theorem of Quantum Mechanics, Aaron Buikema '13

Nash Equilibria in a Hotelling-Type Model with Non-Uniform Consumer Density, Matthew Mazewski '13

An Application of Artificial Neural Networks to Solving ODEs, Jonathan Fosdick '13

Application of the Black-Scholes Model in Baseball Free Agency, Brett Cohen '14

Using Box Models to Study Ocean Dynamics, Brittney Li '14

Membrane Harmonics: Isospectral non-isometric membranes and their properties, Aspen deVries '14

Analysis of GRANTISM Ice Sheet Model, Margaret Duffy '15

Epidemic Modeling and the 2014 Ebola Outbreak, Alyssa Lavin '15

Solving the Ising Problem on the Chimera Graph, Muyuan Li '15

The Second Derivative Test in the Calculus of Variations, David Marsico '15

Calculus of Variations and Optimal Control: Applications to Economics, Samuel Fujimori '16

K-Robust Nearest Neighbor Search and Classification, Jason Feinberg '16

Integrability and Chaos in Classical Dynamical Systems, Jiayue Wan '16

Convex Optimization, Newton's Method, and Interior Point Method, Haoqian Li '18

Modeling Immune-Cancer Interactions, Yancheng Dai '18

A Random Walk Down the Wiener Measure and the Brownian Motion, Daisuke Nakayama '18

Mathematically Modeling the Western honeybee population over time with respect to colony collapse disorder: A Senior Bee-This, Mairin Fitzpatrick '19

Infected: Application of epidemiological models to John Oliver's #MakeDonaldDrumpfAgain Campaign, Ben Forde '19

Improved Bruteforcing Methods with Markov Model, Justin Hiemstra '19

Calculus of Variations and Optimal Control Theory, Daisy Zhan '20

Calculus of Variations: Geodesics on Surfaces in 3D, Shivani Dixit '20

Reinforcement Learning, Q-Learning, and Extension to Multi-agent Systems, Matt Scharf '20

Modeling Firearm Violence in Philadelphia: A Regression Perspective, Henry Nye '20

Optimization in Finance: Minimizing Trade Costs, Maximizing Portfolio Performance, Alice Hu '21

Chaos Theory: From 1D to 3D, Jason Ngo '21

Pollard's Rho Algorithm for Elliptic Curve Cryptography, Ben Roodman '22

Applications of Markov Decision Processes and Monte Carlo Simulations for Property Management, David Raymond '22

Topics in One Dimensional Discrete Dynamical Systems and Fractals, Junyi Chen '22
Statistical Analysis of the Winners of the Professional Cycling Grand Tours, John Collins '23
Fighting Cancer: Can Differential Equations Provide the Punch?, Katharine Ference '23
Optimizing MLB Free Agency with the Genetic Algorithm, Zach Landry '23
Modeling Perfect Play in Cookie Clicker using Shortest Path Algorithms, Abraham Levin '23
Modeling Energy Grids over Variable Time Periods, Anay Mehta '23
Evolutionary Algorithms applied to Transit Systems, Harry Weinstock '23