



Andrew Spakowitz

Senior Associate Dean for Research and Faculty Affairs, Professor of Chemical Engineering, of Materials Science and Engineering and, by courtesy, of Applied Physics

Bio

BIO

Theory and Computation of
Biological Processes and
Complex Materials

The Spakowitz lab is engaged in projects that address fundamental chemical and physical phenomena underlying a range of biological processes and soft-material applications. Current research in our lab focuses on four main research themes: chromosomal organization and dynamics, protein self-assembly, polymer membranes, and charge transport in conducting polymers. These broad research areas offer complementary perspectives on chemical and physical processes, and we leverage this complementarity throughout our research. Our approach draws from a diverse range of theoretical and computational methods, including analytical theory of semiflexible polymers, polymer field theory, continuum elastic mechanics, Brownian dynamics simulation, equilibrium and dynamic Monte Carlo simulations, and analytical theory and numerical simulations of reaction-diffusion phenomena. A common thread in our work is the need to capture phenomena over many length and time scales, and our flexibility in research methodologies provides us with the critical tools to address these complex multidisciplinary problems.

ACADEMIC APPOINTMENTS

- Professor, Chemical Engineering
- Professor, Materials Science and Engineering
- Professor (By courtesy), Applied Physics
- Member, Bio-X
- Affiliate, Precourt Institute for Energy
- Member, Institute for Computational and Mathematical Engineering (ICME)

ADMINISTRATIVE APPOINTMENTS

- Chair of the Department of Chemical Engineering, Stanford University, (2022-2025)

HONORS AND AWARDS

- Terman Fellow, Stanford University (2006-2009)
- CAREER Award, NSF (2009)
- ACS Global Outstanding Mentor, ACS (2024)
- Barrer Lecture, Penn State University (2025)

PROFESSIONAL EDUCATION

- PhD, California Institute of Technology (2004)

LINKS

- Spakowitz Research Group Website: <http://web.stanford.edu/~ajspakow/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Theory and computation of biological processes and complex materials

Teaching

COURSES

2025-26

- Molecular Thermodynamics: CHEMENG 340 (Aut)

2022-23

- Special Topics in Biopolymer Physics: CHEMENG 514 (Aut)
- Undergraduate Practical Training: CHEMENG 199 (Sum)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Aidan Cabral, Otto Fajen, Rachael Mow, Srikant Sagireddy, Tee Udomlumleart

Orals Evaluator

Noah Eckman

Doctoral Dissertation Advisor (AC)

Zachary Montgomerie

Doctoral Dissertation Co-Advisor (AC)

Jihyun In, Goldie Roth, Lucy Wang, William Xu

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biophysics (Phd Program)

Publications

PUBLICATIONS

- **High-resolution dynamic imaging of chromatin DNA communication using Oligo-LiveFISH.** *Cell*
Zhu, Y., Balaji, A., Han, M., Andronov, L., Roy, A. R., Wei, Z., Chen, C., Miles, L., Cai, S., Gu, Z., Tse, A., Yu, B. C., Uenaka, et al
2025
- **Nucleosome placement and polymer mechanics explain genomic contacts on 100 kbp scales**
Corrette, J., Li, J., Shao, H., Veerasubramanian, P. K., Spakowitz, A. J., Downing, T. L., Allard., J. F.
CELL PRESS.2025
- **Modeling DNA methyltransferase function to predict epigenetic correlation patterns in healthy and cancer cells.** *Proceedings of the National Academy of Sciences of the United States of America*
Tse, A. Y., Spakowitz, A. J.

2025; 122 (2): e2415530121

- **Modeling DNA methyltransferase function to predict epigenetic correlation patterns in healthy and cancer cells** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Tse, A. Y., Spakowitz, A. J.
2025; 122 (2)
- **Cell tumbling enhances stem cell differentiation in hydrogels via nuclear mechanotransduction.** *Nature materials*
Ayushman, M., Mikos, G., Tong, X., Sinha, S., Lopez-Fuentes, E., Jones, S., Cai, P. C., Lee, H. P., Morrison, A. J., Spakowitz, A., Heilshorn, S. C., Sweet-Cordero, A., Yang, et al
2024
- **Nucleosome placement and polymer mechanics explain genomic contacts on 100kbp scales.** *bioRxiv : the preprint server for biology*
Corrette, J., Li, J., Shao, H., Veerasubramanian, P. K., Spakowitz, A., Downing, T. L., Allard, J.
2024
- **The lysogenic filamentous Pseudomonas bacteriophage phage Pf slows mucociliary transport.** *PNAS nexus*
Burgener, E. B., Cai, P. C., Kratochvil, M. J., Rojas-Hernandez, L. S., Joo, N. S., Gupta, A., Secor, P. R., Heilshorn, S. C., Spakowitz, A. J., Wine, J. J., Bollyky, P. L., Milla, C. E.
2024; 3 (9): pgae390
- **Determining mesoscale chromatin structure parameters from spatially correlated cleavage data using a coarse-grained oligonucleosome model.** *bioRxiv : the preprint server for biology*
Clerkin, A. B., Pagane, N., West, D. W., Spakowitz, A. J., Risca, V. I.
2024
- **Physical modeling of nucleosome clustering in euchromatin resulting from interactions between epigenetic reader proteins.** *Proceedings of the National Academy of Sciences of the United States of America*
Wakim, J. G., Spakowitz, A. J.
2024; 121 (26): e2317911121
- **Local changes in protein filament properties drive large-scale membrane transformations involved in endosome tethering and fusion.** *Soft matter*
Ghosh, A., Spakowitz, A. J.
2024
- **Air-liquid intestinal cell culture allows in situ rheological characterization of intestinal mucus.** *APL bioengineering*
Cai, P. C., Braunreuther, M., Shih, A., Spakowitz, A. J., Fuller, G. G., Heilshorn, S. C.
2024; 8 (2): 026112
- **Pf bacteriophages hinder sputum antibiotic diffusion via electrostatic binding.** *Science advances*
Chen, Q., Cai, P., Chang, T. H., Burgener, E., Kratochvil, M. J., Gupta, A., Hargill, A., Secor, P. R., Nielsen, J. E., Barron, A. E., Milla, C., Heilshorn, S. C., Spakowitz, et al
2024; 10 (22): ead15576
- **Exploration of Phase Behavior in Asymmetric Semiflexible Polyelectrolyte Mixtures Using Polymer Field Theory** *MACROMOLECULES*
Beckinghausen, M., Spakowitz, A. J.
2024; 57 (5): 2505-2519
- **Preferred states of single DNA molecules in crowded solutions**
Qian, J., Collette, D., Montgomerie, Z., Dunlap, D., Spakowitz, A. J., Finzi, L.
CELL PRESS.2024: 460A
- **Effect of local active fluctuations on structure and dynamics of flexible biopolymers.** *Soft matter*
Dutta, S., Ghosh, A., Spakowitz, A. J.
2024
- **Conformational Statistics of Ribbon-like Chains** *MACROMOLECULES*
Michaels, W., Spakowitz, A. J., Qin, J.
2023; 56 (20): 8359-8368

- **Leveraging polymer modeling to reconstruct chromatin connectivity from live images.** *Biophysical journal*
Dutta, S., Ghosh, A., Boettiger, A. N., Spakowitz, A. J.
2023
- **Interplay of Polymer Structure, Solvent Ordering, and Charge Fluctuations in Polyelectrolyte Solution Thermodynamics** *MACROMOLECULES*
Beckinghausen, M., Spakowitz, A. J.
2022
- **Closing the loop between microstructure and charge transport in conjugated polymers by combining microscopy and simulation.** *Proceedings of the National Academy of Sciences of the United States of America*
Balhorn, L., MacPherson, Q., Bustillo, K. C., Takacs, C. J., Spakowitz, A. J., Salleo, A.
2022; 119 (46): e2204346119
- **Semiflexible polymer solutions. II. Fluctuations and Frank elastic constants.** *The Journal of chemical physics*
Ghosh, A., MacPherson, Q., Wang, Z., Spakowitz, A. J.
2022; 157 (15): 154906
- **Rheological Characterization and Theoretical Modeling Establish Molecular Design Rules for Tailored Dynamically Associating Polymers.** *ACS central science*
Cai, P. C., Su, B., Zou, L., Webber, M. J., Heilshorn, S. C., Spakowitz, A. J.
2022; 8 (9): 1318-1327
- **Rheological Characterization and Theoretical Modeling Establish Molecular Design Rules for Tailored Dynamically Associating Polymers** *ACS CENTRAL SCIENCE*
Cai, P. C., Su, B., Zou, L., Webber, M. J., Heilshorn, S. C., Spakowitz, A. J.
2022
- **Active and thermal fluctuations in multi-scale polymer structure and dynamics.** *Soft matter*
Ghosh, A., Spakowitz, A. J.
2022
- **Biochemical, biophysical, and immunological characterization of respiratory secretions in severe SARS-CoV-2 infections.** *JCI insight*
Kratochvil, M. J., Kaber, G., Demirdjian, S., Cai, P. C., Burgener, E. B., Nagy, N., Barlow, G. L., Popescu, M., Nicolls, M. R., Ozawa, M. G., Regula, D. P., Pacheco-Navarro, A. E., Yang, et al
2022; 7 (12)
- **Coarse-Grained Modeling Reveals the Impact of Supercoiling and Loop Length in DNA Looping Kinetics.** *Biophysical journal*
Starr, C. H., Bryant, Z., Spakowitz, A. J.
2022
- **Biochemical, Biophysical, and Immunological Characterization of Respiratory Secretions in Severe SARS-CoV-2 (COVID-19) Infections.** *medRxiv : the preprint server for health sciences*
Kratochvil, M. J., Kaber, G., Demirdjian, S., Cai, P. C., Burgener, E. B., Nagy, N., Barlow, G. L., Popescu, M., Nicolls, M. R., Ozawa, M. G., Regula, D. P., Pacheco-Navarro, A. E., Yang, et al
2022
- **Diffusion and distal linkages govern interchromosomal dynamics during meiotic prophase.** *Proceedings of the National Academy of Sciences of the United States of America*
Newman, T. A., Beltran, B., McGehee, J. M., Elnatan, D., Cahoon, C. K., Paddy, M. R., Chu, D. B., Spakowitz, A. J., Burgess, S. M.
2022; 119 (12): e2115883119
- **Statistical behavior of nonequilibrium and living biological systems subjected to active and thermal fluctuations.** *Physical review. E*
Ghosh, A., Spakowitz, A. J.
2022; 105 (1-1): 014415
- **Free Energy and Dynamics of Annihilation of Topological Defects in Nanoconfined DNA** *MACROMOLECULES*
Bucci, G., Gadelrab, K., Spakowitz, A. J.
2021; 54 (20): 9268-9279
- **Microrheology reveals simultaneous cell-mediated matrix stiffening and fluidization that underlie breast cancer invasion.** *Science advances*

- Krajina, B. A., LeSavage, B. L., Roth, J. G., Zhu, A. W., Cai, P. C., Spakowitz, A. J., Heilshorn, S. C.
2021; 7 (8)
- **Dynamic light scattering microrheology for soft and living materials.** *Soft matter*
Cai, P. C., Krajina, B. A., Kratochvil, M. J., Zou, L., Zhu, A., Burgener, E. B., Bollyky, P. L., Milla, C. E., Webber, M. J., Spakowitz, A. J., Heilshorn, S. C.
2021
 - **Impact of chromosomal organization on epigenetic drift and domain stability revealed by physics-based simulations.** *Biophysical journal*
Wakim, J. G., Sandholtz, S. H., Spakowitz, A. J.
2021
 - **Lipid Nanodiscs via Ordered Copolymers** *CHEM*
Smith, A. A., Autzen, H. E., Faust, B., Mann, J. L., Muir, B. W., Howard, S., Postma, A., Spakowitz, A. J., Cheng, Y., Appel, E. A.
2020; 6 (10): 2782–95
 - **Erratum: "Polymer physics across scales: Modeling the multiscale behavior of functional soft materials and biological systems" [J. Chem. Phys. 151, 230902 (2019)].** *The Journal of chemical physics*
Spakowitz, A. J.
2020; 153 (9): 099901
 - **Systematic Approach toward Accurate and Efficient DNA Sequencing via Nanoconfinement** *ACS MACRO LETTERS*
Bucci, G., Spakowitz, A. J.
2020; 9 (8): 1184–91
 - **Physical modeling of the heritability and maintenance of epigenetic modifications.** *Proceedings of the National Academy of Sciences of the United States of America*
Sandholtz, S. H., MacPherson, Q., Spakowitz, A. J.
2020
 - **Brachiation of a polymer chain in the presence of a dynamic network** *PHYSICAL REVIEW E*
Cai, P. C., Krajina, B. A., Spakowitz, A. J.
2020; 102 (2)
 - **Brachiation of a polymer chain in the presence of a dynamic network.** *Physical review. E*
Cai, P. C., Krajina, B. A., Spakowitz, A. J.
2020; 102 (2-1): 020501
 - **Leading Edge Maintenance in Migrating Neutrophil-Like HL-60 Cells is an Emergent Property of Branched Actin Growth**
Garner, R. M., Koslover, E. F., Spakowitz, A. J., Theriot, J.
CELL PRESS.2020: 603A
 - **Chromatin Compaction Leads to a Preference for Peripheral Heterochromatin.** *Biophysical journal*
MacPherson, Q., Beltran, B., Spakowitz, A. J.
2020
 - **Chromosome Structural Mechanics Dictates the Local Spreading of Epigenetic Marks.** *Biophysical journal*
Sandholtz, S. H., Kannan, D. n., Beltran, B. G., Spakowitz, A. J.
2020
 - **Polymer physics across scales: Modeling the multiscale behavior of functional soft materials and biological systems.** *The Journal of chemical physics*
Spakowitz, A. J.
2019; 151 (23): 230902
 - **Impact of Liquid-Crystalline Chain Alignment on Charge Transport in Conducting Polymers** *MACROMOLECULES*
Rudnicki, P. E., MacPherson, Q., Balhorn, L., Feng, B., Qin, J., Salleo, A., Spakowitz, A. J.
2019; 52 (22): 8932–39
 - **Geometrical Heterogeneity Dominates Thermal Fluctuations in Facilitating Chromatin Contacts** *PHYSICAL REVIEW LETTERS*
Beltran, B., Kannan, D., MacPherson, Q., Spakowitz, A. J.

2019; 123 (20)

- **Geometrical Heterogeneity Dominates Thermal Fluctuations in Facilitating Chromatin Contacts.** *Physical review letters*
Beltran, B., Kannan, D., MacPherson, Q., Spakowitz, A. J.
2019; 123 (20): 208103
- **Physical modeling of the spreading of epigenetic modifications through transient DNA looping** *JOURNAL OF PHYSICS A-MATHEMATICAL AND THEORETICAL*
Sandholtz, S. H., Beltran, B. G., Spakowitz, A. J.
2019; 52 (43)
- **Transient Anomalous Diffusion in a Heterogeneous Environment** *FRONTIERS IN PHYSICS*
Spakowitz, A. J.
2019; 7
- **A fluorogenic array for temporally unlimited single-molecule tracking** *NATURE CHEMICAL BIOLOGY*
Ghosh, R. P., Franklin, J., Draper, W. E., Shi, Q., Betran, B., Spakowitz, A. J., Liphardt, J. T.
2019; 15 (4): 401+
- **A fluorogenic array for temporally unlimited single-molecule tracking.** *Nature chemical biology*
Ghosh, R. P., Franklin, J. M., Draper, W. E., Shi, Q., Beltran, B., Spakowitz, A. J., Liphardt, J. T.
2019
- **Bottom-up modeling of chromatin segregation due to epigenetic modifications.** *Proceedings of the National Academy of Sciences of the United States of America*
MacPherson, Q., Beltran, B., Spakowitz, A. J.
2018
- **Active DNA Olympic Hydrogels Driven by Topoisomerase Activity.** *Physical review letters*
Krajina, B. A., Zhu, A., Heilshorn, S. C., Spakowitz, A. J.
2018; 121 (14): 148001
- **Active DNA Olympic Hydrogels Driven by Topoisomerase Activity** *PHYSICAL REVIEW LETTERS*
Krajina, B. A., Zhu, A., Heilshorn, S. C., Spakowitz, A. J.
2018; 121 (14)
- **Strong disorder leads to scale invariance in complex biological systems** *PHYSICAL REVIEW E*
Stylianidou, S., Lampo, T. J., Spakowitz, A. J., Wiggins, P. A.
2018; 97 (6): 062410
- **Thermodynamic Model of Solvent Effects in Semiflexible Diblock and Random Copolymer Assembly** *MACROMOLECULES*
Mao, S., MacPherson, Q., Liu, C., Spakowitz, A. J.
2018; 51 (11): 4167–77
- **Polymer Semiflexibility Induces Nonuniversal Phase Transitions in Diblock Copolymers** *PHYSICAL REVIEW LETTERS*
Mao, S., MacPherson, Q., Spakowitz, A. J.
2018; 120 (6): 067802
- **Stability on the Edge: Probing the Biophysical Mechanisms of Polarity Maintenance in Motile Cells**
Garner, R. M., Koslover, E., Spakowitz, A. J., Theriot, J. A.
CELL PRESS.2018: 648A–649A
- **Long-Range Structural Changes in the Meiotic Nucleus Revealed by Changes in Stress Communication Along the Chromosome**
Newman, T., Beltran, B. G., McGehee, J., Cahoon, C., Elnatan, D., Chu, D., Burgess, S., Spakowitz, A.
CELL PRESS.2018: 30A
- **A Polymer Physics Model for Epigenetic Control of Chromatin Compaction**
MacPherson, Q., Sandholtz, S., Spakowitz, A.
CELL PRESS.2018: 563A
- **Physical Modeling of the Spreading and Maintenance of Epigenetic Modifications through DNA Looping and Condensation**

Sandholtz, S., MacPherson, Q., Spakowitz, A.
CELL PRESS.2018: 583A

● **Interrogating Cell-Mediated Remodeling of the Extracellular Matrix by Dynamic Light Scattering Microrheology**

Krajina, B. A., Zhu, A., Heilshorn, S. C., Spakowitz, A. J.
CELL PRESS.2018: 371A–372A

● **Fluctuation Effects in Semiflexible Diblock Copolymers.** *ACS macro letters*

Mao, S., MacPherson, Q., Spakowitz, A. J.
2018; 7 (1): 59-64

● **Biotemplated synthesis of inorganic materials: An emerging paradigm for nanomaterial synthesis inspired by nature** *PROGRESS IN MATERIALS SCIENCE*

Krajina, B. A., Proctor, A. C., Schoen, A. P., Spakowitz, A. J., Heilshorn, S. C.
2018; 91: 1–23

● **Fluctuation Effects in Semiflexible Diblock Copolymers** *ACS MACRO LETTERS*

Mao, S., MacPherson, Q., Spakowitz, A. J.
2018; 7 (1): 59–64

● **Dynamic Light Scattering Microrheology Reveals Multiscale Viscoelasticity of Polymer Gels and Precious Biological Materials** *ACS CENTRAL SCIENCE*

Krajina, B. A., Tropini, C., Zhu, A., DiGiacomo, P., Sonnenburg, J. L., Heilshorn, S. C., Spakowitz, A. J.
2017; 3 (12): 1294–1303

● **Field-theoretic simulations of random copolymers with structural rigidity** *SOFT MATTER*

Mao, S., Macpherson, Q., Qin, J., Spakowitz, A. J.
2017; 13 (15): 2760-2772

● **Buckling a Semiflexible Polymer Chain under Compression.** *Polymers*

Pilyugina, E., Krajina, B., Spakowitz, A. J., Schieber, J. D.
2017; 9 (3)

● **Buckling a Semiflexible Polymer Chain under Compression** *POLYMERS*

Pilyugina, E., Krajina, B., Spakowitz, A. J., Schieber, J. D.
2017; 9 (3)

● **Crowding and hopping in a protein's diffusive transport on DNA** *JOURNAL OF PHYSICS A-MATHEMATICAL AND THEORETICAL*

Koslover, E. F., de la Rosa, M. D., Spakowitz, A. J.
2017; 50 (7)

● **Cytoplasmic RNA-Protein Particles Exhibit Non-Gaussian Subdiffusive Behavior.** *Biophysical journal*

Lampo, T. J., Stylianidou, S., Backlund, M. P., Wiggins, P. A., Spakowitz, A. J.
2017; 112 (3): 532-542

● **Anomalous Charge Transport in Conjugated Polymers Reveals Underlying Mechanisms of Trapping and Percolation** *ACS CENTRAL SCIENCE*

Mollinger, S. A., Salleo, A., Spakowitz, A. J.
2016; 2 (12): 910-915

● **Large-Scale Conformational Transitions in Supercoiled DNA Revealed by Coarse-Grained Simulation** *BIOPHYSICAL JOURNAL*

Krajina, B. A., Spakowitz, A. J.
2016; 111 (7): 1339-1349

● **Eliminating Fitting from the Modeling of Biological Processes.** *ACS central science*

Spakowitz, A. J.
2016; 2 (9): 584-585

● **Impact of Conformational and Chemical Correlations on Microphase Segregation in Random Copolymers** *MACROMOLECULES*

Mao, S., MacPherson, Q. J., He, S. S., Coletta, E., Spakowitz, A. J.
2016; 49 (11): 4358-4368

- **Potential for measurement of the distribution of DNA folds in complex environments using Correlated X-ray Scattering** *MODERN PHYSICS LETTERS B*
Schenk, G., Krajina, B., Spakowitz, A., Doniach, S.
2016; 30 (8)
- **Physical Modeling of Dynamic Coupling between Chromosomal Loci** *BIOPHYSICAL JOURNAL*
Lampo, T. J., Kennard, A. S., Spakowitz, A. J.
2016; 110 (2): 338-347
- **Physical Modeling of Dynamic Coupling between Chromosomal Loci.** *Biophysical journal*
Lampo, T. J., Kennard, A. S., Spakowitz, A. J.
2016; 110 (2): 338-347
- **Potential for measurement of the distribution of DNA folds in complex environments using Correlated X-ray Scattering.** *Modern physics letters. B, Condensed matter physics, statistical physics, applied physics*
Schenk, G. n., Krajina, B. n., Spakowitz, A. n., Doniach, S. n.
2016; 30 (8)
- **Interplay of Protein Binding Interactions, DNA Mechanics, and Entropy in DNA Looping Kinetics** *BIOPHYSICAL JOURNAL*
Mulligan, P. J., Chen, Y., Phillips, R., Spakowitz, A. J.
2015; 109 (3): 618-629
- **Percolation, Tie-Molecules, and the Microstructural Determinants of Charge Transport in Semicrystalline Conjugated Polymers** *ACS MACRO LETTERS*
Mollinger, S. A., Krajina, B. A., Noriega, R., Salleo, A., Spakowitz, A. J.
2015; 4 (7): 708-712
- **Thermodynamic model of heterochromatin formation through epigenetic regulation.** *Journal of physics. Condensed matter : an Institute of Physics journal*
Mulligan, P. J., Koslover, E. F., Spakowitz, A. J.
2015; 27 (6): 064109-?
- **Physical Modeling of Chromosome Segregation in Escherichia coli Reveals Impact of Force and DNA Relaxation.** *Biophysical journal*
Lampo, T. J., Kuwada, N. J., Wiggins, P. A., Spakowitz, A. J.
2015; 108 (1): 146-153
- **Membrane indentation triggers clathrin lattice reorganization and fluidization** *SOFT MATTER*
Cordella, N., Lampo, T. J., Melosh, N., Spakowitz, A. J.
2015; 11 (3): 439-448
- **Modulation of DNA loop lifetimes by the free energy of loop formation** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Chen, Y., Johnson, S., Mulligan, P., Spakowitz, A. J., Phillips, R.
2014; 111 (49): 17396-17401
- **Rheology and simulation of 2-dimensional clathrin protein network assembly.** *Soft matter*
VanDersarl, J. J., Mehraeen, S., Schoen, A. P., Heilshorn, S. C., Spakowitz, A. J., Melosh, N. A.
2014; 10 (33): 6219-6227
- **Multiscale dynamics of semiflexible polymers from a universal coarse-graining procedure** *PHYSICAL REVIEW E*
Koslover, E. F., Spakowitz, A. J.
2014; 90 (1)
- **Membrane fluctuations destabilize clathrin protein lattice order.** *Biophysical journal*
Cordella, N., Lampo, T. J., Mehraeen, S., Spakowitz, A. J.
2014; 106 (7): 1476-1488
- **An in vitro assay for entry into cilia reveals unique properties of the soluble diffusion barrier** *JOURNAL OF CELL BIOLOGY*
Breslow, D. K., Koslover, E. F., Seydel, F., Spakowitz, A. J., Nachury, M. V.
2013; 203 (1): 129-147

- **Chain conformations dictate multiscale charge transport phenomena in disordered semiconducting polymers** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Noriega, R., Salleo, A., Spakowitz, A. J.
2013; 110 (41): 16315-16320
- **Systematic Coarse-Graining of Microscale Polymer Models as Effective Elastic Chains** *MACROMOLECULES*
Koslover, E. F., Spakowitz, A. J.
2013; 46 (5): 2003-2014
- **Caulobacter chromosome in vivo configuration matches model predictions for a supercoiled polymer in a cell-like confinement** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Hong, S., Toro, E., Mortensen, K. I., de la Rosa, M. A., Doniach, S., Shapiro, L., Spakowitz, A. J., McAdams, H. H.
2013; 110 (5): 1674-1679
- **Single molecule imaging reveals a major role for diffusion in the exploration of ciliary space by signaling receptors.** *eLife*
Ye, F., Breslow, D. K., Koslover, E. F., Spakowitz, A. J., Nelson, W. J., Nachury, M. V.
2013; 2
- **Theoretical study of nanostructured alkaline exchange membrane transport property**
Mao, S., Spakowitz, A., J., Coletta, E., He, S., Toney, M., Frank, C., W.
2013
- **Coarse grain model of nanostructured alkaline exchange membranes: Phase behavior and transport property predictions**
Mao, S., He, S., Coletta, E., Toney, M., Frank, C., W., Spakowitz, A., J.
2013
- **Theoretical study of nanostructured alkaline exchange membrane phase behavior and transport property**
Mao, S., Spakowitz, A., J., Coletta, E., He, S., Frank, C., W., Toney, M.
2013
- **Theoretical model for HP1-Induced heterochromatin formation**
Mulligan, P., J., Koslover, E., F., Spakowitz, A., J.
2013
- **Systematic coarse-graining of the wormlike chain model for dynamic simulations**
Koslover, E., F., Spakowitz, A., J.
2013
- **Semiflexible polymer model for charge mobility in liquid crystalline organic semiconductors**
Mollinger, S., Noriega, R., Salleo, A., Spakowitz, A., J.
2013
- **Self-assembled protein structures are altered by underlying fluctuations**
Cordella, N., Lampo, T., Heilshorn, S., C., Spakowitz, A., J.
2013
- **Membrane Fluctuations Destabilize Clathrin Protein Lattice Order** *Biophysical Journal*
Cordella, N., Lampo, T., J., Mehraeen, S., Spakowitz, A., J.
2013
- **Physical modeling of chromosome segregation in E. Coli reveals impact of force and DNA relaxation**
Lampo, T., Kuwada, N., Wiggins, P., Spakowitz, A., J.
2013
- **Effect of conformation in charge transport for semiflexible polymers**
Noriega, R., Salleo, A., Spakowitz, A., J.
2013
- **An amphiphilic polysulfone-graft-poly(ethylene) glycol random copolymer for alkaline exchange membrane fuel cells**
He, S., Mao, S., Spakowitz, A., J., Frank, C., W.

2013

- **Dynamic remodelling of disordered protein aggregates is an alternative pathway to achieve robust self-assembly of nanostructures** *SOFT MATTER*
Schoen, A. P., Cordella, N., Mehraeen, S., Arunagirinathan, M. A., Spakowitz, A. J., Heilshorn, S. C.
2013; 9 (38): 9137-9145
- **Discretizing elastic chains for coarse-grained polymer models** *SOFT MATTER*
Koslover, E. F., Spakowitz, A. J.
2013; 9 (29): 7016-7027
- **Intrinsic fluctuations lead to broad range of transduced forces in tethered-bead single-molecule experiments** *PHYSICAL REVIEW E*
Mehraeen, S., Spakowitz, A. J.
2012; 86 (2)
- **Force fluctuations impact kinetics of biomolecular systems** *PHYSICAL REVIEW E*
Koslover, E. F., Spakowitz, A. J.
2012; 86 (1)
- **Analytical Tools To Distinguish the Effects of Localization Error, Confinement, and Medium Elasticity on the Velocity Autocorrelation Function** *BIOPHYSICAL JOURNAL*
Weber, S. C., Thompson, M. A., Moerner, W. E., Spakowitz, A. J., Theriot, J. A.
2012; 102 (11): 2443-2450
- **Nonthermal ATP-dependent fluctuations contribute to the in vivo motion of chromosomal loci** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Weber, S. C., Spakowitz, A. J., Theriot, J. A.
2012; 109 (19): 7338-7343
- **Membrane fluctuations alter the fluidity of clathrin protein lattices**
Spakowitz, A., J., Cordella, N., Mehraeen, S.
2012
- **Viral Packaging of Nucleic Acids** *Polymer Science: A Comprehensive Reference*
Spakowitz, A., J., Muthukumar, M.
edited by Möller, M., Matyjaszewski, K.
Elsevier Academic Press, San Diego, CA..2012: 231–245
- **Self-Assembly of Clathrin Protein 3D Structures**
Arunagirinathan, M., A., Gibbons, B., J., Schoen, A., P., Spakowitz, A., J., Heilshorn, S., C.
2012
- **Force Fluctuations Impact Genome Processing Kinetics**
Spakowitz, A., J., Koslover, E.
2012
- **Bridging Length Scales: Hierarchical Coarse-Graining of Elastic Biopolymer Models**
Koslover, E., F., Spakowitz, A., J.
2012
- **Stability of Heterochromatin Condensation Due to Cooperative Binding**
Mulligan, P., J., Koslover, E., F., Spakowitz, A., J.
2012
- **Force Fluctuations Play a Key Role in Biomolecular Kinetics**
Koslover, E., F., Spakowitz, A., J.
2012
- **Selective dispersion of high purity semiconducting single-walled carbon nanotubes with regioregular poly(3-alkylthiophene)s** *NATURE COMMUNICATIONS*
Lee, H. W., Yoon, Y., Park, S., Oh, J. H., Hong, S., Liyanage, L. S., Wang, H., Morishita, S., Patil, N., Park, Y. J., Park, J. J., Spakowitz, A., Galli, et al

2011; 2

- **Theoretical and Computational Modeling of Target-Site Search Kinetics In Vitro and In Vivo** *BIOPHYSICAL JOURNAL*
Koslover, E. F., Diaz de la Rosa, M. A., Spakowitz, A. J.
2011; 101 (4): 856-865
- **A Boltzmann-weighted hopping model of charge transport in organic semicrystalline films** *JOURNAL OF APPLIED PHYSICS*
Kwiatkowski, J. J., Jimison, L. H., Salleo, A., Spakowitz, A. J.
2011; 109 (11)
- **Tension-dependent structural deformation alters single-molecule transition kinetics** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Sudhanshu, B., Mihardja, S., Koslover, E. F., Mehraeen, S., Bustamante, C., Spakowitz, A. J.
2011; 108 (5): 1885-1890
- **Impact of defect creation and motion on the thermodynamics and large-scale reorganization of self-assembled clathrin lattices** *SOFT MATTER*
Mehraeen, S., Cordella, N., Yoo, J. S., Spakowitz, A. J.
2011; 7 (19): 8789-8799
- **Impact of Defect Creation and Motion On the Large-Scale Reorganization Dynamics of Self-Assembled Clathrin Lattices**
Mehraeen, S., Cordella, N., Spakowitz, A., J.
2011
- **Force Fluctuations Dictate Kinetics of Biomolecular Systems**
Spakowitz, A., J.
2011
- **Theoretical Modeling of the Packaging and Accessibility of DNA**
Koslover, E., F., Mulligan, P., J., Díaz de la Rosa, M., A., Spakowitz, A., J.
2011
- **Heterochromatin Protein 1: An Epigenetic Mechanism for Chromatin Condensation**
Mulligan, P., J., Koslover, E., F., Spakowitz, A., J.
2011
- **Force Fluctuations Dictate Kinetics of Biomolecular Systems**
Koslover, E., F., Spakowitz, A., J.
2011
- **Local Geometry and Elasticity in Compact Chromatin Structure** *BIOPHYSICAL JOURNAL*
Koslover, E. F., Fuller, C. J., Straight, A. F., Spakowitz, A. J.
2010; 99 (12): 3941-3950
- **Subdiffusive motion of a polymer composed of subdiffusive monomers** *PHYSICAL REVIEW E*
Weber, S. C., Theriot, J. A., Spakowitz, A. J.
2010; 82 (1)
- **Dynamic Strategies for Target-Site Search by DNA-Binding Proteins** *BIOPHYSICAL JOURNAL*
de la Rosa, M. A., Koslover, E. F., Mulligan, P. J., Spakowitz, A. J.
2010; 98 (12): 2943-2953
- **Bacterial Chromosomal Loci Move Subdiffusively through a Viscoelastic Cytoplasm** *PHYSICAL REVIEW LETTERS*
Weber, S. C., Spakowitz, A. J., Theriot, J. A.
2010; 104 (23)
- **Mathematical Modeling of Charge Transport in Conjugated-Polymer Materials**
Spakowitz, A., J.
2010
- **Theoretical Modeling of the Weaving of Clathrin Into Nanoscale Baskets**

- Mehraeen, S., Cordella, N., Yoo, J., S., Spakowitz, Andrew, J.
2010
- **Theoretical Model of HP1-Induced Heterochromatin Formation**
Mulligan, P., J., Koslover, E., F., Spakowitz, Andrew, J.
2010
 - **Target site search strategy of DNA-binding proteins**
Díaz de la Rosa, M., A., Koslover, E., F., Mulligan, P., J., Spakowitz, A., J.
2010
 - **Role of DNA fluctuations and conformations in RNP polymerase translocation and bulge formation in a single nucleosome**
Sudhanshu, B., Koslover, E., F., Mihardja, S., Spakowitz, A., J.
2010
 - **Role of DNA Elasticity and Nucleosome Geometry in Hierarchical Packaging of Chromatin**
Koslover, E., F., Fuller, C., Straight, A., F., Spakowitz, A., J.
2010
 - **A Predictive Theoretical Model For Clathrin Self-Assembly**
Mehraeen, S., Cordella, N., Spakowitz, A., J.
2010
 - **Chromosomal loci move subdiffusively through a viscoelastic cytoplasm** *Physical Review Letters*
Weber, S., Spakowitz, A., J., Theriot, J.
2010; 104: 238102
 - **Translocation Dynamics of DNA-Binding Proteins**
Díaz de la Rosa, M., A., Koslover, E., F., Mulligan, P., J., Spakowitz, A., J.
2010
 - **Modeling Effects of Nanoparticle Size and Ligand Display On Targeted Cell-Surface Binding**
Cordella, N., Mehraeen, S., Yoo, J., S., Spakowitz, Andrew, J.
2010
 - **Chromosomal Loci Move Subdiffusively through a Viscoelastic Cytoplasm**
Spakowitz, A., J., Weber, S., Theriot, J.
2010
 - **The Impact of Biological Fluctuations On Transport Processes within Live Bacterial Cells**
Spakowitz, A., J., Weber, S., Theriot, J.
2010
 - **Modeling Targeted Binding of Nanoparticles to Cell Surfaces**
Cordella, N., Mehraeen, S., Spakowitz, A., J.
2010
 - **Twist- and Tension-Mediated Elastic Coupling between DNA-Binding Proteins** *PHYSICAL REVIEW LETTERS*
Koslover, E. F., Spakowitz, A. J.
2009; 102 (17)
 - **Twist and Tension-Mediated Elastic Coupling between DNA-Bending Proteins**
Koslover, E., F., Spakowitz, A., J.
2009
 - **Target Site Search Strategy Of Gene Regulatory Proteins**
Díaz de la Rosa, M., A., Spakowitz, A., J.
2009
 - **Theoretical model for the self-assembly of clathrin into targeted nanoscale assemblies**
Mehraeen, S., Schoen, A., Hwang, S., Y., Heilshorn, S., C., Spakowitz, A., J.

2009

- **Target site search strategy of gene regulatory proteins**

Spakowitz, A., J.

2009

- **End-to-end distribution for a wormlike chain in arbitrary dimensions** *PHYSICAL REVIEW E*

Mehraeen, S., Sudhanshu, B., Koslover, E. F., Spakowitz, A. J.

2008; 77 (6)

- **Optical measurement of mechanical forces inside short DNA loops** *BIOPHYSICAL JOURNAL*

Shroff, H., Sivak, D., Siegel, J. J., McEvoy, A. L., Siu, M., Spakowitz, A., Geissler, P. L., Liphardt, J.

2008; 94 (6): 2179-2186

- **Three-dimensional architecture of the bacteriophage phi 29 packaged genome and elucidation of its packaging process** *VIROLOGY*

Comolli, L. R., Spakowitz, A. J., Siegerist, C. E., Jardine, P. J., Grimes, S., Anderson, D. L., Bustamante, C., Downing, K. H.

2008; 371 (2): 267-277

- **Unraveling the Dynamics of Supercoiled DNA with Theoretical Modeling**

Díaz de la Rosa, M., A., Spakowitz, A., J.

2008

- **Structural Fluctuations In the Nucleosome Core Particle**

Sudhanshu, B., Spakowitz, A., J.

2008

- **Chemical Physics Of DNA Packaging In A Nucleosome Core Particle**

Sudhanshu, B., Spakowitz, A., J.

2008

- **Direct optical measurement of stresses inside circularized DNA loops** *51st Annual Meeting of the Biophysical-Society*

Siegel, J., Shroff, H., Sivak, D., McEvoy, A., Spakowitz, A., Geissler, P., Liphardt, J.

CELL PRESS.2007: 350A-350A

- **Target-Site Search Strategies of DNA-Binding Proteins**

Díaz de la Rosa, M., A., Spakowitz, A., J.

2007

- **Theory of Translational and Rotational Fluctuations in Tethered-Bead Single-Molecule Experiments**

Mehraeen, S., Spakowitz, A., J.

2007

- **Target Site Search Strategy Of Gene Regulatory Proteins**

Díaz de la Rosa, M., A., Spakowitz, A., J.

2007

- **Chemical Physics Of DNA Packaging In A Nucleosome Core Particle**

Sudhanshu, B., Spakowitz, A., J.

2007

- **Wrapping Transitions for a Single Nucleosome Under Tension**

Sudhanshu, B., Spakowitz, A., J.

2007

- **High flexibility of DNA on short length scales probed by atomic force microscopy** *NATURE NANOTECHNOLOGY*

Wiggins, P. A., Van der Heijden, T., Moreno-Herrero, F., Spakowitz, A., Phillips, R., Widom, J., Dekker, C., Nelson, P. C.

2006; 1 (2): 137-141

- **Effect of force on mononucleosomal dynamics** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*

Mihardja, S., Spakowitz, A. J., Zhang, Y., Bustamante, C.

2006; 103 (43): 15871-15876

- **Wormlike chain statistics with twist and fixed ends** *EUROPHYSICS LETTERS*
Spakowitz, A. J.
2006; 73 (5): 684-690
- **DNA Structure within a Virus Particle**
Spakowitz, A., J., Comolli, L., Siegerist, C., E., Grimes, S., Jardine, P., Downing, K., H.
2006
- **Coupled Translational and Rotational Fluctuations of Tethered Beads**
Spakowitz, A., J., Bustamante, C.
2006
- **Wrapping Transitions in a Single Nucleosome Under Tension**
Spakowitz, A., J., Mihardja, S., Bustamante, C.
2006
- **Biocompatible force sensor with optical readout and dimensions of 6 nm(3)** *NANO LETTERS*
Shroff, H., Reinhard, B. M., Siu, M., Agarwal, H., Spakowitz, A., Liphardt, J.
2005; 5 (7): 1509-1514
- **DNA packaging in bacteriophage: Is twist important?** *Biophysical Journal*
Spakowitz, A., J., Wang, Z., G.
2005; 88: 3912
- **Semiflexible chain statistics with fixed end orientations**
Spakowitz, A., J.
2005
- **Topological considerations in nucleic acid hybridization kinetics** *Nucleic Acids Research*
Bois, J., S., Venkataraman, S., Choi, H., M. T., Spakowitz, A., J., Wang, Z., G., Pierce, N., A.
2005; 33 (13): 4090
- **End-to-end distance vector distribution with fixed end orientations for the wormlike chain model** *Phys. Rev. E*
Spakowitz, A., J., Wang, Z., G.
2005; 72: 41802
- **Exact results for a semiflexible polymer chain in an aligning field** *Macromolecules*
Spakowitz, A., J., Wang, Z., G.
2004; 37: 5814
- **Semiflexible polymer solutions: I. phase behavior and single-chain statistics** *Journal of Chemical Physics*
Spakowitz, A., J., Wang, Z., G.
2003; 119: 13113
- **A semiflexible polymer confined to a spherical surface** *Physical Review Letters*
Spakowitz, A., J., Wang, Z., G.
2003; 91: 166102
- **Towards an Understanding of the Physical Manipulation of DNA**
Spakowitz, A., J., Wang, Z., G.
2003
- **Twist Effect in DNA Packaging**
Spakowitz, A., J., Wang, Z., G.
2003
- **Shape dynamics of elastic filaments due to internal strain**
Spakowitz, A., J., Wang, Z., G.

2002

- **Free expansion of elastic filaments** *Physical Review E*
Spakowitz, A., J., Wang, Z., G.
2001; 64: 61802