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EDUCATION AND PROFESSIONAL EXPERIENCE

- 2019–Present Assistant Professor, West Virginia University Institute of Technology, Beckley, WV
- 2017–2019 Adjunct Professor, Frederick Community College, Frederick, MD
Visiting Scientist, Center for Cancer Research, National Cancer Institute, Frederick, MD
- 2014–2016 Assistant Research Scientist, Department of Chemistry, New York University, New York, NY
- 2008–2013 Postdoctoral Fellow, National Cancer Institute, Frederick, MD
- 2001–2007 Ph.D., Materials Science/Physics, Washington State University, Pullman, WA
Graduate Student, Department of Physics, Washington State University, Pullman, WA
- 1999–2001 M.S., Physics, National Yamagata University, Yamagata, Japan
- 1991–1998 B.S., Physics, Daegu University, Daegu, Korea

TEACHING AND MENTORING EXPERIENCE

- 2019-Present **Assistant Professor:** Undergraduate physics course, West Virginia University Institute of Technology
Course title: General Physics Lecture and Lab (PHYS 111)
Description: Teaching calculus based physics, 6.0 hours per week
Teaching physics lab, 9.0 hours per week
- 2017–2019 **Adjunct Professor:** Undergraduate physics course, Frederick Community College
Course title: Introductory Physics I (PY-203) and Introductory Physics II (PY-204)
Description: Teaching calculus based physics, 2.5 hours per week
Teaching physics lab, 2.5 hours per week

Course title: Survey of Physics (PY-101)
Description: Teaching a general background of physics, 2.5 hours per week
- 2017 **Invited Lecturer (October 2–4):** “3D Modeling of Nucleic Acid Nanostructures and Molecular Dynamics Simulations”, University of North Carolina at Charlotte
Course title: NanoBioChemistry (CHEM 4090)
Description: Teaching nucleic acid nanostructure modeling and molecular dynamics simulations
- 2012–2013 **Mentoring:** Experimental biology postdoctoral fellows, National Institutes of Health
Project title: “Molecular Dynamics Simulations of siRNA–Bolaamphiphile Complexes”
Description: Teaching computational biophysics
- 2001–2003 **Teaching Assistant:** Undergraduate Physics Lab, Washington State University
Number of sections per semester: 2
Course titles: Physics 102 Lab; Physics 201 Lab
Description: Teaching undergraduate physics lab sections, 3 hours per class per week
Physics tutoring section, 3 hours per week

- 1999–2000 **Mentoring:** Undergraduate and graduate students, National Yamagata University
Project titles: “Building Zone Melting Equipment”
 “Fluorescence Measurement of Anthracene Crystal and Dimerized Anthracene
 Molecules Captured by β - and γ -Cyclodextrins at 4K”

RESEARCH EXPERIENCE

- 2017–2019 Visiting Scientist, RNA Biology Laboratory, National Cancer Institute, Frederick, MD
Research focus:
Development of siRNA delivery systems using cationic vesicles and peptides
- 2014–2016 Assistant Research Scientist, Department of Chemistry, New York University, New York, NY
Research focus:
DNA repair mechanism of DNA polymerase- β and chromatin folding and unfolding
- 2008–2013 Postdoctoral Fellow, Center for Cancer Research, National Cancer Institute, Frederick, MD
Research focus:
Nucleic acid nanostructures
Therapeutic siRNA nanoparticle delivery using cationic micelles
Role of sodium and magnesium ions in the dimerization of HIV-1 subtype-A and -B monomers
Unfolding characteristics of Turnip crinkle virus using an optical tweezers approach and steered
molecular dynamics simulations
- 2004–2007 Graduate Research Assistant, Materials Science, Washington State University, Pullman, WA
Dissertation title: “Molecular Dynamics Simulation of Heat Transport across the Carbon
Nanotube (CNT)–Silicon (Si) Interface”
Research focus:
Molecular dynamics modeling of heat transport across CNT–Si interface
Thermal properties of CNT, silicon, and silicon carbide
Heat pulse propagation in multiwalled carbon nanotubes
- 2001–2004 Graduate Research Assistant, Department of Physics, Washington State University, Pullman, WA
Research focus:
Raman spectroscopy of nanoparticle (C_{60})
- 1999–2001 Graduate Student, Department of Physics, National Yamagata University, Yamagata, Japan
Thesis title: “The Dimerization of Two Anthracene Molecules Inserted into γ -Cyclodextrin”
Research focus:
Fluorescence and Raman spectroscopy of anthracene molecules captured by γ -cyclodextrins

RELEVANT COURSEWORK

- 2018 Scientists Teaching Science, National Institute of Health (NIH) via Canvas
Active learning strategies; Four major learning styles; Diversity in STEM; Course objectives
based on Bloom’s Taxonomy; Effective curriculum design; and Construct a detailed course
syllabus.
- 2018 Certificate for Online Teaching Excellence, Frederick Community College (FCC) via
Blackboard
Online learning environment; Online course design principles; Learning objectives; Copyright
and accessibility; Active learning techniques; Online instructor roles; Creating and moderating
online discussions; Academic integrity; Monitoring student progress; and Group project

SERVICE

- 2017–2018 Poster Judge, Postbac Poster Day, Office of Intramural Training and Education, National Institutes of Health, Bethesda, MD
- 2017 Poster Judge, Spring Research Festival 2017, Fort Detrick and National Cancer Institute, Frederick, MD

HONORS, SCHOLARSHIPS, AND AWARDS

- 2010 Winner, poster presentation at the Spring Research Festival, Fort Detrick and National Cancer Institute, Frederick, MD
- 2003 Outstanding Teaching Assistant Award, Department of Physics, Washington State University, Pullman, WA
- 1998–2001 Ministry of Education, Science and Culture (Japan) Full-Time Scholarship Graduate Student, Department of Physics, National Yamagata University, Japan
- 1996 Ministry of Education, Science and Culture (Japan) Scholarship Exchange Student, Department of Physics, National Yamagata University, Japan
- 1994 President's Academic Scholarship for Fall Semester, Department of Physics, Daegu University, Korea
- 1994 President's Academic Scholarship for Spring Semester, Department of Physics, Daegu University, Korea

SELECTED PUBLISHED ABSTRACTS AND PRESENTATIONS

Kim, T., Afonin, K., Viard, M., Heldman, E., and Shapiro, B. A. (2018) In-Silico, In-Vitro, and In-Vivo Studies of siRNA Delivery using Cationic Bolaamphiphile Vesicles. *Biophysical Journal* 114(3). DOI: 10.1016/j.bpj.2017.11.2412

Kasprzak, W. K., **Kim, T.**, Le, M., Gao, F., Young, M. Y. L., Yuan, X., Seog, J., Simon, A. E., Shapiro, B. A. (2018) Simulations of Optical Tweezers Experiments Reveal Details of RNA Structure Unfolding. *Biophysical Journal* 114(3). DOI: 10.1016/j.bpj.2017.11.1199

Kasprzak, W. K., Afonin, K. A., Bindewald, E., Puppala, P. S., **Kim, T.**, Zimmermann, M. T., Jernigan, R. L., and Shapiro, B. A. (2013) Coarse-Grained Computational Characterization of RNA Nanocube Flexibility Correlates with Experiments. *Biophysical Journal* 104(2). DOI:10.1016/j.bpj.2012.11.119

Kim, T., Afonin, K. A., Heldman, E., Blumenthal, R., and Shapiro B. A. (2012) In Silico and in Ex-Vivo Experiments Indicate the Potential of Nanoparticles Composed of RNA-Bolaamphiphile Complexes as a Therapeutic siRNA Delivery Vehicle. *Biophysical Journal* 102(3). DOI:10.1016/j.bpj.2011.11.3472

Kasprzak, W. K., Bindewald, E., **Kim, T.**, Zimmermann, M. T., Jernigan, R. L., and Shapiro, B. A. (2010) Design and Modeling of RNA Nanostructures with Flexible Building Blocks. *Biophysical Journal* 100(3). DOI:10.1016/j.bpj.2010.12.2766

Kim, T., Heldman, E., Blumenthal, R., and Shapiro, B. A. (2010) Molecular Dynamics Simulations of siRNA Bolaamphiphile Nanoparticle Complexes Suggest Their Potential as a Therapeutic siRNA Delivery Vehicle. *Biophysical Journal* 100(3). DOI:10.1016/j.bpj.2010.12.2767

Le, S., **Kim, T.**, and Shapiro, B. A., (2010) Computational Design of an RNA Nanoparticle Consisting of a Three-Way Junction and pre-miRNAs. *Biophysical Journal* 98(3). DOI:10.1016/j.bpj.2009.12.2169

Kim, T., Marquez, V. E., and Shapiro, B. A. (2010) Characterization of RNA Nano Design Structures by Steered Molecular Dynamics Simulations Approach. *Biophysical Journal* 98(3). DOI:10.1016/j.bpj.2009.12.4162

Kasprzak, W. K., Bindewald, E., **Kim, T.**, Stephen, A., Fisher, R., and Shapiro, B. A. (2010) Evaluation of Selected Kissing-Loops as Building Blocks in RNA Nano Design. *Biophysical Journal* 98(3). DOI:10.1016/j.bpj.2009.12.4161

Kasprzak, W. K., Bindewald, E., **Kim, T.**, and Shapiro, B. A. (2009) Exploration of Structural Building Block Properties for RNA Nanostructures. *Journal of Biomolecular Structure and Dynamics* 26(6)

Kim, T., Marquez, V. E., and Shapiro, B. A. (2009) Carbocyclic Sugars Constrained to North and South Conformations Stabilize and Control RNA Conformations. *Journal of Biomolecular Structure and Dynamics* 26(6)

Kim, T., Marquez, V. E., and Shapiro, B. A. (2009) RNA Bending and Stabilization by Carbocyclic Sugars Constrained to North and South Conformations. *Biophysical Journal* 96(3). DOI:10.1016/j.bpj.2008.12.3024

CONFERENCE PROCEEDINGS

Osman, M., and **Kim, T.** (2010) "Effect of Chirality on the Silicon-Carbon Nanotube Thermal Interface Resistance." In *2010 International Conference on Enabling Science and Nanotechnology (ESciNano)*, Proceedings of meeting in December 2010, Kuala Lumpur, Malasia, Institute of Electrical and Electronics Engineers (IEEE)

ORAL PRESENTATIONS

Kim, T., Afonin, K., Viard, M., Heldman, E., and Shapiro, B. A. (2017) In-Vitro, In-Vivo, and In-Silico Studies of siRNA Delivery Using Cationic Bolaamphiphile Vesicles. Center for Cancer Research (CCR) RNA Biology Laboratory, National Cancer Institute, Frederick, MD

Kim, T., and Shapiro, B. A. (2012) Characterization of siRNA-Bolaamphiphile Micelle Interactions: A Step Towards Developing an siRNA Delivery System. Center for Cancer Research (CCR) Nanobiology Program Seminar Series, National Cancer Institute, Frederick, Maryland

Kim, T., Heldman, E., Blumenthal, R., and Shapiro, B. A. (2011) Nanoparticles Composed of siRNA-Bolaamphiphile Complexes Suggest Potential as a Therapeutic siRNA Delivery Vehicle as Indicated by Molecular Dynamics Simulations. The International Conference on Applied Mathematics, Modeling and Computational Science (AMMCS), Waterloo, Ontario, Canada (**Invited Talk**)

Kim, T., and Shapiro, B. A. (2011) In-Silico Design and In-Vitro Assembly of RNA-based Nanoparticles. Faculty Seminar Series, National Cancer Institute, Frederick, MD

Kim, T., and Shapiro, B. A. (2011) The Role of Sodium and Magnesium Ion Concentration in HIV-1 Subtype-A and Subtype-B Kissing Loop Dimerization Structures. Postdoctoral Seminar Series, National Cancer Institute, Frederick, MD

Kim, T., Marquez, E., and Shapiro, B. A. (2010) Characterization of RNA Nano Design Structures by Steered Molecular Dynamics Simulations Approach. Biophysical Society 54th Annual Meeting, San Francisco, CA

Kim, T., Shapiro, B. A., and Marquez, E. (2009) The Use of Modified Bases Containing Carbocyclic Sugars Constrained to North or South Conformations for Developing RNA-based Nanoparticles. Center for Cancer Research (CCR) Nanobiology Program Seminar Series, National Cancer Institute, Frederick, MD

Kim, T. (2008) Molecular Dynamics Simulation of Heat Pulse Propagation in Multiwall Carbon Nanotubes. Center for Cancer Research Nanobiology Program Seminar Series, National Cancer Institute, Frederick, MD

Kim, T., Osman, M., Richards, C., Richards, R., and Bahr, D. (2006) Molecular Dynamics of Heat Pulse Propagation in Multiwalled Carbon Nanotubes. 7th World Congress on Computational Mechanics, Los Angeles, CA

Kim, T., Osman, M., Richards, C., Richards, R., and Bahr, D. (2006) The Heat Pulse Propagations in Multiwalled Carbon Nanotubes. 8th Annual American Physical Society Northwest Section, Tacoma, WA

Kim, T., Osman, M., Richards, C., Richards, R., and Bahr, D. (2005) Molecular Dynamics Simulations of Heat Pulse Propagations in Single and Multiwalled Nanotubes. 7th Annual American Physical Society Northwest Section, Victoria, British Columbia, Canada

PUBLICATIONS

Peer-Reviewed Research Articles

Bindewald, E., Dai, L., Kasprzak, W., **Kim, T.**, Gu, S., Shapiro, B. A. (2018) RNA-protein Interactions Prevent Long RNA Duplex Formation: Implications for the Design of RNA based Therapeutics. *Molecules*, In Press.

Johnson, B., Halman, J., Satterwhite, E., Zakharov, A., Bui, M., Benkato, K., Goldsworthy, V., **Kim, T.**, Hong, E., Dobrovolskaia, M., Khisamutdinov, E., Marriott, I., Afonin, K. (2017) Programmable Nucleic Acid-Based Polygons with Controlled Neuroimmunomodulatory Properties for Predictive QSAR Modeling. *Small*, 10.1002/smll.201701255.

Bascom, G., **Kim, T.**, and Schlick, T. (2017) Kilobase Pair Chromatin Fiber Contacts Promoted by Living-System-Like DNA Linker Length Distributions and Nucleosome Depletion. *Journal of Physical Chemistry B* 121:3882–3894.

Le, M., Kasprzak, W., **Kim, T.**, Gao, F., Young, M. Y. L., Shapiro, B. A., Seog, J., and Simon, A. E. (2017) Folding behavior of a T-shaped ribosome-binding translation enhancer implicated in a wide-spread conformational switch. *eLife* DOI: 10.7554/eLife.22883.001.

Kim, T., Freudenthal, B., Beard, W., Wilson, S., and Schlick, T. (2016) Insertion of Oxidized Nucleotide Triggers Rapid DNA Polymerase Opening. *Nucleic Acids Research* 44: 4409–4424.

Bindewald, E., Afonin, K., Viard, M., Zakrevsky, P., **Kim, T.**, and Shapiro, B. A. (2016) Multi-strand Structure Prediction of Nucleic Acid Assemblies and Design of RNA Switches. *Nano Letters* 16: 1726–1735.

Gupta, K., Afonin, K., Viard, M., Herrero, V., Kasprzak, W., Kagiampakisi, I., **Kim T.**, Koyfmand, A., Purie, A., Steplera, M., Sappea, A., KewalRamani, V., Grinberg, S., Linderf, C., Heldmang, E., Blumenthal, R., Shapiro, B. A. (2015) Bolaamphiphiles as Carriers for siRNA Delivery: From Chemical Syntheses to Practical Applications. *Journal of Controlled Release* 213: 142–151.

Freudenthal, B., Beard, W., Perera, L., Shock, D., **Kim, T.**, Schlick, T., and Wilson, S. (2015) Uncovering the Polymerase-Induced Cytotoxicity of an Oxidized Nucleotide. *Nature* 517: 635–639.

Afonin, K., Kasprzak, W., Bindewald, E., Puppala, P., Diehl, A., Hall, K., **Kim, T.**, Zimmermann, M., Jernigan, R., Jaeger, L., and Shapiro, B. A. (2014) Computational and Experimental Characterization of RNA Cubic Nanoscaffolds. *Methods* 67: 256–265.

Afonin, K., Desai, R., Viard, M., Kireeva, M., Bindewald, E., Case, C., Maciag, A., Kasprzak, W., **Kim, T.**, Sappe, A., Stepler, M., KewalRamani, V., Kashlev, M., Blumenthal, R., and Shapiro, B. A. (2013) Co-transcriptional Production of RNA-DNA Hybrids for Simultaneous Release of Multiple Split Functionalities. *Nucleic Acids Research* 42: 2085–2097.

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Kim, T., Afonin, K., Viard, M., Koyfman, A., Sparks, S., Heldman, E., Grinberg, S., Linder, C., Blumenthal, R., and Shapiro, B. A. (2013) In silico, In vitro and In vivo Studies Indicate the Potential Use of Bolaamphiphiles for Therapeutic siRNAs Delivery. *Molecular Therapy – Nucleic Acids* 2: e80; DOI:10.1038/mtna.2013.5.

Kim, T., and Shapiro, B. A. (2012) The Role of Sodium and Magnesium Ion Concentration in HIV-1 Subtype-A and Subtype-B Kissing Loop Dimerization Structures. *Journal of Biomolecular Structure and Dynamics* 31:495–510.

Kasprzak, W., Bindewald, E., **Kim, T.**, Jaeger, L., and Shapiro, B. A. (2011) Use of RNA Structure Flexibility Data in Nanostructure Modeling. *Methods* 54:239–250.

Kim, T., Marquez, V. E., Barchi, Jr., J. J., and Shapiro, B. A. (2011) Understanding the Effects of Carbocyclic Sugars Constrained to North and South Conformations on RNA Nanodesign. *Journal of Molecular Graphics and Modelling* 29:624–634.

Kim, T., Osman, M., Richards, C., Richards, R., and Bahr, D. (2007) Molecular Dynamics of Heat Pulse Propagation in Multiwall Carbon Nanotubes. *Physical Review B* 76:155424.

Book Chapters

Osman, M., and **Kim, T.** (2018) “Thermal Interface Resistance Between Silicon and Single Wall Carbon Nanotubes” in *Nanotube Superfiber Materials, Science to Commercialization*, Elsevier Science. In press.

Kim, T., Kasprzak, W., and Shapiro, B. A. (2017) “Protocols for Molecular Dynamics Simulations of RNA Nanostructures” in *RNA Nanostructures: Methods and Protocols*, 33–64. Humana Press.