

Name: Ester J. Kwon

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EDUCATION AND TRAINING

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| Postdoctoral | Massachusetts Institute of Technology
Advisor: Dr. Sangeeta Bhatia, M.D., Ph.D. |
| Ph.D., 2010 | Ph.D. in Bioengineering
University of Washington, Seattle, Washington
Thesis Advisor: Suzie Pun, Ph.D.
Thesis Title: Multi-component peptide vehicles for gene delivery to the central nervous system |
| Bachelors, 2004 | B.S. in Bioengineering with honors
B.A. in Molecular & Cellular Biology with honors
University of California, Berkeley, California |

RESEARCH EXPERIENCE

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| Massachusetts Institute of Technology , Research Scientist | 2016 – present |
| Postdoctoral Fellow | 2012 – 2016 |

Advisor: Sangeeta Bhatia, M.D., Ph.D.

Directed a 4-person research team (technicians, graduate student, postdoc) to reach research milestones for DARPA-funded grant.

Developed tandem peptide nanosystems for therapeutic and diagnostic applications:

- Urinary diagnostic system to detect ultra-small tumor lesions
- siRNA carrier for targeting synthetic lethal gene targets in ovarian cancer
- siRNA carrier for leveraging disrupted blood brain barrier in traumatic brain injury
- Peptide-based anti-infectives for treatment of *P. aeruginosa* pneumonia

Massachusetts Institute of Technology , Postdoctoral Fellow	2010-2012
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Advisor: Li-Huei Tsai, Ph.D.

- Verified sequence-specific regulation of schizophrenia-associated risk genes by microRNA-137.
- Investigated the role of microRNA-137 in hippocampal-dependent learning tasks.

Seattle Genetics , Bothell, Washington, Intern	2008
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Advisor: Peter Senter, Ph.D.

- Prepared fluorophore and toxin peptide conjugates for binding and toxicity evaluation in a panel of cell lines *in vitro*.
- Method development for site-specific conjugation of antibodies.

University of Washington, Seattle , Graduate student	2005-2010
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Advisor: Suzie Pun, Ph.D.

- Developed peptide-modified synthetic gene delivery vehicles for delivery to the central nervous system and evaluated vehicles for gene transfer *in vitro* and *in vivo*.

- Identified ligands that bind neural progenitor cells using phage display.
- Investigated the intracellular trafficking of gene delivery vehicles.
- Synthesized and purified peptides using Fmoc chemistry and HPLC.

Bio-Rad Laboratories, Hercules, California, Intern 2004

- Developed automated protein purification methods and validated software for Bio-Rad's DuoFlow Chromatography System.

University of California, Berkeley, Research Assistant 2003-2005

Advisors: Carlos J. Bustamante & Susan Marqusee

- Unfolded/refolded single protein molecules using optical tweezers.
- Prepared protein-DNA constructs for optical tweezer experiments using subcloning, mutagenesis, and protein purification.
- Simulated protein unfolding/refolding in MATLAB.

PUBLICATIONS:

*Indicates co-first authorship

1. **Kwon EJ**, Skalak M, Bertucci A, Braun G, Ruoslahti E, Sailor MJ, Bhatia SN. Porous Silicon Nanoparticle Delivery of Tandem Peptide Anti-infectives for the Treatment of *P. aeruginosa* Lung Infections. *Advanced Materials*, *Advanced Materials*, *Accepted*.
2. **Kwon EJ***, Dudani JS*, Bhatia SN. Ultrasensitive tumour-penetrating nanosensors of protease activity. *Nature Biomedical Engineering*, 2017, 1: 0054.
3. Lo JH*, **Kwon EJ***, Zhang AQ, Singhal PS, Bhatia SN. A comparison of modular PEG incorporation strategies for stabilization of peptide-siRNA nanocomplexes. *Bioconj Chem*, 2016, 27(10): 2323-2331.
4. **Kwon EJ**, Skalak M, Lo Bu R, Bhatia SN. A Neuron-Targeted Nanoparticle for siRNA Delivery to Traumatic Brain Injuries. *ACS Nano*, 2016, 10 (8), 7926–7933.
5. Kang J, Joo J, **Kwon EJ**, Skalak M, Hussain S, She Z, Ruoslahti E, Bhatia SN, Sailor MJ. Self-sealing porous silicon-calcium silicate core-shell nanoparticles for targeted siRNA delivery to the injured brain. *Advanced Materials*, 2016, 28(36), 7962-7969.
6. Joo J, **Kwon EJ**, Kang J, Skalak M, Anglin EJ, Mann AP, Ruoslahti E, Bhatia SN, Sailor MJ. Porous silicon-graphene oxide targeted delivery of siRNA to the injured brain. *Nanoscale Horizons*. 2016,1, 407-414.
7. Mann AP, Scodeller P, Hussain S, Joo JM, **Kwon EJ**, Braun G, Molder T, She ZG, Kotamraju V, Ranscht B, Krajewski S, Teesalu T, Bhatia SN, Sailor MJ, Ruoslahti E. A peptide for targeted, systemic delivery of imaging and therapeutic compounds into acute brain injuries. *Nat Commun*, 2016; 7:11980.
8. **Kwon EJ**, Lo JH, Bhatia SN. Smart Nanosystems: Bio-inspired Technologies that Interact with the Host Environment. *Proc Natl Acad Sci U S A*. 2015 Nov 24;112(47):14460-6.
9. Siegert S, Seo J, **Kwon EJ**, Rudenko A, Cho S, Wang W, Flood Z, Martorell AJ, Ericsson M, Mungenast AE, Tsai LH. The schizophrenia risk gene product miR-137 alters presynaptic plasticity. *Nat Neurosci*. 2015, 18(7):1008-16.
10. Lin KY, **Kwon EJ**, Lo JH, Bhatia SN. Drug-induced amplification of nanoparticle targeting to tumors. *Nanotoday*. 2014, 9(5):550-559.
11. Wang W, **Kwon EJ**, Tsai LH. MicroRNAs in learning, memory, and neurological diseases. *Learning and Memory*. 2012, 19(9):359-368.
12. **Kwon EJ**, Wang W, Tsai LH. Validation of schizophrenia-associated genes CSMD1,

- C10orf26, CACNA1C and TCF4 as miR-137 targets. *Mol Psychiatry*. 2011, 18(1):11-2.
13. **Kwon EJ**, Liang S, Pun SH. A truncated HGP peptide sequence that retains endosomolytic activity and improves gene delivery efficiency. *Mol Pharm*. 2010, 7(4):1260-5.
 14. **Kwon EJ**, Lasiene J, Jacobson BE, Park IK, Horner PJ, Pun SH. Targeted nonviral delivery vehicles to neural progenitor cells in the mouse subventricular zone. *Biomaterials*. 2010, 31(8):2417-24.
 15. **Kwon EJ**, Bergen JM, Park IK, Pun SH. Peptide-modified vectors for nucleic acid delivery to neurons. *J Control Release*. 2008, 132(3): 230-235.
 16. **Kwon EJ**, Bergen JM, Pun SH. Application of an HIV gp41-derived peptide for enhanced intracellular trafficking of synthetic gene and siRNA delivery vehicles. *Bioconjug Chem*. 2008, 19(4):920-7.
 17. Bergen JM, **Kwon EJ**, Shen TW, Pun SH. Application of an environmentally sensitive fluorophore for rapid analysis of the binding and internalization efficiency of gene carriers. *Bioconjug Chem*. 2008, 19(1):377-84.
 18. Cellitti J, Llinas M, Echols N, Shank EA, Gillespie B, **Kwon E**, Crowder SM, Dahlquist FW, Alber T, Marqusee S. Exploring subdomain cooperativity in T4 lysozyme I: structural and energetic studies of a circular permutant and protein fragment. *Protein Sci*. 2007 May;16(5):842-51.

BOOK CHAPTERS

Kwon EJ*, Takahiro S*, Tsai LH. "Neurodevelopment and Schizophrenia" in: *Neurobiology of Mental Illness*, eds. DS Charney, EJ Nestler, P Sklar, JD Buxbaum, Oxford University Press, 325-336, 2012.

AWARDS AND FELLOWSHIPS

ACS Nano Junior Fellow	2017
NRSA Postdoctoral Fellowship (NIH F32)	2013-2016
Broad Institute Fellow	2012
Simons Postdoctoral Fellowship	2011-2012
NRSA Predoctoral Fellowship (NIH F31)	2009-2010
Conference travel award, American Society for Gene Therapy	2009
Conference travel award and selected presentation, GRC	2008
Conference travel award, American Society for Gene Therapy	2008
NIH Engineered Biomaterials Training Program Fellow (NIH T32)	2008-2009

SERVICE

Community Board Member for Materials Horizons
Reviewer for Molecular Cancer Therapeutics

PLATFORM PRESENTATIONS (PP) AND POSTERS:

1. **Kwon EJ**, Dudani JS, Gurbatri CR, Bhatia SN. Targeted Nanosystems as Precision Tools for Cancer Diagnosis and Therapy. 2016, Biomedical Engineering Society, Minneapolis, MN. **(PP)**
2. **Kwon EJ**, Skalak M, Gurbatri CR, Lo Bu R, Bhatia SN. Tandem peptide nanosystems for delivery of nucleic acid and peptide cargoes. 2016, Drug Carriers in Medicine & Biology, Gordon Research Conference, Waterville Valley, NH.
3. Dudani JS, **Kwon EJ**, Jain PK, Warren AD, Kwong GA, Bhatia SN. Nanosystems to Profile Disease-Associated Proteases In Vivo. 2016, Gordon Research Conference:

- Proteolytic Enzymes & Their Inhibitors, Lucca, Italy.
4. **Kwon EJ**, Skalak M, Bu RL, Bhatia SN. Targeted RNA interference for traumatic brain injury. 2015, Biomedical Engineering Society, Tampa, Florida. **(PP)**
 5. Lo JH, **Kwon EJ**, Muzumdar M, Ren Y, Jacks T, Bhatia SN. Tumor-penetrating nanocomplexes for siRNA delivery to pancreatic cancer. 2014, Biomedical Engineering Society, San Antonio, Texas.
 6. **Kwon EJ**, Liang S, Pun SH. Optimization of HGP peptide for gene delivery. 2010, Controlled Release Society, Portland, Oregon.
 7. **Kwon EJ**, Johnson RN, Burke RS, Jacobson BE, Lasiene J, Park IK, Convertine A, Hoffman AS, Stayton PS, Horner PJ, Pun SH. Peptide-based polymers for neuron gene delivery. 2010 Controlled Release Society, Portland, Oregon.
 8. **Kwon EJ**, Lasiene J, Jacobson BE, Park IK, Horner PJ, Pun SH. Neuron-targeted nonviral gene delivery vehicles. 2009, American Society of Gene Therapy, San Diego, California. **(PP)**
 9. **Kwon EJ**, Lasiene J, Park IK, Horner PJ, Pun SH. 2008, Neuron-targeted nonviral gene delivery vehicles. Gordon Research Conference: Drug Carriers in Biology & Medicine, Big Sky, Montana. **(PP)**
 10. **Kwon EJ**, Bergen JM, Pun SH. 2008. Polycations modified with an HIV gp41-derived peptide efficiently deliver genes and siRNA due to enhanced endosomal release. American Society of Gene Therapy, Boston, Massachusetts.
 11. **Kwon EJ** and Pun SH. 2007. Vehicles Modified with Lytic Peptide for Non-Viral Gene Delivery. Biomedical Engineering Society, Hollywood, California.
 12. Bergen JM, **Kwon EJ**, Shen TW, and Pun SH. 2007. Environmentally-sensitive fluorophores for rapid analysis of the binding and uptake of gene carriers. Biomedical Engineering Society, Hollywood, California.
 13. Pun SH, Bergen JM, **Kwon EJ**, and Park IK. 2007. Multicomponent nanoparticles for controlled intracellular delivery to targeted cells. American Vacuum Society, Seattle, Washington.
 14. **Kwon EJ** and Pun SH. 2007. Lytic Peptides for Non-Viral Gene Delivery. Arthur M. Sackler Colloquia of the National Academy of Sciences, Washington, DC.

TEACHING & OUTREACH EXPERIENCE**Cambridge Science Festival - Koch Institute Demonstration****Massachusetts Institute of Technology, Cambridge, MA** 2015

- Demonstrated an infrared camera and explained photonic materials to the general public (aimed at children of all ages) during the Cambridge Science Festival.

Society of Women Engineers - Keys to Empowering Youth Demonstration**Massachusetts Institute of Technology, Cambridge, MA** 2014

- Developed a 30 minute program including a demonstration and interactive activity for 40 middle school students to understand nanoparticles, infrared light, and materials.

Teaching Assistant, Initiative for Maximizing Student Diversity Summer Teach Lab**University of Washington, Seattle, Washington** 2006, 2007

- Taught laboratory techniques to 20 high school students
- Led discussions on data interpretation and laboratory theory

Undergraduate Student Instructor, Organic Chemistry, Department of Chemistry**University of California, Berkeley, California** 2003

- Led discussions on course material and problem sets
- Explained laboratory theory
- Led 5 hour laboratory class once a week
- Graded laboratory notebooks and exams as a team

MENTORING EXPERIENCE

Mentored two graduate students, two summer Research Experience for Undergraduates (REU) students, and two undergraduates on independent research projects in the Pun Laboratory. Mentored one undergraduate student and two technicians in the Tsai Laboratory. Mentored three undergraduates and three technicians, led teams including two graduate students and two postdoctoral researchers in the Bhatia Lab. 13 out of 14 undergraduate and technician direct supervisees went on to pursue graduate level STEM education.

Mentored eight undergraduate students on individual projects

- Designed independent projects suitable for undergraduate students
- Taught and critiqued laboratory reports
- Instructed students on presentation skills and thesis writing
- Mentored students in professional development

Mentored technicians, graduate students, and postdoctoral researchers

- Discussed overall project goals with trainees
- Led weekly (technician), or monthly meetings (graduate students, postdoctoral researchers) to provide feedback on research directions and progress
- Provided feedback on presentation slides
- Performed annual reviews for strength/weaknesses/threats/opportunity analysis with technicians
- Led the interview and hiring process for two technicians

REFERENCES**Sangeeta N. Bhatia, M.D., Ph.D.**

Investigator, Howard Hughes Medical Institute
John J. and Dorothy Wilson Professor of Health Sciences and Technology & Electrical
Engineering and Computer Science
Massachusetts Institute of Technology
77 Massachusetts Ave. Bld. 76-473
Cambridge, MA 02139
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Relationship: current advisor

Suzie H. Pun, Ph.D.

Robert F. Rushmer Professor of Bioengineering
Adjunct Professor of Chemical Engineering
University of Washington
Box 355061 Foege Building, N530P
Seattle, WA 98195
Phone: (206) 685-3488
Email: spun@uw.edu
Relationship: Ph.D. advisor

Michael J. Sailor, Ph.D.

Distinguished Professor
Departments of Chemistry and Biochemistry, Bioengineering, & Nanoengineering
University of California, San Diego
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La Jolla, CA 92093
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Email: msailor@ucsd.edu
Relationship: current collaborator and mentor

Peter Senter, Ph.D.

Vice President, Chemistry
Senior Distinguished Fellow
Seattle Genetics
21823 30th Drive S.E.
Bothell, WA 98021
Phone: (425) 527-4710
Email: psenter@seagen.com
Relationship: Ph.D. thesis committee member, internship supervisor