

Curriculum Vitae

Jongmin Kim

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Education

- 9/00 – 12/06 **California Institute of Technology**, Pasadena, CA, USA
Ph. D. in Biology. Advisor: Erik Winfree.
Thesis: *In vitro* synthetic transcriptional networks.
- 3/97 – 8/00 **Pohang University of Science and Technology**, Pohang, Korea.
B. S. in Life Science.
Thesis: Purification and Characterization of Caspase.
Graduated early with high honors.

Experience

- 3/14 – present **Research Fellow**, Harvard University, Boston, MA, USA
Wyss Institute for Biologically Inspired Engineering. Advisor: Peng Yin.
Biological sensors and regulatory networks, synthetic biology.
- 3/10 – 3/14 **Postdoctoral Scholar**, California Institute of Technology, Pasadena, CA, USA
Dept. of Bioengineering. Advisor: Richard Murray.
Feedback control in biological systems, cell-free synthetic biology.
Skills: microfluidic chip, light microscopy, cell-free expression systems, modeling control system dynamics.
- 1/07 – 3/10 **Senior Researcher**, CbsBioscience Inc., Daejeon, Korea
Screening for prognostic markers of hepatocellular carcinoma tissues through genomic and proteomic analysis
- 9/00 – 12/06 **Research Assistant**, California Institute of Technology, Pasadena, CA, USA
Neuroscience projects during the rotation in the first year: pattern recognition program and fluorescence labeling of locust brain.
Theory and experiment of biochemical circuits in Winfree group.
Skills: enzyme kinetics, DNA sequence design, fluorescence spectroscopy, surface plasmon resonance, modeling biochemical system dynamics.
- 6/01 – 12/04 **Teaching Assistant**, California Institute of Technology, Pasadena, CA, USA
Held office hours and prepared and graded homeworks for molecular biology experiment course and introduction to neural network course.
- 1/00 – 8/00 **Undergraduate research**, Pohang University of Science and Technology, Pohang, Korea.
Purified and characterized a cell death protein Caspase in an X-ray crystallography group.
Advisor: Byung-Ha Oh.

Honors and Awards

- Wyss Institute cross-platform fellowship, 2014–.
- Predoctoral fellowship from the Korea Foundation for Advanced Studies, 2000–2005.
- Undergraduate fellowship from the Korea Foundation for Advanced Studies, 1998–2000.
- Ranked first in the entrance exam and received full-tuition scholarship from Pohang University of Science and Technology, 1997–2000.

Students Supervised

- Graduate students: Elisa Franco, Anu Thubagere, Aneesh Acharya
- Undergraduate students: David Y. Zhang, Kristin S. White, Pakpoom Subsoontorn, Arjun Ravikumar, Ishan Khetarpal, Shaunak Kar, Patrik Lundin, Juan Quijano

Publications

Journals

1. Yordanov B, **Kim J**, Petersen R, Shudy A, Kulkarni VV, Phillips A, 2014, Computational design of nucleic acid feedback control circuits, *ACS Synthetic Biology* 3:600–616.
2. **Kim J**, Khetarpal I, Sen S, Murray RM, 2014, Synthetic circuit for exact adaptation and fold-change detection, *Nucleic Acids Research* 42:6078–6089.
3. Siegal-Gaskins D*, Tuza ZA*, **Kim J***, Noireaux V, Murray RM, 2014, Resource usage and gene circuit performance characterization in a cell-free ‘breadboard’, *ACS Synthetic Biology* 3:416–425 (*, co-first authors).
4. Kulkarni VV, Kharisov E, Hovakimyan N, **Kim J**, 2014, Load capacity improvements in nucleic acid based systems using partially open feedback control, *ACS Synthetic Biology* 3:617–626.
5. Takahashi M, Chappell J, Hayes C, Sun ZZ, **Kim J**, Singhal V, Spring K, Al-Khabouri S, Fall C, Noireaux V, Murray RM, Lucks J, 2014, Rapidly characterizing the fast dynamics of RNA genetic circuitry with cell-free transcription-translation (TX-TL) systems, *ACS Synthetic Biology* (in press).
6. Weitz M, **Kim J**, Kapsner K, Winfree E, Franco E, Simmel FC, 2014, Diversity in the dynamical behaviour of a compartmentalized programmable biochemical oscillator, *Nature Chemistry* 6:295–302.
– **Cover article**
7. Subsoontorn P*, **Kim J***, Winfree E, 2012, Ensemble Bayesian analysis of bistability in a synthetic transcriptional switch, *ACS Synthetic Biology* 1:299–316 (*, co-first authors).
8. Franco E, Friedrichs E, **Kim J**, Jungmann R, Murray RM, Winfree E, Simmel FC, 2011, Timing molecular motion and production with a synthetic transcriptional clock, *Proceedings of the National Academy of Sciences USA* 108:E784–E793.
– **Highlights in Biopolymers**
9. Lee D, Do IG, Choi K, Sung CO, Jang KT, Choi D, Heo JS, Choi SH, **Kim J**, Park JY, Cha HJ, Joh JW, Choi KY, Kim DS, 2012, The expression of phospho-AKT1 and phospho-mTOR is associated with a favorable prognosis independent of PTEN expression in intrahepatic cholangiocarcinomas, *Modern Pathology* 25:131–139.
10. Cha HJ, **Kim J**, Hong SJ, Hong SM, Park JH, Kim ES, Choi YJ, Do IG, Joh JW, Kim DS, Choi KY, 2012, Overexpression of renal tumor antigen is associated with tumor invasion and poor prognosis of hepatocellular carcinoma, *Annals of Surgical Oncology* Suppl 3:S404–11.

11. **Kim J**, Winfree E, 2011, Synthetic *in vitro* transcriptional oscillators, *Molecular Systems Biology* 7:465.
12. Kwon JH*, **Kim J***, Park JY, Hong SM, Park CW, Hong SJ, Park SY, Choi YJ, Do IG, Joh JW, Kim DS, Choi KY, 2010, Overexpression of HMGB2 is associated with tumor aggressiveness and prognosis of hepatocellular carcinoma, *Clinical Cancer Research* 16:5511–21 (*, co-first authors).
– **Highlights in *Clinical Cancer Research***
13. **Kim J**, Hong SJ, Park JY, Park JH, Yu YS, Park SY, Lim EK, Choi KY, Lee EK, Paik SS, Lee KG, Wang HJ, Do IG, Joh JW, Kim DS, 2010, Epithelial-mesenchymal transition gene signature to predict clinical outcome of hepatocellular carcinoma, *Cancer Science* 101:1521–28.
– **A prognostic test (OncoHepa^{Test}) based on this study is licensed as new health technology by Ministry of Health and Welfare in Korea (Ministry of Health and Welfare Notice 2010-83)**
14. **Kim J***, Kim JM*, Hong SJ, Park JH, Park SY, Hwang T, Yi GS, Kim SH, Cho EY, Joh JW, Park JY, Kim DS, 2009, Increased expression of autophagy protein Beclin1 and LC3 in high-grade hepatocellular carcinoma and metastatic carcinoma, *Biochip Journal* 3:316–25 (*, co-first authors).
15. Hong SJ*, **Kim J***, Park JH, Lim EK, Kim J, Choi YJ, Gu H, Kim SW, Choi KY, Joh JW, Kim DS, 2009, Proteomic profiling of human hepatocellular carcinoma tissues by two-dimensional electrophoresis and mass spectrometry, *Biochip Journal* 3:237–48 (*, co-first authors).
16. **Kim J**, Hong SJ, Park JH, Lee CB, Kim SW, Gu H, Choi GS, Kwon CHD, Joh JW, Kim DS, 2009, Real-time reverse transcription PCR analysis for validation of transketolase gene in hepatocellular carcinoma tissues, *Biochip Journal* 3:130–8.
17. **Kim J**, Hong SJ, Park JH, Park SY, Kim SW, Cho EY, Do IG, Joh JW, Kim DS, 2009, Expression of cystathionine beta-synthase is downregulated in hepatocellular carcinoma and associated with poor prognosis, *Oncology Reports* 21:1449–54.
18. **Kim J**, Hong SJ, Lim EK, Yu YS, Kim SW, Roh JH, Do IG, Joh JW, Kim DS, 2009, Expression of nicotinamide N-methyltransferase in hepatocellular carcinoma is associated with poor prognosis, *Journal of Experimental and Clinical Cancer Research* 28:20.
19. **Kim J**, White KS, Winfree E, 2006, Construction of an *in vitro* bistable circuit from synthetic transcriptional switches, *Molecular Systems Biology* 2:68.
– **News & Views** by Michael Simpson in *Molecular Systems Biology* 2:69.

Conference Papers & Book Chapters

1. Yeung E, Ng A, **Kim J**, Sun ZZ, Murray RM, Modeling the effects of compositional context on promoter activity in an *E. coli* extract based transcription-translation system, (accepted).
2. Sen S, **Kim J**, Murray RM, Designing robustness to temperature in a feedforward loop circuit, (accepted).
3. **Kim J**, Franco E, 2014, Synthetic biochemical devices for programmable dynamic behaviors, Chapter 12 in *A Systems Theoretic Approach to Systems and Synthetic Biology II: Analysis and Design of Cellular Systems*, Kulkarni V, Stan G-B, Raman K (eds.), Springer.
4. Yeung E, **Kim J**, Murray RM, 2013, Resource competition as a source of non-minimum phase behavior in transcription-translation systems, *IEEE Conference on Decision and Control*, p. 4060–4067.

5. Tuza ZA, Singhal V, **Kim J**, Murray RM, 2013, An *in silico* modeling toolbox for rapid prototyping of circuits in a biomolecular ‘breadboard’ system, *IEEE Conference on Decision and Control*, p. 1404–1410.
6. Franco E, **Kim J**, Simmel FC, 2013, Transcription Oscillators, Chapter 4 in *Multiscale Analysis and Nonlinear Dynamics: From Genes to the Brain*, Misha (Meyer) Z. Pesenson (ed.), WileyVCH Verlag GmbH & Co. KGaA.
7. Yeung E*, **Kim J***, Yuan Y, Goncalves J, Murray RM, 2012, Quantifying crosstalk in biochemical systems, *IEEE Conference on Decision and Control*, p. 5528–5535, (*, co-corresponding authors).
8. Kulkarni VV, Chanyaswady T, Riedel M, **Kim J**, 2012, Robust tunable *in vitro* transcriptional oscillator networks, *50th Annual Allerton Conference on Communication, Control, and Computing*, p. 114–119.
9. **Kim J**, Murray RM, 2011, Analysis and design of a synthetic transcriptional network for exact adaptation, *IEEE Biomedical Circuits and Systems Conference*, p. 345–348.
10. Friedrichs E, **Kim J**, Jungmann R, Franco E, Murray RM, Winfree E, Simmel FC, 2010, Driving DNA tweezers with an *in vitro* transcriptional oscillator, *Biophysical Journal* 98:430a–431a. (published abstract)
11. **Kim J**, 2009, Synthetic Networks, Chapter 10 in *Automation in proteomics and genomics: an engineering case-based approach*, Alterovitz G, Benson R, Ramoni M (eds.), John Wiley & Sons.
12. **Kim J**, Hopfield JJ, Winfree E, 2004, Neural network computation by *in vitro* transcriptional circuits, *Advances in Neural Information Processing Systems* 17:681–688, MIT Press, Cambridge, MA.

Manuscripts in preparation

1. **Kim J**, Quijano J, Yeung E, Murray RM, Synthetic logic circuits using RNA aptamer against T7 RNA polymerase, (submitted).
2. **Kim J**, Thubagere A, Ravikumar A, Khetarpal I, Murray RM, Detecting sequence of molecular events using synthetic circuits, (in preparation).
3. Yeung E, **Kim J**, Yuan Y, Goncalves J, Murray RM, Robust dynamical network reconstruction in biochemical systems, (in preparation).
4. Franco E, Blanchini F, **Kim J**, Analysis of a negative feedback biochemical oscillator, (in preparation).
5. Cha HJ, Lee MJ, Hong SM, Yun YS, Hong BH, Lee MS, Kim EH, **Kim J**, Jang DS, Cui XD, Nam HG, Kim DG, Choi KY, Antitumor effects of an mTOR inhibitor in combination with an EGFR kinase inhibitor in cholangiocarcinoma, (in preparation).

PRESENTATIONS

- [Poster] Ribocomputers for in vivo logic computation, 2015 *The 6th Molecular Programming Project workshop*
- [Talk] *In vivo* application of an inhibitory RNA aptamer against T7 RNA polymerase, 2014 *The 2nd annual winter q-bio meeting*
- [Poster] Synthesis of an event detector in a cell-free expression system, 2013 *The 5th Molecular Programming Project workshop*

- [Talk] Synthetic circuit for exact adaptation and fold-change detection, 2013 *The 19th International Conference on DNA Computing and Molecular Programming*
- [Poster] Synthesis of an event detector in a cell-free expression system, 2013 *Synthetic biology 6.0*
- [Talk] Synthetic biology: Bottom-up approaches and applications, 2013 *Yonsei University*
- [Talk] Synthetic biology: Bottom-up approaches and applications, 2013 *Seoul National University*
- [Talk] Programmability of synthetic transcriptional networks, 2012 *The 4th Molecular Programming Project workshop*
- [Talk] Neural network computation with DNA circuits, 2012 *International Brain Research Symposium-2012*
- [Talk] Synthetic biology: Bottom-up approaches and applications, 2012 *Pohang University of Science and Technology*
- [Talk] Analysis and design of a synthetic transcriptional network for exact adaptation, 2011 *IEEE Biomedical Circuits and Systems Conference*
- [Tutorial] Genelets: synthetic in vitro transcriptional circuits (with Josh Bishop and Elisa Franco), 2011 *17th international conference on DNA computing and molecular programming*
- [Poster] Towards synthesis of an event detector in a cell-free expression system, 2011 *17th international conference on DNA computing and molecular programming*
- [Talk] Molecular classification and prediction of survival in hepatocellular carcinoma patients by gene expression profiling, 2011 *Pohang University of Science and Technology*
- [Poster] Towards synthesis of an event detector in a cell-free expression system, 2011 *The 3rd Molecular Programming Project workshop*
- [Poster] Molecular classification and prediction of survival in hepatocellular carcinoma patients fulfilling the Milan criteria by gene expression profiling, 2011 *The 3rd JCA-AACR special joint conference*
- [Talk] *In vitro* synthetic oscillators, 2009 *Non-coding RNAs & Synthetic Biology-2009*
- [Short talk] *In vitro* synthetic oscillators, 2008 *Synthetic biology 4.0*
- [Talk] *In vitro* synthetic oscillators, 2008 *BiosysBio2008*
Best synthetic biology presentation award
- [Poster] Construction of an *in vitro* bistable circuit from synthetic transcriptional switches, 2006 *Synthetic biology 2.0*
- [Demo] Real time monitoring of biochemical circuits, 2004 *Neural Information Processing Systems*
- [Poster] Neural network computation by *in vitro* transcriptional circuits, 2004 *Neural Information Processing Systems*
- [Talk] Neural network computation by *in vitro* transcriptional circuits, 2004 *Banff Research Station Workshop - Dynamics, Control and Computation in Biochemical Networks*
- [Poster] *In vitro* transcriptional circuits, 2004 *Synthetic biology 1.0*
- [Talk] *In vitro* transcriptional circuits, 2003 *9th annual international meeting on DNA based computers*

PATENTS

1. Markers for prognosis of liver cancer (Korean patent 10-0964193, PCT applied for)
2. Protein markers for diagnosis of liver cancer progression (Korean patent 10-1004960)
3. Protein markers for early diagnosis of liver cancer (Korean patent pending, PCT applied for)
4. Compositions, kits, and methods for predicting prognosis of liver cancer
(Korean patent pending, PCT applied for)
5. Markers for prognosis of liver cancer (Korean patent pending)