Jongmin Kim

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Education

Ph.D. California Institute of Technology, Biology - Pasadena, CA, USA — June 2007
Advisor: Prof. Erik Winfree
Thesis: "*In vitro* synthetic transcriptional networks"

B.S., Pohang University of Science and Technology, Life Sciences - Pohang, Korea — August 2000
Graduated *summa cum laude*
Thesis Advisor: Prof. Byung-Ha Oh
Thesis: "Purification and Characterization of Caspase"

Experience

Associate Professor, Life Sciences, POSTECH – Pohang, Gyeongbuk, Korea — September 2024–Present
Assistant Professor, Life Sciences, POSTECH – Pohang, Gyeongbuk, Korea — May 2018–August 2024
Synthetic Biology and Molecular Computing

Senior Scientist, NuProbe USA Inc. – Cambridge, MA, USA — March 2018–April 2018
DNA toehold probes for cell-free DNA detection

Postdoctoral Research Fellow, Harvard University – Boston, MA, USA — March 2014–April 2018
Wyss Institute for Biologically Inspired Engineering, Advisor: Prof. Peng Yin

Postdoctoral Scholar, California Institute of Technology – Pasadena, CA, USA — March 2010–March 2014
Department of Bioengineering, Advisor: Prof. Richard Murray

Senior Researcher, CbsBioscience Inc. – Daejeon, Korea — January 2007–March 2010
Prognostic markers of hepatocellular carcinoma

Patents

- Compositions comprising riboregulators and methods of use thereof (US patent 11124846)
- Markers for prognosis of liver cancer (Korean patent 10-0964193)
- Protein markers for diagnosis of liver cancer progression (Korean patent 10-1004960)

Honors & Awards

Wyss Institute cross-platform fellowship	2014–2017
Korea Foundation for Advanced Studies predoctoral fellowship	2000–2005
Korea Foundation for Advanced Studies undergraduate fellowship	1998–2000
Pohang University of Science and Technology full-tuition scholarship	1997–2000

Selected Recent Publications

1. Lee G*, **Kim J***, Construction of synthetic protein-binding non-genetic DNA systems in living cells, ***Nature Chemistry*** (published online).
2. Lee G*, **Kim J***, Non-genetic DNAs as programmable molecular baits, ***Nature Chemistry*** (in press). – *Research Briefing*
3. Heo T†, Park D†, Shin W, **Kim J***, SUPER: Upcycling genetic parts for precise gene expression control, leakage minimization, and genetic circuit stability, ***Advanced Science*** 13:e14653, 2026**.**
4. **Kim J***, Franco E*, Hashing the message with cells, ***Nature Chemical Biology*** 21:166-167, 2025. – *News & Views*
5. Goh H†, Choi S†, **Kim J***, Synthetic translational coupling element for multiplexed signal processing and cellular control, ***Nucleic Acids Research*** 52:13469-13483, 2024.
6. Kim J†, Seo M†, Lim Y, **Kim J***, START: A versatile platform for bacterial ligand sensing with programmable performances, ***Advanced Science*** 11:2402029, 2024**.**
7. Kang H†, Park D†, **Kim J***, Logical regulation of endogenous gene expression using programmable, multi-input processing CRISPR guide RNAs, ***Nucleic Acids Research*** 52:8595-8608, 2024.
8. **Kim J***, Simmel FC*, Scaling up genelet circuits, ***Nature Chemistry*** 14:1210-1211, 2022. – *News & Views*
9. **Kim J**, Franco E, RNA nanotechnology in synthetic biology, ***Current Opinion in Biotechnology*** 63:135–141, 2020.
10. **Kim J**†, Zhou Y†, Carlson PD, Teichmann M, Chaudhary S, Simmel FC, Silver PA, Collins JJ, Yin P, Green AA, De novo-designed translation-repressing riboregulators for multi-input cellular logic, ***Nature Chemical Biology*** 15:1173–1182, 2019. – **Cover article**
11. Green AA†, **Kim J**†, Ma D, Silver PA, Collins JJ, Yin P, Complex cellular logic computation using ribocomputing devices, ***Nature*** 548:117–121, 2017.

Full List of Journal Publications

1. Hong S†, Shoaib SS†, Foo M*, Tang X*, **Kim J***, Multi-level regulation in RNA-protein hybrid incoherent feedforward loop circuits for tunable pulse dynamics in *Escherichia coli*, ***ACS Synthetic Biology*** 15:426-436, 2026.
2. Goh H†, Kang H†, Kim C, **Kim J***, RATEX: A Scalable RNA-based platform for logical and multi-layered cellular programming, ***Angewandte Chemie*** (in revision).
3. Hong S†, Lim Y†, Kang H, **Kim J***, Protein-inducible ribosomal frameshifting enables programmable translational control for genetic circuit design in *Escherichia coli*, ***Journal of Biological Engineering*** (published online).
4. Lee G*, **Kim J***, Non-genetic DNAs as programmable molecular baits, ***Nature Chemistry*** (in press). – *Research Briefing*
5. Lee G*, **Kim J***, Construction of synthetic protein-binding non-genetic DNA systems in living cells, ***Nature Chemistry*** (published online).
6. Goh H†, Heo T†, Kim J†, Kim Y, Lim B, Woo MK, Choi KY, Kim C-S*, **Kim J***, Prostate cancer diagnosis using sensitive and sophisticated machine learning classifiers based on non-invasive urinary RNA biomarkers (PCASSO), ***Scientific Reports*** 16:2445, 2026.
7. Heo T†, Park D†, Shin W, **Kim J***, SUPER: Upcycling genetic parts for precise gene expression control, leakage minimization, and genetic circuit stability, ***Advanced Science*** 13:e14653, 2026.
8. Park J, Polizzi KM, **Kim J**, Kim J*, Manipulating subcellular protein localization to enhance target protein accumulation in minicells, ***Journal of Biological Engineering*** 19:27, 2025.
9. **Kim J***, Franco E*, Hashing the message with cells, ***Nature Chemical Biology*** 21:166-167, 2025. – *News & Views*
10. Zhao M†, Kim J†, Jiao J, Lim Y, Shi X, Guo S*, **Kim J***, Construction of multilayered gene circuits using de-novo-designed synthetic transcriptional regulators in cell-free systems, ***Journal of Biological Engineering*** 18:64, 2024.
11. Goh H†, Choi S†, **Kim J***, Synthetic translational coupling element for multiplexed signal processing and cellular control, ***Nucleic Acids Research*** 52:13469-13483, 2024.
12. Kim J†, Seo M†, Lim Y, **Kim J***, START: A versatile platform for bacterial ligand sensing with programmable performances, ***Advanced Science*** 11:2402029, 2024.
13. Kang H†, Park D†, **Kim J***, Logical regulation of endogenous gene expression using programmable, multi-input processing CRISPR guide RNAs, ***Nucleic Acids Research*** 52:8595-8608, 2024.
14. Koksaldi IC†, Park D†, Atilla A, Kang H, **Kim J***, Seker UOS*, RNA-based sensor systems for affordable diagnostics in the age of pandemics, ***ACS Synthetic Biology*** 13:1026-1037, 2024.
15. Gwak SH, Lee J, Oh E, Lee D, Han W, **Kim J***, Kim KT*, Vaccinia-related kinase 2 variants differentially affect breast cancer growth by regulating kinase activity, ***Oncology Research*** 32:421-432, 2024.
16. Paulino NMG, Foo M, de Greef TFA, **Kim J**, Bates DG, A theoretical framework for implementable nucleic acids feedback systems, ***Bioengineering*** 10:466, 2023.
17. **Kim J***, Simmel FC*, Scaling up genelet circuits, ***Nature Chemistry*** 14:1210-1211, 2022. – *News & Views*
18. Ryan J, Hong S, Foo M, **Kim J**, Tang X, Model-based investigation of the relationship between regulation level and pulse property of I1-FFL gene circuits, ***ACS Synthetic Biology*** 11:2417–2428, 2022.
19. Choi S, Lee G, **Kim J***, Cellular computational logic using toehold switches, ***International Journal of Molecular Sciences*** 23:4265, 2022.
20. van der Linden AJ, Pieters PA, Bartelds MV, Nathalia BL, Yin P, Huck WTS*, **Kim J***, de Greef TFA*, DNA input classification by a riboregulator-based cell-free perceptron, ***ACS Synthetic Biology*** 11:1510-1520, 2022.
21. **Kim J**, Quijano JF, Kim J, Yeung E, Murray RM, Synthetic logic circuits using RNA aptamer against T7 RNA polymerase, ***Biotechnology Journal*** 17:2000449, 2022.
22. Heo T†, Kang H†, Choi S†, **Kim J***, Detection of pks island mRNAs using toehold sensors in *Escherichia coli*, ***Life*** 11:1280, 2021.
23. Yeung E, **Kim J**, Yuan Y, Gonçalves J, Murray RM, Data-driven network models for genetic circuits from time-series data with incomplete measurements, ***Journal of the Royal Society Interface*** 18:20210413, 2021.
24. Hong S†, Jeong D†, Ryan J†, Foo M*, Tang X*, **Kim J***, Design and evaluation of synthetic RNA-based incoherent feed-forward loop circuits, ***Biomolecules*** 11:1182, 2021.
25. Pieters PA, Nathalia BL, van der Linden AJ, Yin P, **Kim J***, Huck WTS*, de Greef TFA*, Cell-free characterization of coherent feed-forward loop-based synthetic genetic circuits, ***ACS Synthetic Biology*** 10:1406-1416, 2021.
26. Hong S†, Kim J†, **Kim J***, Multilevel gene regulation using switchable transcription terminator and toehold switch in *Escherichia coli*, ***Applied Sciences*** 11:4532, 2021.
27. Hwang Y, Kim SG, Jang S, **Kim J***, Jung GY*, Signal amplification and optimization of riboswitch-based hybrid inputs by modular and titratable toehold switches, ***Journal of Biological Engineering*** 15:11, 2021.
28. Paulino NMG, Foo M, **Kim J**, Bates DG, On the stability of nucleic acid feedback control systems, ***Automatica*** 119:109103, 2020.
29. **Kim J**, Franco E, RNA nanotechnology in synthetic biology, ***Current Opinion in Biotechnology*** 63:135–141, 2020.

30. **Kim J**†, Zhou Y†, Carlson PD, Teichmann M, Chaudhary S, Simmel FC, Silver PA, Collins JJ, Yin P, Green AA, De novo-designed translation-repressing riboregulators for multi-input cellular logic, ***Nature Chemical Biology*** 15:1173–1182, 2019. – **Cover article**
31. Jin M†, Garreau N†, Kim Y, **Kim J***, Yin P*, Programmable CRISPR-Cas repression, activation, and computation with sequence-independent targets and triggers, ***ACS Synthetic Biology*** 8:1583-1589, 2019.
32. Paulino NMG, Foo M, **Kim J**, Bates DG, PID and state feedback controllers using DNA strand displacement reactions, ***IEEE Control Systems Letters*** 3:805-810, 2019.
33. Paulino NMG, Foo M, **Kim J**, Bates DG, Robustness analysis of a nucleic acid controller for a dynamic biomolecular process using the structured singular value, ***Journal of Process Control*** 78:34-44, 2019.
34. Jeong D†, Klocke M†, Agarwal S, Kim J, Choi S, Franco E*, **Kim J***, Cell-Free Synthetic Biology Platform for Engineering Synthetic Biological Circuits and Systems, ***Methods and Protocols*** 2:39, 2019.
35. Green LN, Subramanian HKK, Mardanlou V, **Kim J**, Hariadi R, Franco E, Autonomous dynamic control of DNA nanostructure self-assembly, ***Nature Chemistry*** 11:510-520, 2019.
36. **Kim J**, Green AA, Yin P, Ribocomputing: Cellular logic computation using RNA devices, ***Biochemistry*** 57:883–885, 2018.
37. Mardanlou V, Yaghoubi KC, Green LN, Subramanian HK, Hariadi RF, **Kim J**, Franco E, A coarse-grained model captures the temporal evolution of DNA nanotube length distributions, ***Natural Computing*** 17:183–199, 2018.
38. Green AA†, **Kim J**†, Ma D, Silver PA, Collins JJ, Yin P, Complex cellular logic computation using ribocomputing devices, ***Nature*** 548:117–121, 2017.
39. Foo M, Kim J, **Kim J**, Bates DG, Proportional-integral degradation (PI-Deg) control allows accurate tracking of biomolecular concentrations with fewer chemical reactions, ***IEEE Life Sciences Letters*** 2:55–58, 2016.
40. Cuba C, Giordano G, **Kim J**, Blanchini F, Franco E, Molecular titration promotes oscillations and bistability in minimal network models with monomeric regulators, ***ACS Synthetic Biology*** 5:321–333, 2016.
41. 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, Rapidly characterizing the fast dynamics of RNA genetic circuitry with cell-free transcription-translation (TX-TL) systems, ***ACS Synthetic Biology*** 4:503–515, 2015.
42. Yordanov B, **Kim J**, Petersen R, Shudy A, Kulkarni VV, Phillips A, Computational design of nucleic acid feedback control circuits, ***ACS Synthetic Biology*** 3:600–616, 2014.
43. **Kim J**, Khetarpal I, Sen S, Murray RM, Synthetic circuit for exact adaptation and fold-change detection, ***Nucleic Acids Research*** 42:6078–6089, 2014.
44. Siegal-Gaskins D†, Tuza ZA†, **Kim J**†, Noireaux V, Murray RM, Resource usage and gene circuit performance characterization in a cell-free 'breadboard', ***ACS Synthetic Biology*** 3:416–425, 2014.
45. Kulkarni VV, Kharisov E, Hovakimyan N, **Kim J**, Load capacity improvements in nucleic acid based systems using partially open feedback control, ***ACS Synthetic Biology*** 3:617–626, 2014.
46. Weitz M, **Kim J**, Kapsner K, Winfree E, Franco E, Simmel FC, Diversity in the dynamical behaviour of a compartmentalized programmable biochemical oscillator, ***Nature Chemistry*** 6:295–302, 2014. – **Cover article**
47. Subsoontorn P†, **Kim J**†, Winfree E, Ensemble Bayesian analysis of bistability in a synthetic transcriptional switch, ***ACS Synthetic Biology*** 1:299–316, 2012.
48. 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, 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, 2012.
49. Cha HJ, **Kim J**, Hong SJ, Hong SM, Park JH, Kim ES, Choi YJ, Do IG, Joh JW, Kim DS, Choi KY, Overexpression of renal tumor antigen is associated with tumor invasion and poor prognosis of hepatocellular carcinoma, ***Annals of Surgical Oncology*** Suppl 3:S404–11, 2012.
50. Franco E, Friedrichs E, **Kim J**, Jungmann R, Murray RM, Winfree E, Simmel FC, Timing molecular motion and production with a synthetic transcriptional clock, ***Proceedings of the National Academy of Sciences USA*** 108:E784–E793, 2011.
51. **Kim J**, Winfree E, Synthetic in vitro transcriptional oscillators, ***Molecular Systems Biology*** 7:465, 2011.
52. Kwon JH†, **Kim J**†, Park JY, Hong SM, Park CW, Hong SJ, Park SY, Choi YJ, Do IG, Joh JW, Kim DS, Choi KY, Overexpression of HMGB2 is associated with tumor aggressiveness and prognosis of hepatocellular carcinoma, ***Clinical Cancer Research*** 16:5511–21, 2010.
53. **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, Epithelial-mesenchymal transition gene signature to predict clinical outcome of hepatocellular carcinoma, ***Cancer Science*** 101:1521–28, 2010.
54. **Kim J**†, Kim JM†, Hong SJ, Park JH, Park SY, Hwang T, Yi GS, Kim SH, Cho EY, Joh JW, Park JY, Kim DS, Increased expression of autophagy protein Beclin1 and LC3 in high-grade hepatocellular carcinoma and metastatic carcinoma, ***Biochip Journal*** 3:316–25, 2009.
55. Hong SJ†, **Kim J**†, Park JH, Lim EK, Kim J, Choi YJ, Gu H, Kim SW, Choi KY, Joh JW, Kim DS, Proteomic profiling of human hepatocellular carcinoma tissues by two-dimensional electrophoresis and mass spectrometry, ***Biochip Journal*** 3:237–48, 2009.

56. **Kim J**, Hong SJ, Park JH, Lee CB, Kim SW, Gu H, Choi GS, Kwon CHD, Joh JW, Kim DS, Real-time reverse transcription PCR analysis for validation of transketolase gene in hepatocellular carcinoma tissues, ***Biochip Journal*** 3:130–8, 2009.
57. **Kim J**, Hong SJ, Park JH, Park SY, Kim SW, Cho EY, Do IG, Joh JW, Kim DS, Expression of cystathionine betasynthase is downregulated in hepatocellular carcinoma and associated with poor prognosis, ***Oncology Reports*** 21:1449–54, 2009.
58. **Kim J**, Hong SJ, Lim EK, Yu YS, Kim SW, Roh JH, Do IG, Joh JW, Kim DS, Expression of nicotinamide N-methyltransferase in hepatocellular carcinoma is associated with poor prognosis, ***Journal of Experimental and Clinical Cancer Research*** 28:20, 2009.
59. **Kim J**, White KS, Winfree E, Construction of an in vitro bistable circuit from synthetic transcriptional switches, ***Molecular Systems Biology*** 2:68, 2006.