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EDUCATION:

Ph.D. Chemical Engineering (minor in Biology)	4/95
California Institute of Technology	
M.S. Chemical Engineering	4/93
California Institute of Technology	
B.S.E. Chemical Engineering and Certificate in Engineering Biology	6/91
Princeton University	

PROFESSIONAL EXPERIENCE:

National Institute for Innovation in Manufacturing Biopharmaceuticals	
Institute Director	1/17-present

University of Delaware

Gore Professor of Chemical & Biomolecular Engineering	8/07-present
Senior Research Scientist, ChristianaCare Health System	9/11-present
Director, NSF IGERT: Systems Biology of Cells in Engineered Environments	7/12-7/19
Director, Delaware Biotechnology Institute	9/08-1/17

Cornell University

Professor School of Chemical & Biomolecular Engineering	4/07–8/07
The Samuel C. and Nancy M. Fleming Professor of Molecular and Cell Biology	2005-2007
Director of the Institute for Biotechnology and Life Science Technologies	2005-2007
Director of the New York State Center for Life Science Enterprise	2005-2007
Associate Professor, School of Chemical and Biomolecular Engineering	4/03–4/07
Assistant Professor, School of Chemical and Biomolecular Engineering	11/97–4/03

Education / Training

Postdoctoral Scholar, Biology Division, California Institute of Technology	9/95–10/97
Graduate Research Asst. and Research Fellow, Inst. Biotech. Swiss Federal Institute of Technology (Zürich, Switzerland)	4/93-9/95
Graduate Research Asst., Chemical Engineering/Molecular Biotech. California Institute of Technology	9/91-4/93

HONORS

- National Science Foundation Graduate Fellowship (1991-1994)
- DuPont Young Professor (1999-2002)
- National Science Foundation CAREER Award (1999-2003)
- J.P. and Mary Barger '50 College of Engineering Excellence in Teaching Award 2000
- MIT *Technology Review* Top 100 Innovators in the World in Business & Technology 2002
- Jay Bailey Young Investigator Best Paper Award in *Metabolic Engineering* 2002
- Camille Dreyfus Teacher-Scholar Award 2003

- Cornell Provost's Ronay and Richard Menschel Award for Distinguished Scholarship 2004.
- Distinguished Professor, NYS Office of Science, Technology and Academic Research 2004.
- Samuel C. and Nancy M. Fleming Professor of Molecular and Cell Biology 2005.
- Gore Professor of Chemical Engineering 2007.
- Inaugural Winner of the *Biochemical Engineering* Journal Young Investigator Award, 2009.
- Elected Fellow of American Institute of Medical and Biological Engineers, 2010.
- Elected Fellow of American Association for the Advancement of Science, 2011.
- Inaugural Winner of the American Electrophoresis Society Award, 2011.
- *Bioprocess International* Upstream Collaboration of the Decade Finalist, 2012.
- Professional Progress Award for Outstanding Progress in Chemical Engineering, AIChE, 2013.
- Delaware Scientist of the Year, Delaware Bioscience Association, 2016.
- Biotechnology and Bioengineering Elmer Gaden Award for Outstanding Publication, 2017.
- ACS BIOT Marvin Johnson Award in Microbial and Biochemical Technology. 2018.

Peer-Reviewed Journal Publications.

- 1) MG Harrington, KH Lee, T Zewert, M Yun, JE Bailey, LE Hood (1993). Mechanical precision in two-dimensional electrophoresis can improve protein spot positional reproducibility, *Applied and Theoretical Electrophoresis* **3**: 347-353.
- 2) MG Harrington, KH Lee, JE Bailey, LE Hood (1994). Sponge-like Electrophoresis Media - Mechanically Strong Materials Compatible With Organic-Solvents, Polymer-Solutions and 2-Dimensional Electrophoresis, *Electrophoresis* **15**: 187-194.
- 3) WA Renner, KH Lee, V Hatzimanikatis, JE Bailey, H Eppenberger (1995). Recombinant Cyclin E Expression Activates Proliferation and Obviates Surface Attachment of Chinese Hamster Ovary (CHO) Cells in Protein-Free Medium, *Biotechnology and Bioengineering* **47**: 476-482.
- 4) V Hatzimanikatis, KH Lee, WA Renner, JE Bailey (1995). A Mathematical Mode for the G1/S Transition of the Mammalian Cell, *Biotechnology Letters* **17**: 669-674.
- 5) KH Lee, A Sburlati, W Renner, JE Bailey (1996). Deregulated Expression of Cloned Transcription Factor E2F-1 in Chinese Hamster Ovary Cells Shifts Protein Patterns and Activates Growth in Protein-Free Medium, *Biotechnology and Bioengineering* **50**: 273-279.
- 6) KH Lee, MG Harrington, JE Bailey (1996). Two-Dimensional Electrophoresis of Proteins as a Tool in the Metabolic Engineering of Cell Cycle Regulation, *Biotechnology and Bioengineering* **50**: 336-340.
- 7) G Hsich, K Kenney, CJ Gibbs, KH Lee, MG Harrington (1996). The 14-3-3 Brain Protein in Cerebrospinal Fluid as a Marker for Transmissible Spongiform Encephalopathies, *New England Journal of Medicine* **335**: 924-930. PMID: 8782499
- 8) KH Lee and MG Harrington (1996). Premortem Diagnosis of Creutzfeldt-Jakob Disease by Cerebrospinal Fluid Analysis, *The Lancet* **348**: 887. PMID: 8826819
- 9) RG Will, M Zeidler, P Brown, M Harrington, KH Lee, K Kenney (1996). Cerebrospinal Fluid Test for New Variant Creutzfeldt-Jakob Disease, *The Lancet* **348**: 955.
- 10) JE Bailey, A Sburlati, V Hatzimanikatis, KH Lee, W Renner, P Tsai (1996). Inverse Metabolic Engineering: A Strategy for Directed Genetic Engineering of Useful Phenotypes, *Biotechnology and Bioengineering* **52**: 109-121. Reprinted in a special issue as **79**: 568-579 (2002).
- 11) P Kachroo, KH Lee, C Schwerdel, JE Bailey, B Chattoo (1997). Analysis of host-induced response in the rice blast fungus *Magnaporthe grisea* using two-dimensional polyacrylamide gel electrophoresis,

Electrophoresis **18**: 163-169.

- 12) KH Lee and MG Harrington (1997). The Assay Development of a Molecular Marker for Transmissible Spongiform Encephalopathies, *Electrophoresis* **18**: 502-506.
- 13) KH Lee and MG Harrington (1997). 14-3-3 and BSE, *The Veterinary Record* **140**: 206-207.
- 14) LH Choe, W Chen, KH Lee (1999). Proteome Analysis of Fis Overexpression in *E. coli*, *Electrophoresis* **20**: 798-805. PMID: 10344250
- 15) V Hatzimanikatis, LH Choe, KH Lee (1999). Proteomics: Theoretical and Experimental Considerations, *Biotechnology Progress* **15**: 312-318. PMID: 10356248
- 16) V Hatzimanikatis, KH Lee (1999). Dynamical Analysis of Gene Networks Requires Both mRNA and Protein Expression Information, *Metabolic Engineering* **1**: 275-281 (E1-E7).
- 17) V Hatzimanikatis, KH Lee, JE Bailey (1999). A Mathematical Description of Regulation of the G1-S Transition of the Mammalian Cell Cycle, *Biotechnology and Bioengineering* **65**: 631-637.
- 18) LH Choe, KH Lee (2000). A Comparison of Three Commercially Available Isoelectric Focusing Units for Proteome Analysis: the Multiphor, the IPGphor and the Protean IEF Cell, *Electrophoresis* **21**: 993-1000. PMID: 10768786
- 19) PS Lee, KH Lee (2000). Genomic Analysis, *Current Opinion in Biotechnology* **11**: 171-175.
- 20) MJ Dutt, KH Lee (2000). Proteomic Analysis, *Current Opinion in Biotechnology* **11**: 176-179. PMID: 10753759
- 21) V Hatzimanikatis, D Collins, S Lawrence, S Browning, KH Lee (2000). Bioinformatics, Genomics and the Chemical Engineer – a Perspective, *Chemical Engineering Education* **34**: 346-349.
- 22) MJ Dutt and KH Lee (2001). The Scaled Volume as an Image Analysis Variable for Detecting Changes in Protein Expression Levels by Silver Stain, *Electrophoresis* **22**: 1627-1632. PMID: 11425218
- 23) KH Lee (2001). Proteomics: A Technology-Driven and a Technology-Limited Discovery Science, *Trends in Biotechnology* **19**: 217-222. PMID: 11356283
- 24) LH Choe, A Green, R Knight, E Thompson and KH Lee (2002). Apolipoprotein E and Other Cerebrospinal Fluid Proteins Differentiate Antemortem Variant Creutzfeldt-Jakob From Antemortem Sporadic Creutzfeldt-Jakob Disease, *Electrophoresis* **23**: 2242-2246. PMID: 12210228
- 25) LH Choe, MJ Dutt, N Relkin and KH Lee (2002). Studies of Potential Cerebrospinal Fluid Molecular Markers for Alzheimer's Disease, *Electrophoresis* **23**: 2247-2251. PMID: 12210229
- 26) E Hayduk, LH Choe and KH Lee (2002). Proteomic tools in discovery-driven science, *Current Science* **83**: 840-844.
- 27) C Li, WC Lee, and KH Lee (2003). Affinity Separations Using Microfabricated Microfluidic Devices: *In situ* Photopolymerization and Use in Protein Separations, *Biotechnology and Bioprocess Engineering* **8**: 240-245.
- 28) LB Shaw, R Zia and KH Lee (2003). Totally asymmetric exclusion process with extended objects: A model for protein synthesis, *Physical Review E Statistical Nonlinear Soft Matter Physics* **68**: 021910.
- 29) K Aggarwal and KH Lee (2003). Functional Genomics and Proteomics as a Foundation for Systems

- Biology, *Briefings in Functional Genomics and Proteomics* **2**: 175-184.
- 30) LH Choe and KH Lee (2003). A Quantitative and Qualitative Measure of Intralaboratory Two-dimensional Gel Reproducibility and the Effects of Sample Preparation, Sample Load, and Image Analysis, *Electrophoresis* **24**: 3500-3507. PMID: 14595697
 - 31) EJ Finehout and KH Lee (2003). A Comparison of Automated In-Gel Digest Methods for Femtomole Level Samples, *Electrophoresis* **24**: 3508-3516.
 - 32) PS Lee and KH Lee (2003). *Escherichia coli*—a Model System That Benefits From and Contributes to the Evolution of Proteomics, *Biotechnology and Bioengineering* **84**: 801-814. PMID: 14708121
 - 33) A Mehra, KH Lee and V Hatzimanikatis (2003). Insights into the Relation Between mRNA and Protein Expression Patterns. I. Theoretical Considerations, *Biotechnology and Bioengineering* **84**: 822-833.
 - 34) PS Lee*, LB Shaw*, LH Choe*, A Mehra, V Hatzimanikatis and KH Lee (2003). Insights into the Relation Between mRNA and Protein Expression Patterns. II. Experimental Observations in *Escherichia coli*, *Biotechnology and Bioengineering* **84**: 834-841. PMID: 14708124
 - 35) WC Lee and KH Lee (2004). Applications of Affinity Chromatography in Proteomics, *Analytical Biochemistry* **324**: 1-10.
 - 36) LB Shaw, A Kolomeisky and KH Lee (2004). Local Inhomogeneity in Asymmetric Simple Exclusion Processes with Extended Objects, *Journal of Physics A: Mathematical and General* **37**: 2105-2113.
 - 37) EJ Finehout and KH Lee (2004). An Introduction to Mass Spectrometry Applications in Biological Research, *Biochemistry and Molecular Biology Education* **32**: 93-100.
 - 38) E Hayduk, LH Choe and KH Lee (2004). A Two-dimensional Electrophoresis Map of Chinese Hamster Ovary Cell Proteins Based on Fluorescence Staining, *Electrophoresis* **25**: 2545-2556. PMID: 15300775
 - 39) EJ Finehout, Z Franck, and KH Lee (2004). Towards two-dimensional electrophoresis mapping of the cerebrospinal fluid proteome from a single individual, *Electrophoresis* **25**: 2564-2575.
 - 40) L Shaw, J Sethna, and KH Lee (2004). Mean field approaches to the totally asymmetric exclusion process with quenched disorder and large particles, *Physical Review E Statistical Nonlinear Soft Matter Physics* **70**: 021901.
 - 41) C Li and KH Lee (2004). Affinity depletion of albumin from human cerebrospinal fluid using Cibacron-blue-3G-A-derivatized photopatterned copolymer in a microfluidic device, *Analytical Biochemistry* **333**: 381-388.
 - 42) YC Park, SG Kim, KH Lee, K Park, and JH Seo (2004). Fed-batch production of D-ribose from sugar mixtures by transketolase deficient *Bacillus subtilis* SPK1, *Applied Microbiology and Biotechnology* **66**: 297-302.
 - 43) KS Brown, CC Hill, GA Calero, C Myers, KH Lee, JP Sethna and RA Cerione (2004). The statistical mechanics of complex signaling networks: nerve growth factor signaling, *Physical Biology* **1**: 184-195.
 - 44) PS Lee and KH Lee (2005). Engineering HlyA Hypersecretion in *Escherichia coli* Based on Proteomic and Microarray Analyses, *Biotechnology and Bioengineering* **89**: 195-205.
 - 45) EJ Hayduk and KH Lee (2005). Cytochalasin D Improves Heterologous Protein Productivity in Adherent Chinese hamster ovary cells, *Biotechnology and Bioengineering* **90**: 354-364.

- 46) C Li, Y Yang, HG Craighead and KH Lee (2005). Isoelectric Focusing in Cyclic Olefin Copolymer Microfluidic Channels Coated by Polyacrylamide Using a UV Photografting Method, *Electrophoresis* **26**: 1800-1806.
- 47) K Aggarwal, LH Choe and KH Lee (2005). Quantitative Analysis of Protein Expression Using Amine-Specific Isobaric Tags in *Escherichia coli* Cells Expressing rhsA Elements, *Proteomics* **5**: 2297-2308. PMID: 15887184
- 48) E Finehout, J Cantor and KH Lee (2005). Kinetic Characterization of Sequencing Grade Modified Trypsin, *Proteomics* **5**: 2319-2321.
- 49) EJ Finehout, Z Franck and KH Lee (2005). Complement Protein Isoforms in CSF as Possible Biomarkers for Neurodegenerative Disease, *Disease Markers* **21**: 93-101.
- 50) LH Choe*, K Aggarwal*, Z Franck and KH Lee (2005). A Comparison of the Consistency of Proteome Quantitation Using Two-Dimensional Electrophoresis and Shotgun Isobaric Tagging in *Escherichia coli* Cells, *Electrophoresis* **26**: 2437-2449. PMID: 15924362
- 51) J Diao, D Ren, JR Engstrom, and KH Lee (2005). A Surface Modification Strategy on Silicon Nitride for Developing Biosensors, *Analytical Biochemistry* **343**: 322-328.
- 52) Y Yang, C Li, KH Lee, and HG Craighead (2005). Coupling On-Chip Solid Phase Extraction to Electro spray Mass Spectrometry Through an Integrated Electro spray Tip, *Electrophoresis* **26**: 3622-3630.
- 53) Y Yang, C Li, J Makeoka, KH Lee and HG Craighead (2005). A Polymeric Microchip with Integrated Tips and in situ Polymerized Monolith for Electro spray Mass Spectrometry, *Lab on a Chip* **5**: 869-876.
- 54) R Kuczynski, K Aggarwal, and KH Lee (2005). Improved Understanding of Gene Expression Regulation Using Systems Biology, *Expert Review of Proteomics* **2**: 915-924.
- 55) M D'Ascenzo, NR Relkin, and KH Lee (2005). Alzheimer's Disease Cerebrospinal Fluid Biomarker Discovery: A Proteomics Approach, *Current Opinion in Molecular Therapeutics* **7**: 557-564. PMID: 16372405
- 56) LH Choe, B Werner, and KH Lee (2006). Two-dimensional Protein Electrophoresis: From Molecular Pathway Discovery to Biomarker Discovery in Neurological Disorders, *NeuroRX* **3**: 327-335. PMID: PMC3593383
- 57) K Aggarwal, LH Choe and KH Lee (2006). Shotgun proteomics using the iTRAQ isobaric tags, *Briefings in Functional Genomics and Proteomics* **5**: 112-120. PMID: 16772272
- 58) EJ Finehout, Z Franck, NR Relkin and KH Lee (2006). Proteomic Analysis of Cerebrospinal Fluid Changes Related to Postmortem Interval, *Clinical Chemistry* **52**: 1906-1913. PMID: 16887899
- 59) DH Lee, SG Kim, YC Park, SW Nam, KH Lee and JH Seo (2007). Proteome analysis of recombinant *Escherichia coli* producing human glucagon-like peptide-1, *Journal of Chromatography B* **849**:323-330.
- 60) EJ Finehout, Z Franck, LH Choe, NR Relkin and KH Lee (2007). Cerebrospinal Fluid Proteomic Biomarkers for Alzheimer's Disease, *Annals Neurology* **61**: 120-129. PMID: 17167789
- 61) Gupta P, Lee KH (2007). Genomics and Proteomics in Process Development: Opportunities and Challenges, *Trends in Biotechnology* **25**: 324-330. PMID: 17475353
- 62) KH Lee, NR Relkin (2007). Reply: Cerebrospinal fluid biomarkers for Alzheimer's disease, *Annals of*

Neurology **61**: 497-498.

- 63) R Kuczenski, K Hong, J Garcia-Ojalvo, and KH Lee (2007). PERIOD-TIMELESS interval timer may require an additional feedback loop, *PLoS Computational Biology* **3**: 1468-1476. PMC1937016.
- 64) Choe LH, D'Ascenzo M, Relkin NR, Pappin D, Ross P, Williamson B, Guertin S, Pribil P, Lee KH (2007). 8-Plex Quantitation of changes in cerebrospinal fluid protein expression in subjects undergoing intravenous immunoglobulin treatment for Alzheimer's disease, *Proteomics* **7**: 3651-3660. PMCID: PMC3594777
- 65) Liao PY, Gupta P, Petrov A, Dinman J, Lee KH (2008). A new kinetic model reveals the synergistic effect of E-, P- and A-sites on +1 ribosomal frameshifting, *Nucleic Acids Research* **36**: 2619-2629. PMC2377451.
- 67) D'Ascenzo M, Choe LH, Lee KH (2008). iTRAQPak: an R Based Analysis and Visualization Package for 8-plex Isobaric Protein Expression Data, *Briefings in Functional Genomics and Proteomics* **7**: 127-135. PMID: 18272547
- 68) Gupta P, Lee KH (2008). Silent Mutations Result in HlyA Hypersecretion by Reducing Intracellular HlyA Protein Aggregates, *Biotechnology and Bioengineering* **101**: 967-974. PMID: 18553505
- 69) Griffiths L, Choe LH, Lee KH, Reardon KF, Orton E (2008). Protein Extraction and Two-Dimensional Gel Electrophoresis of Water- and Lipid-Soluble Proteins From Bovine Pericardium, a Low-Cellularity Tissue, *Electrophoresis* **29**: 4508-4515. PMC2791994.
- 70) Park SM, Lee KH, Craighead HC (2008). On-chip coupling of electrochemical pumps and an SU-8 tip for electrospray ionization mass spectrometry, *Biomedical Microdevices* **10**: 891-897. PMID: 18563570
- 71) Rudrappa T, Choi YS, Levia DF, Legates DR, Lee KH, Bais HP (2009). *Phragmites australis* root secreted phytotoxin undergoes photodegradation to execute severe phytotoxicity, *Plant Signaling and Behavior* **4**: 1-8. PMC2688296.
- 72) Liao PY, Choi YS, Lee KH (2009). FSscan: a mechanism-based program to identify +1 ribosomal frameshift hotspots., *Nucleic Acids Research* **37**: 7302-11. PMC2790909.
- 73) Liao PY, Lee KH (2010). From SNPs to functional polymorphism: the insight into biotechnological applications, *Biochemical Engineering Journal* **49**: 149-158.
- 74) Bechler ME, Doody AM, Racoosin E, Lin L, Lee KH, Brown WJ (2010). The phospholipase complex PAFAH 1b regulates the functional organization of the Golgi complex, *Journal of Cell Biology* **190**: 45-53. PMC291670.
- 75) Choi Y, Choe LH, Lee KH (2010). Recent cerebrospinal fluid biomarker studies of Alzheimer's disease, *Expert Review of Proteomics* **7**: 919-926. PMID: 21142892
- 76) Liao PY, Choi YS, Dinman J, Lee KH (2011). The many paths to frameshifting: kinetic modelling and analysis of the effects of different elongation steps on programmed -1 ribosomal frameshifting, *Nucleic Acids Research* **39**: 300-312. PMC3017607.
- 77) Shayan G, Choi Y, Shusta EV, Shuler ML, Lee KH (2011). Murine *In vitro* Model of the Blood-Brain Barrier for Evaluating Drug Transport, *European Journal of Pharmaceutical Sciences* **42**: 148-55. PMID: 21078386
- 78) Hammond S, Swanberg JC, Kaplarevic M, and Lee KH (2011). Genomic sequencing and analysis of a Chinese Hamster ovary cell line using Illumina sequencing technology, *BMC Genomics* **12**: 67.

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- 79) Wu CY, Whye D, Glazewski L, Choe L, Kerr D, Lee KH, Mason RW, Wang W (2011). Proteomic assessment of a cell model of Spinal Muscular Atrophy, *BMC Neuroscience* **12**: 25. PMC3063191.
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- 81) Xu X, Nagarajan H, Lewis NE, Pan Shengkai, Liu X, Chen W, Xie M, Wang W, Hammond S, Andersen M, Neff N, Passarelli B, Koh W, Lee KH, Betenbaugh MJ, Quake SR, Famili I, Palsson BO, Wang J (2011). The Genomic Sequence of the Chinese Hamster Ovary (CHO) K1 Cell Line, *Nature Biotechnology* **29**: 735-741. PMC3164356.
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- 87) Wuest D, Harcum S, Lee KH (2011). Genomics in Mammalian Cell Culture Bioprocessing, *Biotechnology Advances* **30**: 629-638. PMID: 22079893
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- 91) Hammond S, Swanberg J, Polson S, Lee KH (2012). Profiling Conserved MicroRNA Expression in Recombinant CHO Cell Lines Using Illumina Sequencing, *Biotechnology and Bioengineering* **109**: 1371-1375. PMID: 22189905 PMCID: PMC3330154.
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- 93) Valente K, Choe LH, Lenhoff A, Lee KH (2012). Optimization of Protein Sample Preparation for Two-Dimensional Electrophoresis. *Electrophoresis*. **33**: 1947-1957. PMID: 22806459.

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- 111) Valente K, Lenhoff A, and KH Lee (2015). Expression of Difficult-to-Remove Host Cell Protein Impurities During Extended Chinese Hamster Ovary Cell Culture and Their Impact on Continuous Bioprocessing. *Biotech. Bioeng.* 112 (6), 1232-1242.
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