RAYMOND CHEONG

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EDUCATION

M.D. Johns Hopkins University, School of Medicine 2014
Medical Scientist Training Program

Ph.D. Johns Hopkins University, Biomedical Engineering Defended 2010
Advisor: Prof. Andre Levchenko, Dept. of Biomedical Engineering
Dissertation: *Information processing in the tumor necrosis factor (TNF) signaling pathway: a systems biology approach*

B.S. University of Maryland, Chemical Engineering 2002
Summa cum laude
Certificate in biochemical engineering
University Honors Citation

RESEARCH AND WORK EXPERIENCE

(Unnamed) Biotech Investment Fund, New York City, NY 2013-present
- Perform diligence on companies spanning a range of stages and therapeutic areas
- Vice President 2017-present, Associate 2013-2017

Co-Founder & President, Euveda Biosciences, Inc., Baltimore, MD 2011-2012
- Lead development and commercialization of microfluidics-based platform for high content analysis and cell-based assays for drug discovery
- Raised $240,000 of non-dilutive seed funding for research and development

Graduate Student, Johns Hopkins University, Baltimore, MD 2004-2010
- Advisor: Dr. Andre Levchenko, Dept. of Biomedical Engineering
- Applied systems biology approaches to understand information processing by the tumor necrosis factor (TNF) signaling network in single cells
- Extensive experience in mathematical modeling/quantitative analysis of cell signaling, microfluidic-based experimentation, and fluorescence microscopy
- Mentored 2 graduate and 2 undergraduate students

Undergraduate Research Fellow, University of Maryland, College Park, MD 1999-2002
- Advisor: Dr. Jason Kahn, Dept. of Chemistry & Biochemistry
- Modeled effect of protein interactions on DNA topology using Monte Carlo methods

Research Assistant, Johns Hopkins University, Baltimore, MD Summers 1996-1998
- Advisor: Dr. Gary Pasternack, Dept. of Pathology
- Studied interactions between the oncogene myc and the cancer-related protein pp32 (research during high school)

TEACHING EXPERIENCE

Teaching Assistant, Johns Hopkins University, Baltimore, MD 2006-2007
- Teaching assistant for Biological Models and Simulation with Matlab (580.223) and Physical Chemistry of Materials I: Thermodynamics (510.312)

Founder, Baltimore County Math League 2005-2008
- Created, piloted, and expanded a new extracurricular mathematics activity for public high schools in Baltimore County, MD
- Taught mathematics problem solving skills to dozens of gifted & talented students
- Head Coach of Baltimore County ARML Team and Owings Mills HS Math Team

Teaching Assistant, University of Maryland, College Park, MD 2000-2001
- Sole teaching assistant for Computer Methods in Chemical Engineering (ENCH250) and Chemical Engineering Thermodynamics (ENCH300)

PUBLICATIONS

Papers, peer-reviewed

1. I Habibi, R Cheong, T Lipniacki, A Levchenko, ES Emamian, A Abdi. "Computation and measurement of cell decision making errors using single cell data." *PLoS Computational Biology*. 13(4):e1005436 (2017).
2. A Rhee*, R Cheong*, A Levchenko. "Noise decomposition of intracellular biochemical signaling networks using nonequivalent reporters." *Proceedings of the National Academy of Sciences (USA)*. 111(48):17330-5 (2014).
3. M Brennan, R Cheong, A Levchenko. "How information theory handles cell signaling and uncertainty." *Science*. 338(6105):334-5 (2012).
4. A Rhee, R Cheong*, A Levchenko*. "The application of information theory to biochemical signaling systems." *Physical Biology*. 9(4):045011 (2012). (* Co-corresponding author)
5. R Cheong, A Rhee, CJ Wang, I Nemenman, A Levchenko. "Information transduction capacity of noisy biochemical signaling networks." *Science*. 334(6054):354-8 (2011). **(Featured in *Science*'s Perspectives and *Biopolymers*' Research highlights.)**
6. EM Hur, IH Yang, DH Kim, J Byun, Saijilafu, WL Xu, PR Nicovich, R Cheong, A Levchenko, N Thakor, FQ Zhou. "Engineering neuronal growth cones to promote axon regeneration over inhibitory molecules." *Proceedings of the National Academy of Sciences (USA)*. 108(12):5057-62 (2011).
7. MJ Stine, CJ Wang, WF Moriarty, B Ryu, R Cheong, WH Westra, A Levchenko, RM Alani. "Integration of genotypic and phenotypic screening reveals molecular mediators of melanoma-stromal interaction." *Cancer Research*. 71(7):2433-44 (2011).
8. R Cheong, A Levchenko. "Oscillatory signaling processes: the how, the why and the where." *Current Opinion in Genetics and Development*. 20(6):665-9 (2010).
9. B Compani, T Su, I Chang, J Cheng, KH Shah, T Whisenant, Y Dou, A Bergmann, R Cheong, B Wold, L Bardwell, A Levchenko, P Baldi, E Mjolsness. "A scalable and integrative system for pathway bioinformatics and systems biology." *Advances in Experimental Medicine and Biology*. 680:525-34 (2010).

10. Z Yin, SC Tao, R Cheong, H Zhu, A Levchenko. "An integrated micro-electro-fluidic and protein arraying system for parallel analysis of cell responses to controlled microenvironments." *Integrative Biology*. 2(9):416-23 (2010).
11. R Cheong, S Paliwal, A Levchenko. "High content screening in microfluidic devices." *Expert Opinion on Drug Discovery*. 5(8): 715-20 (2010).
12. D Fan, Z Yin, FQ Zhu, R Cheong, R Cammarata, CL Chien, A Levchenko. "Subcellular-resolution delivery of a cytokine through precisely manipulated nanowires." *Nature Nanotechnology*. 5(7):545-51 (2010). **(Featured in News and Views.)**
13. M Fosbrink, NN Aye-Han, R Cheong, A Levchenko, J Zhang. "Visualization of JNK activity dynamics with a genetically encoded fluorescent biosensor." *Proceedings of the National Academy of Sciences (USA).* 107(12):5459-5464 (2010).
14. DH Kim, EA Lipke, P Kim, R Cheong, S Thompson, M Delannoy, KY Suh, L Tung, A Levchenko. "Nanoscale cues regulate the structure and function of macroscopic cardiac tissue constructs." *Proceedings of the National Academy of Sciences (USA).* 107(2):565-570 (2010).
15. R Cheong*, Paliwal S*, A Levchenko. "Models at the single cell level." *Wiley Interdisciplinary Reviews: Systems Biology and Medicine*. 2(1):34-48 (2010). (* Co-first author)
16. R Cheong, CJ Wang, A Levchenko. "Using a microfluidic device for high-content analysis of cell signaling." *Science Signaling*. 2(75):pl2 (2009). **(Featured on cover.)**
17. R Cheong*, CJ Wang*, A Levchenko. "High-content cell screening in a microfluidic device." *Molecular and Cellular Proteomics*. 8(3):433-42 (2009). (* Co-first author) **(Featured in Science Signaling.)**
18. R Cheong, A Hoffmann, A Levchenko. "Understanding NF-kappaB signaling via mathematical modeling." *Molecular Systems Biology*. 4:192 (2008).
19. R Cheong, A Levchenko. "Wires in the soup: quantitative models of cell signaling." *Trends in Cell Biology*. 18(3):112-8 (2008).
20. A Kaneda, CJ Wang, R Cheong, W Timp, P Onyango, B Wen, CA Iacobuzio-Donahue, R Ohlsson, R Andraos, MA Pearson, AA Sharov, DL Longo, MS Ko, A Levchenko, AP Feinberg. "Enhanced sensitivity to IGF-II signaling links loss of imprinting of IGF2 to increased cell proliferation and tumor risk." *Proceedings of the National Academy of Sciences (USA).* 104(52):20926-31 (2007).
21. R Cheong, RK Wilson, I Cortese, DE Newman-Toker. "Mothball withdrawal encephalopathy: case report and review of paradichlorobenzene neurotoxicity." *Substance Abuse*. 27(4):63-7 (2006).
22. R Cheong, A Bergmann, S Werner, A Hoffmann, A Levchenko. "Transient IkappaB kinase activity mediates temporal NF-kappaB dynamics in response to a wide range of tumor necrosis factor-alpha doses." *Journal of Biological Chemistry*. 281(5):2945-50 (2006).
23. JD Kahn, R Cheong, RA Mehta, LM Edelman, MA Morgan. "Flexibility and control of protein-DNA loops." *Biophysical Reviews and Letters*. 1(4):327-41 (2006).
24. D Barken, CJ Wang, J Kearns, R Cheong, A Hoffmann, A Levchenko. "Comment on 'Oscillations in NF-kappaB signaling control the dynamics of gene expression'." *Science.* 308(5718):52 (2005).
25. LM Edelman, R Cheong, JD Kahn. "Fluorescence resonance energy transfer over approximately 130 basepairs in hyperstable lac repressor-DNA loops." *Biophysical Journal*. 84(2 Pt 1):1131-1145 (2003).

Book Chapters, peer-reviewed

1. R Cheong, A Levchenko. "Survey of the NF-kappaB Transcription Factor: Function, Structure, Regulation, Pathways, and Applications." *Encyclopedia of Molecular Cell Biology and Molecular Medicine, 2nd edition*. Wiley-VCH: New York, 2005.

Patents

1. A Levchenko, R Cheong, CJ Wang. "Device for high-throughput stimulation, immunostaining, and visualization of single cells." US 8,822,206 B2 (Issued Sep 2, 2014).

Conference Abstracts and Presentations

1. MD Brennan, B Lim, R Cheong, SY Shvartsman, A Levchenko. "Noise sources and accuracy of Drosophila dorsoventral patterning." 6th q-bio Conference on Cellular Information Processing. Santa Fe, NM, USA (Aug 8 2012 – Aug 12 2012).
2. R Cheong. "Methods to reverse engineer sports rating formulas applied to the Sagarin ratings." New England Symposium on Statistics in Sports. Cambridge, MA, USA (Sep 24 2011).
3. R Cheong, A Rhee, CJ Wang, I Nemenman, A Levchenko. "Information transduction capacity of noisy biochemical signaling networks." Mathematical Biosciences Institute Workshop 2: Stochastic Processes in Cell and Population Biology. Columbus, OH, USA (Oct 24 2011 – Oct 28 2011).
4. R Cheong, A Rhee, CJ Wang, I Nemenman, A Levchenko. "Advantages and limitations of network-based information processing in biological signaling systems." 5th q-bio Conference on Cellular Information Processing. **Selected for oral presentation.** Santa Fe, NM, USA (Aug 10 2011 – Aug 13 2011).
5. R Cheong, A Rhee, I Nemenman, A Levchenko. "Information processing in the TNF-stimulated NF-κB signaling pathway in fibroblasts: what thousands of little cells can tell you?" 3rd q-bio Conference on Cellular Information Processing. Santa Fe, NM, USA (Aug 5 2009 – Aug 9 2009).
6. R Cheong, A Levchenko. "A consensus model for the TNF-NF-kappaB signaling pathway." Pacific Symposium on Biocomputing. Kamuela, Big Island, Hawaii, USA (Jan 5 2009 – Jan 9 2009).
7. CJ Wang*, R Cheong*, A Levchenko. "Microfluidic device for high-throughput immunofluorescent staining of signaling proteins in attachment-dependent cells." 10th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS2006). **Selected for oral presentation** (session 4A2, given by CJW). Tokyo, Japan (Nov 5 2006 – Nov 9 2006). (* Co-first author)
8. R Cheong, CJ Wang, A Levchenko. "Towards systems-level understanding of NF-κB signaling through integrated modeling and experimentation." Keystone Symposia, NF-κB: 20 Years on the Road from Biochemistry to Pathology. **Selected for oral presentation.** Banff, Canada. (Mar 23 2006 – Mar 28 2006).
9. R Cheong, A Bergmann, A Hoffmann, A Levchenko. "The IkappaB-NFkappaB Signaling Module: Signal Downregulation Is Required for Initial Response to TNFalpha." Foundations of Systems Biology in Engineering. Santa Barbara, CA, USA (Aug 7 2005 – Aug 10 2005).
10. R Cheong, A Bergmann, A Levchenko. "Using similarity metrics in robustness analysis of a NF-kappaB model." Workshop on Genomic Signal Processing and Statistics (GENSIPS). Baltimore, MD, USA (May 26 2004 – May 27 2004).

11. JD Kahn, LM Edelman, R Cheong, RA Mehta. "Analysis and control of protein-DNA loops." American Chemical Society, 226th Annual Meeting. New York, NY, USA (Sep 07 2003 – Sep 11 2003).
12. M Morgan, L Edelman, R Cheong, R Mehta, J Kahn. "Design and analysis of hyperstable protein-DNA loops and nanostructures." Greater Washington Area Nanoscience Open House, University of Maryland. College Park, MD, USA. (Oct 25 2001).
13. R Cheong, JR Brody, L Lee, GR Pasternack. "Phosphoprotein 32 (pp32) inhibits c-myc transactivation and transformation." American Association for Cancer Research (AACR), 90th Annual Meeting. Philadelphia, PA, USA. (Apr 10 1999 – Apr 14 1999).
14. J Bai, SS Kadkol, R Cheong, JR Brody, M Chamberlin, GR Pasternack. "Cell-type specific suppression of human prostate carcinoma cell proliferation by a novel tumor suppressor, pp32." American Association for Cancer Research (AACR), 90th Annual Meeting. Philadelphia, PA, USA. (Apr 10 1999 – Apr 14 1999).

GRANTS

Small Business Innovation Research (SBIR), Phase I — $150,000 — 2012
National Science Foundation
- Title: Microfluidic platform for high throughput drug screening using primary cells
- Goals: Development of an ultraminiaturized cell-based assay
- Role: PI

Maryland Tech Transfer & Commercialization Award (MTTCF) — $75,000 — 2011
Maryland Technology Development Corporation (TEDCO)
- Title: Microfluidic cell-based assays
- Goals: Refinement of microfluidic technology into high content screening products
- Role: PI

TechStart Award — $15,000 — 2010
Maryland Technology Development Corporation (TEDCO)
- Title: Microfluidic cell-based assays: applications in drug discovery and personalized medicine
- Goals: Business plan development and freedom-to-operate analysis
- Role: PI

Mathematics Education Partnership Program (MEPP) — $12,500 (total) — 2008, 2009
National Security Agency (NSA)
- Title: Baltimore County Math League and Baltimore County Math Team
- Goals: Expand extracurricular math activities for Baltimore County (MD) public high schools
- Role: Primary grant author, Director of BCML, Head Coach of BCMT

HONORS & AWARDS

Michael A. Shanoff Young Investigator Award (most outstanding JHU thesis research) — 2012
Siebel Scholar — 2010
North American Winner, Biotechnology Young Entrepreneurs Scheme — 2004
Medical Scientist Training Program appointment at Johns Hopkins University — 2002-present
A. James Clark School of Engineering Dean's Award — 2002
American Institute of Chemical Engineers Othmer National Scholarship — 2001

Winner, International Obfuscated C Code Contest	2000, 2001
Howard Hughes Medical Institute Undergraduate Research Fellowship	2000-2002
Ranked among top 300 students nationwide, Putnam Mathematical Exam	1999
University of Maryland Banneker/Key Scholarship (highest academic scholarship)	1998-2002
Fourth Place Grand Award, Biochemistry, Intel International Science & Engineering Fair	1998
Semifinalist, Westinghouse Science Talent Search	1998

SERVICE ACTIVITIES

Ad-hoc reviewer (e.g., *Biophysical Journal*, *Physical Biology*)	2011-2013
Member, Advisory Board, Siebel Scholars Foundation	2010-present
Member, Board of Directors, New York City Interscholastic Math League	2008-present
Author, Annual ARML Scrimmage	2006-2013
Founder and Head Coach, Baltimore County Math League and ARML Team	2005-2008
Online archivist, Student-authored Hopkins medical school notes	2002-2009
Online publisher, Men's college basketball computer rankings	1999-present