

KERWYN CASEY HUANG, Ph. D.

DEPARTMENT OF MOLECULAR BIOLOGY, PRINCETON UNIVERSITY
LEWIS THOMAS LABORATORY 343A • PRINCETON NJ 08544
Phone 609-258-8699 • Fax 609-258-8616 • E-mail KCHuang@Princeton.edu

EDUCATION

- Massachusetts Institute of Technology (GPA: 4.9/5.0)** 1999–2004
Ph.D. in Physics. *Thesis:* Polaritonic Photonic Crystals, Melting, and Min-Protein Oscillations.
- University of Cambridge** 1998–1999
M.Phil. in Physics. *Thesis:* *Ab initio* Determination of Energetics and Forces in Molecules.
- California Institute of Technology (GPA: 4.0/4.0)** 1994–1998
B.S. with Honors in Physics and Mathematics.

RESEARCH EXPERIENCE

- Princeton University, Department of Molecular Biology, Princeton, NJ** 2004 – present
Visiting Research Fellow and Associate Research Scholar, Laboratory of Professor Ned Wingreen.
- Research into the biophysics of cell-shape detection, including polymer formation, lipid localization, and cell-wall synthesis.
 - Awarded a National Institutes of Health K25 Mentored Quantitative Research Career Development Award, \$625,000 direct costs 2005-2010, to develop a molecular model of Min-protein polymer formation in *E. coli*.
- Massachusetts Institute of Technology, Department of Physics, Cambridge, MA** 1999 – 2004
Graduate student, Laboratory of Professor John Joannopoulos.
- Theoretical and computational studies of field expulsion and reconfiguration phenomena in polaritonic photonic crystals, metamaterials as optical-frequency magnetic sources, and characterization of Bloch states in the presence of dielectric losses.
 - Density Functional Theory analysis of surface melting in semiconductors, including superheating and induced melting.
- NEC Laboratories, America, Princeton, NJ** 2002 – 2004
Intern, Biophysics research group of Dr. Ned Wingreen and Dr. Chao Tang.
- Research into Min-protein oscillations. This work contributed substantially to Wingreen NIH R01 grant at Princeton.
- University of Cambridge, Department of Physics, Cambridge, United Kingdom** 1998 – 1999
M. Phil. student, Laboratory of Dr. Gunaretnam Rajagopal.
- Research into all-electron Quantum Monte Carlo calculations of hydrogen-bond energies in water-dimer clusters.

FELLOWSHIPS AND AWARDS

- NIH K25 Quantitative Research Career Development Award**, Grant No. 1k25gm75000, \$625,000 direct costs (2005-2010).
- Helen Hay Whitney Fellowship**, \$150,000 direct costs (2005-2008).
- Pan-American Studies Institute Fellowship**, Meeting on Nano and Biotechnology, Barilloche, Argentina. (2006).
- Cold Spring Harbor Fellowship**, Advanced Bacterial Genetics course (2004).
- NSF Graduate Research Fellowship** (1999-2002).
- MIT Robert Stockbarger Graduate Research Fellowship** (1999-2001).
- Churchill Scholarship**, University of Cambridge (1998-1999).
- Goldwater Academic Scholarship** (1996-1998).
- Caltech Academic Merit Scholarship** (1996-1998).
- H. J. Ryser Scholarship**, California Institute of Technology, Mathematics Department Top Undergraduate (1996-1997).

PATENTS

A Karalis, D Chan, Y Fink, **KC Huang**, M Ibanescu, JD Joannopoulos, E Lidorikis, E Reed, and M Soljagic, "Surface-Plasmon Index-Guided (SPIG) waveguides and Surface-Plasmon Effective-Index-Guided (SPEIG) waveguides," US Patent number 7184641, issued Feb. 27, 2007.

PUBLICATIONS

A Varma, **KC Huang**, and KD Young, "The Min system as a general cell-geometry detection mechanism: patterns of Min oscillations respond to changes in cell shape in aberrantly shaped *Escherichia coli*," *in press, J. Bacteriol.*

T Ursell, **KC Huang**, E Peterson, and R Phillips, "Cooperative gating and spatial organization of membrane proteins through elastic interactions," *PLoS Comp. Biol.* **3** e81 (2007).

KC Huang, R Mukhopadhyay, and NS Wingreen, "A curvature-mediated mechanism for localization of lipids to bacterial poles," *PLoS Comp. Biol.* **2** 1357 (2006).

KC Huang, T Wang, and JD Joannopoulos, "Control of melting using nanoscale coatings," *Proceedings of The Minerals, Metals, and Materials Society* (2007).

KC Huang, T Wang, and JD Joannopoulos, "Nanoscale properties of melting at the surface of semiconductors," *Phys. Rev. B* **72** 195314 (2005). *Selected for November 21, 2005 issue of Virtual Journal of Nanoscale Science & Technology.*

X Jiang, Y Zhang, S Feng, **KC Huang**, Y Yi, and JD Joannopoulos, "Photonic Band-Gaps and Localization in the Thue-Morse Structures," *Appl. Phys. Lett.* **86** 201110 (2005). *Selected for May 23, 2005 issue of Virtual Journal of Nanoscale Science & Technology.*

KC Huang, T Wang, and JD Joannopoulos, "Superheating and Induced Melting at Semiconductor Interfaces," *Phys. Rev. Lett.* **94** 175702 (2005).

KC Huang and NS Wingreen, "Min oscillations in round bacteria," *Phys. Bio.* **1** 229 (2004).

RV Kulkarni, **KC Huang**, M Kloster, and NS Wingreen, "Pattern Formation within *Escherichia coli*: Diffusion, Membrane Attachment, and Self-Interaction of MinD Molecules," *Phys. Rev. Lett.* **93** 228103 (2004). *Selected for December 1, 2004 issue of Virtual Journal of Biological Physics.*

KC Huang, ML Povinelli, and JD Joannopoulos, "Negative effective permeability in polaritonic photonic crystals," *Appl. Phys. Lett.* **85** 543 (2004). *Selected for August 9, 2004 issue of Virtual Journal of Nanoscale Science & Technology.*

KC Huang, E Lidorikis, X Jiang, JD Joannopoulos, KA Nelson, P Bienstman, and S Fan, "The nature of lossy Bloch states in polaritonic photonic crystals," *Phys. Rev. B* **69**, 195111 (2004). *Selected for June 7, 2004 issue of Virtual Journal of Nanoscale Science & Technology.*

KC Huang, Y Meir, and NS Wingreen, "Dynamic structures in *Escherichia coli*: Spontaneous formation of MinE rings and MinD polar zones," *Proc. Nat. Acad. Sci. USA* **100**, 12724 (2003). *Selected for November 15, 2003 issue of Virtual Journal of Biological Physics.*

KC Huang, P Bienstman, JD Joannopoulos, KA Nelson, and S Fan, "Phonon-polariton excitations in photonic crystals," *Phys. Rev. B* **68**, 075209 (2003). *Selected for September 8, 2003 issue of Virtual Journal of Nanoscale Science & Technology.*

KC Huang, P Bienstman, JD Joannopoulos, KA Nelson, and S Fan, "Field Expulsion and Reconfiguration in Polaritonic Photonic Crystals," *Phys. Rev. Lett.* **90**, 196402 (2003). *Selected for May 26, 2003 issue of Virtual Journal of Nanoscale Science & Technology.*

KC Huang, RJ Needs, and G Rajagopal, "Comment on "Quantum Monte Carlo study of the dipole moment of CO" [J. Chem. Phys. **110**, 11700 (1999)]," *J. Chem. Phys.* **112**, 4419 (2000).

PREPUBLICATIONS

KC Huang, R Mukhopadhyay, B Wen, Z Gitai, and NS Wingreen, "Robustness of the cell wall of Gram-negative bacteria and the determination of cell shape," *manuscript in preparation.*

R Mukhopadhyay, **KC Huang**, and NS Wingreen, "Lipid localization in bacterial cells through curvature-mediated microphase separation", *manuscript in preparation.*

S Sciochetti, **KC Huang**, and A Newton, "Spatial Regulation of the PleC Kinase is Essential for Flagellar Pole Development Events in *Caulobacter crescentus*," *manuscript in preparation.*

SELECTED INVITED TALKS

Dynamics Days 2008 International Conference on Chaos and Nonlinear Dynamics, 2008.

Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany, 2007.

Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, 2007.

Temasek Life Sciences Laboratory, Singapore, Cell Dynamics Group, 2007.

American University in Cairo, Department of Biology, 2007.
Temasek Life Sciences Laboratory, Singapore, Cell Division Group, 2007.
Bioinformatics Institute, Singapore, 2007.
Stanford University, Department of Electrical Engineering, 2007.
University of British Columbia, Department of Physics, 2007.
Harvard University, Department of Systems Biology, 2007.
Massachusetts Institute of Technology, Department of Physics, 2007.
American Physical Society March Meeting, *Elasticity of Biological Membranes Symposium*, 2007.
TMS Annual Meeting, *Computational Thermodynamics and Phase Transformations Symposium*, 2007.
TU Delft Kavli Nanoscience Institute, Department of Molecular Biophysics, 2007.
Stanford University, Department of Biochemistry, 2007.
University of Michigan, Ann Arbor, Department of Physics, 2007.
California Institute of Technology, Department of Chemistry, 2007.
California Institute of Technology, Department of Applied Physics, 2007.
Johns Hopkins School of Medicine, Department of Biophysics and Biophysical Chemistry, 2007.
Carnegie Mellon University, Department of Physics, 2006.
Society for Industrial and Applied Mathematics, Annual Meeting, *Spatial and Temporal Inhomogeneities in Bacteria Symposium*, 2006.
University of California, San Francisco, Department of Biochemistry and Biophysics, 2006.
University of Louisville, 6th Annual KC Huang Memorial Seminar, Department of Pharmacology and Toxicology, 2006.
Virginia Tech, Department of Physics, 2005.
Brown University, Department of Physics, 2005.
Brandeis University, Molecular and Cellular Biophysics, 2005.
University of Oxford, Department of Microbiology, 2005.
Princeton University, Department of Molecular Biology Annual Retreat, 2004.
Brown University, Department of Physics, 2004.
University of Arkansas Medical Science, Department of Physiology, 2004.
Williams College, Department of Physics, 2003.
Boston University, Department of Physics, 2003.

SELECTED INVITED LECTURES

Temasek Lifesciences Laboratory, Singapore: Cell Biology.

Bioinformatics Institute, Singapore: Physical Biology.

TEACHING AND ADMINISTRATION

Princeton University, Department of Molecular Biology (2005-2007): Designed and instructed new course *Introduction to Perl and MATLAB for Biology* (35 students/yr., 16 lecture hours/yr).

Princeton University, Department of Molecular Biology Postdoc Committee Chairman (2005-2007): organized seminar series and annual career symposium.

MIT Alumni Club of Princeton, (2005-2007): board member and co-director of Young Alumni events.

Massachusetts Institute of Technology, (2000-2002): Teaching Assistant for *Physics 8.511-8.512: Theory of Solids I&II*.

California Institute of Technology, (1997-1998): Teaching Assistant for *Applied Physics 130: Optoelectronics*.

REFERENCES

Ned Wingreen, Professor of Molecular Biology
Princeton University, Lewis-Thomas 347

Bonnie Bassler, Professor of Molecular Biology
Princeton University, Lewis-Thomas 329

Princeton, NJ 08544
(609) 258-8476
wingreen@princeton.edu

John Joannopoulos, Francis Wright Davis Professor of Physics
Massachusetts Institute of Technology, 12-116
Cambridge, MA 02139
(617) 253-4806
joannop@mit.edu

Gunaretnam Rajagopal, Executive Director, Bioinformatics
The Cancer Institute of New Jersey
Room 5572, 195 Little Albany Street
New Brunswick, NJ 08903
(732) 235-7559
Email: rajagogu@umdnj.edu

Princeton, NJ 08544
(609) 258-2857
bbassler@princeton.edu

Rob Phillips, Professor of Applied Physics
Caltech, 159 Broad, MC 114-96
Pasadena, CA 91126
(626) 395-3374
phillips@pboc.caltech.edu