Harris H. Wang

Columbia University
Medical Center   Office: 212-305-1697
HHSC 1308B   Mobile: 617-955-9575
701 W, 168th Street   Email: hw2429@columbia.edu
NY, NY 10032   Web: wanglab.c2b2.columbia.edu

ACADEMIC INTERESTS

Functional genomics; gut microbiome; genome engineering; evolutionary biology; quantitative biology; systems and synthetic biology.

EDUCATION

2010   **Harvard University**
            Ph.D. in Biophysics

2010   **Harvard-MIT Health Sciences and Technology**
            Joint-Ph.D. in Medical Engineering Medical Physics (MEMP)

2005   **Massachusetts Institute of Technology**
            B.S. in Physics, B.S. in Applied Mathematics, minor in Biomedical Engineering

PROFESSIONAL EXPERIENCE

Starting 3/2013   Assistant Professor of Systems Biology
                   Department of Pathology & Cell Biology and the Systems Biology Initiative,
                   Columbia University Medical Center, New York, USA

2010-2013   Wyss Technology Development Fellow (PI status)
                   Instructor, Department of Systems Biology, Harvard Medical School
                   Wyss Institute for Biologically Inspired Engineering, Harvard University.
                   Faculty mentors: Jim J. Collins (BU), George M. Church (HMS),
                                       Don E. Ingber (HMS)
                   Projects: Functional metagenomic reprogramming of the human microbiome;
                   Engineered cooperativity in synthetic ecosystems.

2005-2010   NSF Graduate Research Fellowship
                   NDSEG Graduate Research Fellowship
                   Department of Genetics, Harvard Medical School, Boston, MA
                   Ph.D. thesis advisor: George M Church,
                   Thesis committee: Jack Szostak (HMS), Jon Beckwith (HMS), David Liu
                                         (Harvard). Ron Weiss (MIT), Jim Hogle (HMS)
                   Ph.D. thesis title: "Multiplex Automated Genome Engineering (MAGE) for the
                                         Optimization of Metabolic Pathways, Construction of New
                                         Genetic Codes, and Evolution of Synthetic Organisms."

2008   Medical Clerkship, Winter Mount Auburn Hospital, Cambridge, MA
                   Advisor: Dr. Valerie Pronio-Stelluto
                   Description: 3 month internal medicine rotation through HST MEMP

PUBLICATIONS

* denote shared first authorship

- Lajoie MJ, Rovner AJ, Goodman DB, Aerni H, Mercer JA, **Wang HH**, Carr PA, Schultz PG, Jacobson JM, Rinehart J, Church GM, Isaacs FJ. *Genomically Recoded Organisms Impart New Biological Functions.* Science (in revision 2013)

- Yaung S, **Wang HH**. "*Engineering Human-associated Microbiomes"* in Engineering Multicellular Systems, Methods Mol Biol (in press 2013)

- **Wang HH***, Mee MT*, Church GM. "Applications of Engineered Synthetic Ecosystems" in Synthetic Biology: Tools and Applications. Editor: Huimin Zhao, Elsevier, (in press 2013)

- Esvelt K, **Wang HH**. *Genome-scale engineering for systems and synthetic biology* (review). Mol Sys Biol 9:641, (2013)

- Mosberg JA*, Gregg CJ*, Lajoie MJ, **Wang HH**, Church GM. *Improving Lambda Red Genome Engineering via Rational Removal of Endogenous Nucleases.* PLoS ONE 7(9): e44638. doi:10.1371/journal.pone.0044638, (2012).

- Mee M, **Wang HH**. *Engineering ecosystems and synthetic ecologies.* Mol Biosys DOI: 10.1039/C2MB25133G, (2012)

- **Wang HH***, Kim HB*, Cong L, Jeong JH, Bang D, Church GM. *Genome-scale Promoter Engineering by Co-Selection MAGE.* Nat Methods **9**: 591-3 (2012).

- Carr PA*, **Wang HH***, Sterling B*, Isaacs FJ, Xu G, Kraal L, Bang D, Jacobson J, Church GM. *Enhanced Multiplex Genome Engineering through Cooperative Oligonucleotide Co-selection.* Nucleic Acids Res DOI: 10.1093/nar/gks455, (2012).

- **Wang HH***, Huang P*, Xu G, Marbelstone A, Li J, Forster T, Jewett MC, Church GM. *Multipliexed* i*n vivo tagging of enzyme ensembles with MAGE for in vitro single-pot multi-enzyme catalysis.* ACS Synth. Biol.**1**: 43−52 (2012).

- Isaacs FJ*, Carr PA*, **Wang HH***, Lajoie MJ, Sterling B, Kraal L, Tolonen AC, Gianoulis TA, Goodman DB, Reppas NB, Emig CJ, Bang D, Hwang SJ, Jewett MC, Jacobson JM, Church GM. *Precise manipulation of chromosomes in vivo enables genome-wide codon replacement.* Science **333**: 348-53 (2011).

- **Wang HH**, Xu G, Vonner AJ, Church G. *Modified bases enable high-efficiency oligonucleotide-mediated allelic replacement via mismatch repair evasion.* Nucleic Acids Res **39**(16): 7336-47 (2011).

- **Wang HH**, Church GM. *Multiplexed genome engineering and genotyping methods applications for synthetic biology and metabolic engineering.* Method Enzymol **498**: 409-26 (2011).

- **Wang HH**. *Synthetic Genomes for Synthetic Biology.* J Mol Cell Biol **2**(4): 178-179, (2010).

- **Wang HH***, Isaacs FJ*, Carr PA, Sun ZZ, Xu G, Forest CR, Church GM. *Programming cells by multiplex genome engineering and accelerated evolution.* Nature **460**: 894-8, (2009).

- **Wang HH**, Menezes NM, Zhu MW, Ay H, Koroshetz WJ, Aronen HJ, Karonen JO, Liu Y, Nuutinen J, Wald LL, Sorensen AG. *Physiological noise in MR images: an indicator of the tissue response to ischemia?* J Magn Reson Imaging **27**(4): 866-71 (2008).

- **Wang HH**, Wang XF. "Analytical methods of atherosclerosis research." in *Current Development in Atherosclerosis Research*, 33-66, Nova Science Publishing, NY (2006).

- **Wang HH**, Wang XF. "Modeling atherosclerosis." in *Trends in Atherosclerosis Research*, 279-311, Nova Science Publishing, NY, (2004).

- **Wang HH**. *Analytical model of atherosclerosis* (Review). <u>Atherosclerosis</u> **159**: 1-7 (2001)

INVITED TALKS

- Wang, HH. "*Engineered Cooperativity in Synthetic Ecosystems*" Cold Spring Harbor Asia, Suzhou, China (2011 Nov)

- Wang, HH. "*Construction of Synthetic Organisms through Large-scale Genome Engineering*" 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Boston, MA (Sept 2011)

- Wang, HH. "*Recoding Genomes for Synthetic and Orthogonal Biology*" 2011 International Union of Microbiological Societies, Sapporo, Japan (Sept 2011)

- Wang, HH. "*Implications of Engineered Biological Chassis on Safety and Security*" Workshop on Genome Engineering, Defense Threat Reduction Agency (DTRA), Springfield, VA, USA (2010 Oct)

- Wang, HH. "*Whole Genome Construction by Multiplexed Engineering and Automation*" Bio International Convention, Chicago, IL, USA (2010 May)

- Wang, HH. "*Fast-pace Genome Engineering of Synthetic Organisms*" 17th Annual Microbial Genomics Conference, Rocky Gap, MD, USA (2009 Oct)

- Wang, HH. "*Engineering, Evolving, and Editing Genomes for Bioenergy Applications*" Joint Bioenergy Institute, UC-Berkeley, Berkeley, CA, USA (2009 Sept)

- Wang, HH. "*Synthetic biology, accelerated evolution, and exploring diversity in biological systems.*" (<u>Keynote</u>) IEEE Congress on Evolutionary Computation, Trondheim, Norway (2009 May)

- Wang, HH. "*Synthetic biology, accelerated evolution, and exploring diversity in biological systems.*" BBN Technologies, Boston, MA, USA (2009 April)

ORAL & POSTER PRESENTATIONS

- Wang, HH et al. "*Genome Engineering Multiplex Automation and the Construction of New Genetic Codes.*" Poster presentation at Synthetic Biology 4.0, Hong Kong, China (2008 Oct)

- Wang, HH et al. "*Genome engineering multiplex automation (GEMA) enables safe and efficient strain engineering and novel protein synthesis.*" Poster presentation at Massachusetts Life Sciences Innovation Conference, Boston, MA, USA (2008 June)

- Isaacs FJ, Wang HH. "*Towards Whole Genome Engineering and the Construction of New Genetic Codes.*" Poster presentation at Synthetic Biology 3.0, Zurich, Switzerland (2007 June)

- Wang HH, et al. "*MAGE: Multiplex Automated Genome Engineering.*" Poster presentation at Synthetic Biology 3.0, Zurich, Switzerland (2007 June)

- Wang HH, et al. "*Variance in perfusion-weighted MRI: indicator of tissue response to ischemia?*" Oral presentation at 29th International Stroke Conference in CA. Abstract in *Stroke*, 35(1), 248 (2004)

- Wang HH, et al. "*Physiological and thermal noise contributions to diffusion weighted magnetic resonance images.*" Poster presentation at 11th ISMRM Conference in Toronto, Canada (2003)

PATENT APPLICATIONS

- *Multiplex Automated Genome Engineering.* Church GM, Wang HH, Isaacs FJ. WO2008/052101A2

- *Assembling partial and whole genomes via living intermediates.* Jacobson JJ, Church GM, Isaacs FJ, Wang HH, Carr, PA, Kosuri S, Tolonen A, Lajoie M. (in prep)

- *Multiparameter method of screening for atherosclerosis-related coronary heart disease or stroke.* Wang XF, Wang HH. US Patent No: 7415360 (2008); Russian Patent No: 2356052 (2009); Australia Patent No: 200431867 (2009);

SELECTED AWARDS

2012	Forbes 30 under 30 in Science
2011-2016	NIH Director's Early Independence Award ($2,112,500)
2011-2013	Wyss Technology Development Fellowship ($210,000)
2009	Collegiate Inventors Competition Grand Prize Winner, National Inventors Hall of Fame ($30,000)
2009	Certificate of Distinction in Teaching, Derek Bok Center, Harvard University
2008-2010	National Science Foundation Graduate Fellowship ($121,500)
2006-2008	National Defense Science and Engineering Graduate Fellowship ($152,642)
2002	Exceptional Summer Student at NINDS
2001	Paul E. Gray UROP Researcher
2001	National Merit Scholar ($2,500)

PROFESSIONAL MEMBERSHIP

2011-2013	American Society of Microbiology
2011-2013	American Chemical Society
2011-2013	American Association for the Advancement of Science

FUNDING AWARDED

1DP5OD009172-01 (Lead PI: Harris Wang)   9/01/11 – 9/01/16
National Institutes of Health, Director's Early Independence Award $2,112,500
Title: Functional Metagenomic Reprogramming of Human Microbiome through Mobilome Eng.
Description: Development of methods to engineer human-microbiome *in vivo* using new
        synthetic biology and genome manipulation approaches.

TEACHING EXPERIENCE

2009 Fall	Teaching Fellow, Harvard University (awarded Certificate of Distinction in Teaching) Course: Biophysics 101 Genomics, Computing, and Economics (U/G level) Instructor: George Church, Department of Genetics, Harvard Medical School

2007   Teaching Fellow, Harvard University
Summer   Course: International Genetically Engineered Machines (iGEM) team
            Instructor: Alain Viel, Department of MCB, Harvard University

OTHER PAST RESEARCH ACTIVITIES

Prof. George Whitesides, Harvard University, Cambridge, MA (2006)
"PEG-Terminated SAMs on Platinum Resist Protein Adhesion and Cell Attachment."

Prof. Sangeeta Bhatia, Massachusetts Institute of Technology, Cambridge, MA (2005)
 "Rational Nanoparticle Design and Synthesis for Drug Delivery and Tumor Cell Targeting."

Dr. Meng Lean, Palo Alto Research Center (PARC), Palo Alto, CA (2005)
"Electrostatic traveling wave based gel electrophoresis"

Prof. Susumu Tonegawa, Massachusetts Institute of Technology, Cambridge, MA (2004-2005)
"Analysis of spatial memory encoding of dentate gyrus specific NMDA receptor KO mice."

Prof. Elazer Edelman, Massachusetts Institute of Technology, Cambridge, MA (2002-2004)
"Distant hemodynamic impact of local geometrical alterations in the arterial tree."

Prof. A. Gregory Sorensen, Martinos Center for Biomedical Imaging, MGH, Charlestown, MA
(2003-2004)
"Variance in perfusion-weighted MRI: indicator of tissue response to ischemia?"

Dr. Steven Warach, NIH/NINDS, Bethesda, MD (2002)
 "Physiological & thermal noise contributions to diffusion-weighted magnetic resonance images."