Curriculum Vitae

Shan X. Wang

Full Professor of Materials Science & Engineering, jointly of Electrical Engineering, and by courtesy of Radiology

Associate Chair, Department of Materials Science and Engineering

Director, Stanford Center for Magnetic Nanotechnology

Co-PI, Center for Cancer Nanotechnology Excellence (CCNE)

Faculty Leader, SystemX Alliance Bio Interfaces Thrust

Affiliated Faculty of Stanford Bio-X Program, Cancer Institute, Canary Center for Cancer Early Detection, Cardiovascular Institute, Neurosciences Institute, and Precourt Institute for Energy, Center for Innovation in Global Health (CIGH)

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RESEARCH INTERESTS

Magnetic nanotechnology and nanobiotech: *bio-magnetic sensors (magneto-nanosensors), in-vitro diagnostics of cancer and other complex diseases, magnetic separation (circulating tumor cells), magnetic nanoparticles, nanoscale synthetic antiferromagnets.*

Magnetoresistive materials, sensors, and spin electronics: *Spin filtering and tunneling, specular GMR spin valves, spin transfer torque devices, spin transistors, MRAM, sensors for power grids and autonomous vehicles.*

Magnetic inductive heads, integrated inductors/transformers, and soft magnetic materials: *nanogranular materials and amorphous materials, laminated inductive head, high frequency inductive applications, power delivery and conversion.*

TEACHING INTERESTS

Biochips, Imaging and Nanomedicine
Thin Film Synthesis
Information Storage Systems
Magnetic Materials in Nanotechnology, Sensing, and Energy
Magnetism and Magnetic Nanostructures
Electronic Behavior of Solids
Waves and Diffraction
Great Inventions that Matter

EDUCATION

1993 Ph.D., Electrical & Computer Eng., Carnegie Mellon University, Pittsburgh, PA
1988 M.S., Physics, Iowa State University, Ames, IA
1986 B.S., Physics, University of Science and Technology of China

EMPLOYMENT

2014-present Associate Chair, Department of Materials Science and Engineering
2010-present Full Professor by courtesy, Dept. of Radiology, Stanford Medical School
2006-present Full Professor, Dept. of Materials Science & Engineering, and jointly with Dept. of Electrical Engineering, Stanford University
2001-2006 Associate Professor, Dept. of Materials Science & Engineering, and

jointly with Dept. of Electrical Engineering, Stanford University

1993-2000 Assistant Professor, Dept. of Materials Science & Engineering, and jointly with Dept. of Electrical Engineering, Stanford University

AWARDS & HONORS

- Qualcomm Tricorder XPrize Finalist, 2016.
- Senior Fellow, Center for Innovation in Global Health, 2015.
- XPRIZE Foundation's Nokia Sensing XCHALLENGE Distinguished Award, 2014.
- IBM Faculty Award, 2014.
- Faculty Fellow, Stanford Center at Peking University (SCPKU), Summer, 2013.
- Outstanding Paper Award (coauthor), 2013 ASME Global Congress on Nano Engineering for Medicine and Biology (NEMB), February 4-6, 2013, Boston, MA, USA.
- Fellow of American Physical Society (APS), 2012.
- Thousand Talents Professor (short term), Tsinghua University, 2011-Present.
- Gates Foundation Grand Challenge Exploration Award, 2010.
- Fellow of the Institute of Electrical and Electronics Engineers (IEEE), 2009.
- BMEidea Competition 1st Prize Award (as mentor), 2009.
- The James Clerk Maxwell Young Writers Prize, Philosophical Magazine (coauthor), 2009.
- Obducat Prize 2007 Award (1st Prize), 2007-8.
- Best Student Paper, International Electronic Device Meeting (IEDM, as coauthor), 2006.
- National Academies Keck Futures Initiative Award, 2006-7.
- Paper #1 on Science Watch "Hot Ten" List of papers in chemistry (as coauthor), 2005.
- IEEE Magnetics Society Distinguished Lecturer, 2001-2.
- IBM Partnership Award, 1999.
- Inaugural Frederick Terman Faculty Fellow, 1994-97.
- CUSPEA Scholarship organized by Nobel Laureate T. D. Lee, 1986.

PROFESSIONAL ACTIVITIES

- Fellows Nomination Subcommittee, IEEE Magnetics Society, 2009-present.
- Local Chair, The Magnetic Recording Conference (TMRC), 2002, 2005 & 2016.
- Co-Chair, Workshop on "Bio-Interfaces: Connecting Ideas, Technologies and Unmet Needs", Stanford University, Mar 1, 2016.
- Co-Chair, Workshop on Frontier of Spintronics and Magnetic Sensing, May 11, Stanford Center at Peking University (SCPKU), 2015.
- Symposium Organizer and Editor, MRS Spring Meeting, 2012-2013.
- Reviewer for US NIH, NSF, DOD, DOE, etc.; Reviewer for funding agencies in Germany, Ireland, China, S. Korea, and Singapore; Reviewer for Nature and Nature Series, Nano Letters, ACS Nano, APL, JAP, Advanced Materials, IEEE Transactions, Lab on a chip, etc.
- Conference Co-Chair, Nanotechnologies in Medicine, 2011 (The Quadrus Center, Palo Alto, CA, August 13.)
- Session Chair, Scientific and Clinical Applications of Magnetic Carriers, 2010 & 2012.
- Dept. of Energy (DOE) ARPA-E review panel, 2010.
- Symposium Organizer, Materials Science & Technology Conference and Exhibition, Detroit, Michigan, 2007.
- Program Chair, International Magnetics Conference, 2006.

- Finance Chair, IEEE Magnetics Society, 2003-2004.
- Administrative Committee, IEEE Magnetics Society, 1998-2000, 2002-7.
- Chair, IEEE Magnetics Society Santa Clara Valley Chapter, 1999-2000.
- Symposium Organizer and Editor, MRS Spring Meeting, 2000.
- Advisory Board, Perpendicular Magnetic Recording Conference (PMRC), 2004.
- Editor, IEEE Transaction on Magnetics, 2008-2011.
- Editorial Board, ACM Transaction on Storage 2004-2011, Sensor Letters 2003-2010.
- Fellow, American Physical Society, 2012-present; Member, 2003-present.
- Fellow, IEEE Magnetics Society, 2009-present; Member, 1988-present.
- Member, Materials Research Society, 1998-present.
- Board of Director and Scientific Founder, MagArray Inc., 2005-present.
- Scientific Advisory Board, Nvigen Inc., 2011-present.
- Founding Member, Cytomag LLC, 2011-present.
- Technical Advisory Board, MCube Inc., 2009-present.
- Scientific Advisor, T3Memory Inc., 2014-present.
- Technology Council, ST Microelectronics, 2010 & 2012.
- Technical Advisory Board, Veeco Instruments Process Equipment Group, 2003.

PUBLICATIONS
(5 books, monographs, or invited reviews, 8 published or pending book chapters, 250 journal papers and conference publications, 53 issued or pending patents, *listed in reverse chronological order except patents*)

Books, Monographs, and Invited Reviews

5. Adam de la Zerda and Shan X. Wang, Biochips and Medical Imaging, Wiley, 2017.

4. Wei Hu, Robert J. Wilson, Ai Leen Koh, Shan X. Wang, Novel Synthetic Magnetic Nanoparticles for Biomedical Applications, ISBN 978-3-639-17835-7, VDM Verlagsservicegesellschaft mbH, October, 2009.

3. S. X. Wang and G. Li, Advances in GMR Biosensors with Magnetic Nanoparticle Tags: Review and Outlook (Invited Review for Advances in Magnetics), *IEEE Trans. Magn*., vol. 44, no.7, 1687-1702, 2008.

2. M. A. Seigler, C. B. Murray, T. P. Nolan, S. X. Wang, B. J. Daniels, (editors), *Magnetic Materials, Structures, and Processing for Information Storage*, MRS Proceedings, 2001.

1. S. X. Wang and A. M. Taratorin, *Magnetic Information Storage Technology*, Academic Press, April, 1999.

Book Chapters

8. Chin Chun Ooi, Dawson Wong, Seung-min Park, Christopher E. Earhart, and Shan X. Wang, "Capture and genetic analysis of CTCs using a magnetic separation device (magnetic sifter)", book chapter in Circulating Tumor Cells – Methods and Protocols, Editors: John W. Park and Mark Jesus M. Magbanua, to be published under the Springer's Book Series "Methods in Molecular Biology" (Series Editor John M. Walker), 2017.

7. Jung-Rok Lee, Drew A. Hall, Richard S. Gaster, and Shan X. Wang, GMR Biosensors, book chapter in *Spin Transport and Magnetism in Electronic Systems (the 2nd Edition)*, Editors: Evgeny Tsymbal and Igor Žutić, Taylor & Francis, 2017.

6. D. W. Lee, L. Li, S. X. Wang, Jiongxin Lu, C. P. Wong, Swapan K. Bhattacharya, and

John Papapolymerou, Embedded Passives, book chapter in *Materials for Advanced Packaging (the 2nd Edition)*, Daniel Lu, CP Wong, Eds., Springer, 2017.

5. Jung-Rok Lee and Shan X. Wang, In Vitro Diagnostics, book chapter in *Nanotheranostics for Cancer Applications*, Editors: Prakash Rai and Stephanie A. Morris, Springer, 2017.

4. Richard S. Gaster, Drew A. Hall, and Shan X. Wang, Magneto-nanosensor Diagnostic Chips, book chapter in *Point of Care Diagnostics on a Chip*, Editors: Robert M Westervelt and David Issadore, Springer, 2013.

3. Drew A. Hall, Richard S. Gaster, and Shan X. Wang, GMR Biosensors, book chapter in *Spin Transport and Magnetism in Electronic Systems*, Editors: Evgeny Tsymbal and Igor Žutić, Taylor & Francis, 2012.

2. D. W. Lee, L. Li, S. X. Wang, Jiongxin Lu, C. P. Wong, Swapan K. Bhattacharya, and John Papapolymerou, Embedded Passives, book chapter in *Materials for Advanced Packaging*, Daniel Lu, CP Wong, Eds., Springer, 2008.

1. S. J. Osterfeld and S. X. Wang, MagArray Biochips for Protein and DNA Detection with Magnetic Nanotags: Design, Experiment, and Signal to Noise Ratio, book chapter in *Microarrays - Preparation, Microfluidics, Detection Methods*, *and Biological Applications* (Eds.: K. Dill, R. Liu, R. Grodzinsky), Springer, New York, pp. 299-314, 2008.

Papers in Refereed Archival Journals

208. Jung-Rok Lee, D. James Haddon, Nidhi Gupta, Jordan V. Price, Grace M. Credo, Vivian K. Diep, Kyunglok Kim, Drew A. Hall, Madoo Varma, Paul J. Utz, and Shan X. Wang, "High resolution analysis of antibodies to post-translational modifications using reusable peptide nanosensor microarrays," *Nano Letters*, submitted.
207. Elizabeth Brett, Elizabeth R. Zielins, Anna Luan, Chin Chun Ooi, Siny Shailendra, David Atashroo, Siddarth Menon, Charles Blackshear, John Flacco, Natalina Quarto, Shan X. Wang, Michael T. Longaker, and Derrick C. Wan, "Magnetic nanoparticle-based upregulation of Bcl-2 enhances bone regeneration," *Stem Cells Translational Medicine*, in press.
206. Jung-Rok Lee, Joohong Choi, Tyler O. Shultz, and Shan X. Wang, "Small molecule detection in saliva facilitates roadside tests of marijuana abuse," *Anal. Chem.*, in press.
205. Jung-Rok Lee, David James Haddon, Hannah E Wand, Jordan V Price, Vivian K Diep, Drew A Hall, Michelle Petri, Emily C Baechler, Imelda M Balboni, Paul J Utz, and Shan X Wang, "Multiplex giant magnetoresistive biosensor microarrays identify interferon-associated autoantibodies in systemic lupus erythematosus," *Sci. Rep*. 6, 27623; doi: 10.1038/srep27623, 2016.
204. Jung-Rok Lee, Daniel J.B. Bechstein, Chin Chun Ooi, Ashka Patel, Richard S. Gaster, Elaine Ng, Lino C. Gonzalez, and Shan X. Wang, "Magneto-nanosensor platform for probing low-affinity protein-protein interactions: characterization of the PD-1 – PD-L1/PD-L2 inhibitory checkpoint axis," *Nature Communications*, in press.
203. Seung-min Park, Dawson J. Wong, Chin Chun Ooi, David M. Kurtz, Ophir Vermesh, Amin Aalipour, Susie Suh, Kelsey L. Pian, Jacob J. Chabon, Sang Hun Lee, Mehran Jamali, Carmen Say, Justin N. Carter, Luke P. Lee, Ware G. Kuschner, Erich J. Schwartz, Joseph B. Shrager, Joel W. Neal, Heather A. Wakelee, Maximilian Diehn, Viswam S. Nair, Shan X. Wang, and Sanjiv S. Gambhir, "Molecular profiling of single circulating tumor cells from lung cancer patients," *Proc. Natl. Acad. Sci.* (*PNAS)*, under 2nd round review.

202. Joohong Choi, Adi Wijaya Gani, Daniel J Bechstein, Jung-Rok Lee, Paul J Utz, Shan X Wang, "Portable, One-step, and Rapid GMR Biosensor Platform with Smartphone Interface," *Biosensors and Bioelectronics*, in press.
201. Noriyuki Sato, Amal El-Ghazaly, Robert M. White, and Shan X. Wang, "Effect of Mg Oxidation Degree on Rashba-Effect-Induced Torques in Ta/CoFeB/Mg(MgO) Multilayer," *IEEE Trans. Magn*., in press.
200. Noriyuki Sato, Robert M. White, and Shan X. Wang, "Effect of annealing on exchange stiffness of ultrathin CoFeB film with perpendicular magnetic anisotropy," *Applied Physics Letters*, 108, 152405, 2016.
199. Elaine Ng, Kari C. Nadeau, and Shan X. Wang, "Giant Magnetoresistive Sensor Array for Sensitive and Specific Multiplexed Food Allergen Detection," *Biosensors and Bioelectronics*, 80, 359–365, 2016.
198. Yue Guo, Yu-Hung Li, Zhiqiang Guo, Kyunglok Kim, Fu-Kuo Chang and Shan X. Wang, "Bio-Inspired Stretchable Absolute Pressure Sensor Network," *Sensors*, 16, 55, 2016.
197. Jung-Rok Lee, Noriyuki Sato, Daniel J.B. Bechstein, Sebastian J. Osterfeld, Junyi Wang, Adi Wijaya Gani, Drew A. Hall, and Shan X. Wang, "Experimental and theoretical investigation of the precise transduction mechanism in giant magnetoresistive biosensors," *Sci. Rep.* 6, 18692, 2016.
196. Daniel J. B. Bechstein, Elaine Ng, Jung-Rok Lee, Stephanie G. Cone, Richard S. Gaster, Sebastian J. Osterfeld, Drew A. Hall, James A. Weaver, Robert J. Wilson and Shan X. Wang, "Microfluidic multiplexed partitioning enables flexible and effective utilization of magnetic sensor arrays," *Lab Chip*, 15, 4273-4276, 2015.
195. Mingliang Zhang, Nicolas Large, Ai Leen Koh, Yang Cao, Alejandro Manjavacas, Robert Sinclair, Peter Nordlander, and Shan X. Wang, "High-Density 2D Homo- and Hetero- Plasmonic Dimers with Universal Sub-10-nm Gaps," *ACS Nano*, 9 (9), pp 9331–9339, 2015.
194. A.D. Henriksen, S.X, Wang, and M.F. Hansen, "On the importance of sensor height variation for detection of magnetic labels by magnetoresistive sensors," *Sci. Rep*., 5, 12282, 2015.
193. D.J.B. Bechstein, J.-R. Lee, C.C. Ooi, A.W. Gani, K. Kim, R.J. Wilson, and S.X. Wang, "High performance wash-free magnetic bioassays through microfluidically enhanced particle specificity," *Sci. Rep.*, 5, 11693, 2015.
192. Yue Guo, Junyi Wang, Robert M. White, and Shan X. Wang, "Reduction of magnetic 1/f noise in miniature anisotropic magnetoresistive sensors," *Appl. Phys. Lett*. 106, 212402 (3 pages), 2015.
191. Fen Xue, Jun Hu, Shan X. Wang, and Jinliang He, "Optimum direct current magnetic bias in ferromagnetic phase for improvement of magnetoelectric effect," *Applied Physics Letters*, 106, 262902, 2015.
190. Jinchi Han, Jun Hu, Zhongxu Wang, Shan X. Wang, and Jinliang He, "Magnetoelectric effect in shear-mode Pb(Zr,Ti)O3/NdFeB composite cantilever," *Applied Physics Letters*, 106, 182901, 2015.
189. Zhao, Gen, Hu, Jun, Ouyang, Yong, He, Jinliang, Wang, Shan X., Yuan, Zhiyong, "Mobile ions generated by external direct current electric field influence direct current measurement of giant magnetoresistance current sensors," *Journal of Applied Physics*, 117, 17, 2015.

188. Han, Jinchi, Hu, Jun, Wang, Zhongxu, Wang, Shan X., He, Jinliang, "Enhanced performance of magnetoelectric energy harvester based on compound magnetic coupling effect," *Journal of Applied Physics*, 117, 144502, 2015.
187. Ouyang, Yong, He, Jinliang, Hu, Jun, Zhao, Geg, Wang, Zhongxu, Wang, Shan X., "Prediction and Optimization of Linearity of MTJ Magnetic Sensors Based on Single-Domain Model," *IEEE Transactions on Magnetics*, 51, 11, 2015.
186. Ouyang, Yong, He, Jinliang, Hu, Jun, Zhao, Geg, Wang, Zhongxu, Wang, Shan X., "Contactless Current Sensors Based on Magnetic Tunnel Junction for Smart Grid Applications," *IEEE Transactions on Magnetics*, 51, 11, 2015.
185. Jinchi Han, Jun Hu, Yang Yang, Zhongxu Wang, Shan X. Wang, and Jinliang He, "A Nonintrusive Power Supply Design for Self-powered Sensor Networks in the Smart Grid by Scavenging Energy from AC Power Line," *IEEE Transaction on Industrial Electronics*, 62, 4398-4407, 2015.
184. Jinchi Han, Jun Hu, Yong Ouyang, Shan X. Wang, and Jinliang He, "Hysteretic Modeling of Output Characteristics of Giant Magnetoresistive Current Sensors," *IEEE Transaction on Industrial Electronics,* 62, 516-524, 2015.
183. Jinchi Han, Jun Hu, Shan X. Wang, and Jinliang He, "Great enhancement of energy harvesting properties of piezoelectric/magnet composites by the employment of magnetic concentrator," *Journal of Applied Physics*, 117, 17A304 (4 pages), 2015.
182. Jinchi Han, Jun Hu; Shan X. Wang, and Jinliang He, "A novel cylindrical torsional magnetoelectric composite based on d15 shear-mode response," *J. Phys. D: Appl. Phys.* 48, 045001 (6pp). 2015.
181. A. El-Ghazaly, R. M. White, and S. X. Wang, "Increasing ferromagnetic resonance frequency using lamination and shape," *Journal of Applied Physics* 117, 17E502 (4 pages), 2015.
180. Fen Xue, Jun Hu, Shan X. Wang, and Jinliang He, "In-plane longitudinal converse magnetoelectric effect in laminated composites: Aiming at sensing wide range electric field," *Applied Physics Letters* 106, 082901 (5 pages), 2015.
179. Yong Ouyang, Jun Hu, Jinliang He, Gen Zhao, Fen Xue, Zhongxu Wang, Shan X. Wang, Zhiyong Yuan, Zejun Ding, "Modeling the Frequency Dependence of Packaged Linear Magnetoresisitive Sensors Based on MTJ," *IEEE Trans. Magn*., vol. 50(11), 4006404 (4 pages), 2014.
178. Jinchi Han, Jun Hu, Shan X. Wang, and Jinliang He, "Magnetic energy harvesting properties of piezofiber bimorph/NdFeB composites," *Applied Physics Letters*, 104, 093901 (4 pages), 2014.
177. M. Zhang, D. J. B. Bechstein, R. J. Wilson, and S. X. Wang, "Wafer-scale synthesis of monodisperse synthetic magnetic multilayer nanorods," *Nano Letter*, 14 (1), pp 333–338, 2014.
176. C. M. Earhart, C. E. Hughes, R. S. Gaster, C. Ooi, R. J. Wilson, L. Y. Zhou, E. W. Humke, L. Xu, D. J. Wong, S. B. Willingham, E. J. Schwartz, I. L. Weissmanh, S. S. Jeffrey, J. W. Neal, R. Rohatgi, H. A. Wakelee, and S. X. Wang, "Isolation and mutational analysis of circulating tumor cells from lung cancer patients with magnetic sifters and biochips," *Lab on a Chip*, 14, 78–88, 2014. (*Cover article*, Themed Issue on Circulating Tumor Cells, DOI: 10.1039/c3lc50580d)
175. D. Kim, C. Fu, X. B. Ling, Z. Hu, G. Tao, Y. Zhao, Z. J. Kastenberg, K. G. Sylvester, S. X. Wang, "Pilot Application of Magnetic Nanoparticle-Based Biosensor for Necrotizing

Enterocolitis," *J Proteomics Bioinformatics*, S5: 002, 2013. doi:10.4172/jpb.S5-002.
174. M. Zhang, X. Xie, M. Tang, C. S. Criddle, Y. Cui, S. X. Wang, "Magnetically ultra-responsive nanoscavengers for next-generation water purification systems," *Nature Communications*, 4,1866, 2013.
173. M. Zhang, C. M. Earhart, C. Ooi, R. J. Wilson, M. Tang, and S. X. Wang, "Functionalization of high-moment magnetic nanodisks for cell manipulation and separation," *Nano Research*, 6(10), 745–751, 2013.
172. D. Kim, F. Marchetti, Z. Chen, S. Zaric, R. J. Wilson, D. A. Hall, R. S. Gaster, J.-R. Lee, J. Wang, S. J. Osterfeld, H. Yu, R. M. White, W. F. Blakely, L. Peterson, S. Bhatnagar, B. Manion, S. Tseng, K. Roth, M. Coleman, A. M. Snijders, A. J. Wyrobek, and S. X. Wang, "Nanosensor dosimetry of mouse blood proteins after exposure to ionizing radiation," *Scientific Reports*, 3, 2234; DOI:10.1038/srep02234, 2013.
171. J. Mullenix, A. El-Ghazaly, S. X. Wang, "Integrated Transformers with Sputtered Laminated Magnetic Core," *IEEE Tran. Magn*., 49(7), 4021-7, 2013.
170. C. Ooi, C. M. Earhart, R. J. Wilson, and S. X. Wang, "Rapid Characterization of Magnetic Moment of Cells for Magnetic Separation," *IEEE Tran. Magn*., 49(7), 3434-7, 2013.
169. A. El-Ghazaly, J. W. Mullenix, R. M. White, S. X. Wang, "Kerr-Imaged Edge-Curling Wall Effects of Narrow Magnetic Cores," *IEEE Tran. Magn*., 49(7), 4017-20, 2013.
168. D. A. Hall, R. S. Gaster, K. Makinwa, S. X. Wang, B. Murmann, "A 256 pixel magnetoresistive biosensor microarray in 0.18μm CMOS," *IEEE Journal of Solid-State Circuits (JSSC)*, VOL. 48, NO. 5, 1290-1301, 2013.
167. J.-R. Lee, M. Magee, R. S. Gaster, J. LaBaer, S. X. Wang, "Emerging Protein Array Technologies for Proteomics," *Expert Review of Proteomics*, 10(1), 65-75, 2013.
166. C. Ooi, C. M. Earhart, R. J. Wilson, and S. X. Wang, "Effect of Magnetic Field Gradient on Effectiveness of the Magnetic Sifter for Cell Purification," *IEEE Tran. Magn*., 49(1), 316-320, 2013.
165. D. Kim, J.R. Lee, E. Shen, and S. X. Wang, "Modeling and experiments of magneto-nanosensors for diagnostics of radiation exposure and cancer," *Biomed Microdevices*, 15, 665–671, 2013. (DOI 10.1007/s10544-012-9678-z online 2012)
164. Y. Ouyang, J. He, J. Hu, and S. X. Wang, "A Current Sensor Based on the Giant Magnetoresistance Effect: Design and Potential Smart Grid Applications," *Sensors*, 12, 15520-15541, 2012.
163. H. Budworth, A. M. Snijders, F. Marchetti1, B. Mannion, S. Bhatnagar, E. Kwoh, Y. Tan, S. X. Wang, W. F. Blakely, M. Coleman, L. Peterson and A. J. Wyrobek, "DNA repair and cell cycle biomarkers of radiation exposure and inflammation stress in human blood," *PLoS One*, 7 (11), e48619, 2012.
162. A. Fu, R. J. Wilson, B. R. Smith, J. Mullenix, C. Earhart, D. Akin, S. Guccione, S. X. Wang, S. S. Gambhir, "Fluorescent Magnetic Nanoparticles for Magnetically Enhanced Cancer Imaging and Targeting in Living Subjects," *ACS Nano*, 6(8), 6862-9, 2012.
161. D. Kim and S. X. Wang, "A Magneto-Nanosensor Immunoassay for Sensitive Detection of Aspergillus Fumigatus Allergen Asp f 1," *IEEE Tran. Magn*., 48(11), 3266-8, 2012.
160. A. Kozhanov, M. Popov, I. Zavislyak, D. Ouellette, D. W. Lee, S. X. Wang, M. Rodwell,and S. J. Allen, "Spin wave modes in ferromagnetic tubes," *J. Appl. Phys*. 111, 013905, 2012.
159. J.-S. Wi, S. Sengupta, R. J. Wilson, M. Zhang, M. Tang, and S. X. Wang, "Raman-

active Two-tiered Ag Nanoparticles with a Concentric Cavity," *Small*, 7(23), 3276-80, 2011.
158. J.-S. Wi, E. S. Barnard, R. J. Wilson, M. Zhang, M. Tang, M. L. Brongersma and S. X. Wang, "Sombrero-shaped Plasmonic Nanoparticles with Molecular-level Sensitivity and Multifunctionality," *ACS Nano*, 5(8), 6449-57, 2011.
157. J. He, S. Ji, J. Liu, J. Hu, and S. X. Wang, "The application of current sensors based on GMR effect in smart grids," Dianwang Jishu/Power System Technology, no.05, pp 8-14, 2011. (This publication is in Chinese.)
156. R.S. Gaster, D.A. Hall, S.X. Wang, "Autoassembly protein arrays for analyzing antibody cross-reactivity," *Nano Letters*, 11, 2579–2583, 2011. (Cover article)
155. Jung-Sub Wi, Robert J Wilson, Donkoun Lee, Robert M White and Shan X Wang, "Silicon nano-well arrays for reliable pattern transfer and locally confined high temperature reactions," *Nanotechnology*, 22, 305304 (5pp), 2011.
154. R. S. Gaster, L. Xu, S.-J. Han, R. J. Wilson, D. A. Hall, S. J. Osterfeld, H. Yu, and S. X. Wang, "Quantification of Protein Interactions and Solution Transport Using High-Density GMR Sensor Arrays," *Nature Nanotechnology*, 6, 314-320, 2011.
153. W. Hu, M. Zhang, R. J. Wilson, A. L. Koh, J.-S. Wi, M. Tang, R. Sinclair and S. X. Wang, "Fabrication of Planar, Layered Nanoparticles Using Tri-layer Resist Templates," *Nanotechnology*, 22, 185302 (6pp), 2011.
152. J.-S. Wi, R. J. Wilson, R. M. White, and S. X. Wang, "Gradual Pressure Release for Reliable Nanoimprint Lithography," *J. Vac. Sci. Technol. B*29, 033001, 2011.
151. R.S. Gaster, D.A. Hall, S.X. Wang, "nanoLAB: An ultraportable, handheld diagnostic laboratory for global health," *Lab on a Chip*, 11 (5), 950 - 956, 2011.
150. K. L. Tsai, M. Ziaei-Moayyed, R. N. Candler, W. Hu, V. Brand, N. Klejwa, S. X. Wang, R. T. Howe, "Magnetic, mechanical, and optical characterization of a magnetic polymer for microactuation," *JMEMS*, 20(1), 65-72, 2011.
149. K. D. Wilson, N. Sun, M. Huang, W. Y. Zhang, A. J. Lee, Z. Li, S. X. Wang, J. C. Wu, "Effects of ionizing radiation on self renewal and pluripotency of human embryonic stem cells," *Cancer Research*, 70(13), 5539-48, 2010.
148. S.J. Han and S.X. Wang, "Magnetic Nanotechnology for Biodetection," *J. Association for Laboratory Automation* (JALA), 15(2), Special Issue, 93-98, 2010.
147. J. M. Wright, D. W. Lee, A. Mohan, A. Papou, P. Smeys, and S. X. Wang, "Analysis of integrated solenoid inductor with closed magnetic core," *IEEE Trans. Magn*., 46, 2387-90, 2010.
146. D. A. Hall, R. S. Gaster, S. J. Osterfeld, B. Murmann, and S. X. Wang, "GMR biosensor arrays: correction techniques for reproducibility and enhanced sensitivity," *Biosensors and Bioelectronics*, 25, 2177-2181, 2010.
145. D. A. Hall, R. S. Gaster, T. Lin, S. J. Osterfeld, S. Han, B. Murmann, and S. X. Wang, "GMR biosensor arrays: a system perspective," *Biosensors and Bioelectronics*, 25, 2051-2057, 2010.
144. A. C. Mak, S. J. Osterfeld, H. Yu, S. X. Wang, R. W. Davis, O. A. Jejelowo, N. Pourmand, "Sensitive giant magnetoresistive-based immunoassay for multiplex mycotoxin detection," *Biosensors and Bioelectronics*, 25, 1635-1639, 2010.
143. A. L. Koh, W. Hu, R. J. Wilson, C. M. Earhart, S. X. Wang, and R. Sinclair, "Structural and magnetic characterization of high moment synthetic antiferromagnetic nanoparticles fabricated using self-assembled stamps," *J. Appl. Phys*., 107, 09B522 (3 pages), 2010.

142. M. Zhang, W. Hu, C. M. Earhart, M. Tang, R. J. Wilson, S. X. Wang. "Silane-based functionalization of synthetic antiferromagnetic nanoparticles for biomedical applications," *J. Appl. Phys*., 107, 09B325 (3 pages), 2010.
141. D. Lee, S. Raghunathan, R. J. Wilson, D. E. Nikonov, K. Saraswat, and Shan X. Wang, "The influence of Fermi level pinning/depinning on the Schottky barrier height and contact resistance in Ge/CoFeB and Ge/MgO/CoFeB structures," *Appl. Phys. Lett*., 96, 052514 (3 pages), 2010.
140. Richard S. Gaster, Drew A. Hall, Carsten H. Nielsen, Sebastian J. Osterfeld, Heng Yu, Kathleen E. Mach, Robert J. Wilson, Boris Murmann, Joseph C. Liao, Sanjiv S. Gambhir, and Shan X. Wang, "Matrix-insensitive protein assays push the limits of biosensors in medicine," *Nature Medicine*, 15, 1327-1332, 2009.
139. M. R. Benoit, D. Mayer, Y. Barak, I. Y. Chen, Z. Cheng, W. Hu, S. X. Wang, S. S. Gambhir, A. Matin, "Visualizing implanted tumors in mice with MRI using magnetotactic bacteria," *Clin. Cancer Res*., 15(16), 5170-7, 2009.
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HIGHLIGHT and MEDIA COVERAGE

Stanford School of Engineering highlights a number of research groups on campus, including the Wang Group: "Shan Wang: How Magnetic Nanoparticles can be used as Medical Sensors" ─ A team of researchers tracks disease the way naturalists track animals in the wild. (April 12, 2016)

Stanford Medicine Magazine highlights Profs. Sam Gambhir and Shan Wang's research in nanomedicine, nanoparticles and nanosensors "Small wonder - How nanotechnology could detect and treat cancer" (March, 2016)

Cloud DX Inc. (Cloud DX) and Dr. Shan Wang at the Stanford Center for Magnetic Nanotechnology (SCMN) have joined forces to incorporate advanced Giant Magnetoresistance (GMR) biosensors developed at Stanford into the Cloud DX "Vitaliti" Tricorder for submission in the final phase of the Qualcomm Tricorder XPRIZE competition.

http://www.clouddx.com/downloads/CloudDX_Stanford_Press_Release_080316.pdf

The National Cancer Institute (NCI) has again awarded several five-year, Multi-institution grants in continued support of its Alliance for Nanotechnology in Cancer program. The third phase of the program will be composed of Centers of Cancer Nanotechnology Excellence (CCNE), Innovative Research in Cancer Nanotechnology (IRCN U01 grants), Cancer Nanotechnology Training Centers (CNTC), and the Nanotechnology Characterization Laboratory (NCL). Stanford won both CCNE (Gambhir and Wang, PIs) and CNTC (Rao and Felsher, PIs) for 2015-2020.
http://nano.cancer.gov/action/news/news_release_2015_09_28.asp

Eigen Lifescience team led by Drs. Shan X. Wang and PJ Utz won a Distinguished Award in the Nokia Sensing XCHALLENGE organized by XPRIZE Foundation (Nov., 2014). The award-winning work is a mobile health solution based on magneto-nanosensors controlled by a cell phone.

MagSifter for enriching circulating tumor cells (CTC) and mutational analysis (with magneto-nanosensor) appeared as a cover article in the Special Themed Issue on CTCs of Lab on a Chip (Jan., 2014).

Nature Scientific Report on radiation exposure triaging was highlighted by a Lawrence Berkeley National Lab press release and by KQED (2013).

Nature Communications paper entitled "Magnetically ultra-responsive nanoscavengers for next-generation water purification systems" was highlighted by Stanford Report, Nano Today, and ABC-KGO TV (2013).

Autoassembly protein arrays paper appeared as a cover article in the 2011 July issue of Nano Letters.

Nature Nanotechnology paper (online April 10, 2011) was highlighted in Nature Nanotechnology News and Views (May 2011) and received news coverage by Stanford Report (April 19, 2011) and many others.

Stanford-led Center for Cancer Nanotechnology Excellence and Translation (CCNE-T) was awarded by National Cancer Institute on Sept. 24, 2010. (Role: Co-PI)

Nature Medicine paper (Oct. 11, 2009) was highlighted in Nature News (Oct. 15, 2009) and was the subject of Stanford Report (Oct. 12, 2009) and Canary Foundation News (Oct. 11, 2009).

NanoLab (Lab on a stick) invention by Gaster and Hall, graduate students from Wang Group, won BMEidea Competition (1st prize) and IEEE Change the World Competition (1st prize). It was widely reported in public media, including San Jose Mercury News (June 24, 2009) and Stanford Report (July 23, 2009).

Magnetic multiplex protein assay (PNAS, Dec. 30, 2008) was widely reported in public media, including Stanford Report (Dec. 1, 2008), World Journal (Dec. 4, 2008), ABC-KGO TV (Dec. 18, 2008), MIT Technology Review (Dec. 19, 2008), and Genome Technology (Jan. 28, 2009).

Lab on a chip with magnetic biosensors was reported in The Economist online (Oct. 15) and in print (Dec. 6, 2008) and Nature Nanotechnology News and Views (Vol. 2, Dec 2007, p. 747).

CMOS-integrated DNA chip work from Wang Group was highlighted in 2006 International Electronic Device Meeting (IEDM) pre-conference press kit and Solid State Technology Magazine (Sept., 2006). It was later reported in MIT Technology Review (Dec. 12, 2006) and EE Times (Dec. 12, 2006).

Prof. Wang played a critical role in bringing to Stanford the Center for Cancer Nanotechnology Excellence (CCNE), a $20M grant from US National Cancer Institute, and

industry-funded Western Institute of Nanoelectronics (WIN). See Stanford Report (April 19, 2006), World Journal and KCBS Radio (April 20, 2006), People's Daily (May 10, 2006).

INVITED PRESENTATIONS IN MAJOR CONFERENCES AND MEETINGS

92. Shan X. Wang, "Magneto-nanosensors for detecting novel protein interactions and early stage diseases," Plenary Session: Advances in Biosensing, American Institute of Chemical Engineers (AICHE) Annual Meeting, San Francisco, 11/13-18, 2016. (Committed)
91. Shan X. Wang, Jung-Rok Lee, and Daniel J.B. Bechstein, "The Intricacies of the Transduction Mechanism in Giant Magnetoresistive Biosensors with Magnetic Nanoparticle Labels," Spring Materials Research Society (MRS) meeting, Phoenix, AZ, March 28- Apr. 1, 2016.
90. S. X. Wang et al., "Nanotechnologies for assessing single CTC molecular profiles in the diagnosis and treatment of lung cancer and kidney cancer," Symposium K on Materials Science, Technology and Devices for Cancer Modeling, Diagnosis and Treatment, Fall Materials Research Society (MRS) meeting, Boston, MA, Nov. 29- Dec. 4, 2015.
89. S. X. Wang et al., "Nanofabrication and characterization of nanoparticles for biosensing and plasmonics," the 2nd International Conference & Exhibition for Nanopia (NANOPIA 2015), November 12-13th, 2015, Changwon Convention Exhibition Center (CECO), Korea.
88. S. X. Wang, D. J. B. Bechstein, J.-R. Lee, J. Choi, and A. W. Gani, "Magnetic sensors for mobile health," International Magnetics Conference (Intermag), Beijing, China, May 12-15, 2015.
87. S. X. Wang, "Multiferroics for tunable RFIC and sensor networks," Nanoscale Multiferroic Structures for Meso-Micro RF Devices Workshop, UCLA, Nov. 13, 2014.
86. S. X. Wang, "Magnetic sensors and magnetic separation: finding killer apps in new context," Keynote Speaker, 10th European Conference on Magnetic Sensors and Actuators, EMSA 2014, Vienna, Austria, July 6-9, 2014.
85. S. X. Wang, "Developing nanotechnologies for in vitro diagnostics," National Cancer Institute, Annual CSSI Science Day, Bethesda, MD - June 25, 2014.
84. S. X. Wang, "Mobile Devices for Disease Diagnosis in Global Heath," Cancer Detection, Diagnosis and Treatment Technologies for Global Health, NIH Bethesda, MD, January 10, 2014.
83. S. X. Wang, "Magneto-Nano Chips for Ultrasensitive and Multiplex Detection of Protein Biomarkers of Tumor", NCI Alliance for Nanotechnology in Cancer Annual Principal Investigators Meeting, Bethesda, MD, September 17-19, 2013.
82. S. X. Wang, "Magneto-Nano Chips for Ultrasensitive and Multiplex Detection of Protein Biomarkers of Tumor", Keynote Lecture in the panel session of "Nanobiotechnology and Nanomedicine" at the ChinaNANO 2013 (International Conference on Nanoscience & Technology, China 2013), Beijing, China, September 5 to 7, 2013.
81. S. X. Wang, "Magneto-Nano Chips for Ultrasensitive and Multiplex Detection of Protein Biomarkers of Tumor," The National Biotechnology Conference (NBC), Symposium on Nanotechnology Platform-based Biomarker Assays, San Diego, May 21, 2013.
80. S. X. Wang, "Cancer sample preparation with micromachined magnetic sifter and nanoparticles," 2013 Molecular Medicine Tri-Conference, the Moscone North Convention Center in San Francisco, February 11-15, 2013.

79. S. X. Wang, "Tools to battle cancer: micro- and nanofluidic protein chips and cell sorters," Keynote Lecture in Track 2, Nano-/Microfluidics in Biology and Medicine: Analysis, Diagnostics and Therapeutics, ASME 2013 Global Congress on NanoEngineering for Medicine and Biology (NEMB2013), Boston, MA, Feb. 4-6, 2013.
78. J. W. Mullenix, Amal El-Ghazaly and Shan X. Wang, "Sputtered Laminated Magnetic Materials and Their Use in Integrated Transformers," Joint MMM/Intermag Conference (MMM/Intermag 2013), Chicago, Illinois, January 14 – 18, 2013.
77. J. W. Mullenix, Amal El-Ghazaly and Shan X. Wang, "Integrated Transformers with Sputtered Laminated Magnetic Materials," The Third International Workshop on Power Supply on Chip 2012 (PowerSoC), San Francisco, CA, USA, November 16th to 18th, 2012.
76. S. X. Wang, "Nano-tools to battle cancer: magnetic nanotags, protein chips and cell sorters," Plenary Speech, The 6th Annual IEEE International Conference on Nano/ Molecular Medicine and Engineering (IEEE-NANOMED 2012), Bangkok, Thailand, Nov 4 to 7, 2012.
75. S. X. Wang, "Functional Magnetic Nanotags for Drug Discovery," Symposium on Biomedical Applications of Magnetic Nanoparticles and Nanostructures, International Conference on Magnetics (Intermag), Vancouver, Canada, May 7-11, 2012.
74. S. X. Wang, "Multiplex Magneto-Nanosensor Array for Protein Quantitation, Kinetics, and Point of Care Diagnostics," CHI Future Diagnostics, Irvine, CA, April 16-17, 2012.
73. S. X. Wang, "Tools to battle cancer: magnetic protein chips and cell sorters," Update 2012, 27-28 March, Dunkers Kulturhus, Helsingborg, Sweden.
72. S. X. Wang, "Wash-free multiplex protein assay based on magnetic nanotechnology and its applications in cancer research", Symposium on Nanofunctional Materials, Nanostructures and Nanodevices for Cancer Applications, MRS Fall Meeting, Boston, MA, November 28 – December 1, 2011.
71. S. X. Wang, "Deploy an Ultrasensitive Multiplex Magneto-Nanosensor Platform for Improvements in Protein Quantitation, Antibody Screening, and Kinetics," Cell Based Assays and Bioanalytical Method Development, Berkeley, CA, Oct. 3-5, 2011.
70. S. X. Wang, "Multiplex Magneto-Nanosensor Array for Protein Quantitation, Antibody Screening, and Kinetics," Keynote speech, Microarray World Congress, South San Francisco, CA, September 29-30, 2011.
69. S. X. Wang, "Technology Platforms for Cancer Recognition and Diagnosis – How to Compare Performance Across Platforms; Validation of Platforms; Barriers to Clinical Acceptance; Biomarker Discovery and Validation; Ligand Development," The Annual NCI Alliance for Nanotechnology in Cancer Investigators' Meeting, Boston, MA, September 21-23, 2011.
68. S. X. Wang, "Bench top and handheld magneto-nanosensor platform for multivariate in vitro diagnostics of cancer," NIH Conference on Cancer Detection and Diagnostics Technologies for Global Health, Bethesda, Maryland, August 22-23, 2011.
67. S. X. Wang, "Multiplex wash-free magnetic biosensors for cancer diagnostics and drug development," Keynote speech, Silicon Valley Magnetics Technology Symposium, San Jose, June 18, 2011.
66. S. X. Wang, R. S. Gaster, and D. A. Hall, "Wash-free multiplex protein assay based on magnetic nanotechnology and its applications in cancer research," Symposium on Advances on Biomagnetic Research, International Conference on Magnetics (Intermag),

Taipei, April 25-29, 2011.

65. S. X. Wang, "Magneto-Nano Chips for Ultrasensitive and Multiplex Detection of Biomarkers of Tumor and Exposure," Symposium 11: Biomarkers of Exposure, *Environmental Mutagen Society Annual Meeting,* Omni Hotel, Fort Worth, Texas, October 23–27, 2010.
64. S. X. Wang, "Magneto-Nano Chip Platform for Cancer Research and Diagnostics," The 2nd Joint U.S.-China Symposium on Nanobiology and Nanomedicine, Washington, DC, September 16-18, 2010.
63. R.S. Gaster and S. X. Wang, "Magneto-Nano Chips for Cancer Diagnostics," *NSTI Nanotech Conference and Expo*, Anaheim, CA, June 23, 2010.
62. S. X. Wang, "Magneto-Nano Chip Platform for Cancer Research and Diagnostics," *The First Physical Sciences in Oncology Symposium* at the University of Southern California, Los Angeles, CA, June 18, 2010.
61. S. X. Wang, "Magneto-Nano Chips for Biomedical Diagnostics," *The 8th International Conference on the Scientific and Clinical Applications of Magnetic Carriers*, Rostock, Germany, May 25-29, 2010.
60. S. X. Wang, "Magneto-Nano Protein Chip and Multiplex Sorter for Monitoring Tumor Markers," *NCI Alliance for Nanotechnology in Cancer Annual Meeting*, Manhattan Beach, California, Oct.19-22, 2009. (Also moderated a Working Group session on In-Vitro Diagnostics of Cancer.)
59. S. X. Wang, "Functional Synthetic Antiferromagnetic Nanoparticles for Magnetic Manipulation and Biomolecule Detection" ECI Conference: Nanotechnology for the Study of Cellular and Molecular Interactions, Il Ciocco Hotel and Conference Center, Barga (Tuscany), Italy, June 14-June 18, 2009.
58. S. X. Wang, "Protein Assays Based on Magnetic Nanotags and GMR Sensors: A New Tool for Fighting Cancer and Rapid Triaging", Symposium on Bionanomagnetism, *International Conference on Magnetics* (*Intermag*), Sacramento, CA, May 4-8, 2009.
57. S. X. Wang, "A new tool for cancer early detection and therapy: ultrasensitive and multiplex protein assay based on magnetic nanotechnology", *Canary Foundation Annual Conference*, Stanford, CA, May 4-5, 2009.
56. S. X. Wang, "NanoMagnetic Biochips — A New Tool for Fighting Cancer and Rapid Triaging", *37th Annual Northern California Electronic Materials Symposium*, Santa Clara, Apr. 10, 2009.
55. S. X. Wang, "A new tool for cancer detection and therapy monitoring: ultrasensitive and multiplex protein assay based on magnetic nanotechnology", The inaugural *Skippy Frank Translational Medicine Fund Multidisciplinary Cancer Conference*, The Quadrus Center, Palo Alto, CA, January 16th and 17th, 2009.
54. S. X. Wang, "Magnetic Nanoparticles for Biomolecular Detection, Manipulation, and Imaging," Asian Magnetics Conference, Bushan, Korea, Dec. 10-13, 2008.
53. S. X. Wang, "Physically fabricated synthetic magnetic nanoparticles with tunable magnetic properties," *MRS Fall Meeting*, Symposium K: Nanomaterials by Design, Boston, Dec. 1-5, 2008.
52. S. X. Wang, "Magneto-nano DNA and protein chips for multiplex molecular diagnostics," *MRS Fall Meeting*, in a special Symposium FF: Nanofunctional Materials, Structures and Devices for Biomedical Applications, Boston, Dec. 1-5, 2008.
51. S. X. Wang, "Rapid and multiplex molecular diagnosis and therapeutic monitoring of

cancer based on real-time magnetic nanotag sensing," *National Cancer Institute (NCI) Translational Science Meeting*, Washington, DC, November 7-9, 2008.

50. S. X. Wang, "Embedded Integrated Inductors with a Single Layer Magnetic Core: Performance Gains and Trade-offs," *Power Supply on Chip Workshop*, Cork, Ireland, Sept 22-24, 2008.
49. D. W. Lee and S. X. Wang, "Fabrication and Analysis of High-Performance Integrated Solenoid Inductor with Magnetic Core," Invited paper AG-01, *International Conference on Magnetics (Intermag)*, Madrid, Spain, May 4-8, 2008.
48. S. X. Wang, D.W. Lee, K.-P. Hwang, "Comparison of solenoid and spiral integrated inductors," International Workshop on High Frequency Micromagnetic Devices and Materials, Madrid, Spain, May 9, 2008.
47. C. Earhart and S. X. Wang, "Magnetic sifters and biochips for early diagnosis and therapy monitoring of cancer," Invited talk in the Symposium: Emerging Nano-based Diagnostics and Therapeutics: Approaches to Cancer Treatment, *American Physical Society March Meeting*, New Orleans, March 9-14, 2008.
46. S. X. Wang, "Molecular diagnostics and nanomagnetic biosensors," Invited Tutorial, *American Physical Society March Meeting*, New Orleans, March 9-14, 2008.
45. S. X. Wang and Chris Earhart, "Magnetic sifter and nanoparticles for molecular biology and medicine," *MRS Fall Meeting*, Boston, Nov.26-30, 2007.
44. S. X. Wang, "CMOS integrated magnetic biochip for cancer diagnostics," FA-04 in an invited symposium, *The International Conference on Magnetism and Magnetic Materials* (*MMM*), Tampa, Nov. 5-9, 2007.
43. S. X. Wang, "Magnetic Nanotechnology for Cancer Diagnostics and Therapy Monitoring," *NCI Alliance for Nanotechnology in Cancer Annual Meeting*, Chapel Hill, North Carolina, Oct.16-18, 2007. (Also moderated a panel discussion on Nanotechnology Devices for Early Diagnosis of Cancer.)
42. S. X. Wang, "CMOS integrated magnetic biochip with high density spin valve sensor arrays," *European Symposium on Biomagnetism and Magnetic Biosystems Based on Molecular Recognition Processes (ESF-EMBO Symposium)*, Sant Feliu de Guixols, Spain, Sept 22-27, 2007.
41. S. X. Wang, "Nanomagnetic biosensors and biochips for pathogen detection and cancer diagnostics," Defense Science Research Council (DSRC) meeting, Santa Cruz, California, July 19, 2007.
40. S. X. Wang, "Nanomagnetic biosensors: status and outlook," *The 6th International Storage Technology Symposium (ISTS)*, Kalamata, Greece, June 17 - 22, 2007.
39. S. X. Wang, "Design, fabrication, and application of nanomagnetic biosensors and biochips," *International Symposium on Advanced Magnetic Materials and Applications (ISAMMA)*, Jeju, Republic of Korea, May 28 – June 1, 2007.
38. S. X. Wang, "Magnetic nanotechnology for early diagnosis and therapy of cancer," BIO International Convention, Boston, MA, May 6-9, 2007.
37. S. X. Wang, "Spin valve sensors for ultrasensitive detection of superparamagnetic nanoparticles for biological applications", *MRS Spring Meeting*, San Francisco, April 9-13, 2007.
36. S. X. Wang, "Magnetic nanoparticles and biochips for cancer diagnostics," *The 20th International Conference on Bio and Pharmaceutical Science and Technology* (ICBPST06), San Diego, CA, December 18-21, 2006.

35. S. X. Wang, "Magneto-Nano Biosensors for Medicine," *The 2nd Annual Meeting of American Academy of Nanomedicine*, Washington, DC, Spet. 9-10, 2006.
34. S. X. Wang, "Magneto-nano biochips for sensitive detection of nucleic acids and proteins," *The 11th International Symposium of Society of Chinese Bioscientists in America (SCBA)*, W9-05, San Francisco, July 21, 2006.
33. S. X. Wang, "Functionalization and characterization of magnetic biochips for sensitive DNA detection," *Pacific Polymer Federation IX Conference*, Maui, Hawaii, Dec. 10-14, 2005.
32. S. X. Wang, "MagArray: a magnetic biochip for rapid diagnosis of infectious disease", *The Genomic Revolution: 3rd Annual National Academies Keck Futures Initiative Conference*, Irvine, CA, Nov. 10-13, 2005,.
31. S. X. Wang, "Magnetic magic in nanotechnology and biosensing," *T. D. Lee Lectures*, Chinese Academy of Sciences Graduate School, Beijing, China, June 30, 2005.
30. S. X. Wang, Liangliang Li, and Dok Won Lee, "Low resistance and high quality factor magnetic inductors: materials and design issues," *International Workshop on High Frequency Micromagnetic Devices and Materials*, Sendai, Japan, 2005.
29. S. X. Wang, "Magnetic microarray for ultrasensitive molecular diagnostics," *MRS Fall Meeting*, Boston, 2004.
28. S. Sun, H. Zeng, H. Yu, D. Robinson, G. Li, R. White and S. X. Wang, "Synthesis and surface modification of monodisperse magnetic nanoparticles for biological applications," American Vacuum Society 51st International Symposium, Session MI-TuA, Anaheim, 2004. (SXW delivered the invited talk.)
27. S. X. Wang, "Challenges in nano-biomagnetic sensors," *MRSEC Symposium on Emerging Challenges on Nanomagnetics*, University of Nebraska, Lincoln, Nebraska, Sept. 24, 2004.
26. S. X. Wang, "MagArray™: Magnetic DNA Microarray", *Diskcon 2003*, San Jose, 2003.
25. N. X. Sun and S. X. Wang, "Damping criterion of magnetization in ferromagnetic ellipsoids," *IEEE Magnetic Recording Conference*, 2003.
24. S. X. Wang, et al., *"Design and Fabrication of Bio-magnetic Sensors and* Magnetic Nanobead Labels for DNA Detection and Identification," paper EC-01, *International Conference on Magnetics (Intermag),* Boston, 2003.
23. S. X. Wang, "Advanced magnetic materials and transducers", *American Physical Society March Meeting*, Austin, Texas, 2003.
22. S. X. Wang, "Advanced magnetic materials and transducers: enabling information explosion and magnetic nanotechnology," *Frontiers in Magnetism Research*, *Advanced Light Source Workshop*, Berkeley, 2002.
21. S. Sun, S. X. Wang, G. Li, R. L. White, J. Kemp, "Magnetic nanoparticles for DNA labeling", *The 47th Annual Conference on Magnetism and Magnetic Materials (MMM),* Tampa, 2002.
20. S. X. Wang, "Advanced magnetic materials and transducers for information technology and magnetoelectronics," *Symp. Magnetoelectronics & Superconducting Elec. Eng.*, Beijing, 2002.
19. S. X. Wang, "Advanced magnetic materials and transducers: enabling factors of data storage explosion and magnetic nanotechnology," <u>*IEEE Distinguished Lectures*</u>, 2001-2002.
18. S. X. Wang, "High saturation Fe-Co-N films for GHz integrated inductors and magnetic

recording heads," *International Workshop on High Frequency Micromagnetic Devices and Materials*, Delft, The Netherlands, 2002.

17. S. X. Wang, N. X. Sun, and Ankur M. Crawford, "Advanced magnetic materials for GHz magnetic recording heads and integrated inductors," *MRS Spring Meeting*, San Francisco, 2002.
16. S. X. Wang and N. X. Sun, "High saturation soft magnetic Fe-Co-N films for write heads," *International Symposium on Physics of Magnetic Materials*, 2001.
15. S. X. Wang, N. X. Sun, T. J. Silva, A. Kos, "Soft magnetic properties and high frequency behavior of Fe-Co-N high saturation materials," *IEEE Magnetic Recording Conference*, 2001.
14. S. X. Wang, K. Yamada, and W. E. Bailey, "Specularity in GMR spin valves and real-time electrical and magnetotransport measurements," paper GB-01, *International Conference on Magnetics (Intermag)*, Toronto, 2000.
13. N. X. Sun and S. X. Wang, "Microstructures and soft magnetic properties of high saturation Fe-Co-N thin films", *MRS Spring Meeting*, 2000.
12. S. X. Wang, "Advanced materials for extremely high density recording heads," *The 15th IIST Workshop on Information Storage*, *Lake Arrowhead,* 1999.
11. S. X. Wang, "Inversion of spin polarization and tunneling magnetoresistance*", NSF-MRSEC Workshop on Magnetic Heterostructures*, 1998.
10. S. X. Wang and J. Hong, "Magnetic and microstructural characterization of FeTaN high saturation materials," *IEEE Magnetic Recording Conference*, 1998.
9. S. X. Wang, J. Hong, and K. Sin, "Microstructures and properties of high saturation soft magnetic materials for advanced recording heads", *MRS Spring Meeting*, 1998.
8. B. Wilson, S. X. Wang, and T. Coughlin, "Read-back nonlinearity in longitudinal keepered recording", *IEEE Magnetic Recording Conference*, 1997.
7. A. Taratorin, J. Fitzpatrick, S. X. Wang and B. Wilson, "Nonlinear group transition and their relation to medium magnetization and error rates in high-density magetic recording", paper E-2, *IEEE Magnetic Recording Conference*, 1996.
6. S. X. Wang, W. E. Bailey, C. Suergers, "Ion beam deposition and structural characterization of GMR spin valves", paper AA-05, *International Conference on Magnetics (Intermag)*, Seattle, 1996.
5. S. X. Wang and S.-Y. Bae, "Epitaxial growth of magnetic ceramic materials by sol-gel method", *Pacific Regional Meeting of American Ceramics Society*, Seattle, 1995.
4. S. X. Wang and S.-Y. Bae, "Sol-gel deposited perovskite manganites for colossal magnetoresistance",*Workshop on Colossal Magnetoresistance*, Los Alamos, 1995.
3. S. X. Wang, F. Liu, K. Maranowski, and M. H. Kryder, "Fabrication and performance of high moment FeAlN multilayer thin film recording heads", invited paper, *IEEE Magnetic Recording Conference,* 1993.
2. S. X. Wang, "FeAlN multilayers for thin film recording heads", *Symposium on Production Processes for the Gb/in^2 World*, San Jose, CA, 1993.
1. M. H. Kryder, S. X. Wang and K. Rook, "FeAlN/SiO_2 and FeAlN/Al_2O_3 multilayers for thin film recording heads", *The International Conference on Magnetism and Magnetic Materials* (*MMM*), Houston, 1992.

INVITED SEMINARS and TALKS (Listed the most recent ones only)

40. S. X. Wang, "Nanosensors for Cancer Detection and Mobile Health", Workshop on Bio-Interfaces: Connecting Ideas, Technology and Unmet Needs, Stanford, March 1, 2016.
39. S. X. Wang, "Noninvasive detection of small molecule drugs with a handheld GMR biosensor platform", Sony DADC Symposium: Bringing Ideas to Market 3.0 - Collaborations by Design, Saratoga, CA, USA, January 13-14, 2016. |
38. S. X. Wang, "High Sensitivity Biosensors and Internet of Everything", Hitachi High-Tech Corporation, Japan, July 14, 2015.
37. S. X. Wang, "The application of magnetic nanotechnologies in in vitro diagnostics", American Association of Clinical Chemistry (AACC) Philly Section Seminar, August 11-15, 2014.
36. S. X. Wang, "Magnetic nanotechnology for medical diagnostics and drug development", Beijing University, Beijing, China, March 28, 2014.
35. S. X. Wang, "Magneto-Nano Chips for Ultrasensitive and Multiplex Detection of Protein Biomarkers of Tumor," Northeastern University, Boston, Aug. 7, 2013.
34. S. X. Wang, "Magneto-Nano Chips for Ultrasensitive and Multiplex Detection of Protein Biomarkers of Tumor," Scienion User's Symposium, Houston, Aug. 2, 2013.
33. S. X. Wang, "Nano-tools to battle cancer: magnetic nanotags, protein chips and cell sorters," Florida State University, Tallahassee, Florida, Nov. 26, 2012.
32. S. X. Wang, "Nano-tools to battle cancer: magnetic nanotags, protein chips and cell sorters," Wright State University and Air Force Research Laboratory (711 HPW/RHDJ), Wright Patterson Air Force Base, Ohio, Oct. 26, 2012.
31. S. X. Wang, "Nano-tools to battle cancer: magnetic nanotags, protein chips and cell sorters," Distinguished Lecturer, The 72nd Frontiers in Chemistry, Case Western Reserve University, Cleveland, Ohio, October 25, 2012.
30. S. X. Wang, "Nano-tools to battle cancer: magnetic nanotags, protein chips and cell sorters," Life Science Center of Tsukuba Advanced Research Alliance (TARA), Tsukuba, Japan, October 11, 2012.
29. S. X. Wang, "Stanford's spintronic sensors and their applications," AISIN Corp., Kariya, Japan, October 9, 2012.
28. S. X. Wang, "Bench Top and Handheld Magneto-Nanosensor Platform for Multivariate In Vitro Diagnostics," China Nano Center, Beijing, Dec. 23, 2011.
27. S. X. Wang and J. W. Mullenix, "Sputtered magnetic materials and their use in integrated inductors and transformers," Texas Instruments, Dallas, TX, Oct. 13, 2011.
26. S. X. Wang, "Multiplex Magneto-Nanosensor Array for Protein Quantitation, Antibody Screening, and Kinetics," Intel Labs, Santa Clara, CA, Oct. 6, 2011.
25. S. X. Wang and D. Lee, "Nano-aperture spin injection into a magnetic tunnel junction with a MgO tunnel barrier," MAGIC Technologies, Milpitas, CA, July 12, 2011.
24. S. X. Wang and D. Lee, "Nano-aperture spin injection into a magnetic tunnel junction with a MgO tunnel barrier," Intel, Hillsboro, OR, June 30, 2011.
23. S. X. Wang, "Magneto-Nano Chip Platform for Cancer Research and Diagnostics," Argonne National Lab, March 30, 2011.
22. S. X. Wang, "Magneto-Nano Chip Platform for Cancer Research and Diagnostics," Sectoral Asset Management Biannual Meeting, Stanford, CA, Sept. 9, 2010.
21. S. X. Wang, "Magneto-Nano Chip Platform for Cancer Research and Diagnostics," China Cancer Center, Beijing, August 13, 2010.
20. S. X. Wang, "Magneto-Nano Chips for Cancer Diagnostics," Center for Integrated

Systems Round Table Day, Stanford University, CA, May 18, 2010.

19. S. X. Wang, "Magnetic Nanotechnology Based Biochips: A New Tool for Cancer Diagnostics and Radiation Triage," Booz Allen Hamilton Distinguished Colloquium, Dept. of Electrical Engineering, University of Maryland, College Park, April 2, 2010.
18. S. X. Wang, "Magnetic Nanotechnology Based Biochips: A New Tool for Cancer Diagnostics and Radiation Triage," Lawrence Berkeley National Lab, Mar. 15, 2010.
17. S. X. Wang, "Magnetic Nanotechnology Based Biochips: A New Tool for Cancer Diagnostics and Radiation Triage," Dept. of Electrical Engineering, Caltech, Pasadena, Feb. 26, 2010.
16. S. X. Wang, "Multiplex, Ultrasensitive, Magnetic Protein Assays for Cytokine Monitoring," Seminar, Stanford Medical School Institute of Immunity, Oct. 23, 2009.
15. S. X. Wang, "Nanomagnetic Materials and Devices for Biomedical Diagnostics," Colloquium, Materials Science and Engineering Dept., Stanford, Oct. 2, 2009.
14. S. X. Wang, "Nanomagnetic Materials and Devices for Cancer Diagnostics and Efficient Power Delivery," Special Lecture, Tsinghua University, Beijing, July 10, 2009.
13. S. X. Wang, "Nanomagnetic Materials and Devices for Cancer Diagnostics and Efficient Power Delivery," T.D. Lee Lecture, Graduate School of Chinese Academy, Beijing, July 9, 2009.
12. S. X. Wang, "Multiplex protein assay with real time magnetic nanotag signaling," SLAC Colloquium, May 18, 2009.
11. S. X. Wang, "Spintronic Devices Based on Spin Filtering," Nanoelectronics Research Initiative E-Workshop, Tuesday, October 28, 2008.
10. S. X. Wang, "Magnetic Nanoparticles for Biomolecular Detection, Manipulation, and Imaging," Nanoscale Science and Engineering Seminar, UC Berkeley, Sept. 26, 2008.
9. S. X. Wang, "Chip-Based High Throughput Proteomic Triage for Radiation Exposure," Invited Briefing to The Biomedical Advanced Research and Development Authority (BARDA), US Department of Health and Human Services, Washington, DC, Sept. 5, 2008.
8. S. X. Wang and D.-W. Lee, "High-Performance Integrated Solenoid Inductor with Magnetic Core," National Semiconductor Virtual Lab Distinguished Faculty Seminar, Santa Clara, April 24, 2008.
7. S. X. Wang, "CMOS Integrated Magnetic Biochip with High Density Spin Valve Sensor Array and Magnetic Nanoparticles," Hitachi GST Research Laboratory, San Jose, Oct. 24, 2007.
6. S. X. Wang, "MagArray Biochips with Homogeneous Assay Format for Detecting Protein and DNA Signatures in Cancer," SomaLogic, Boulder, Colorado, Nov. 20, 2006.
5. S. X. Wang, Nader Pourmand, Shouheng Sun, "Miniature PCR-less Magneto-Nano Chip and Sample Preparation for DNA Fingerprinting and Pathogen Detection," DARPA/DTRA Workshop on Magnetic Biosensors, Fort Belvoir, Virginia, Sept. 22, 2006.
4. S. X. Wang, "Magnetic nanotechnology for doctors," University of Maryland, Dept. of ECE, August 28, 2006.
3. S. X. Wang, "Magneto-nano chip for detection of nucleic acids and proteins," UCSD, Dept. of ECE, June 2, 2006.
2. S. X. Wang, "Magnetic biochips for sensitive detection of pathogens," LLNL, April 10, 2006.

1. S. X. Wang, “Magnetic biochips: laboratory curiosity or killer app?” IEEE Magnetics Society Santa Clara Valley Chapter Meeting, Feb. 21, 2006.