

Zhuxin DONG, Ph.D.

Date of Birth: December 26, 1982

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EXPERIENCE

Research Assistant Professor

University of Notre Dame

Aug. 19 – Present

- Perform and support research that involves the use of sub-nanometer-diameter pores in ultra-thin inorganic membranes for sequencing biomolecules such as protein or DNA through measurements of the blockade current. Lead and contribute to scientific manuscripts and research proposals.

Senior Scientist

Quantapore Inc.

Oct. 18 – Jul. 19

- Developing next generation sequencer: build up a hybrid platform consisting of solid-state and biological nanopores as a high throughput and large scalability device for genetic sequencing; lead projects by theoretical design and hands-on experiments.

Postdoctoral Research Associate

University of Notre Dame

Nov. 12 – Oct. 18

- Measurement of the size and correlations between single ions: study the properties of ions with water in a confined topography; the size of metal alkali and alkali earth ions and protons were obtained by measuring the ionic current through a solid-state sub-nanopore and conductance extrapolations; the current noise spectra at low frequency indicates similar results.
- Protein sequencing: synthesizing solid-state sub-nanopores in ultra-thin inorganic membrane using transmission electron microscope (TEM); reading the primary structure of a protein molecule using a sub-nanopore by associating fluctuations in ionic current blockade due to a translocation of the molecule through the pore with its amino acid (AA) residues; revealing a sub-nanopore is capable of sensing the volume change similar to the smallest AA residue by detecting a post translational modification on single site detection.
- Discriminating residue substitutions in a single protein molecule: tethering a protein molecule to an atomic force microscope (AFM) tip to enable ultra-slow translocation; study the role of denaturants, such as sodium dodecyl sulfate (SDS), during a molecule translocation through a sub-nanopore; discriminating two almost-identical single protein molecules due to a few AA residue substitutions.
- Detecting secretions from single cancer cells using a nanopore: synthesizing solid-state nanopores in ultra-thin inorganic membrane with proper sizes for secretion targets using TEM; detecting and analyzing secretions from single cancer cells through measurements of blockades in the ionic current due to single molecules translocating through a nanopore; identifying the chemokine CCL5 via the corresponding blockades.
- TEM multislice simulation and finite element simulations (FES): multislice simulation using Dr. Probe software package for calculated TEM images with close correspondence to real

TEM images of sub-nanopores; revealing precise size and structure of subnanopores; FES via Comsol to estimate electric properties of a subnanopore in electrolytes with a cross-membrane potential bias.

- Decoration of AFM Tips for Tip-Enhanced Raman Spectroscopy (TERS): AFM based electrochemical reduction is employed to coat silver nanostructures in various sizes onto Si tips. Their TERS ability is studied using apertureless near-field scanning optical microscopy (ANSOM).

Research Assistant

Micro and Nano Systems Engineering Laboratory, University of Arkansas Sept. 08 – Oct. 12

- Cleanroom/MEMS: design, fabrication and testing of CNT integrated ISFET as pH sensor for microliter solutions; micro/nano fluidic system development for particle separation; and *E. coli* flagellar motor based explosives sensor using optical MEMS in a microfluidic system.
 - ❖ Mask design
 - ❖ Photolithography (lift-off, wet/dry etch) and e-beam lithography
 - ❖ Oxidation/Diffusion
 - ❖ Thermal/e-beam evaporation and sputtering
 - ❖ Metal/SU-8 based PDMS modeling and bonding
- AFM related manipulation and characterization: surface nanoscratching to create 3-dimensional nanochannels on different material surface; nanoindentation to estimate mechanical properties for various samples, such as protein microbubbles, engineered soft tissue scaffolds, and vertically aligned carbon nanofibers; impedance and capacitance characterization of individual chicken infectious Laryngotracheitis virus; atomic-level image graphene and tailor into desired edge shapes.
- Biosensor and bioinstrumentation: incubate/culture *E. coli* cells; develop economic and handy biosensor for fluoride detection in lake water samples.

Research Assistant

Centre for Micro & Nano Systems, The Chinese University of Hong Kong Sep. 05 – Jul. 08

- Calibration of MEMS Inertial Sensors in Digital Writing Instrument: software design multi-layer PCBs, hardware soldering and debugging; optical tracking using a high speed camera to calibrate 3D accelerometers, gyroscopes and magnetometers integrated in the digital writing instrument; MS Visual Studio based programming for block matching algorithm to calibrate the accelerometers; Matlab based binocular camera calibration for 3D reconstruction to calibrate the gyroscopes and magnetometers.

Undergraduate Intern

State Key Laboratory of Robotics, Shenyang Institute of Automation, CAS Jan.-Jun. 05

- Development of linear approach for robot hand-eye calibration using a projection matrix M

EDUCATION

Ph.D. in Mechanical Engineering, **2012**, University of Arkansas, Fayetteville, AR GPA: 3.7/4.0

Dissertation Title: *“Design, Fabrication, Testing of CNT Based ISFET and Characterization of Nano/Bio Materials Using AFM”*

M.Phil. in Automation and Computer Aided Engineering, **2008**, The Chinese University of Hong Kong, HKSAR, China

Thesis Title: “*A Calibration Method for MEMS Inertial Sensors Based on Optical Techniques*”

B. of Sci. in Biomedical Engineering, **2005**, Shenyang University of Technology, Shenyang, Liaoning, China

Thesis Title: “*Development of Linear Approach for Robot Hand-Eye Calibration Based on Projection Matrix M*”

SOFTWARE PROFICIENCY

Microsoft Office	Matlab	AutoCAD	Solidworks
ANSYS	Protel DXP	Igor	Labview
PicoView	PicoImage	PicoLith	Gwyddion
L-Edit	Clampfit	Clampex	COMSOL

PUBLICATION

Journal

1. E. Rigo*(co-first author), **Z. Dong*(co-first author)**, J. Park, E. Kennedy, M. Hokmabadi, L. Almonte-Garcia, L. Ding, N. Aluru, and G. Timp, “Measurements of the size and correlations between ions using an electrolytic point contact”. *Nature Communications*, 2019.
2. E. Kennedy, M. Hokmabadi, **Zhuxin Dong**, Kim McKelvey, E. Nelson, and G. Timp, “Detecting Secretions from Single Cancer Cell Using a Nanopore”. *Nano Lett.*, **2018**, 18(7), pp 4263-4272.
3. **Zhuxin Dong**, E. Kennedy, M. Hokmabadi, and G. Timp, “Discriminating Residue Substitutions in a Single Protein Molecule Using a Sub-nanopore”. *ACS Nano*, 2017, DOI: 10.1021/acsnano.6b08452.
4. M. Kolmogorov, E. Kennedy, **Zhuxin Dong**, G. Timp, and P. Pevzner, “Single-Molecule Protein Identification by Sub-Nanopore Sensors”. *PLoS Computational Biology*, 13(5): e1005356, 2017.
5. E. Kennedy*, **Zhuxin Dong*(co-first author)**, C. Tennant, and G. Timp, “Reading the primary structure of a protein with 0.07 nm³ resolution using a subnanometre-diameter pore”. *Nature Nanotechnology*, 2016, **11**, 968-976.
6. K. Sarveswaran*, V. Kurz*, **Zhuxin Dong**, T. Tanaka, S. Penny, and G. Timp, “Synthetic Capillaries to Control Microscopic Blood Flow”. *Scientific Reports*, 6:21885 (2016).
7. U. Wejinya, N. Willems, **Zhuxin Dong**, and M. Abolhassani, “The Effects of Process Conditions on Reliability of Silicon Nanowires”. *Nanomaterials and Nanotechnology*, 2016, **6**:36.
8. **Zhuxin Dong**, Uchechukwu C. Wejinya, Siva Naga Sandeep Chalamalasetty, and M. Meyyappan, “Dimensional Analysis and Mechanical Properties Characterization of Carbon Nanofibers under Subzero Temperatures”. *IEEE Transactions on Nanotechnology*, 2013, vol. 12, issue 5, pp. 810-816.
9. Haitao Wang, **Zhuxin Dong**, and Chongzheng Na, “Hierarchical Carbon Nanotube Membrane-Supported Gold Nanoparticles for Rapid Catalytic Reduction of *p*-Nitrophenol”. *ACS Sustainable Chem. Eng.*, 2013, 1 (7), pp. 746-752.
10. **Zhuxin Dong**, Uchechukwu C. Wejinya, and Imad H. Elhajj, “Fabrication and testing of ISFET based pH sensors for microliter target solution”. *Sensors and Actuators: A: Physical*, 194 (2013) pp. 181-187.
11. Uchechukwu C. Wejinya, Siva Naga Sandeep Chalamalasetty, **Zhuxin Dong**, Prabhu U. Arumugam and Meyya Meyyappan, “Carbon Nanofiber Nano-electrode Array: Effect of Process Conditions on Reliability”. *IEEE Transactions on Nanotechnology*, Volume 12, Issue 1, pp. 101-107, 2013.
12. Uchechukwu C. Wejinya, Siva Naga Sandeep Chalamalasetty, **Zhuxin Dong**, Meyya Meyyappan, Sunny E. Iyuke, “Dimensional Analysis of Acid Etching Effects on Vertically Grown Carbon Nanofibers Using Atomic Force Microscopy”. *Nanomaterials and Nanotechnology*, vol. 3, pp. 3-9, 2013.
13. **Zhuxin Dong** and Uchechukwu C. Wejinya, “Atomic Force Microscopy Based Repeatable Surface Nanomachining for Nanochannels on Silicon Substrate”. *Applied Surface Science*, 258 (2012), pp. 8689-8695.

14. **Zhuxin Dong**, Uchechukwu C. Wejinya and Siva Naga Sandeep Chalamalasetty, "Development of CNT-ISFET based pH sensing system using atomic force microscopy". *Sensors and Actuators: A: Physical*, 173 (2012) pp. 293-301.
15. Yanxia Zhu, **Zhuxin Dong**, Uchechukwu C. Wejinya, Sha Jin and Kaiming Ye, "Determination of mechanical properties of soft tissue scaffolds by atomic force microscopy nanoindentation". *Journal of Biomechanics*, 44 (2011) pp. 2356-2361.
16. **Zhuxin Dong** and Uchechukwu C. Wejinya, "Characterization of Vertically Aligned Carbon Nanofibers without Electrochemical Treatment Using Atomic Force Microscopy". *IEEE Transactions on Nanotechnology*, Volume 10, Issue 3, pp. 639-646, 2010.
17. **Zhuxin Dong**, Uchechukwu C. Wejinya and Wen J. Li, "An Optical-Tracking Calibration Method for MEMS-Based Digital Writing Instrument". *IEEE Sensors Journal*, pp. 1543-1551, Vol. 10, No. 10, Oct. 2010.

Magazine

1. Steve Tung, Michael B. Schulte, **Zhuxin Dong**, Jin-Woo Kim, Uche Wejinya, Hyung-Mo Moon and Byung-Whi Kong, "Electrical Properties of an Individual Chicken Infectious Laryngotracheitis Virus". *IEEE Nanotechnology Magazine*, vol. 4, issue 3, pp. 10-14, September 2010.

Conference Proceedings

1. Uchechukwu C. Wejinya, Nathan Willems, and **Zhuxin Dong**, "The Effects of Temperature and Humidity Exposure on reliability of Silicon Nanowires". *Proceedings of the 7th IEEE International Conference on Nano/Molecular Medicine and Engineering (NANOMED 2013)*, November 10-13, Phuket, Thailand.
2. Nathan Willems, Uchechukwu C. Wejinya and **Zhuxin Dong**, "Temperature Treatment on Silicon Nanowires for Reliability Studies". *Proceedings of the 13th IEEE International Conference on Nanotechnology (NANO 2013)*, August 05-08, Beijing, China.
3. **Zhuxin Dong**, Uchechukwu C. Wejinya, and Alan M. Albrecht, "Nanomanipulation of Graphene Using Atomic Force Microscopy". *Proceedings of IEEE 13th International Conference on Nanotechnology (NANO 2013)*, August 05-08, Beijing, China.
4. **Zhuxin Dong**, Uchechukwu C. Wejinya, John M. Vaughan, and Alan M. Albrecht, "Fabrication and Testing of ISFET based pH Sensor for Microliter Scale Solution Targets". *Proceedings of IEEE the 7th Nanotechnology Materials and Devices Conference (NMDC 2012)*, Oct. 16-19, Waikiki Beach, HI, USA.
5. **Zhuxin Dong** and Uchechukwu C. Wejinya, "Atomic Force Microscopy-Based Repeatable Surface Nanomachining for Nanochannels on Bare Silicon Substrates". *Proceedings of IEEE 12th International Conference on Nanotechnology (NANO 2012)*, August 20-23, Birmingham, UK.
6. Siva Naga Sandeep Chalamalasetty, Uchechukwu C. Wejinya, **Zhuxin Dong** and Meyya Meyyappan, "A Study of Sulfuric and Acetic Acid Effect on Vertically Aligned Carbon Nanofibers for Bio/Chemical Sensors Development". *Proceedings of 11th IEEE International Conference on Nanotechnology (NANO 2011)*, August 15-18, 2011, Portland, Oregon, USA.
7. **Zhuxin Dong**, Uchechukwu C. Wejinya, Siva Naga S. Chalamalasetty and Matthew Margis*, "Atomic Force Microscopy Based Nano Manipulation towards CNT-ISFET pH Sensing System". *Proceedings of IEEE 6th International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2011)*, Feb. 20-23, Kaohsiung, Taiwan.
8. Siva Naga Sandeep Chalamalasetty, Uchechukwu C. Wejinya, **Zhuxin Dong**, Mathew R. Margis*, Theodore G. Duensing* and Trent Chudej*, "A Study of Temperature Effect on Unetched and Etched Vertically Aligned Carbon Nanofibers for Bio/Chemical Sensors Development". *Proceedings of the 2010 IEEE International Conference on Robotics and Biomimetics (ROBIO 2010)*, December 14-18, Tianjin, China.
9. **Zhuxin Dong**, Uchechukwu C. Wejinya, Yanxia Zhu and Kaiming Ye, "Force Measurement Study of Engineered Collagen-Chitosan Scaffold Using Atomic Force Microscopy". *Proceedings of 2010 IEEE International Conference on Nano/Molecular Medicine and Engineering (NANOMED 2010)*, Dec. 5-9, Hong Kong/Macau, China.
10. Siva Naga Sandeep Chalamalasetty, Uchechukwu C. Wejinya and **Zhuxin Dong**, "Characterization of Etched and Unetched Vertically Aligned Carbon Nanofibers (VACNFs) Using Atomic Force Microscopy". *Proceedings of the 2010 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2010)*, Oct. 18-22, Taipei, Taiwan.

11. **Zhuxin Dong**, Uchechukwu C. Wejinya, Siva Naga Sandeep Chalamalasetty, Mathew R. Margis* and Theodore G. Duensing*, “Acid Etch Study of Vertically Aligned Carbon Nanofibers (VACNFs)”. *Proceedings of 2010 IEEE Nanotechnology Materials and Devices Conference (NMDC 2010)*, Oct. 12-15, Monterey, California, USA.
12. Siva Naga Sandeep Chalamalasetty, Uchechukwu C. Wejinya and **Zhuxin Dong**, “A study of Temperature Effect on Vertically Aligned Carbon Nanofibers for Bio/Chemical Sensors Development”. *Proceedings of 10th IEEE International Conference on Nanotechnology Joint Symposium with Nano Korea 2010 (NANO 2010)*, Aug. 17-20, KINTEX, Korea.
13. **Zhuxin Dong** and Uchechukwu C. Wejinya, “Electrical Property Measurement of Carbon Nanotubes Using Atomic Force Microscopy for Nano Sensor Applications,” *Proceedings of the 5th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2010)*, Jan. 20-23, Xiamen, China, 2010.
14. **Zhuxin Dong**, Uchechukwu C. Wejinya and Wen J. Li, “Calibration of MEMS Accelerometer Based on Plane Optical Tracking Technique and Measurements,” *Proceedings of the 4th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2009)*, Jan. 5-8, Shenzhen, China.
15. **Zhuxin Dong**, Uchechukwu C. Wejinya, Haibo Yu and Imad H. Elhaji, “Design, Fabrication, and Testing of CNT-Based ISFET for Nano pH Sensor Application: A Preliminary Study”, *Proceedings of IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM 2009)*, July 14-17, Singapore.
16. **Zhuxin Dong** and Uchechukwu C. Wejinya, “Design, Fabrication, and Measurement of CNT-Based ISFET for Nano Devices”, *Proceedings of IEEE Nanotechnology Materials and Devices Conference (NMDC 2009)*, June 2-5, Traverse City, MI, USA.
17. **Zhuxin Dong**, Uchechukwu C. Wejinya, Imad H. Elhaji and Meyya Meyyappan, “Characterization of Vertically Aligned Carbon Nanofibers Grown on Ni Dots Nanoelectrode Array Using Atomic Force Microscopy”, *Proceedings of the 2009 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2009)*, Oct. 11-15, St. Louis, MO USA.
18. Michael B. Schulte, **Zhuxin Dong**, Steve Tung, Jin-Woo Kim, Uche Wejinya, Hyung-Mo Moon and Byung-Whi Kong, “Impedance Spectroscopy of Chicken Infectious Laryngotracheitis Virus Based on Atomic Force Microscopy”. *Proceedings of the 2009 IEEE 3rd International Conference on Nano/Molecular Medicine and Engineering (NANOMED 2009)*, Oct. 18-21, Tainan, Taiwan.
19. **Zhuxin Dong**, Uchechukwu C. Wejinya, Holly D. Tourtillott*, Imad H. Elhaji and Meyya Meyyappan, “Scanning and Measurement of Carbon Nanofiber Nanoelectrode Arrays Using Atomic Force Microscopy”. *Proceedings of the 2009 IEEE International Conference on Robotics and Biomimetics (ROBIO 2009)*, Dec. 19-23, Guilin, China.
20. **Zhuxin Dong**, Uchechukwu C. Wejinya, Shengli Zhou, Qing Shan and Wen J. Li, “Real-Time Written-Character Recognition Using MEMS Motion Sensors: Calibration and Experimental Results”. *Proceedings of the 2008 IEEE International Conference on Robotics and Biomimetics (ROBIO 2008)*, Feb. 21-26, 2009, Bangkok, Thailand.
21. Shengli Zhou, **Zhuxin Dong**, Wen J. Li and Chung Ping Kwong, “Hand-Written Character Recognition Using MEMS Motion Sensing Technology”. *Proceedings of the 2008 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM 2008)*, July 2-5, Xi’an, China.
22. **Zhuxin Dong**, Guanglie Zhang, Chi Chiu Tsang, Guangyi Shi, Wen J. Li, Philip H. W. Leong and Ming Yiu Wong, “ μ IMU-Based Handwriting Recognition Calibration by Optical Tracking”, *Proceedings of 2007 IEEE International Conference on Robotics and Biomimetics (ROBIO 2007)*, Dec. 15-18, Sanya, China.
23. Chi Chiu Tsang, Philip H. W. Leong, Guanglie Zhang, Chor Fung Chung, **Zhuxin Dong**, Guangyi Shi and Wen J. Li, “Handwriting Tracking based on Coupled μ IMU/Electromagnetic Resonance Motion Detection”. *Proceedings of the 2007 IEEE International Conference on Robotics and Biomimetics (ROBIO 2007)*, Dec. 15-18, Sanya, China.
24. **Zhuxin Dong**, Guanglie Zhang, Yilun Luo, Chi Chiu Tsang, Guangyi Shi, Sze Yin Kwok, Wen J. Li, Philip H. W. Leong and Ming Yiu Wong, “A Calibration Method for MEMS Inertial Sensors Based on Optical Tracking”, *Proceedings of 2007 IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2007)*, Jan. 16-19, Bangkok, Thailand.
25. Chi Chiu Tsang, Gary Chun Tak Chow, Philip H. W. Leong, Guanglie Zhang, Yilun Luo, **Zhuxin Dong**, Guangyi Shi, Sze Yin Kwok, Heidi Y. Y. Wong, Wen J. Li and Ming Yiu Wong, “A Novel Real-Time Error Compensation Methodology for μ IMU-based Digital Writing Instrument”. *Proceedings of the 2006 IEEE International Conference on Robotics and Biomimetics (ROBIO 2006)*, Dec. 17-20, Kunming, China.
26. Yilun Luo, Chi Chiu Tsang, Guanglie Zhang, **Zhuxin Dong**, Guangyi Shi, Sze Yin Kwok, Wen J. Li, Philip H. W. Leong and Ming Yiu Wong, “An Attitude Compensation Technique for a MEMS Motion

Sensor Based Digital Writing Instrument". *Proceedings of the 1st IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2006)*, Jan. 18-21, Zhuhai, China.

TEACHING EXPERIENCE

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|-------------|---|
| 2006 | <ul style="list-style-type: none">• Certificated in the Professional Development Course for Teaching Assistants demanded by the Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong. |
| 2008 – 2009 | <ul style="list-style-type: none">• Teaching Assistant for MEEG 4253-Introduction to Robotics (13 Students)• Teaching Assistant for MEEG 2013-Dynamics (50 Students)• Mentored for Research Experiences for Undergraduates (REU) Program |
| 2009 – 2010 | <ul style="list-style-type: none">• Teaching Assistant for MEEG 4253-Introduction to Robotics (3 Students)• Teaching Assistant for MEEG 2013-Dynamics (28 Students)• Teaching Assistant for MEEG 3013-Mechanics of Materials (37 Students)• Mentored for Research Experiences for Undergraduates (REU) Program |
| 2010 – 2011 | <ul style="list-style-type: none">• Teaching Assistant for MEEG 4253-Introduction to Robotics (9 Students)• Teaching Assistant for MEEG 2013-Dynamics (34 Students)• Teaching Assistant for MEEG 2703-Computer Methods in Mechanical Engineering (76 Students)• Mentored for Research Experiences for Undergraduates (REU) Program• Instructor of interactive demonstration of LEGO Mindstorms Robotic Education Series for elementary school groups, UDAY, University of Arkansas. |
| 2011 – 2012 | <ul style="list-style-type: none">• Teaching Assistant for MEEG 4253-Introduction to Robotics (11 Students)• Teaching Assistant for MEEG 2703-Computer Methods in Mechanical Engineering (90 Students)• Mentored for Research Experiences for Undergraduates (REU) Program• Volunteer teacher in Robotics session of Alpha Phi Omega's (APO) Scouting University |
| 2013 | <ul style="list-style-type: none">• Lab Instructor of CE 60345 Environmental Nanomaterials and Nanotechnology, University of Notre Dame |