BIOGRAPHICAL SKETCH

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NAME: he, jin

eRA COMMONS USER NAME (credential, e.g., agency login): hejinoled

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Fudan University, Shanghai	BS	07/1999	Physics
Arizona State university, Tempe	PHD	05/2015	Biophysics

A. Personal Statement

My primary research interest focuses on single molecule cellular biophysics. I have expertise, experience, motivation and necessary skills to successfully carry out the proposed research. I am a biophysicist by training and have expertise in condensed matter physics, physical chemistry and biophysics. I have worked on electron transport through single molecule between two metal electrodes, the mass transport of small molecules through nanopores and have applied these techniques to develop the next generation DNA sequencing techniques. At FIU, my group aims to develop novel single molecule/single cell techniques for the fundamental understanding of important biology problems. We are developing nanopore and nanoelectrode based hybrid methods with the integration of electrical, electrochemical and optical approaches to achieve single molecule level sensing and imaging in a single cell (ref. 1). They have been developed both on microfabricated chip platform and scanning ionic conductance microscopy (SICM)/inverted optical microscopy platforms. We are applying these novel techniques in drug delivery using synthetic nanoparticles, bioelectricity and cancer researches.

I have collaborated with PI since joining at FIU. We have used a scanning probe microscopy technique, SICM, to study the cell surfaces in response to various polymer nanoparticles. We have found that the cell surface morphologies are significantly dependent on the physical properties of CPNs (ref. 2). In this proposal, I will collaborate with the PI to study the effects of the chemical/physical properties of CPNs on the cellular interaction, especially on the pore formation in the cellular membranes of cancer cells. Understanding the cellular behaviors of drug carriers is pivotal to improve the efficacy.

I have leadership and management skills for the proposed project. In the past five years at FIU, I have assembled a research team with postdoc, graduates and undergraduates. Currently I am conducting two NSF projects including a NSF CAREER award as a PI to develop novel nanopore/nanoelectrode probes in both microchip and microscope based platforms for extracellular detection and imaging. I had experience managing grant (e.g. staffing, research directions, budget), supervising graduate students, collaborating with other PIs and collaborators, and publishing research results. I have experience in supervising undergraduate and graduate students in research. I currently have a group with one postdoc and four PhD students. The current graduate students have made steady progress and several manuscripts have been published in peer-reviewed journals. I also provided research opportunities for more than ten undergraduates.

In summary, I have necessary knowledge and experience to conduct the proposed research activities. I strongly believe that studies of the endocytosis mechanism of nanoparticles will help us design and develop efficient drug delivery systems for therapeutics.

1. Shan Y, Panday N, Myoung Y, Twomey M, Wang X, Li W, Celik E, Moy V, Wang H, Moon JH, He J.

Scanning Ion Conductance Microscopic Study for Cellular Uptake of Cationic Conjugated Polymer Nanoparticles. Macromol Biosci. 2016 Apr;16(4):599-607. PubMed PMID: 26757346.

2. Tiwari PB, Astudillo L, Miksovska J, Wang X, Li W, Darici Y, He J. Quantitative study of protein-protein interactions by quartz nanopipettes. Nanoscale. 2014 Sep 7;6(17):10255-63. PubMed PMID: 25060094.

B. Positions and Honors

Positions and Employment

1998 - 2000	Research Assistant, National key laboratory of Surface Physics, Fudan University, Shanghai
2001 - 2005	Research Associate, Physics and Astronomy Department, Arizona State University , Tempe, AZ
2005 - 2007	Postdoc Research Associate, Center for Single Molecule Biophysics, the Biodesign Institute, Arizona State University, Tempe, AZ
2007 - 2011	Assistant Professor Research, Center for Single molecule Biophysics, the Biodesign Institute, Arizona State University, Tempe, AZ
2011 -	Assistant Professor, Florida International University, miami, FL

Other Experience and Professional Memberships

2003 -	Member, American Physics Society
2013 -	Member, Biophysical Society

Honors

2012	FIU Faculty summer research Award, Florida International University
2015	FIU Top Scholar, Florida International University
2015	NSF CAREER Award, NSF

C. Contribution to Science

1. In my early research, I developed micro/nanofabricated fixed gold nanojunction devices and scanning tunneling microscope (STM) based break junction/fixed junction techniques to reliably measure electron transport through single molecule between two metal electrodes and used the techniques to understand the charge transport in various molecules of the photosynthesis center and small biomolecules. These works are highly impactful.

    a. Li X, He J, Hihath J, Xu B, Lindsay SM, Tao N. Conductance of single alkanedithiols: conduction mechanism and effect of molecule-electrode contacts. J Am Chem Soc. 2006 Feb 15;128(6):2135-41. PubMed PMID: 16464116.

    b. He J, Sankey O, Lee M, Tao N, Li X, Lindsay S. Measuring single molecule conductance with break junctions. Faraday Discuss. 2006;131:145-54; discussion 205-20. PubMed PMID: 16512369.

    c. He J, Lindsay SM. On the mechanism of negative differential resistance in ferrocenylundecanethiol self-assembled monolayers. J Am Chem Soc. 2005 Aug 31;127(34):11932-3. PubMed PMID: 16117519.

    d. He J, Chen F, Li J, Sankey OF, Terazono Y, Herrero C, Gust D, Moore TA, Moore AL, Lindsay SM. Electronic decay constant of carotenoid polyenes from single-molecule measurements. J Am Chem Soc. 2005 Feb 9;127(5):1384-5. PubMed PMID: 15686365.

2. Later on, I expanded the research to use quantum tunneling phenomena for sensitive DNA base recognition. I laid the groundwork by finishing a series of concept-proof experiments. This research resulted two patents and have been purchased by Roche. At FIU, we have test the recognition

tunneling concept in new platforms other than STM formed nanogaps.

a. Zhang Y, Liu J, Li D, Dai X, Yan F, Conlan XA, Zhou R, Barrow CJ, He J, Wang X, Yang W. Self-Assembled Core-Satellite Gold Nanoparticle Networks for Ultrasensitive Detection of Chiral Molecules by Recognition Tunneling Current. ACS Nano. 2016 May 24;10(5):5096-103. PubMed PMID: 27104661.
b. Foroushani A, Zhang Y, Li D, Mathesh M, Wang H, Yan F, Barrow CJ, He J, Yang W. Tunnelling current recognition through core-satellite gold nanoparticles for ultrasensitive detection of copper ions. Chem Commun (Camb). 2015 Feb 18;51(14):2921-4. PubMed PMID: 25585717.
c. Huang S, He J, Chang S, Zhang P, Liang F, Li S, Tuchband M, Fuhrmann A, Ros R, Lindsay S. Identifying single bases in a DNA oligomer with electron tunnelling. Nat Nanotechnol. 2010 Dec;5(12):868-73. PubMed PMID: 21076404; PubMed Central PMCID: PMC4121130.
d. Chang S, He J, Kibel A, Lee M, Sankey O, Zhang P, Lindsay S. Tunnelling readout of hydrogen-bonding-based recognition. Nat Nanotechnol. 2009 May;4(5):297-301. PubMed PMID: 19421214; PubMed Central PMCID: PMC2698135.

3. I have worked on nanopore biophysics for 8 years. I have explored the possibilities of using conductive carbon nanotube based nanofluidic devices for DNA translocation and sequencing. This research resulted one patent and has been purchased by Roche. Now we focused on the glass nanopipette based multifunctional nanopore techniques.We are developing nanopore and nanoelectrode based hybrid methods with the integration of electrical, electrochemical and optical approaches (Raman and Fluorescence) to achieve single molecule level sensing for single cell analysis.

a. Tiwari PB, Astudillo L, Miksovska J, Wang X, Li W, Darici Y, He J. Quantitative study of protein-protein interactions by quartz nanopipettes. Nanoscale. 2014 Sep 7;6(17):10255-63. PubMed PMID: 25060094.
b. Shan YP, Tiwari PB, Krishnakumar P, Vlassiouk I, Li WZ, Wang XW, Darici Y, Lindsay SM, Wang HD, Smirnov S, He J. Surface modification of graphene nanopores for protein translocation. Nanotechnology. 2013 Dec 13;24(49):495102. PubMed PMID: 24231385; PubMed Central PMCID: PMC3925770.
c. Song W, Pang P, He J, Lindsay S. Optical and electrical detection of single-molecule translocation through carbon nanotubes. ACS Nano. 2013 Jan 22;7(1):689-94. PubMed PMID: 23248975; PubMed Central PMCID: PMC3551996.
d. Liu H, He J, Tang J, Liu H, Pang P, Cao D, Krstic P, Joseph S, Lindsay S, Nuckolls C. Translocation of single-stranded DNA through single-walled carbon nanotubes. Science. 2010 Jan 1;327(5961):64-7. PubMed PMID: 20044570; PubMed Central PMCID: PMC2801077.

4. We are developing scanning ion conductance microscopy (SICM) based techniques for single cell imaging. We will integrate multifunctional nanopipette techniques with SICM to achieve multiparameter, high temporal and spatial resolution single cell imaging. The current focus is to use our techniques to study the effects of the chemical/physical properties of CPNs on the cellular behaviors.

a. Shan Y, Panday N, Myoung Y, Twomey M, Wang X, Li W, Celik E, Moy V, Wang H, Moon JH, He J. Scanning Ion Conductance Microscopic Study for Cellular Uptake of Cationic Conjugated Polymer Nanoparticles. Macromol Biosci. 2016 Apr;16(4):599-607. PubMed PMID: 26757346.

Complete List of Published Work in My Bibliography:
http://bit.ly/2dHcg9s

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

CBET-1454544 , NSF He, Jin (PI) 08/01/15-07/31/20

CAREER: Investigate 3D Extracellular Potential Distribution at Single Cell Level
The objective of this project is to develop a novel scanning probe microscopy based imaging method to reveal the extracellular potential distribution at sub cell level.
Role: PI

CMMI-1334417 , NSF He, Jin (PI) 09/01/13-08/31/17
Carbon Nanotube based nanofluidic device for biological sensing
The objective of this project is to develop a novel nanofluidic-nanoelectronic sensor for single cell analysis
Role: PI