

CONTACT  
INFORMATION

Institute for Collaborative Biotechnologies  
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RESEARCH  
INTERESTS

Microfluidics, multiphase transport processes, chemical analysis system design, micro/nanoscale reactor design, surface chemistry, DNA chemistry, electrochemistry, cell-free systems

PROFESSIONAL  
EXPERIENCE

***Co-founder, Chief Scientist, and Invited Board Participant***  
*SpectraFluidics, Inc.* **July 2011 to Present**  
Supervisor: Dr. Carl D. Meinhart, CTO

***Co-founder and Vice President of Research and Development***  
*SpectraFluidics, Inc.* **November 2008 to July 2011**  
Supervisor: Dr. Carl D. Meinhart, CTO

***Technical Consultant***  
*Gas Reaction Technologies, Inc.* **July 2004 to Present**  
Supervisor: Dr. Daniel J. Auerbach, CTO

ACADEMIC  
EXPERIENCE

**University of California, Santa Barbara, Santa Barbara, California USA**

***Project Scientist***  
*Institute for Collaborative Biotechnologies* **November 2009 to Present**

- Working with Prof. Carl Meinhart and Prof. Martin Moskovits
- Fundamental research towards multiphase micro/nanoscale chemical and biomolecular processes

***Graduate Student Researcher***  
*Department of Mechanical Engineering* **September 2004 to December 2008**

- Committee: Prof. Carl D. Meinhart, Prof. Sanjoy Banerjee, Prof. Martin Moskovits, Prof. Tom Soh
- Co-invented and investigated Free Surface Microfluidics
- Developed MEMS-based detector of vapors emanated from explosive compounds and narcotics at room temperature and co-founded the startup company SpectraFluidics, Inc. to commercialize the technology
- Awarded *Best Ph.D. Dissertation Award, 2008-2009* by department faculty

***Postgraduate Researcher***  
*Department of Chemical Engineering* **July 2002 to September 2004**

- Investigated fluid shear stresses with nanoscale resolution using Atomic Force Microscopy (AFM)
- Investigated microtubule dynamics using AFM and microfluidic cell-free systems
  - Designed/conducted AFM experiments relating microtubule self-assembly dynamics to chemotherapeutic agent concentration for protein structure/function analysis and efficacy studies
  - Designed/fabricated microfluidic systems for in vitro AFM studies of microtubule dynamics

- Designed/implemented custom AFM automation software and algorithms including machine vision

***Undergraduate Researcher***

*Department of Chemical Engineering*

**September 2000 to July 2002**

- Investigated microbreaking phenomena in macro-scale open channel flows
  - Designed gas/liquid transport experiments and experimental equipment
  - Conducted gas/liquid transport experiments and analyzed data
  - Designed and implemented custom PIV analysis software

***Undergraduate Student***

*Department of Chemical Engineering*

**September 1999 to June 2002**

- Undergraduate Scholarships
  - Robert Medley Memorial Chemistry Department Scholarship
  - Major William C. Carr Engineering Memorial Scholarship

EDUCATION

**University of California, Santa Barbara**, Santa Barbara, California USA

Ph.D., Mechanical Engineering, December 2008

- Advisor: Prof. Carl D. Meinhart
- Thesis Topic: Transport Processes in Free Surface Microfluidics
- Area of Study: MEMS, Fluid Dynamics, Chemistry/Biochemistry, Design of chemical detection systems

B.S., Chemical Engineering, June 2002

- Advisor: Prof. Sanjoy Banerjee
- Completed specialty track in Materials Science
- Completed specialty track in Mathematics and Process Control

PUBLICATIONS

Changsong Ding, Gaurav Soni, Payam Bozorgi, Brian D. Piorek, Carl D. Meinhart, Noel C. MacDonald, "A Flat Heat Pipe Architecture Based on Nanostructured Titania". *J. MEMS* (2010) **99** 1-7

Seung Joon Lee, Brian D. Piorek, Carl D. Meinhart and Martin Moskovits, "Photoreduction at a Distance: Facile, Nonlocal Photoreduction of Ag Ions in Solution by Plasmon-Mediated Photoemitted Electrons". *Nano Lett.* (2010) **10** 4 1329-1334.

Brian D. Piorek, Seung Joon Lee, Juan G. Santiago, Martin Moskovits, Sanjoy Banerjee and Carl D. Meinhart, "Free-surface microfluidic control of surface-enhanced Raman spectroscopy for the optimized detection of airborne molecules". *Proc. Natl. Acad. Sci. USA* (2007) **104** 48 18898-18901.

Patrick E. Freudenthal, Matt Pommer, Carl D. Meinhart and Brian D. Piorek, "Quantum nanospheres for sub-micron particle image velocimetry". *Exp. Fluids* (2007) **43** 525-533.

Brian Piorek, Adam Mechler, Ratnesh Lal, Patrick Freudenthal, Carl Meinhart and Sanjoy Banerjee, "Nanoscale resolution microchannel flow velocimetry by atomic force microscopy". *Appl. Phys. Lett.* (2006) **89** 153123-153125.

Yi Xiao, Brian D. Piorek, Kevin W. Plaxco and Alan J. Heeger, "A Reagentless Signal-On Architecture for Electronic, Aptamer-Based Sensors via Target-Induced Strand Displacement". *J. Am. Chem. Soc.* (2005) **127** 51 17990-17991.

Adam Mechler, Brian Piorek, Ratnesh Lal and Sanjoy Banerjee, “Nanoscale velocity-drag force relationship in thin liquid layers measured by atomic force microscopy”. *Appl. Phys. Lett.* (2004) **85** 17 3881-3883.

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PRESENTATIONS

Brian D. Piorek\*, Chrysafis Andreou, Seung Joon Lee, Martin Moskovits, Carl Meinhart, “Free-surface digital microfluidic systems for optimized SERS analysis in gas chromatography”. *63rd Annual Meeting of the American Physical Society, Division of Fluid Dynamics* **55** 16, November 22, 2010.

Brian Piorek\*, Carl Meinhart, Seung Joon Lee, Sanjoy Banerjee and Martin Moskovits, “Free Surface Microfluidics for Explosives Detection”. *XXII International Congress of Theoretical and Applied Mechanics*, August 28, 2008.

Brian Piorek\*, Seung Joon Lee, Juan Santiago, Martin Moskovits, Sanjoy Banerjee and Carl Meinhart, “Detection of Gas-Phase Species by a Microfluidic SERS Apparatus”. *2006 Annual Meeting, American Institute of Chemical Engineers*, November 13, 2006.

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PAPERS

Brian D. Piorek, Seung Joon Lee, Nick Judy, Carl D. Meinhart, Martin Moskovits, Augustus Fountain, Steven Christesen, and Jason Guicheteau, “Free surface microfluidic/SERS for detection of gas-phase DNT”. *Proc. SPIE*, Vol. 7665, 76650L (2010)

Changsong Ding, Gaurav Soni, Payam Bozorgi, Brian Piorek, Carl D. Meinhart, and Noel C. MacDonald, “A Titanium Based Flat Heat Pipe”. *Proceedings of IMECE2008*, #IMECE2008-68967, ASME International Mechanical Engineering Congress and Exposition, October 31–November 6, 2008, Boston, MA, USA.

Ira Leifer, Brian Piorek, Walter Smith and Sanjoy Banerjee, “Large-Scale Turbulence Generation and Microbreaking Waves”. *Third International Symposium on Turbulence and Shear Flow Phenomena*, 2003, Sendai, Japan.

PATENTS

February 2010: 5 patents submitted, 3 in preparation in the fields of MEMS and chemical detection.

PERSONAL  
REFERENCES

Ph.D. Advisor: Prof. Carl D. Meinhart (meinhart@engineering.ucsb.edu)  
*Additional references available upon request*

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