

**Jong Wook Hong, Ph.D.**  
**Department of Applied Physics**  
**California Institute of Technology**  
M/C 128-95, 1200 E. California, Pasadena, CA  
Phone: 626/395-4848, Fax: 626/793-8675, E-mail: [jwhong@caltech.edu](mailto:jwhong@caltech.edu)  
Home Phone & Fax: 626-568-1107

### **Education**

**The University of Tokyo, School of Engineering, Tokyo, Japan**

**Ph.D. in Chemistry and Biotechnology (Biochemical Engineering), October 2000**

- Emphasis in Microelectromechanical Systems (MEMS)
- Dissertation: “Development of Microfabricated Genetic Analysis Systems: Integrated poly(dimethylsiloxane) (PDMS) Microchip for Polymerase Chain Reaction (PCR) and Capillary Gel Electrophoresis (CGE)”, Advisor: Prof. Minoru Seki

**Pukyong National University, Pusan, Korea**

**M.S. in Microbiology, August 1995**

- Emphasis in Marine Biotechnology
- Thesis: “Studies on the Fermentation Production of the Polysaccharides from a marine bacterium *Zoogloea* sp. and their application to Enzyme Immobilization”

**Pukyong National University, Pusan, Korea**

**B.S. in Biotechnology & Bioengineering, February 1991**

- Thesis: “Computer-aided Process Control for Bioreaction”

### **Research & Professional Experiences**

**California Institute of Technology, Department of Applied Physics, Pasadena, CA**

**Postdoctoral Scholar**, December 2001 – Present, Advisor: Prof. Stephen R. Quake

- Developed integrated microfluidic devices for single cell analyses (the first complicated nanoliter systems in parallel architecture)
- Devised the first microfluidic systems for molecular biology such as gene isolation, ligation, and gene transformation
- Led application of microfluidic systems for environmental application (the first trial to analyze termite gut sample with Prof. Jared R. Leadbetter)

**Hitachi Electronics Engineering, Co., Saitama, Japan**

**Mitsubishi Chemical Co., Tokyo, Japan**

**Arbitech Co., Tokyo, Japan**

**Consultant**, October 1999 – December 2001

- Conducted experiments and provided technical consulting for the development of integrated microfluidic genetic analysis systems for commercial products including electrokinetic control system of fluid, temperature control system, optical detection system, and data acquisition system.
- Carried out extensive evaluation experiment of commercial microfluidic devices from various polymer substrates as well as glass, quartz, and silicon.

**The University of Tokyo, Institute of Industrial Science (IIS), Tokyo, Japan**

**Postdoctoral Research Fellow**, September 2000 – December 2001,

- Developed evaluation platform to determine optimal conditions for the operation of microchip for electrophoresis, electrochromatography and other analytical applications (the first system which combines both point detection and image processing for the data acquisition from microfluidic systems)
- Carried out micro particle image velocimetry ( $\mu$ PIV) for the determination of electrokinetic movement of the fluid inside microchips fabricated by glass, quartz as well as polymer substrates
- Evaluated zeta potential of various substrates

**The Institute of Physical and Chemical Research (RIKEN)**, Saitama, Japan

**Junior Research Associate & Collaborative Scientist**, April 1998 – March 2001,  
Advisor: Dr. Isao Endo

- Developed integrated and distributed microBioProcessor systems
- Maintained microfabrication laboratory

**Research Institute of Bioscience and Biotechnology (KRIBB)**, Taejeon, Korea

**Intern**, July – August 1993

- Studied manufacturing process of bio-insecticides through the operation of pilot plant bioreactor including upstream and downstream process

**Korean Army**, R.O.T.C. Officer, **Lieutenant**, February 1991 – June 1993

- Carried out defensive missions related to anti-atomic, biological, and chemical attacks

### **Research Interests**

Integrated MicroBiosystems, BioMEMS (Microelectromechanical Systems), Polymer MEMS, Nano/Microfluidics, Lab-on-a-Chip, Biosensors,  $\mu$ TAS (micro Total Analysis Systems), Nano/Micro Bioreactor, DNA/Protein Microarray, Single Cell Analyses (Mammalian Stem Cells, Pathogenic Bacterial Cells and Environmental Samples), Functional Genomic, Proteomics, Systems Biology, Enzyme Immobilization, Cell-free Protein Synthesis, AFM for NanoBiotechnology, Microbiology, Fermentation, Mammalian Cell Culture, Oncogenesis, Biopolymer, Polysaccharides, Drug Delivery, High-throughput Screening, Bioseparation

### **Teaching Interests**

Graduate: Integrated MicroBiosystems, BioMEMS, Nano/Microfluidics, Biomedical Engineering, Biochemical Engineering, Bioprocess Engineering, Bioseparation Engineering, Biophysics, Analytical Chemistry, Molecular Biology, Microbiology, Immunology

Undergraduate: Biotechnology for Engineers, Microfluidics laboratory, MEMS laboratory, Nano/Microfabrication Laboratory, Introduction to Molecular Biology, Introduction to Immunology, Introductory Chemistry, Introductory Biology, Introductory Biophysics, Introductory Immunology, Introductory Analytical Chemistry, Instrumental Analysis

### **Intellectual Properties**

- **Jong Wook Hong**, Vincent Studer, N. French Anderson and Stephen R. Quake

- "Microfluidic Nucleic Acid Analysis", Nonprovisional U.S. Patent Application No. 20174C-010310US.
- Toshiharu Shiraishi, Teruo Fujii and **Jong Wook Hong**, "Fluorescence intensity measurement system and the method: Method for the detection of fluorescent intensity by image analysis" Japanese Patent, Application No. 2002-159179.
  - Toshiharu Shiraishi, Teruo Fujii and **Jong Wook Hong**, "Fluorescence intensity measurement system and the method: Method for the detection of fluorescent intensity by point-detection and image analysis" Japanese Patent, Application No. 2002-159178.
  - Minoru Seki, Ryusuke Aoyama, **Jong Wook Hong**, Teruo Fujii, and Isao Endo, "Trace liquid control mechanism", Japanese Patent, Application No. 2001-163740. U.S. Patent Application No. 10/157,075.
  - Hiroaki Machida, Toshiyuki Sakurai, Yusuke Miyazaki, Toshio Yoshida, **Jong Wook Hong**, Mitoru Seki, Teruo Fujii, and Isao Endo, "Microchip and Microchip Electrophoresis Apparatus", Japanese Patent Application No. 2001-117902, Japanese Patent Pub. Number: 2002-310992A.
  - Takatoki Yamamoto, Teruo Fujii, **Jong Wook Hong**, and Isao Endo, "Hybrid microreactor and process for production thereof", Japanese Patent Application No. 2000-278502, U.S. Patent Pub. No. US2002/0094303A1.
  - Minoru Seki, Yasuhiro Kakigi, **Jong Wook Hong**, Teruo Fujii, and Isao Endo, "Microchip for aquatic partitioning and the partitioning method", Japanese Patent, Application No. 2000-89078, U.S. Patent Pub. No. US2001/0035350A1
  - **Jong Wook Hong**, Teruo Fujii, Minoru Seki, Isao Endo, and Kazuo Hosokawa, "Microchip for capillary gel electrophoresis and the method of manufacture", Japanese Patent Application No. H11-345050, Japanese Patent Pub. No. 2001-157855A.

#### Awards

- IIS Postdoctoral Fellowship, Institute of Industrial Science (IIS), the University of Tokyo, Tokyo, Japan, October 2000 – December 2001
- YABEC Award, Young Asian Biochemical Engineers Community, November 2000, Fukuoka, Japan
- RIKEN Junior Research Associate, The Institute of Physical Chemical Research (RIKEN), April 1998– September 2000, Saitama, Japan
- Excellent Research Award for Graduate Student, the Society of Chemical Engineers, Japan, Tokyo Branch, September 1999, Tokyo, Japan
- Japanese Government Fellowship, Ministry of Education, Science, Culture, Sports, Science and Technology, April 1997 – September 2000, Tokyo, Japan

#### Academic Societies

IEEE Engineering in Medicine and Biology Society  
American Institute of Chemical Engineers  
The Society of Chemical Engineers, Japan  
The Society for Bioscience and Bioengineering, Japan

### Invited Talks

- Department of Physics, California State University, Long Beach, February 2004.
- Department of Chemistry, California State University, Los Angeles, January 2004.
- Institute of Industrial Science, the University of Tokyo, Tokyo, Japan, November 2003.
- Department of Mechanical Engineering, Center of Excellence for the 21<sup>st</sup> Century, The University of Tokyo, Tokyo, Japan, November 2003.
- Department of Mechanical Engineering, Pohang University of Science and Technology (POSTECH), Pohang, Korea, October, 2003.
- Lab Automation 2003, Association for Laboratory Automation, Palm Springs, CA, February 2-5, 2003.
- Department of Mechanical and Aerospace Engineering, University of California, Los Angeles, CA, October 2001.
- Department of Bioengineering, University of Wisconsin, Madison, WI, October 2001.
- Department of Chemical Engineering, Purdue University, West Lafayette, IN, October 2001.
- Department of Bioengineering, University of California, Berkeley, CA, January 2001.
- Applied Biosystems, Foster City, CA, January, 2001.
- IBM Zurich Research Laboratory, Rüschlikon, Switzerland, October 2000.
- Department of Chemistry, Imperial College, London, U.K., October 2000.
- Oak Ridge National Laboratory, Oak Ridge, TN, October 1999.

### Publication List

#### Archival Journal Papers

1. **Jong Wook Hong**, Toshiharu Shiraishi and Teruo Fujii, "Real-time Imaging and Data Processing of Electrokinetic Separation of Nucleic Acids using an Evaluation Platform for Microfluidic Devices", in preparation.
2. **Jong Wook Hong**, Vincent Studer, Gao Hang, N. French Anderson and Stephen R. Quake "A Nanoliter Scale Nucleic Acid Processor with Parallel Architecture", *Nature Biotechnology*, under review.
3. **Jong Wook Hong** and Stephen R. Quake, "Integrated Nanoliter Systems", *Nature Biotechnology*, 21, pp. 1179-1183, 2003.
4. **Jong Wook Hong**, Kazuo Hosokawa, Teruo Fujii, Minoru Seki, and Isao Endo, "Microfabricated Polymer Chip for Capillary Gel Electrophoresis", *Biotechnology Progress*, 17, pp. 958-962, 2001.
5. **Jong Wook Hong**, Teruo Fujii, Minoru Seki, Takatoki Yamamoto and Isao Endo, "Gene Amplification and Electrophoretic Separation on a PDMS-Glass Hybrid Microchip", *Electrophoresis*, 22 (2), pp. 328-333, 2001.

#### International Conference Proceeding Papers

1. Haruyuki Kinoshita, Marie Oshima, **Jong Wook Hong**, Teruo Fujii, Tetsuo Saga and Toshio Kobayashi, "Micro PIV Measurement for Electroosmotic Flow", Proceedings of 10th International Symposium on Flow Visualization, 2002, pp. 12-17. Aug. 26-29, 2002, Kyoto, Japan.

2. Haruyuki Kinoshita, Marie Oshima, **Jong Wook Hong**, Teruo Fujii, Tetsuo Saga and Toshio Kobayashi, "Micro PIV Measurement of Microchannel Flow", Proceedings of Japan-Korea Joint PIV Seminar, 2002, pp. 143-149, Dec. 2-3, 2002, Fukuoka, Japan.
3. Haruyuki Kinoshita, Marie Oshima, **Jong Wook Hong**, Teruo Fujii, Tetsuo Saga and Toshio Kobayashi, "Micro PIV Measurement of Electroosmotic Flow", Proceedings of the 6<sup>th</sup> International Conference on Miniaturized Chemical and Biochemical Analysis Systems (*microTAS2002*), Vol. 1. pp. 374-376, November 3-7, 2002, Nara, Japan.
4. Haruyuki Kinoshita, Marie Oshima, **Jong Wook Hong**, Teruo Fujii, Tetsuo Saga and Toshio Kobayashi, "PIV Measurement of Pressure- and Electrokinetically-driven Flow in Microchannels", Proceedings of **SPIE-Beijing** 2002 (CD-ROM), Sep. 3-6, 2002, Beijing, China.
5. **Jong Wook Hong**, Hisashi Hagiwara, Teruo Fujii, Hiroaki Machida, Mika Inoue, Minoru Seki, and Isao Endo, "Separation and Collection of a Specified DNA Fragment by Chip-based CE system", Proceedings of the 5<sup>th</sup> International Conference on Miniaturized Chemical and Biochemical Analysis Systems (*microTAS2001*), pp. 113-114, October 21 – 25, 2001, Monterey, CA, USA.
6. Minoru Seki, Masumi Yamada, Ryutaro Ezaki, Ryusuke Aoyama, **Jong Wook Hong**, "Chromatographic Separation of Proteins on a PDMS-polymer Chip by Pressure Flow", Proceedings of the 5<sup>th</sup> International Conference on Miniaturized Chemical and Biochemical Analysis Systems (*microTAS2001*), pp. 48-50, October 21-25, 2001, Monterey, CA, USA.
7. Minoru Seki, Ryusuke Aoyama, **Jong Wook Hong**, Teruo Fujii, and Isao Endo, "Novel Liquid Injection Method with Wedge-shaped Microchannel on a PDMS Microchip System for Diagnostic Analyses", Proceedings of the 11<sup>th</sup> International Conference on Solid-State Sensors and Actuators (*TRANSDUCERS2001*), pp. 1232-1235, June 10-14, 2001, Munich, Germany.
8. Minoru Seki, Ryusuke Aoyama, **Jong Wook Hong**, Teruo Fujii, and Isao Endo, "Multiple Diagnostic Analyses by Chemical and Enzymatic Reactions on a PDMS Microchip", Proceedings of the 1<sup>st</sup> International **IEEE EMBS** Special Topic Conference on Microtechnology in Medicine and Biology, pp. 21-24, October 12-14, 2000, Lyon, France.
9. **Jong Wook Hong**, Teruo Fujii, Minoru Seki, Takatoki Yamamoto, and Isao Endo, "Hybrid PDMS-Glass Microchip for Gene Amplification", Proceedings of the 1<sup>st</sup> International **IEEE EMBS** Special Topic Conference on Microtechnology in Medicine and Biology, pp. 407-410, October 12-14, 2000, Lyon, France.
10. Takatoki Yamamoto, Teruo Fujii, Takahiko Nojima, **Jong Wook Hong**, and Isao Endo, "Cell-free Protein Synthesis in a PDMS-Glass Hybrid Microreactor", Proceedings of **SPIE's** International Symposium on Micromachining and Microfabrication, Vol. 4177, pp. 72-79, September 18-21, 2000, Santa Clara, CA, USA.
11. **Jong Wook Hong**, Kazuo Hosokawa, Teruo Fujii, Minoru Seki, and Isao Endo, "Micromachined Polymer Microchip for DNA Separation", Proceedings of the 5<sup>th</sup> Asia-Pacific biochemical Engineering Conference (*APBioChEC'99*), p-bp44.pdf, Nov. 15-18, 1999, Phuket, Thailand.
12. **Jong Wook Hong**, Kazuo Hosokawa, Teruo Fujii, Minoru Seki, and Isao Endo,

“Capillary Gel Electrophoresis on a Disposable PDMS (polydimethylsiloxane) Microchip”, Proceedings of the 21<sup>st</sup> International Conference of the Engineering in Medicine and Biology Society (*IEEE EMBS'99*), p. 728, Oct. 13-16, 1999, Atlanta, GA, USA.

13. **Jong Wook Hong**, Kazuo Hosokawa, Teruo Fujii, Minoru Seki, and Isao Endo, “An Inexpensive PDMS (polydimethylsiloxane) Microchip for Capillary Gel Electrophoresis”, Proceedings of the 10<sup>th</sup> International Conference on Solid-State Sensors and Actuators (*TRANSDUCERS'99*), pp. 760-763, June 7-10, 1999, Sendai, Japan.

### International Conference Abstracts

1. **Jong Wook Hong**, Toshiharu Shiraishi, and Teruo Fujii, “Development of an evaluation platform for microfluidic devices: Real time imaging and data processing of chip-based analysis”, Abstract of the 15th International Symposium on Microscale Separations and Analysis (*HPCE2002*), April 13-18, Stockholm, Sweden.
2. **Jong Wook Hong**, Hisashi Hagiwara, Teruo Fujii, Hiroaki Machida, Minoru Seki and Isao Endo, “Picking up a DNA Fragment for the Downstream Analysis of CE on-a-Chip”, Abstracts of the International Symposium on Microchemistry and Microsystems (*ISMM 2001*), pp. 78-79, September 16-18, 2001, Kawasaki, Japan.
3. Takatoki Yamamoto, Takahiko Nojima and **Jong Wook Hong** and Teruo Fujii, “PDMS-Glass Hybrid Microreactor for Proteomics”, Abstracts of the International Symposium on Microchemistry and Microsystems (*ISMM2001*), pp. 80-81, September 16-18, 2001, Kawasaki, Japan.
4. Minoru Seki, **Jong Wook Hong**, Ryusuke Aoyama, Ryutaro Ezaki, Yasuhiro Kakigi, Masumi Yamada, Teruo Fujii, and Isao Endo, “Diagnostic Analysis by Biochemical Reactions and Separations on a Chip”, Proceedings of *IMRET5*, pp. 178-179, May 27-30, 2001, Starsbourg, France.
5. **Jong Wook Hong**, Teruo Fujii, Minoru Seki, Takatoki Yamamoto, and Isao Endo, “Genetic Analysis on a PDMS (polydiemthylsiloxane)-based microchip by PCR and Capillary Electrophoresis”, Abstract of the 14th International Symposium on Microscale Separations and Analysis (*HPCE2001*), p. 81, January 13-18, Boston, MA, USA.
6. Minoru Seki, Ryutaro Ezaki, **Jong Wook Hong**, Teruo Fujii, and Isao Endo, “Ion-exchange Chromatography on a PDMS Microchip”, Abstract of the 14th International Symposium on Microscale Separations and Analysis (*HPCE2001*), p. 120, January 13-18, Boston, MA, USA.
7. **Jong Wook Hong**, Teruo Fujii, Minoru Seki, Takatoki Yamamoto, and Isao Endo, “A PDMS (polydimethylsiloxane) – Glass Hybrid Microchip for Gene Amplification”, Abstracts of the 2000 International Chemical Congress of Pacific Basin Societies (*Pacificchem 2000*), ANYL 0290, Dec. 14-19, 2000, Honolulu, HI, USA.
8. Minoru Seki, Yasuhiro Kakigi, **Jong Wook Hong**, Teruo Fujii and Isao Endo, “Aqueous Phase System for the Continuous Separation of Macromolecules and Particulates in a Microchannel”, Abstracts of the 2000 International Chemical Congress of Pacific Basin Societies (*Pacificchem2000*), ANYL 0229, Dec. 14-19, 2000,

Honolulu, HI, USA.

9. Takatoki Yamamoto, Teruo Fujii, T. Nojima, **Jong Wook Hong**, and Isao Endo, "Multiple PDMS-glass Hybrid Microreactor for Cell-free Protein Synthesis", Abstracts of the 2000 International Chemical Congress of Pacific Basin Societies (*Pacificchem2000*), ANYL 0711, Dec. 14-19, 2000, Honolulu, HI, USA.
10. Takatoki Yamamoto, Teruo Fujii, Takahiko Nojima, **Jong Wook Hong**, and Isao Endo, "PDMS-Glass Hybrid Microreactor for Cell-Free Protein Synthesis", Handout of the 4<sup>th</sup> European Conference on Micro and Nanoscale Technologies for Biosciences (*Nanotech2000*), November 26-30, 2000, Montreux, Switzerland.
11. **Jong Wook Hong**, Teruo Fujii, Minoru Seki, Takatoki Yamamoto, and Isao Endo, "MicroBiochemical Engineering: Biochemical Reaction and Separation on a Microchip", Abstracts of the 6<sup>th</sup> Conference of the Young Asian Biochemical Engineers Community (*YABEC2000*), Nov. 5-7, 2000, Fukuoka, Japan.
12. Minoru Seki, **Jong Wook Hong**, Ryusuke Aoyama, Ryutaro Ezaki, Yasuhiro Kakigi, Teruo Fujii, and Isao Endo, "Development of Microsystems with Microchannel", Proceedings of the 3<sup>rd</sup> International Soybean Processing and Utilization, pp. 657-660, October 15-20, Tsukuba, Japan.
13. Teruo Fujii, **Jong Wook Hong**, Kazuo Hosokawa, Minoru Seki, and Isao Endo, "PDMS (polydimethylsiloxane) Microchip for Capillary Gel Electrophoresis and Microfluidic Operations", Abstracts of the 12<sup>th</sup> International Symposium on High Performance Capillary Electrophoresis and Related Microscale Techniques (*HPCE 2000*), p. 112, Feb. 20-24, 2000, Saarbrücken, Germany.
14. Minoru Seki, **Jong Wook Hong**, Teruo Fujii, and Isao Endo, "MicroBioChemical Engineering – A Promising new Field for the 21<sup>st</sup> Century", Abstracts of the 5<sup>th</sup> Conference of the Young Asian Biochemical Engineers Community (*YABEC'99*), pp. 13-15, Aug. 20-22, 1999, Busan, Korea.
15. **Jong Wook Hong**, Kazuo Hosokawa, Teruo Fujii, Minoru Seki, and Isao Endo, "Bioseparation of Biomolecules in Microfabricated Structures", Abstracts of the International Conference on Bioseparation Engineering 'Recovery and Recycle of Resources to Protect the Global Environment' (*RRR'99*), p. 31, June 4-7, 1999, Nikko, Japan.

### Book Chapters

1. **Jong Wook Hong**, Kazuo Hosokawa, Teruo Fujii, Minoru Seki, and Isao Endo, "Microfabricated Structures for Bioseparation", in *Bioseparation Engineering*, Vol. 16, Ed. by Isao Endo, et al., Elsevier Science, pp. 69-74, 2000, Amsterdam, the Netherlands.
2. **Jong Wook Hong**, Kazuo Hosokawa, Teruo Fujii, Minoru Seki, and Isao Endo, "Optimization of DNA Separation by Capillary Gel Electrophoresis on a Microfabricated Polymer Chip", *Chem. Eng. Symp. Series*, 70, pp. 177-180, 1999.

## References

Dr. Stephen R. Quake  
Professor of Applied Physics and Physics  
California Institute of Technology  
MC 128-95, Pasadena, CA 91106  
Phone: 626-395-3362  
Fax: 626-793-8675  
e-mail: [quake@caltech.edu](mailto:quake@caltech.edu)

Dr. Jared R. Leadbetter  
Professor of Environmental Microbiology  
California Institute of Technology  
MC 138-78, Pasadena, CA 91106  
Phone: 626-395-4182  
Fax: 626-395-2940  
e-mail: [jleadbetter@caltech.edu](mailto:jleadbetter@caltech.edu)

Dr. Minoru Seki (former the University of Tokyo)  
Professor of Chemical Engineering  
Osaka Prefecture University  
Gakuen-cho, Sakai, Osaka 599-8531, Japan  
Phone: +81-72-254-9296 (or +81-3-5841-7341 until February 2004)  
Fax: +81-72-254-9911  
e-mail [seki@chemeng.osakafu-u.ac.jp](mailto:seki@chemeng.osakafu-u.ac.jp) or [mseki@chembio.t.u-tokyo.ac.jp](mailto:mseki@chembio.t.u-tokyo.ac.jp)

Dr. Shintaro Furusaki (former the University of Tokyo)  
Professor of Applied Life Science  
Sojo University  
4-21-1 Ikeda, Kumamoto 860-0082, Japan  
Phone: +81-96-326-3111 Ext. 5223  
Fax: +81-96-323-1331  
e-mail: [furusaki@life.sojo-u.ac.jp](mailto:furusaki@life.sojo-u.ac.jp)

Dr. Frank A. Gomez, Ph.D.  
Professor of Chemistry  
California State University, Los Angeles  
5151 State University Drive  
Los Angeles, CA 90032-8202  
Phone: 323-343-2368  
Fax: 323-343-6490  
e-mail: [fgomez2@calstatela.edu](mailto:fgomez2@calstatela.edu)