

FRANK VOLLMER

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CURRICULUM VITAE

ACADEMIC CAREER

Research Group Leader
PI, Rowland Junior Fellow

Harvard University 04-
Cambridge, MA present

EDUCATION

Ph.D. Physics & Biology
Advisor: Dr. A. Libchaber

Rockefeller University 04
New York, NY

Thesis: "Resonant Detection of Nano- to Microscopic Objects using Whispering Gallery Modes" (collaboration with Dr. S. Arnold, Polytechnic Institute of NYU)

M.S. Biochemistry
Advisor: Dr. R.G. Roeder

University Hannover 98
Germany

Thesis (external at Rockefeller University): "Cloning and Characterization of a Human Homologue of the TATA Box Binding Protein"

B.S. Biochemistry

University Bayreuth 95
Germany

ACADEMIC AWARDS AND HONORS

- Rowland Junior Fellowship, Harvard University 04
- Boehringer Ingelheim Fonds Ph.D. Fellowship (www.BIFonds.de) 00
- Valedictorian Moerike Gymnasium Esslingen, Germany 92

LICENSES

- Safety Officer for Molecular Biology (Medical School Hannover, Germany, 97)
- Surgical Operations of Small Laboratory Animals (Medical School Hannover, Germany, 96)
- Radio-Labeling of Biomolecules (Medical School Hannover, Germany, 96)

LEADERSHIP ACTIVITIES & TEACHING

Research Experience for Undergraduates (REU, Harvard)	05-07
Participated in Freshman Seminar (Harvard)	04-05
Rowland Methods Seminar (Rowland Institute)	04-08
Photonic Atom Sensors, Inc. (NY)	President 03-05
Co-organizer, APS March Meeting Symposium	07

PROFESSIONAL ACTIVITIES

Referee (Science, Optics Letters, Applied Physics Letters, Biophysical Journal, Lab on a Chip, Optics Express, Journal of Applied Physics, JOSAB, J. Sel. Top. Quant. Electron., IEEE Sensor Journal, Journal of Biophotonics)

OTHER WORK EXPERIENCE

Micro- & Nanofabrication (Center for Nanoscale Systems, Harvard)	05-08
Medical-Technical Assistant	Katharinen Hospital 92-93 Suttgart, Germany

CONTACT FOR REFERENCES

- **Prof. Albert Libchaber** PhD Advisor, Rockefeller University, NY
The Rockefeller University, 1230 York Ave Box #265, New York, NY 10065
phone: (212) 327 8185, email: libchbr@rockefeller.edu
- **Prof. Frans Spaepen** Dean, SEAS at Harvard University
Harvard University, Pierce 208, Cambridge, MA 02138
phone: (617) 495 3760, email spaepen@seas.harvard.edu
- **Prof. Howard Berg** The Rowland Institute at Harvard University
Harvard Biological Laboratories, Room 3063, 16 Divinity Avenue, Cambridge, MA 02138
phone (617) 495 0924, email: hberg@mcb.harvard.edu

- **Prof. Stephen Arnold** Polytechnic Institute of NYU, Brooklyn, NY
Polytechnic University, RH 620, Six Metro Tech Center, Brooklyn, NY 11201
phone: (718) 260 3899, email: sarnold935@aol.com
- **Dr. Mike Burns** Director, The Rowland Institute at Harvard University
The Rowland Institute, 100 Edwin H.Land Blvd, Cambridge, MA 02142
phone: (617) 497 4698, email: burns@rowland.harvard.edu
- **Prof. Jim Hudspeth** PhD Thesis Committee, Rockefeller University, NY
Laboratory of Sensory Neuroscience, 1230 York Avenue box 314, New York, NY
10065
phone: (212) 327 7351, email: hudspaj@rockefeller.edu

PUBLICATIONS

F. Vollmer, S. Arnold, D. Keng “Single virus detection from reactive shift of a whispering-gallery mode”, *under review at PNAS*

F. Vollmer, S. Arnold “Whispering-gallery-mode biosensing: label-free detection down to single molecules”, *Nature Methods* 5 (2008)

J. Yang, J. Heo, T. Zhu, J. Xu, J. Topolancik, **F. Vollmer**, R. Ilic, P. Bhattacharya “Enhanced photoluminescence from embedded PbSe colloidal quantumdots in Si-based random photonic crystal microcavities”, *Appl. Phys. Lett.* 93 (2008)

J. Topolancik, B. Ilic, **F. Vollmer** “Experimental observation of strong photon localization in disordered photonic crystal waveguides”, *Phys. Rev. Lett.* 99 (2007)

H.-C. Ren, **F. Vollmer**, S. Arnold, A. Libchaber “High-Q microsphere biosensor - analysis for adsorption of rodlike bacteria”, *Optics Express* 15 (2007)

J. Topolancik, **F. Vollmer**, B. Ilic “Random high-Q cavities in disordered photonic crystal waveguides”, *Appl. Phys. Lett.* 91 (2007)

V. Lien, **F. Vollmer** “Microfluidic flow rate detection based on integrated optical fiber cantilever” *Lab Chip* 7 (2007)

J. Topolancik, **F. Vollmer** “Photoinduced transformations in bacteriorhodopsin membrane monitored with optical microcavities” *Biophysical Journal* 92 (2007)

F. Vollmer, P. Fischer “Frequency- domain displacement sensing with a fiber ring-resonator containing a variable gap” *Sensors and Actuators A* 134 (2007)

J. Topolancik, **F. Vollmer** “All-optical switching in the near-IR with bacteriorhodopsin-coated microcavities” *Appl. Phys. Lett.* 89 (2006)

F. Vollmer, P. Fischer “Ring- resonator-based frequency-domain optical activity measurements of a chiral liquid” *Optics Letters* 31 (2006)

F. Vollmer "Taking detection to the limit" *B.I.F. Futura* 20 (2005), a publication of the Boehringer Ingelheim Fonds, Germany (<http://www.bifonds.de/public/inhaltf4.htm>).

G. Guan, **F. Vollmer** "Polarized transmission spectra of the fiber-microsphere system" *Appl. Phys. Lett.* 86 (2005)

S. Arnold, M. Noto, **F. Vollmer**, "Ultra-sensitive detection of perturbations by biomolecules" In: B. DiBartolo, O. Forte (eds.) "Frontiers of optical spectroscopy" *Kluwer Academic Publishers* (2005)

M. Noto, **F. Vollmer**, D. Keng, I. Teraoka, S. Arnold "Nanolayer characterization through wavelength multiplexing of a microsphere resonator" *Optics Letters* 30 (2005)

Doctoral Dissertation **F. Vollmer**, "Resonant detection of nano to microscopic objects using whispering gallery modes" *The Rockefeller University* (2004).

F. Vollmer, S. Arnold, D. Braun, I. Teraoka, A. Libchaber "Multiplexed DNA quantification by spectroscopic shift of two microsphere cavities" *Biophysical Journal* 3 (2003)

I. Teraoka, S. Arnold, **F. Vollmer** "Perturbation approach to shift of whispering-gallery modes in microspheres by protein adsorption" *Journal of the Optical Society of America B* 20 (2003)

S. Arnold, M. Khoshshima, I. Teraoka, S. Holler, **F. Vollmer** "Shift of whispering-gallery modes in microspheres by protein adsorption" *Optics Letters* 28 (2003)

F. Vollmer, D. Braun, A. Libchaber, M. Khoshshima, I. Teraoka, S. Arnold "Protein detection by optical shift of a resonant microcavity" *Appl. Phys. Lett.* 80 (2002)

M. Teichmann, Z. Wang, E. Martinez, A. Tjernberg, D. Zhang, **F. Vollmer**, B.T. Chait, R.G. Roeder, "Human TATA-binding protein-related factor-2 (hTRF2) stably associates with hTFIIA in HeLa cells" *PNAS* 96 (1999)

CONFERENCE PAPERS

F. Vollmer, J. Topolancik "Disorder-induced High-Q cavities in photonic crystal waveguides" *Photonics West LASE*, San Jose, CA, USA (2008)

J. Deng, A. Tippie, **F. Vollmer**, V. Lien, E. Chen "Whispering-gallery-mode microdisk biosensor: fabrication and characterization" *Optics East*, Boston, MA, USA (2007)

J. Topolancik, **F. Vollmer** "Monitoring of molecular transformations with optical microresonators" Technical Digest 18th *International Conference on Optical Fiber Sensors*, Cancun, Mexico (2006)

F. Vollmer, S. Arnold, I. Teraoka, A. Libchaber "Whispering gallery mode biosensor" Technical Digest 16th *International Conference on Optical Fiber Sensors*, Nara, Japan (2003)

F. Vollmer, S. Arnold, D. Braun, et al. "DNA detection from shift of whispering gallery modes in microspheres" *Annual Biophysical Society Meeting*, San Antonio, TX, USA (2003)

F. Vollmer, S. Arnold, A. Libchaber "Novel, fiber-optic biosensor based on morphology dependent resonances in dielectric micro-spheres" *Annual Biophysical Society Meeting*, San Francisco, CA (2002)

PATENT APPLICATIONS

F. Vollmer, J. Topolancik "System and method for strong photon localization by disordered photonic crystal structures (quasicrystals)" 60/941,950 & 60/980,816

F. Vollmer, J. Topolanick "Methods and devices for measurement using pump-probe spectroscopy in High-Q microcavities" WO/2008/034118

F. Vollmer, V. Lien "Devices and methods for microfluidic flow-rate and particle detection based on integrated optical fiber cantilever" provisional

F. Vollmer, J. Topolancik "Methods, materials and devices for light manipulation with oriented molecular assemblies in micronscale photonic circuit elements with High-Q or slow light" WO/2007/134177

F. Vollmer, P. Fischer "Method and apparatus for measuring and monitoring optical properties based on a ring-resonator" 20060227331

S. Arnold, I. Teraoka, **F. Vollmer** "Perturbation approach to resonance shift of whispering gallery modes in a dielectric microsphere as a probe of a surrounding medium" 20040238744

S. Arnold, I. Teraoka, Y. Okamoto, **F. Vollmer** "Using a change in one or more properties of light in one or more microspheres for sensing chemicals such as explosives and poison gases" 20040196465

S. Arnold, I. Teraoka, **F. Vollmer** "Enhancing the sensitivity of a microsphere sensor using a shift of whispering gallery modes in the microsphere caused by adsorption of target entities" 20040137478

SEMINARS

UMissouri (Dr. Fan), MO	05/2008
Queens College (Dr. Genack), NY	03/2008
UMaine (Dr. Amar), ME	11/2007
MIT (Dr. Bhatia), MA	6/2007
Workshop "Physics of Microresonators" UNC Charlotte (Dr. Astratov), NC	6/2007
University Massachusetts Boston (Dr. Rao), Boston, MA	2/2007
Lehigh University (Dr. Vezenov), Bethlehem, PA	9/2006
Center for Genomics, Harvard University, Cambridge, MA	5/2005

Courant Institute, Applied Math Seminar (Dr. Zhang), New York, NY

4/2004

The Rockefeller University, TriLab Seminar, New York, NY

2/2004