

# Déborah Berebichez

e-mail: [debbieb@gmail.com](mailto:debbieb@gmail.com)  
URL: [www.math.nyu.edu/~debbie1](http://www.math.nyu.edu/~debbie1)  
[www.thesciencebabe.com](http://www.thesciencebabe.com)  
tel: (917) 816-8103

## Education

### **NSF Postdoctoral Fellowship in Applied Mathematics and Physics, 2006**

Courant Institute for Mathematical Sciences, NYU and Department of Applied Physics and Applied Mathematics, Columbia University, New York, NY

**Research:** *Optimization of Scattering Resonances in Photonic Crystals*

- Determined novel uses of photonic crystals for nanotechnology applications such as small devices for data communications. Work involved optimization via sensitivity analysis and the use of finite-differences to solve partial differential equations with varying coefficients. Developed expertise in numerical iterative methods for root finding and minimization such as conjugate gradient and Newton search

### **Ph.D. in Physics, Stanford University, Stanford, CA, 2004**

**Dissertation:** *Time reversal for temporal compression and spatial focusing of acoustic signals in enclosures*

- Built physical model for wave propagation in inhomogeneous media. Introduced and developed new designs for wireless communications systems in indoor buildings that have potential advantages over current approaches

### **M.Sc. in Physics, Stanford University, Stanford, CA, 2000**

### **M.Sc. in Physics with concentration in Biophysics, UNAM, Mexico City, Mexico, 1998**

### **B.A. in Physics and Philosophy, Brandeis University, Waltham, MA, 1996**

## Honors

- June 2008** Keynote speaker at Oprah's national leadership conference: Women Rule! Shared the stage with Gayle King, Marie Wilson. Selected to participate from over 3,000 applicants
- 1998-2002** Stanford University, Stanford, CA. CONACYT full scholarship for academic merit
- 1996-1998** Universidad Nacional Autónoma de México, Mexico City. Academic merit DGAPA scholarship
- 1993-1996** Wien International full tuition scholarship, awarded to five students per year, Brandeis University, Waltham, MA.  
*Summa Cum Laude, Phi Beta Kappa*, highest honors in physics and philosophy theses.

## Experience

June 2008-present

### **MSCI Barra, New York, NY**

#### ***Senior Associate in Equity Analytics***

- Work closely with research, product development and client service to identify quantitative analysis solutions to assist in the investment process of broker dealers and hedge funds. Participate in the expansion and deployment of fixed income and equity risk, optimization and performance analytics tools.

January 2007-January 2008

**AQR Capital, Greenwich, CT**

***Research Associate in the Global Stock Selection Group***

- Perform mathematical and statistical analysis on financial data to develop new and improve on current quantitative investment strategies. Used MSCI Barra's Global Equity Risk Model and Optimizer to analyze financial data and examine the performance of proprietary investment strategies

September 2001-January 2002

**Stanford Linear Accelerator Center, Stanford, CA**

***Research Assistant in physics***

- CP violation in heavy quark decays. Tests of the Standard Model at higher energy  $e^+e^-$  colliders. Constructed an original detecting device to discover sub-atomic particles that penetrate the earth's atmosphere after traveling through inter-galactic space. Elaborated the theory and computer simulation of this process to validate experimental results.

September 1999-August 2001

**Steve Chu Biophysics Lab, Physics Department, Stanford, CA**

***Research Assistant in physics***

- Theoretical Biophysics of Gene Regulation. Carried out fluorescence resonance energy transfer (FRET) experiments to study biophysics of single molecules. Created kinetic model to explain the mechanisms by which RNA polymerase recognizes and binds to promoters in DNA. Model included role of the specific DNA-binding regulatory proteins in transcription initiation. Showed that the enzyme exhibits the properties of meta-stability and memory.

September 1996-August 1997

**Medical physics and Biophysics Lab, Medical School, Mexico City, Mexico**

***Research Assistant in physics***

September 1994-July 1996

**Physics Department, Brandeis University/ Raytheon Co, Waltham, MA**

***Research Assistant in Electro-optics***

- Built an electro-optic device using liquid crystals for future application in space telecommunication. Acted as project liaison between lab team members, industry scientists and executives to translate experimental results and evaluate production and design costs.

## Teaching

September 1998- June 2004 Teaching Assistant, Stanford University, Stanford, CA

- Undergraduate classes: Introduction to classical mechanics, electrodynamics.
- Graduate classes: Quantum mechanics, statistical mechanics.  
Responsibilities included:
  - Delivering bi-weekly lectures, held office hours, and conducted weekly discussion sections
  - Organized graduate and undergraduate courses and designed curricula
  - Supervised and managed team of 15 Teaching Assistants.

## Conferences and workshops

- Extensive public speaking at over 15 conferences, including large audiences of high-tech innovators and scientists. Most recent published article: P. Heider, D. Berebichez, R.V. Kohn, and M.I.

- Weinstein, "Optimization of scattering resonances," Structural and Multidisciplinary Optimization.
- Speaker at Internet Cowboy Unconference (ICUC), Jackson Hole, WY, July 9-13, 2008.
  - Invited speaker at Mathematical Modeling of Novel Optical Materials and Devices, Snowbird, Utah, June 11-17, 2005.
  - Time-reversal for acoustic communications, ARCC workshop in time reversal and communications, American Institute of Mathematics, Palo Alto, CA, October 18-22, 2004.
  - Spatial and temporal focusing in enclosures after time-reversal, Seventh International Conference on Mathematical and Numerical Aspects of Wave Propagation, Brown University, June 20-24, 2005.
  - Time reversal numerical experiments in enclosures, Workshop on Time-reversal methods, University of California at Irvine, August 8-11, 2003.
  - Mathematical Geophysics Summer School (MGSS), Stanford University, Stanford, CA, August 2002
  - American Physical Society Meeting (APS), Seattle, WA, March 2001.
  - Condensed Matter Physics Meeting, Universidad Carlos III de Madrid, Madrid, Spain, July 2001.
  - Energy Landscapes and Drug Design Conference, Supercomputing Center, University of California, San Diego, CA 2001.
  - Biophysics Conference, Boston, MA, 2001.
  - American Physical Society Meeting (APS), Atlanta, GA, March 1999.
  - Member of the American Physical Society.

### Scientific film

Simulation of a time-reversal experiment in an enclosure with a keyhole, 2004.

### Professional Skills

**Languages** - Fluent in English, Spanish, Hebrew, Yiddish, intermediate French, reading proficiency in German, Greek.

**Computer Programming** - Expert in Matlab, experienced in C, C++, Unix/Linux, Vision, Microsoft Office, Mathematica, xml

**Practical experience** - Science writer, financial risk analyst, decision analysis, video producer and entrepreneurial leader

### Leadership

**Science communication project "The Science of Everyday Life":** [www.thesciencebabe.com](http://www.thesciencebabe.com)

**Public Relations:** organized major physics conference in Mexico City to promote adviser Nobel Prize winner Robert Laughlin's book "A Different Universe." Obtained press interviews, organized four lectures, translated simultaneously to Spanish.

**Science Writer:** Recent Essay on "Scientific Literacy in the XXI Century."

**Committee for the Advancement of Women in Physics:** Pioneered and organized monthly events to promote participation, solve ongoing problems, and make resources available for women in physics.

**Newspaper Columnist:** Founding writer of "Crossroads" in the Stanford Daily focusing on the business impact of science and technology.

**Mexican Student Association, Board Member:** Planned and coordinated cultural, social and academic events of interest to the Stanford community and the greater Bay Area.

**Acting:** Four years of acting experience wrote three plays and performed professionally in Jean Genet's "The Maids" in Mexico City.