



Miller Institute News

The Miller Institute is "dedicated to the encouragement of creative thought and the conduct of research and investigation in the field of pure science and investigation in the field of applied science in so far as such research and investigation are deemed by the Advisory Board to offer a promising approach to fundamental problems."

Miller Fellow Focus: Emily Brodsky

First year Miller Fellow Emily Brodsky develops novel interpretations of geophysical data using fluid mechanics. Dr. Brodsky is hosted by Professor Michael Manga in the Department of Earth and Planetary Science.

Fluid mechanics can have important ramifications for both the qualitative and quantitative study of solid Earth geophysics. For instance, in a recent *Journal of Geophysical Research* paper with Professor Kanamori of Caltech, Dr. Brodsky demonstrated that faults may be lubricated by the same mechanism as oiled bearings. In 1886 Oswald Reynolds first proposed an explanation for Beauchamp Tower's experimental discovery that introducing a continuous film of oil into a bearing reduces both the frictional resistance and the wear. Reynolds calculated the pressure increase expected from shearing the viscous oil using the Navier-Stokes equations. He found that the shear stress was sufficient to increase the oil pressure as observed. The high pressure pushed the faces of the bearing apart therefore minimizing the wear that would have resulting from grinding metal parts.

Dr. Brodsky found parallels between natural faults and lubricated bearings. In both cases, a large load must be supported during the shearing of a thin gap. In the case of a fault, the faces are of rock instead of metal and the viscous fluid is mud instead of oil. Applying lubrication theory to faults helps to explain why frictional heat generation during earthquakes is relatively low. The theory also suggests an explanation for the recent puzzling observation that large earthquakes sometimes slip more smoothly than smaller ones. For large earthquakes, the lubrication pressure is sufficient to elastically deform the fault walls and reduce the rapid grinding of surface asperities. The slip threshold for such smoothing behavior is consistent with the slip observed during the recent magnitude 7.6 1999 Chi-Chi, Taiwan earthquake for a reasonable set of model parameters.

While at Berkeley, Dr. Brodsky has been focusing on observing and modeling the effects of seismic waves on confined aquifers at large distances (>100 km) from large earthquakes (magnitude >7). Well-water level changes in excess of 10 cm recorded in response to distance earthquakes have proven enigmatic for over 30 years. Recent observations of seismicity triggered by distant earthquakes in fluid-dominated geothermal systems has added a new incentive to understanding the the mechanism for the seismically induced hydrological changes. In collaboration with Dr. Evelyn Roeloffs of the U.S. Geological Survey and colleagues at the Department of Water Resources in Oregon, Dr. Brodsky is using high sampling rate water level data to perform the first simultaneous analysis of the dynamic response of water level and permanent offsets.

DEADLINE TO NOTE

Monday, February 11, 2002 Visiting
Miller Professor nominations for terms in
Academic Year 2002-03.

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Recent Publications

**Miller Professor Michael Christ (2000-2001)**

published two papers during his term with the Miller Institute: "On certain elementary trilinear operators," *Math. Research Letters* 8 (2001), 43-56, "WKB and spectral analysis of one-dimensional Schrödinger operators with slowly varying potentials," with A. Kiselev, *Comm. Math. Phys.* 218 (2001), 245-262.

Miller Professor J.C. Séamus Davis (2000-2001)

published five papers during his year with the Miller Institute: "STM studies of The Electronic Structure of Vortex Cores in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+d}$," with S. H. Pan, E. W. Hudson, A. K. Gupta, K-W Ng, H. Eisaki and S. Uchida, *Phys. Rev. Lett.* 85, 1536 (2000), "A Detailed Scanning Tunnelling Microscopy Study of the CuO chains of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$," with D. J. Derro, S. H. Pan, E. W. Hudson, K. M. Lang, K. Mochizuki, J. T. Markert and A. de Lozanne, *Physica C* 341, 425 (2000), "Interplay of magnetism and high-Tc superconductivity at individual magnetic impurity atoms in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+d}$," with E. E. Hudson, K. M. Lang, V. Madhavan, S. H. Pan, H. Eisaki and S. Uchida, *Nature* 411, 920 (2001), "Observation of The Shapiro Effect in a Superfluid ^3He Weak Link," with R. W. Simmonds, A. Marchenkov, and R. E. Packard, *Phys. Rev. Lett.* 87, 5602 (2001), and "Quantum Interference of Superfluid ^3He ," with R.W. Simmonds, A. Marchenkov, and R. E. Packard, *Nature* 412, 55 (2001).

Miller Professor Stuart Linn (Fall 2000)

completed six papers during his prolific term with the Miller Institute: "Human Damage-specific DNA Binding Protein p48," with A. F. Nichols, T. Itoh, J. A. Graham, W. Liu and M. Yamaizumi, *J. Biol. Chem.* 275, 21422-214428 (2000), "Nuclear Transport of Human DDB Protein Induced by Ultraviolet Light," with W. Liu, A.F. Nichols, J. A. Graham, R. Dualan, and A. Abbas, *J. Biol. Chem.* 275, 214429-214434 (2000), "Identification and Cloning of Two Histone-fold Motif Containing Subunits of HeLa DNA Polymerase α ," with Y. Li, and Z. F. Pursell, *J. Biol. Chem.* 275, 23247-23252 (2000), "MDM2 interacts with the carboxy terminus of the catalytic subunit of DNA polymerase Epsilon," with N. Vlatkovic, S. Guerrero, S. Li, D. S. Haines, and M. T. Boyd, *Nuc. Ac. Res.* 28, 3581-3586 (2000), "Proteolysis of the human DNA polymerase epsilon catalytic subunit by caspase-3 and calpain specifically during apoptosis," with W. Liu, *Nuc. Ac. Res.* 28, 4180-4188 (2000), and "A mammalian DNA polymerase alpha inhibitor," with Y. Mizushima, S. Kamisuki, T. Mizuno, M. Takemura, H. Asahara, T. Yamaguchi, A. Matsukage, F. Hanaoka, S. Yoshida, M. Saneyoshi, F. Sugawara, and K. Sakaguchi, *J. Biol. Chem.* 275, 33957-33961 (2000)

Miller Fellow Focus: Emily Brodsky Continued

Aquifer properties such as permeability can be measured by examining the ratio of the amplitude of seismic waves in the well to the amplitude in the ground as recorded by a seismometer. Dr. Brodsky interprets a change in this ratio with time as evidence for a transient colloidal barriers in the fractured aquifer. Based on these observations, the group is proposing a new model for coseismic pore pressure changes in which a temporary barrier is removed by the flow induced by seismic waves.

Dr. Brodsky will be leaving the Miller Institute in February to accept a position as Asst. Professor at UCLA.



Miller Fellow
Emily Brodsky

 Recent Miller Institute Awards **Miller Professorships**

The Executive Committee and Advisory Board granted ten new Miller Professorship awards for terms during the 2002-2003 academic year.

<i>Astronomy</i>	Professor Jonathan Arons
<i>Chemistry</i>	Professor Robert Bergman Professor Birgitta Whaley
<i>Civil & Environmental Engineering</i>	Professor Anil Chopra
<i>Earth & Planetary Science</i>	Professor James Kirchner
<i>Integrative Biology</i>	Professor Wayne Sousa
<i>Physics</i>	Professor Dmitry Budker
<i>Plant & Microbial Biology</i>	Professor Brian Staskawicz
<i>Statistics</i>	Professor Steven Evans Professor Yuval Peres

Visiting Miller Professorships

The Executive Committee and Advisory Board of the Miller Institute have also granted awards to the following Visiting Miller Professors. Their terms range from fourteen days to one semester during the 2002-2003 academic year.

<i>Astronomy</i>	Prof. Philip Myers, Harvard-Smithsonian CFA
<i>Chemical Engineering</i>	Prof. Andreas Acrivos, City College of New York
<i>Chemistry</i>	Prof. Donna Blackmond, University of Hull, UK Prof. Marsha Lester, University of Pennsylvania
<i>EECS</i>	Prof. Dimitris Bertsimas, Massachusetts Institute of Technology
<i>Mathematics</i>	Prof. Nicolas Burq, Universite Paris Sud-Orsay, France
<i>MCB</i>	Prof. Edwin Levitan, University of Pittsburgh
<i>Optometry</i>	Prof. Subrata Tripathi, Tata Institute of Fundamental Research, India
<i>Physics</i>	Prof. Jon Leinaas, University of Oslo, Norway Prof. Eliezer Rabinovici, Racah Institute of Physics, Israel
<i>Plant & Microbial Biology</i>	Prof. David Read, University of Sheffield, UK
<i>Psychology</i>	Prof. Vittorio Gallese, Universita di Parma, Italy
<i>Statistics</i>	Prof. Fabio Martinelli, Universita di Roma Tre, Italy



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2536 Channing Way #5190
Berkeley, CA 94720-5190
Phone: (510) 642-4088
Fax: (510) 643-7393
<http://socrates.berkeley.edu/~4mibrs>

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Awards and Honors



Former Miller Fellow Matthew Francis has been appointed Assistant Professor in the Department of Chemistry at the University of California, Berkeley.

Former Miller Fellow Adam Summers was appointed Assistant Professor in the Department of Ecology and Evolutionary Biology at the University of California, Irvine in July 2001.

Former Miller Professor Anil Chopra ('90-'91) was awarded the 2001 Norman Medal from the American Society of Civil Engineers. The award is given for the best paper among all the journals published by the society.



Stork Club

The Miller Institute would like to congratulate third year Miller Fellow Tom Juenger and his wife Maria Juenger on the birth of their son Benjamin Thomas Juenger . Ben was born on December 3, 2001.