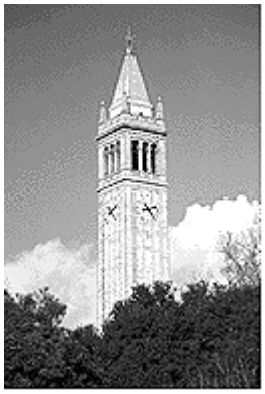

Miller Institute News

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: Philip Kim

Second year Miller Fellow Philip Kim has been working on the investigation of physical properties of nanoscale materials and seeking possible device applications of such materials. Dr. Kim is hosted by Professor Paul McEuen and Professor Seamus Davis in the Physics Department.

The recent availability of novel nanoscale materials, such as fullerenes, carbon nanotubes, nanowires, and nanocrystals, is enabling the assembly and study of 'molecular' electronics and mechanical devices, and allows the exploration of fundamental physics in low-dimensional systems. Progress has been made, possibly in part due to the invention of new experimental tools such as scanning probe microscopy (SPM) and to the advance of semiconductor device technology, including techniques for constructing microelectromechanical systems (MEMS). Combining these new experimental techniques with nanoscale materials has produced ample opportunities to explore the new physical phenomena and may impact future technologies. The focus of Dr. Kim's research at Berkeley has been the investigation of electrical, electromechanical, and thermal properties of novel nanoscale materials and their possible applications.

As a specific example, Dr. Kim studied the thermal transport phenomena in recently discovered carbon nanotubes, which have attracted a great deal of theoretical and experimental work recently. The electronic properties of these materials have been intensively studied and they have exhibited numerous unique phenomena due to the quantum confinement of electrons. However, the thermal and thermoelectric properties of these materials are not well characterized experimentally, despite their importance to understanding the nature of these materials and possible device applications. Dr. Kim investigated the mesoscopic thermal transport phenomena in 1-dimensional nanomaterials at the single nanowire level using a hybrid approach of MEMS technologies and new material synthesis methods. It has been demonstrated during his research that such hybrid devices are, in fact, feasible. They have been employed to measure thermal conductivity and thermoelectric power of carbon nanotubes at mesoscopic scale. These studies recently show that carbon nanotubes have unusually high thermal conductivity, which is the first experimental realization of long lingered theoretical predictions.

Continued on page 2

INSIDE THIS EDITION

Miller Fellow Focus: Philip Kim

In addition to the thermal transport measurement in 1-d structures, Dr. Kim also investigates the electronic properties of novel 2-dimensional (2-d) nanocrystals. Many peculiar physical phenomena, such as strong electron correlation, charge density wave formation, and even high temperature superconductivity, arise in 2-d electronic systems in various layered materials. If small pieces of a single atomic sheet of layered materials, such as graphite, metal-dichalcogenides, and high temperature superconductors, could be extracted from their host crystals, they should serve as a new 2-d confining box for electrons, which will provide a rich physics that one cannot access in bulk materials. He has demonstrated that thin slabs of graphite crystals, whose lateral size is an order of micron and thickness ranges 3-10 nm, could be extracted mechanically from a bulk sample. The electronic properties of these thin slabs of graphite nanocrystals were probed through lithographically defined electrodes on an insulating substrate. The electronic properties of these 2-d nanocrystals can be probed through electronic transport using lithographically defined electrodes. One of the merits of this experiment is that the electron interaction of the 2-d nanocrystals can be tuned using the gate electrode. By changing the voltage on the gate electrode, one can tune the electron density, and hence Fermi level. Dr. Kim demonstrated that, indeed, the Fermi level of such graphite nanocrystalite can be adjusted by an external gate potential without chemical doping, observing the changes in the conductance and periodicities of de Haas-van Alphen oscillation in magneto resistance.

"The Focus of Dr. Kim's research has been the investigation of electrical , electromechanical and thermal properties of novel nanoscale materials"

Exploiting modern state-of-art semiconductor device fabrication technologies and developing new methods of material synthesis are essential for Dr. Kim's research. In this regard, he has been working on interdisciplinary research efforts, established in collaboration with electrical and mechanical engineers, chemists, material scientists, and biologists on UC Berkeley campus. Dr. Kim is planning to continue his research in the field of mesoscopic science, investigating electrical, thermal and mechanical material properties of nanoscale materials, and also exploring their applications in the real world.

As a Korean citizen, Dr. Kim grew up in Seoul, Korea, and received his B.S. at Seoul National University. He then came to the US where he received his Ph. D. from Harvard University. Beginning January 1, 2002 he will join the Physics Department at Columbia University as an assistant professor.

Recent Miller Institute Awards

Visiting Miller Professorships

The Executive Committee and Advisory Board of the Miller Institute have granted awards to the following Visiting Miller Professors. Their terms range from fourteen days to one semester during the 2001-2002 academic year:

Astronomy	Prof. Ronald Ekers, Australia Telescope National Facility Prof. Jonathan Lunine, University of Arizona
Chemistry	Prof. Mats Larsson, Stockholm University, Sweden Prof. Cynthia Jameson, University of Illinois at Chicago
Civil & Envi. Eng.	Prof. James Jirsa, University of Texas
Earth & Planetary Science	Prof. Phillippe Lognonne, University of Paris VII, France
Integrative Biology	Prof. Gerhard Haszprunar, University of Munchen, Germany
Mathematics	Prof. Dietmar Bisch, UC Santa Barbara Prof. David Brenner, Columbia University Prof. Barry McCoy, State University of New York, Stony Brook
MCB	Prof. Peter Lawrence, MRC Laboratory of Molecular Biology and University of Cambridge, England
MCB/Chemistry	Prof. Aziz Sancar, University of North Carolina, School of Medicine Prof. Jennifer Doudna, Yale University
MSE	Prof. Michael Mills, Ohio State University
Physics	Prof. Charles Thorn, University of Florida Prof. Dale Van Harlingen, University of Illinois
Physics/Chemistry	Prof. Evgeniy Alexandrov, Vavilov State Optical Institute, Russia
Physics/Chemistry/Chem Eng	Prof. Mehran Kardar, Massachusetts Institute of Technology
Physics/EPS	Prof. Gordon MacDonald, International Institute for Applied Systems Anyalisis
Statistics/EECS	Prof. Peter Bartlett, Australian National University

Miller Fellowships

Fourteen Miller Fellowships were awarded for a three-year term, generally beginining August 1, 2001.

Chemistry	**Olafur Magnusson**, (University of Wisconsin) will be hosted by Professor Judith P. Klinman **Benjamin McCall,** (University of Chicago) will be hosted by Professor Richard Saykally **Robert Zillich,** (Johannes Kepler University) will be hosted by Professor Birgitta Whaley
Earth & Planetary Science	**Emily Brodsky** (California Institute of Technology) will be hosted by Professor Micahel Manga **Jun Korenaga** (Massachusetts Institute of Technology) will be hosted by Professor Mark Bukowinski. **Sang-Heon Shim** (Princeton University) will be hosted by Professor Raymond Jeanloz.
ESPM	**Andrew Suarez** (University of California, San Diego) will be hosted by Professor George Roderick.
EECS/Computer Science	**Venkatesan Guruswami** (Massachusetts Institute of Technology) will be hosted by Professor Christos Papadimitriou.
Integrative Biology	**Taylor Feild** (Harvard University) will be hosted by Professor Todd E. Dawson. **Sheila Patek** (Duke University) will be hosted by Professor Roy Caldwell
Mathematics	**Marius Crainic** (Utrecht University) will be hosted by Professor Alan Weinstein.
Molecular & Cell Biology	**Clarissa Henry** (University of Washington) will be hosted by Professor Sharon Amacher.
MCB:CDB	**Aaron Van Hooser** (Baylor College of Medicine) will be hosted by Professor Rebecca Heald.
Plant & Microbial Biolgy	**Anne Pringle** (Duke University) will be hosted by Professor John Taylor.

Miller Professorships

The Executive Committee and Advisory Board also granted eleven new Miller Professorship awards. Terms will be one or two semesters in length during the 2001-2002 academic year.

Chemistry	Professor Paul Alivisatos Professor Martin Head-Gordon
Computer Science	Professor Jitendra Malik
Earth & Planetary Science	Professor Walter Alvarez
Economics	Professor Christina Shannon
Integrative Biology	Professor Mary Power
Mathematics	Professor Craig Evans
Material Science & Min Engineering	Professor Eugene Haller
Molecular & Cell Biology	Professor Terry Machen
Physics	Professor Kam-Biu Luk Professor Paul Richards

RECENT PUBLICATIONS

Miller Professor Stuart Linn had a prolific term (Fall 2000) with the Miller Institute, publishing six papers: “Human Damage-specific DNA Binding Protein p48: Characterization of XPE Mutations and Regulation Following UV-irradiation”, with Nichols, A. F., Itoh, T., Graham, J. A., Liu, W., and Yamaizumi, M., J. Biol. Chem. 275, 21422-21428, “Nuclear Transport of Human DDB Protein Induced by Ultraviolet Light”, with Liu, W., Nichols, A. F., Graham, J. A., Dualan, R., and Abbas, A., J. Biol. Chem. 275, 21429-21434, “Identification and Cloning of Two Histone-fold Motif Containing Subunits of HeLa DNA Polymerase å”, withLi, Y., and Pursell, Z. F., J. Bio. Chem. 275, 23247-23252, “MDM2 interacts with the carboxy terminus of the catalytic subunit of DNA polymerase Epsilon”, with Vlatkovic, N., Guerrera, S., Li, Y., Haines, D. S., and Boyd, M. T., Nuc. Ac. Res. 28, 3581-3586, “Proteolysis of the human DNA polymerase epsilon catalytic subunit by caspase-3 and calpain Specifically during apoptosis”, with Liu, W., Nuc. Ac. Res. 28, 4180-4188, and “Dehydroaltenusin: A mammalian DNA polymerase alpha inhibitor”, with Mizushima, Y., Kamisuki, S., Mizuno, T., Takemura, M., Asahara, H., Yamaguchi, T., Matsukage, A., Hanaoka, F., Yoshida, S., Saneyoshi, M., Sugawara, F., and Sakaguchi, K., J. Biol. Chem. 275, 33957-33961.

Miller Professor Lisa Pruitt published 5 papers during her term (Fall 2000) with the Miller Institute: “Biochemical Characterization of Atherosclerotic Plagues using Spectroscopic and Histological Methods”, with D. Ebenstein, C. Li, K. Hugjes, and C. Xu, 27th Annual Meeting of the Society for Biomaterials, April 20 2001, Saint Paul, MN, “Nanoindentation of Hydrated Visoelastic Materials”, with D. Ebenstein, and L. Kuhn, 27th Annual Meeting of the Society for Biomaterials, April 20 2001, Saint Paul, MN, “The Effect of â-Glycerophosphate on the Chemical and Mechanical Character of Mineral Produced by Bone Cells In Vitro”, with E. A. Nauman, D. Ebenstein, K. Hughes, B. P. Halloran, D. Bikle, and Tony Keaveny, 47th Annual Meeting, Orthopaedic Research Society, February 2001, San Francisco, “Characterization of Sub-micron Mechanical Behavior and Fracture Processes of Polymers and Biomaterials”, 13th European Conference on Fracture, September 2000, San Sebastian, Spain, and “Differentiation of Mechanical Properties of Vascular Plague Constitutents using Nanomechanical Methods”, with D. Ebenstein, L. Kuhn, and A. Lundkvist, 6th World Biomaterials Congresss, 531, May 2000, Kamuela, HI.

Miller Institute News
Spring 2001
2536 Channing Way #5190
Berkeley, CA 94720-5190
Phone: (510) 642-4088
Fax: (510) 643-7393
http://socrates.berkeley.edu/~4mibrs

Please send address corrections to the Miller Institute

Awards & Honors

Former Miller Fellow ('84-'86) and Miller Professor (Spring '97) **Alex Filippenko** of the Department of Astronomy was named by the Phi Beta Kappa Society as one of its 2001-2002 visiting scholars.

Former Miller Professor ('77-'78, Spring 89, and '98 - 99') **Alex Pines** of the Department of Chemistry was awarded the $50,0000 Dickson Prize in Science to Chemistry by Carnegie Mellon University for his contributions to the field of nuclear magnetic reonance.

Current first Year Miller Fellow **Ray Jayawardhana** of the Department of Astronomy was featured in the Sunday Times, Sri Lanka for his significant contribution to science and for being a role model for aspiring Astronomers.

Former Visiting Miller Professor **Jean Taylor** (Spring '99) of the Department of mathematics at Rutgers University received an honorary doctorate from

COMPETION DEADLINES

Miller Professorship Applications
Monday, October 1, 2001
for terms in Academic year 2002-2003

Miller Fellow Nominations
Thursday, October 4, 2001
for the term 2002-2005

Visiting Miller Professor Nominations
Monday, October 8, 2001 and
Monday, February 11, 2002
for visits during Academic year 2002-2003.

More information for each program is available on the Miller Institute website: http://socrates.berkeley.edu/~4mibrs

All materials are due in the Miller Institute office by 4:00 pm of deadline date.