CALIFORNIA INSTITUTE *of* TECHNOLOGY

One Hundred Tenth Annual Commencement

June 11, 2004

Cover: Caltech's commencement ceremony,
by Joseph Stoddard.

This program is produced by the Public Relations Office.
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CALIFORNIA INSTITUTE
of TECHNOLOGY

One Hundred Tenth
Annual Commencement

Friday Morning at Ten O'Clock
June Eleventh, Two Thousand Four

IN HIS DIARY ENTRY of September 1, 1891, Pasadena philanthropist Amos Throop wrote, "Planted potatoes, cleaned a water pipe, husked the corn . . . In afternoon, saw Mr. Wooster and rented his block for five years . . . and hope I have made no mistake." Were he here today, Throop could rest assured in his decision. For the building of which he wrote, the Wooster Block, was rented for the purpose of establishing Throop University—the forerunner of Caltech.

In November of that year, Throop University opened its doors to 31 students and a six-member faculty. Could anyone have imagined then that the school would become a world center for science and engineering research and education? Perhaps . . . for in the first year, the board of trustees began to reconsider the mission of the school. In 1892, they decided to emphasize industrial training, and in 1893, reflecting this new focus, renamed the school Throop Polytechnic Institute.

Throop might have remained just a good local school had it not been for the arrival in Pasadena of George Ellery Hale. A faculty member at the University of Chicago and a noted astronomer, Hale settled here in 1903. From that time until his death in 1938, he made significant contributions to Pasadena and Southern California: he established the Mount Wilson Observatory, raised funds for Palomar Observatory and its 200-inch telescope, participated in the creation of the Huntington Library and Art Gallery, helped design the Civic

Center in downtown Pasadena, and—perhaps his single greatest achievement—set the course for the development of Throop into the California Institute of Technology, a school he envisioned as a scientific institution of the highest rank.

In 1913, Hale convinced Arthur Amos Noyes, professor of chemistry and former president of the Massachusetts Institute of Technology, to join him in Pasadena. With the arrival in 1917 of Robert Andrews Millikan, professor of physics at the University of Chicago, Hale had assembled the founders of the new institution. The world center of scientific and engineering research and education he had imagined soon took shape under a new name, the California Institute of Technology, administered by Millikan and enriched with the scientific talents of Noyes and his faculty colleagues.

Caltech today has a 124-acre campus and operates seven off-campus astronomical, seismological, and marine biological facilities, and administers NASA's Jet Propulsion Laboratory as well. At present, the Institute has an enrollment of some 2,000 students, more than half of whom are in graduate studies; 283 professorial faculty members, including four Nobel laureates and three Crafoord laureates; and more than 200 research faculty members.
Today, Caltech will award 208 students the B.S. degree; 156 students the M.S. degree; 2 scholars the degree of Engineer; and 166 doctoral candidates the Ph.D. degree, for a total of 532 graduates—quite a leap from the one man and one woman who constituted the first collegiate graduating class of Throop Polytechnic Institute.

Please note:
Video footage of commencement may be viewed on the Caltech website at http://www.caltech.edu/commencement/04/. Broadcast is scheduled to begin after 3:00 p.m.

THESE TRIBAL RITES have a very long history. They go back to the ceremony of initiation for new university teachers in mediaeval Europe. It was then customary for students, after an appropriate apprenticeship to learning and the presentation of a thesis as their masterpiece, to be admitted to the Guild of Masters of Arts and granted the license to teach. In the ancient University of Bologna this right was granted by authority of the Pope and in the name of the Holy Trinity. We do not this day claim such high authority.

As in any other guild, whether craft or merchant, the master's status was crucial. In theory at least, it separated the men from the boys, the competent from the incompetent. On the way to his master's degree, a student might collect a bachelor's degree in recognition of the fact that he was half-trained, or partially equipped. The doctor's degree was somewhat different. Originally indistinguishable from the master's, the doctor's gradually emerged by a process of escalation into a super magisterial role—first of all in the higher faculties of theology, law, and medicine. It will come as no surprise that the lawyers had a particular and early yen for this special distinction.

These graduations and distinctions are reflected in the quaint and colorful niceties of academic dress.

Of particular interest is the cap or mortarboard. In the form of the biretta it was the peculiar sign of the master. Its use has now spread far beyond

that highly select group to school girls and choir boys and even to the nursery school. *Sic transit . . .*

The gown, of course, is the basic livery of the scholar, with its clear marks of rank and status—the pointed sleeves of the bachelor, the oblong sleeves of the master, the full sleeves and velvet trimmings of the doctor. The doctors, too, may depart from basic black and break out into many colors—Harvard crimson or Yale blue or the scarlet splash of Oxford.

Color is the very essence of the hood: color in the main body to identify the university; color perhaps in the binding to proclaim the subject of the degree—orange for engineering, gold for science, the baser copper for economics, white for arts and letters, green for medicine, purple for law, scarlet for theology, and so on. Size is a further variable, as the hoods tend to lengthen from the three feet of the bachelor to the four of the doctor. So the birds are known by their plumage.

With this color and symbolism, which is mediaeval though mutated, we stage our brief moment of pageantry, paying homage to that ancient community of scholars in whose shadow we stand, and acknowledging our debt to the university as one of the great institutional constructs of the Middle Ages. While looking back, however, we also celebrate the achievements of this present generation of students and look forward to the future of these our younger colleagues, whom we now welcome to our midst.

David C. Elliot

Professor of History, Emeritus

CARLY FIORINA is chairman and chief executive officer of HP, a leading global provider of computing and imaging solutions and services, which is focused on making technology and its benefits accessible to all.

In order to accelerate HP's strategy, catalyze growth in a changing technology landscape, and increase long-term shareowner and customer value, Fiorina led the HP merger with Compaq, which was completed in May 2002.

Since joining HP in July 1999, Fiorina has led HP's reinvention as a company that makes the Internet work for businesses and consumers. Under her leadership, HP has returned to its roots of innovation and inventiveness and is focused on delivering the best total customer experience.

Prior to joining HP, Fiorina spent nearly 20 years at AT&T and Lucent Technologies, where she held a number of senior leadership positions. At Lucent, she expanded the company's international business and spearheaded the planning and execution of its initial public offering and subsequent spin-off from AT&T.

Fiorina holds a bachelor's degree in medieval history and philosophy from Stanford University; a master's degree in business administration from the Robert H. Smith School of Business at the University of Maryland at College Park; and a master of science degree from MIT's Sloan School.

In July 2001, she was named an Honorary Fellow of the London Business School. Fiorina's corporate citizenship efforts were honored with the 2003 Appeal of Conscience Award and the 2003 Concern Worldwide "Seeds of Hope" Award. Fiorina has previously served on the boards of Cisco Systems, Kellogg Company, and Merck & Company.

ACADEMIC PROCESSION

Chief Marshal
Kim C. Border, Ph.D.

Marshals
Marianne Bronner-Fraser, Ph.D.
David G. Goodwin, Ph.D.
Barbara C. Green, Ph.D.
Catherine Jurca, Ph.D.
Jean-Paul Revel, Ph.D.
Anneila I. Sargent, Ph.D.

Faculty Officers
David G. Goodwin, Ph.D.
Henry A. Lester, Ph.D.
David B. Wales, Ph.D.

MARCHING ORDER

Candidates for the Degree of Bachelor of Science
Candidates for the Degree of Master of Science
Candidates for the Degree of Engineer
Candidates for the Degree of Doctor of Philosophy
Faculty Officers
The Faculty
The Chairs of the Divisions
The Deans
The Provost
The Trustees
The Commencement Speaker
The President
The Chairman of the Board of Trustees

PROGRAM

Organ Prelude	Leslie J. Deutsch, Ph.D.
PROCESSIONAL	The Caltech Convocations Brass and Percussion Ensemble *Allen R. Gross, D.M.A., Conductor*
PRESIDING	Benjamin M. Rosen *Chairman of the Board of Trustees* *California Institute of Technology*
COMMENCEMENT SPEAKER	Carleton S. Fiorina *Chairman and CEO,* *Hewlett-Packard Company*
CHORAL SELECTION	The Caltech Glee Clubs *Desiree LaVertu, M.M., Conductor*
"There's Just One" music by George Frideric Handel, lyrics by K. Giapis and D. Caldwell	
CONFERRING OF DEGREES	David Baltimore, Ph.D. *President* *California Institute of Technology*

PRESENTATION OF CANDIDATES FOR DEGREES

For the Degree of Bachelor of Science	Jean-Paul Revel, Ph.D. *Dean of Students*
For the Degree of Master of Science	Margo Post Marshak, J.D. *Vice President for Student Affairs*
For the Degree of Engineer	Edward M. Stolper, Ph.D. *Acting Provost*
For the Degree of Doctor of Philosophy	Dr. Stolper
Biology	Elliot M. Meyerowitz, Ph.D. *Division Chair*

Chemistry and Chemical Engineering	David A. Tirrell, Ph.D. *Division Chair*
Engineering and Applied Science	Richard M. Murray, Ph.D. *Division Chair*
Geological and Planetary Sciences	Edward M. Stolper, Ph.D. *Division Chair*
The Humanities and Social Sciences	Jean E. Ensminger, Ph.D. *Division Chair*
Physics, Mathematics and Astronomy	Thomas A. Tombrello, Ph.D. *Division Chair*

ANNOUNCEMENT OF AWARDS AND CONCLUDING REMARKS — President Baltimore

ALMA MATER — The Caltech Glee Clubs, The Caltech Convocations Brass and Percussion Ensemble, and Organ

"Hail CIT"
by Manton Barnes, BS '21 EE
(The audience may join in; lyrics are found on page 48*.)*

RECESSIONAL — The Caltech Convocations Brass and Percussion Ensemble

Organ Postlude — *Dr. Deutsch*

You are invited to attend a reception on the Athenaeum West Lawn following the program.

Bachelor of Science

Megumi Abe* *Boston, Massachusetts* Chemistry
Joshua Quentin Adams *Sioux Falls, South Dakota* Engineering and Applied Science
Neda Afsarmanesh *Claremont, California* Biology
Lailani Del Carmen Arcia *Panama City, Panama* Engineering and Applied Science
David Paul Armet *Tucson, Arizona* Mechanical Engineering
Shane Rainier Arney *Seattle, Washington* Engineering and Applied Science
Brian Emre Aydemir* *Austin, Texas* Computer Science
Brian Kenichi Bairstow* *Visalia, California* Engineering and Applied Science (Aeronautics)
Brandon Louis Ballara *Miami, Florida* Mechanical Engineering
Tamara Reba Becher *Croton-on-Hudson, New York* Engineering and Applied Science
Ronald Bruce Beckman *Mission Viejo, California* Physics
Renat Bekbolatov* *Aktobe, Kazakhstan* Mathematics
Stephen Arthur Berardi *Silver Spring, Maryland* Engineering and Applied Science
Iram Parveen Bilal* *Islamabad, Pakistan* Engineering and Applied Science
Jordan Lee Boyd-Graber* *Hot Springs, Arkansas* Computer Science and History
Burak Ismail Cendek *Istanbul, Turkey* Electrical Engineering
Marko Cetina* *Belgrade, Serbia and Montenegro* Applied Physics and Applied and Computational Mathematics
Yuan-Heng Chao* *Taipei, Taiwan* Electrical Engineering
Nicholas Kuang-Hua Chiang *Fort Dodge, Iowa* Electrical Engineering
Lawrence Waikai Chieng *Ventura, California* Electrical and Computer Engineering
Anita Shuk Man Choi* *Toronto, Canada* Chemistry
Jae-Woo Choi *Pasadena, California* Electrical and Computer Engineering
Ameerah Naz Chowdhury *Boca Raton, Florida* Mathematics
Kamilee Willow Christenson *Salt Lake City, Utah* Biology
Craig Tan Chu* *Arlington, Texas* Applied and Computational Mathematics
Rumi Chunara* *Brampton, Ontario, Canada* Electrical Engineering
Sara Elsa Cina* *Malvern, Pennsylvania* Geology
Michael Wayne Clemons II *Dallas, Texas* Business Economics and Management
Patrick James Codd* *Ft. Collins, Colorado* Biology
Odell Brown Austin Collins *Waco, Texas* Physics
Jeffrey Bryan Cox *Littleton, Colorado* Mechanical Engineering
Michael Edmund Davenport* *Vienna, Virginia* Physics

Students whose names are followed by an asterisk are being graduated with honor in accordance with a vote of the faculty.

Bachelor of Science *continued*

Rachel Muthoni Deco *Los Angeles, California* Geochemistry
Robin Christine Deis* *Livermore, California* Biology and Literature
Joseph Filamor de Jesus* *Chino Hills, California* Electrical and Computer Engineering
Natalia Irma Deligne *Princeton, New Jersey* Geology
Cesar Alberto Del Solar *Bronx, New York* Electrical Engineering
Yile Ding* *Shanghai, China* Biology
Bogdan Dumitru *Ploiesti, Romania* Engineering and Applied Science
Colin Morrisey Dundas* *Missoula, Montana* Planetary Science
Linda Yi Da Dunn* *Hong Kong, China* Electrical Engineering
Kathryn Anna Dyl* *Buffalo, New York* Geochemistry
Jeffrey Andrews Edlund *Hemet, California* Physics
Aaron Palmer Esser-Kahn* *Bloomfield Hills, Michigan* Chemistry
Andrei Faraon* *Falticeni, Romania* Physics
Ian Alexander Farmer *Glendora, California* Engineering and Applied Science
Vicente Ignacio Fernandez* *New York, New York* Mechanical Engineering
Suvi Frances Flagan *Pasadena, California* Engineering and Applied Science
Christopher Shannon Flatt *Tampa, Florida* Engineering and Applied Science
Thomas Steven Fletcher* *Pleasant Hill, California* Chemistry and Economics
Rebecca Anne Flint* *Wellesley, Massachusetts* Physics
Courtney Irene Folgeman *Orlando, Florida* Business Economics and Management
William Tin Wai Fong* *Lodi, California* Applied and Computational Mathematics
David Thomas Forhan *Centennial, Colorado* Engineering and Applied Science
Peter Louis Freddolino* *Okemos, Michigan* Biology
Graham Nicholas Free* *Ithaca, New York* Economics
Mikhail Patrick Garvey* *Oakton, Virginia* Electrical and Computer Engineering
Elaine Pei-San Gee* *Frederick, Maryland* Physics
Daniel Honghu Geng *San Diego, California* Electrical Engineering
Caroline Michelle Gibbs* *Edmond, Oklahoma* Chemistry
Melanie Ann Goodrich *Los Angeles, California* Business Economics and Management
Benjamin Rudolph Granett *Davis, California* Astrophysics
Erik Michael Granstedt* *Lemon Grove, California* Applied Physics
Megan Ann Greenfield *Houston, Texas* Chemical Engineering (Biomolecular)
Megan Elizabeth Guichard* *Walla Walla, Washington* Mathematics
Matthew Eric Haigh, Jr.* *Howell, Michigan* Computer Science
Koun Han* *Charlotte, North Carolina* Chemistry
Paul Earl Hand* *Corvallis, Oregon* Applied and Computational Mathematics
Sean Soyka Hardesty *Arlington, Virginia* Physics
Ali Alan Hassani *Springfield, Virginia* Mathematics and Economics
John Russell Heberle* *Dallas, Texas* Mechanical Engineering
David James Hedley *Long Beach, California* Electrical Engineering

Bachelor of Science *continued*

Brian Daniel Hefelfinger *Ventura, California* Mechanical Engineering
James Wesley Hegeman* *Iowa City, Iowa* Mathematics
William Nicholas Heltsley* *Tullahoma, Tennessee* Mechanical Engineering
Sarah E. Hendrickson* *Bellevue, Washington* Engineering and Applied Science (Aeronautics)
Isaac Avram Hilburn* *Ventura, California* Geophysics
Katherine Ann Homann *West Des Moines, Iowa* Biology
Sarah Marie Horst* *Gainesville, Florida* Planetary Science and Literature
Chuck Jen-Chung Hsiao *Walnut, California* Mechanical Engineering
Andrew Lee Hsieh *Katy, Texas* Biology
Samuel Hsiung* *Chicago, Illinois* Computer Science
Kathryn Chialuo Hsu *Chico, California* Mechanical Engineering and History
Di Hu* *Lake Worth, Florida* Biology
Hermes Chi-Yuan Huang* *Kingwood, Texas* Applied Physics
Jonathan David Hunt *Northport, New York* Geology
Joseph Stephen Jewell* *Stevensville, Michigan* Engineering and Applied Science (Aeronautics) and History
Liang Jiang* *Suzhou, P.R. China* Physics
Cristian Sandel Jitianu* *Craiova, Romania* Biology and Chemistry
Greta Susan Jo *Houston, Texas* Biology
William Christopher Johnson *McDonald, Ohio* Engineering and Applied Science
Thomas James Juliano* *Cleveland, Ohio* Engineering and Applied Science (Aeronautics)
Elliott Michael Karpilovsky* *Chico, California* Computer Science
Helena Marjatta Kauppila* *Espoo, Finland* Mathematics
Jeremy Lynn Kemper *San Diego, California* Engineering and Applied Science
Megan Ruth Kennedy *San Dimas, California* Planetary Science and Literature
Robert Thomas Kern *Frederick, Maryland* Geophysics
Kathleen Postlewaite Kiernan* *White Plains, New York* Mathematics
Seong-Min Grace Kim *Los Angeles, California* Applied Physics
Jessie Mary Kneeland *Deerwood, Minnesota* Geology
Angel Pui Ying Kong* *Hong Kong, China* Electrical Engineering
Charles La* *Marseille, France* Computer Science
Ghee Xiong Lai* *Singapore* Chemistry
Michael Jonathan Lammers* *Tigard, Oregon* Mechanical Engineering
Jolene L. Lau *Downey, California* Chemistry
Stephan Thomas Lavavej* *Thornton, Colorado* Computer Science
Debbie Angela Lee *Torrance, California* Geophysics
Jason Kwok-San Lee* *Hong Kong, China* Electrical Engineering
Jonathan James Lee* *Round Rock, Texas* Electrical and Computer Engineering
Shao Yi Lee *Singapore* Physics

Hongyi Li* *Singapore* Mathematics
Robert Lin Li* *Santa Clara, California* Biology and Computer Science
Weiyi Li *Shanghai, China* Electrical and Computer Engineering
Xiaofeng Li* *Luoyang, China* Electrical Engineering
Ye Li* *Buffalo Grove, Illinois* Business Economics and Management and Engineering and Applied Science
Eric Shin-Hong Lin* *Fremont, California* Physics
Joseph Hsuhuan Lin *West Deptford, New Jersey* Electrical Engineering
Elinor Yen-Ru Lin *Arcadia, California* Biology
Samuel David Lindsay-Levine *St. Paul, Minnesota* Physics
Johnson Chih-Hao Liu* *Rowland Heights, California* Electrical Engineering
Yurun Liu *Panshi, China* Physics
Po-Shen Loh* *Madison, Wisconsin* Mathematics
Dagny Lauren Looper *Bryant, Arkansas* Astrophysics
Sarah Anne Luxenberg *Millbrae, California* Chemistry
Yussanne Patricia Ma *Ottawa, Canada* Applied and Computational Mathematics
Abbey Camille Major* *Dallas, Texas* Applied and Computational Mathematics
Charlene Sow-Lin Mak* *San Francisco, California* Biology and Business Economics and Management
Andrea Valenzuela Manzo *Fairfax, Virginia* Biology
Benjamin John Matthews *Princeton, New Jersey* Biology
Andrea Elizabeth McColl *Manhattan Beach, California* Biology
David Jason McKeen* *River Edge, New Jersey* Physics
Euan James Robin Bourke McLeod* *Portland, Oregon* Mechanical Engineering
Francisco Joel Medina *Chicago, Illinois* Mechanical Engineering
Rachel Abigail Medwood* *Boca Raton, Florida* Economics
Jason Enrico Mitchell *Snow Camp, North Carolina* Engineering and Applied Science
Zeinab Mousavi* *Diamond Bar, California* Electrical Engineering
Jonathan Utan Muliang *Burlingame, California* Physics
Alejandro Daniel Muñoz* *Gilroy, California* Economics and Mechanical Engineering
Arvind Murugan* *Chennai, India* Mathematics
Gautham Padmanabhan Nair* *Cuernavaca, Mexico* Chemical Engineering (Materials)
Danson Kariuki Njoroge *Nairobi, Kenya* Engineering and Applied Science
Harris Samuel Nover* *Chesterfield, Missouri* Mathematics
Jong Oh *Lomita, California* Biology
Joseph Alexander Sofiro Olivier *Latham, New York* Engineering and Applied Science
Dylan Owens *West Nyack, New York* Mechanical Engineering
Melinda Tsaoying Owens* *Stamford, Connecticut* Biology
Michael Anthony Owens *Kihei, Hawaii* Engineering and Applied Science (Aeronautics)
Nicholas Michael Palko *Wichita, Kansas* Physics

Bachelor of Science *continued*

Pankhudi* *Patna, India* Computer Science
Jason Morris Parker* *Pace, Florida* Physics
Raajen Jagdish Patel* *Danbury, Connecticut* Applied and Computational Mathematics
Matthew Ryan Patterson *Rocklin, California* Electrical Engineering
Daniel Martin Perez *Lemoore, California* Engineering and Applied Science
Eric Aaron Peters *Iowa City, Iowa* Chemistry
Nicholas Anthony Piro* *Malibu, California* Chemistry
Jeremy Michael Pitts* *Green River,Wyoming* Mechanical Engineering
Surjeet Rajendran* *Chennai, India* Mathematics
Spencer Taylor Rarrick* *Athens, Georgia* Engineering and Applied Science
James Mario Rebesco *Munster, Indiana* Physics
John Walker Rice* *Wichita Falls, Texas* Electrical and Computer Engineering
Ji-Hoon Ryu* *Seoul, Korea* Electrical and Computer Engineering
Suzana Elena Sburlan* *Los Angeles, California* Applied Physics
Anna Katherine Sczaniecka *Marlton, New Jersey* Biology
Kristin Rachel Shantz *San Jose, California* Electrical and Computer Engineering
Nathan Andrew Sheetz* *Arden Hills, Minnesota* Electrical and Computer Engineering
Hsi-Ping Shawn Shen *Brookfield, Connecticut* Mechanical Engineering
Francy Yi-Hsuan Shu *Walnut, California* Biology
Jonathan Simon* *Chevy Chase, Maryland* Physics
Laura Cathleen Sinclair* *Altadena, California* Physics
Andrea Jean Smith *Lakewood, California* Physics
Veasna Sok *Long Beach, California* Mechanical Engineering
Richard William Spjut *Eureka, California* Mathematics
David Luther Alan Stafford *San Francisco, California* Computer Science
Lawrence Simpson Stewart, Jr.* *Ocean Springs, Mississippi* Electrical Engineering
Melissa Joanne Strausberg *Fairfax Station,Virginia* Planetary Science
Christopher Tao-Kai Sung* *Worthington, Ohio* Biology and Chemistry
Mazhareddin Taghivand* *Northridge, California* Electrical Engineering
Si Hui Tan* *Singapore* Physics
Japeck Tang* *Bethany, Connecticut* Electrical and Computer Engineering
Matthew Austin Terrel* *Bastrop, Texas* Physics
Den Bun Thap *Corona, California* Engineering and Applied Science
Michael Robert Thielman *Eugene, Oregon* Engineering and Applied Science
Cristina Ana Thomas *Chino, California* Planetary Science
Jian Yuan Thum* *Kuala Lumpur, Malaysia* Biology
Theresa Kay Tiefenbrunn* *St. Louis, Missouri* Biology
Jennifer Brooke Treweek* *Pasadena, California* Chemistry
Cuong Chi Trieu* *Monterey Park, California* Chemical Engineering (Materials)
Salomon Joseph Trujillo *Redding, California* Mechanical Engineering

Bachelor of Science *continued*

Victor Chen Tsai* *Albany, California* Geophysics
Joseph Thomas Vanderslice *The Woodlands, Texas* Mechanical Engineering
Luke Adam Voss *St. Louis, Missouri* Physics
Lizhou Lisa Wang* *Honolulu, Hawaii* Applied Physics and Economics
Kirsten Frances Welge *Longview, Texas* History
Gregory Scott West *Birmingham, Alabama* Computer Science
Justin Stewart White* *Reno, Nevada* Physics
Randall Miles White *Eagle, Idaho* Electrical Engineering
Jacquelyn Secor Wilbur *Hopewell, New Jersey* Mechanical Engineering
Daniel Li-Shuan Wu* *Claremont, California* Engineering and Applied Science
Yuan Xie* *Changzhou, China* Computer Science
Andrew Chen-Hao Yang* *Decatur, Georgia* Mathematics
Weiwei Yang *Brooklyn, New York* Engineering and Applied Science
John Jia-Hao Yao *Yorktown Heights, New York* Physics
Sina Yeganeh* *Memphis, Tennessee* Chemistry
Michael Victor Yeh* *Foster City, California* Electrical Engineering
Ernest Chi-Hong Yeung *Hacienda Heights, California* Physics
Timothy Bahk Yoo *Plano, Texas* Applied and Computational Mathematics
Theodore Ernest Yu *Irvine, California* Electrical Engineering
Janet Qi Zhou *Porter Ranch, California* Electrical Engineering and Business Economics and Management

Master of Science

Lotty Ackerman Mayer (*Physics*) Licenciado en Fisica, Universidad Simón Bolívar 2000; Diploma, Abdus Salam International Centre for Theoretical Physics 2001.

James Richard Adleman (*Electrical Engineering*) B.S.E., Duke University 2000.

Anelia Nedelcheva Angelova (*Computer Science*) M.S., Sofia University 2002.

Laura Joan Baker (*Geochemistry*) B.S., University of Maryland, College Park 2001.

Frederick Kiguli Balagadde (*Applied Physics*) B.A., Manchester College 2001.

Iván Bermejo Moreno (*Aeronautics*) Aeronautical Engineer, Universidad Politecnica de Madrid 2001.

Meghara Ashok Bhatt (*Social Science*) A.B., Harvard College 2001.

Chao Bian (*Astrophysics*) B.S., University of Science and Technology of China 2002.

Brandon Arthur Birdwell (*Applied Physics*) B.A., Pomona College 2000.

Vadim Borokhov (*Physics*) B.S., Moscow Institute of Physics and Technology 1996; M.S., 1998.

Víctor Borrero Mayora (*Applied and Computational Mathematics*) Diplôme d'Ingénieur, École Centrale Paris 2000; M.S., California Institute of Technology 2001.

Shannon Theresa Browne (*Mechanical Engineering*) B.S., Johns Hopkins University 2002.

Antoine Jean Bruguier (*Electrical Engineering*) Diplôme d'Ingénieur, École Supérieure d'Ingénieurs en Électrotechnique et Électronique 2004.

Charles Walter Bugg (*Biochemistry and Molecular Biophysics*) A.A., Mississippi Gulf Coast Community College 1997; B.S., University of Southern Mississippi 2000.

Yuval Cassuto (*Electrical Engineering*) B.Sc., Technion-Israel Institute of Technology 2001.

Patrick Chapman Cesarano (*Electrical Engineering*) B.S., University of Virginia 2001.

Stephen Allen Chapman (*Chemical Engineering*) B.S., University of California, Berkeley 2001.

Po-Jui Chen (*Electrical Engineering*) B.S., National Taiwan University 2002.

Wei-Ting Chen (*Enviromental Science and Engineering*) B.S., National Taiwan University 2001.

Hsin-Ying Chiu (*Applied Physics*) B.S., National Tsing Hua University 2000; M.S., 2002.

Francesco Ciucci (*Mechanical Engineering*) Diplôme d'Ingénieur, École Centrale Paris 2001; Laurea in Ingegneria Aerospatiale, Politecnico Di Milano 2003.

Jennifer Ann Cobb (*Aeronautics*) B.S., University of Virginia 2003.

Baris Coskunuzer (*Mathematics*) B.S., Bogazici University 1999.

Michael Hamilton Coward (*Electrical Engineering*) B.S., California Institute of Technology 1995.

Jonathan A. Dama (*Electrical Engineering*) B.S., California Institute of Technology 2003.

Vikram Deshpande (*Applied Physics*) B.Tech., M.Tech., Indian Institute of Technology, Bombay 2002.

Matthew James Dicken (*Applied Physics*) B.S. (*Chemical Engineering and Physics*), University of California, San Diego 2003.

Joanna Lynn Dodd *(Materials Science)* B.S., California Institute of Technology 1999.
Nathan John Downey (*Geophysics*) B.S., University of Alberta 2001.
Gang Duan (*Materials Science*) B.S., Beijing University 1999; M.S., 2002.
Mary Julia Dunlop (*Mechanical Engineering*) B.S.E., Princeton University 2002.
Samantha Faye Edgington (*Physics*) A.B., Princeton University 1997.
Jon Xabier Eguia Egusquiza (*Social Science*) Licenciatura, Universidad de Málaga 2002.
Tamer Magdy Elsayed (*Mechanical Engineering*) A.S., Chaffey Community College 1997; B.S., California State Polytechnic University, Pomona 2002.
Omar Kamal El-Sheikh (*Electrical Engineering*) B.S., California Institute of Technology 2003.
Claudio Fanti *(Computer Science)* Diploma Di Laurea, Università Degli Studi Di Padova 2001.
Daniel Robert Feldman *(Environmental Science and Engineering)* S.B., Massachusetts Institute of Technology 2002.
Michael Sidney Feldman (*Chemical Engineering*) B.S., Rice University 2001.
Ebraheem Ihsan Fontaine (*Mechanical Engineering*) S.B., Massachusetts Institute of Technology 2002.
Christian Franck (*Aeronautics*) B.S., University of Virginia 2003.
Surelys Galano (*Biology*) A.A., Valencia Community College 1999; B.S., University of Central Florida 2002.
Xiaojie Gao (*Computer Science)* B.S., Peking University 2002.
Jiansong Gao *(Applied Physics)* B.S., Tsinghua University 1999; M.S., 2002.
Vikram Gavini (*Applied Mechanics*) B.Tech., Indian Institute of Technology, Madras 2003.
Lisa Maria Goggin (*Physics*) B.Sc., University College Cork 2001.
Emilio Castaño Graff (*Aeronautics*) B.S., California Institute of Technology 2002.
Nicholas Alexander Graham *(Chemical Engineering)* B.S., Washington University 2001.
Blake Bennet Greene (*Chemistry*) B.S., Yale University 2002.
Delia Ruth Grigg (*Social Science*) B.A., University of South Carolina 2002.
Katalin Anna Grubits *(Physics)* Diploma, B.Sc., University of Sydney 2002.
Joel Simon Grus *(Social Science)* B.A., Rice University 1996; M.S., University of Washington 1998.
Wei-Hsin Gu (*Electrical Engineering*) B.S., National Tsing Hua University 1999; M.S., 2001.
Marcelo Ioel Guzman (*Environmental Science and Engineering*) Licenciado en Química, Universidad Nacional de Tucumán 2000.
Feras Habbal (*Mechanical Engineering*) B.S., University of Texas at Austin 2003.
Carl Lars Genghis Hansen *(Applied Physics)* B.A.Sc., University of British Columbia 2000.
Daven Ker Henze (*Chemical Engineering*) B.S. (*Chemistry and Chemical Engineering*), University of Washington 2001.

Jinseong Heo (*Applied Physics*) B.S., Korea Advanced Institute of Science and Technology 2002.

Sarah Anne Hill (*Social Science*) B.S., Texas A&M University 2002.

Hans David Høeg (*Mechanical Engineering*) S.B., Massachusetts Institute of Technology 1994; M.S., Stanford University 1996.

Yu-Ting Huang (*Geology*) B.S., Chinese Culture University 1998; M.S., National Taiwan University 2001.

Wonjin Jang *(Computer Science)* B.S., Seoul National University 1998.

Sanggeun Jeon (*Electrical Engineering*) B.S., Seoul National University 1997; M.S., 1999.

Thomas James Johnson *(Applied Physics)* B.S., University of Oregon 2002.

Eli Emanuel Jorné (*Applied Physics*) B.A., Dartmouth College 2002.

James Alan Karnesky (*Aeronautics*) B.S., (*Aeronautical Engineering, Mathematics, and Mechanical Engineering*), Rensselaer Polytechnic Institute 2003.

Emil Paskalev Kartalov (*Applied Physics*) B.S., California Institute of Technology 1999.

Brendan Melville Kayes (*Applied Physics*) B.A., B.S., University of Auckland 2001; B.S. (Honors), 2002.

Hans-Christian Kessel (*Electrical Engineering*) B.S., Universität Karlsruhe 2003.

Chih-Kai Ko (*Electrical Engineering*) B.S., University of Colorado, Boulder 2002.

Oleg Boris Kogan (*Materials Science*) B.S., Case Western Reserve University 2001.

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Jessica Loren Stumpfel *(Computer Science)* B.A., Duke University 2000.
Yu-Lung Tang (*Electrical Engineering*) M.S., National Taiwan University 2000.
Cristian Tapus *(Computer Science)* B.S., California Institute of Technology 1999; M.S., University of Maryland 2001.
Hareem Tariq (*Applied Physics*) B.Sc., Florida Institute of Technology 2001.
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Master of Science *continued*

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Wanwan Yang *(Environmental Science and Engineering)* B.E., Tsinghua University 2001.
Gunsu Yun *(Applied Physics)* B.S., Pohang University of Science and Technology 1998.
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Siyang Zheng *(Electrical Engineering)* B.S., Tsinghua University 1996; M.S., Pennsylvania State University 2000.
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Doctor of Philosophy

DIVISION OF BIOLOGY

Ramzi I. Azzam (*Biology*) B.S., University of California, Santa Barbara 1996; M.A., 1997.
Thesis: The Role of Net1 Phosphorylation in Regulating CDC14 Release During Mitotic Exit.

Catherine Craig Baker (*Biology*) B.A., Princeton University 1997.
Thesis: Genetic and Genomic Studies of Shoot and Flower Growth in *Arabidopsis*.

Martín Leandro Basch (*Biology*) Licenciado, Universidad de Buenos Aires 1996.
Thesis: Early Neural Crest Specification, Induction and Competence.

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Thesis: Functional and Structural Magnetic Resonance Imaging of Humans and Macaques.

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Thesis: Evolution and Scaling in Mammalian Brains.

Anthony Michael Giannetti (*Biochemistry and Molecular Biophysics*) B.S., University of California, Santa Barbara 1998.
Thesis: Biochemical, Biophysical, and Cellular Investigations of the Interactions of Transferrin Receptor with Transferrin and the Hereditary Hemochromatosis Protein, HFE.

Ying Gong (*Biochemistry and Molecular Biophysics*) B.S., Peking University 1996; M.A., Smith College 1998.
Thesis: Cell Polarity and Morphogenesis: Functions and Mechanisms of Cell Divisions in Vertebrate Gastrulation.

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Thesis: Computational Design and Experimental Characterization of Protein Oligomers.

Daniel Keith Meulemans (*Biology*) B.S., University of Hawaii at Manoa 1996.; M.S., California Institute of Technology 1999.
Thesis: Genetic Correlates of Neural Crest Evolution.

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Thesis: Neural Oscillations and the Decoding of Sensory Information.

Robert J. Peters (*Computation and Neural Systems*) B.S., University of Wisconsin, Madison 1995.
Thesis: Visual, Attention and Object Categorization: From Psychophysics to Computational Models.

When more than one field of study is listed, the first is the major, and the second and others are minors.

Kathleen Miho Sakamoto (*Biology*) B.A., Williams College 1979; M.S., University of Cincinnati College of Medicine 1982.
Thesis: Targeting Proteins for Ubiquitination and Degradation in the Treatment of Human Disease.

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Thesis: Local Control of Synaptic Strength: Neurotrophic and Dopaminergic Modulation of Dendritic Protein Synthesis.

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Thesis: SynGAP Controls Synapse Formation by Regulating Spine Development and Morphology.

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Thesis: Towards Engineering Immunity.

DIVISION OF CHEMISTRY AND CHEMICAL ENGINEERING

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Thesis: Delivery and Activation of Contrast Agents for Magnetic Resonance Imaging.

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Thesis: Structure and Reactivity of Metal Complexes Bound to DNA.

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Thesis: Quantitative Biaxial Texture Analysis with Reflection High-Energy Electron Diffraction for Ion Beam-Assisted Deposition of MgO and Heteroepitaxy of Perovskite Ferroelectrics.

Isaac Sheridan Carrico (*Chemistry*) B.S., University of California, Santa Barbara 1997.
Thesis: Protein Engineering Through *in vivo* Incorporation of Phenylalanine Analogs.

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Thesis: Design and Characterization of Layered Tunnel Barriers for Nonvolatile Memory Applications.

Tae-Lim Choi (*Chemistry*) B.S., Korea Advanced Institute of Science and Technology 1999.
Thesis: Olefin Metathesis - A Versatile Tool for the Synthesis of Small to Large Molecules.

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Thesis: Laboratory Evolution of Cytochrome P450 Peroxygenase Activity.

Doctor of Philosophy *continued*

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Thesis: Oxidative DNA Damage by Long-Range Charge Transport.

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Thesis: Computation Aided Design in Molecular Nanotechnology.

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Thesis: Novel Variants of the Zwitterionic Claisen Rearrangement and the Total Synthesis of Erythronolide B.

Donald Eugene Elmore, Jr. (*Chemistry*) B.A., Grinnell College 1998.
Thesis: Investigations of Ion Channel Structure-Function Relationships Using Molecular Modeling and Experimental Biochemistry.

Shane Foister (*Chemistry*) B.S., University of Kentucky 1998.
Thesis: Shape Selective Recognition of the DNA Minor Groove by Hairpin Polyamides.

Michael Joseph Gordon (*Chemical Engineering*) B.S., Colorado School of Mines 1994; M.S., 1995; M.S., California Institute of Technology 1998.
Thesis: Low Energy Ion Beamline-Scattering Apparatus with Application to Charge Exchange Collisions at Surfaces.

Florian Gstrein (*Chemistry*) Diploma, Montanuniversitat Leoben 1997.
Thesis: Electron-Transfer Processes at Semiconductor/Liquid Interfaces and Metal/Nanogap Junctions.

Sarah Christine Heilshorn (*Chemical Engineering and Biology*) B.S., Georgia Institute of Technology 1998; M.S., California Institute of Technology 2000.
Thesis: Design and Characterization of Artificial Extracellular Matrix Proteins for Use as Small-Diameter Vascular Grafts.

Wendy Sandra Jen (*Chemistry*) S.B., Massachusetts Institute of Technology 1998.
Thesis: Development of New Asymmetric Organocatalytic Methods and Progress towards the Total Synthesis of Guanacastepene A.

M. Yashar S. Kalani (*Biochemistry and Molecular Biophysics*) B.S., M.S., University of California, Los Angeles 2002; M.S., California Institute of Technology 2003.
Thesis: Structure and Function Studies of the Human Dopamine Receptors.

Michael D. Kempe (*Chemical Engineering*) B.S., University of Utah 1997; M.S., California Institute of Technology 2002.
Thesis: Rheology and Dynamics of Side-Group Liquid Crystalline Polymers in Nematic Solvents.

Jacqueline Kessler (*Chemistry*) B.S., University of California, San Diego 1998.
Thesis: Gas and Dust Chemistry in Planet-Forming Disks.

Tristan Hayes Lambert (*Chemistry*) B.S., University of Wisconsin–Platteville 1998.
Thesis: Development of the Lewis Acid Catalyzed Allenoate-Claisen Rearrangement. Investigations of Enantioselective Catalysis of the Allenoate-Claisen Rearrangement. Studies Towards the Total Synthesis of Erythrolide E.

Doctor of Philosophy *continued*

Timothy Michael Lesko (*Chemistry*) B.S., University of California, Riverside 1998.
Thesis: Chemical Effects of Acoustic Cavitation.

Sarah Lynn May (*Chemistry*) B.Sc., University of Victoria 1997; M.Sc., 1999.
Thesis: Site-Specific Incorporation of Unnatural Amino Acids into Receptors Expressed in Mammalian Cells.

Elizabeth Idonia Mayo (*Chemistry*) B.S., Florida State University 1995; M.S., 1999.
Thesis: Kinetics and Thermodynamics of Dye (Group VIII Metal)–Sensitized Nanocrystalline Titanium Dioxide Photoelectrodes.

Daniel Hern Paik (*Chemistry*) B.A., Haveford College 1997.
Thesis: Femtosecond Time-Resolved Spectroscopy of Anionic Systems: Dynamics of Mesoscopic Solvation and Gas-Phase Organic Reactions.

Nick Anthony Paras (*Chemistry*) A.B., Harvard College 1998.
Thesis: Enantioselective Organocatalytic Friedel-Crafts Alkylations of Heterocycles and Electron-Rich Benzenes.

Noah Edward Robinson (*Chemistry*) B.S., Southern Oregon University 1999.
Thesis: Investigations of Peptide and Protein Deamidation.

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Thesis: High-Pressure Microdischarges as Microreactors for Materials Applications.

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Thesis: Enhancing Materials through Controlled Architectures with Ring-Opening Metathesis Polymerization.

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Thesis: The Effect of Ligand Array on Stereocontrol and Molecular Weight in Metallocene-Catalyzed α-Olefin Polymerization and (PNP)$CrPh_3$ Complexes as Well-Defined Ethylene Trimerization Catalysts.

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Thesis: Exploring the Proteome: Insights into Eukaryotic Protein Synthesis Using Puromycin Analogs.

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Thesis: Ligand Design, Coordination Chemistry, and Mechanistic Studies of (Phosphino)Borates and their Platinum, Nickel, and Copper Complexes.

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Thesis: Prediction of Structure, Function, and Spectroscopic Properties of G-Protein-Coupled Receptors: Methods and Applications.

Timothy Mark VanReken (*Chemical Engineering*) B.S., University of Florida 1997.
Thesis: Understanding the Relationship between Aerosols and Clouds: Field Investigations and Instrument Development.

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Thesis: Expanding the Biosynthetic Capacity of the Aminoacyl-tRNA Synthetases.

Doctor of Philosophy *continued*

Donald William Ward (*Chemistry*) B.S., Principia College 1998.
Thesis: Stereoselective Ruthenium-Catalyzed Olefin Metathesis.

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Thesis: Design and Development of New Enantioselective Catalytic Reactions and Progress towards the Total Synthesis of Callipeltoside A.

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Thesis: I. Synthesis, Characterization, and Base Catalysis of Organic-Functionalized Molecular Sieves. II. Selective Oxidation of Ethane via Heteropolyanion-Containing Solid Catalysts.

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Thesis: Fundamental Aspects of DNA-Mediated Charge Transport.

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Thesis: Chemical-scale Manipulation of Ion Channels: *In vivo* Nonsense Suppression and Targeted Disulfide Crosslinking.

DIVISION OF ENGINEERING AND APPLIED SCIENCES

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Thesis: Integration of Optoelectronics and Microfluidics for Biological and Chemical Sensing.

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Thesis: Frequency Generation Techniques for Integrated Applications.

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Thesis: Investigation of Thermal Tempering in Bulk Metallic Glasses.

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Thesis: Vortex Method for Computing High-Reynolds Number Flows: Increased Accuracy with a Fully Mesh-Less Formulation.

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Thesis: Robust Flow Stability: Theory, Computations and Experiments in Near Wall Turbulence.

Doctor of Philosophy *continued*

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Thesis: Superprotonic Solid Acids: Structure, Properties, and Applications.

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Thesis: Temporal and Spatial Patterns of the Interannual Variability of Stratospheric Ozone and Dynamics.

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Thesis: Low-Coherence Interferometric Imaging: Solution of the One-Dimensional Inverse Scattering Problem.

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Thesis: Impulse Generation by Detonation Tubes.

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Thesis: Optimization of Multi-resolution Source Codes.

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Thesis: Distributed Receding Horizon Control of Multiagent Systems.

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Thesis: Constrained Sequential Lamination: Nonconvex Optimization and Material Microstructure.

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Thesis: On Source Coding for Networks.

Doctor of Philosophy *continued*

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Thesis: Data Collection and Distribution in Sensory Networks.

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Thesis: Thermal Properties of Nano- and Microstructures.

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Thesis: Microfluidic Technologies for Structural Biology.

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Thesis: Integrated Concurrent Multi-Band Radios and Multiple-Antenna Systems.

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Thesis: Mechanisms of Indirect Mineral Reduction by Bacteria.

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Thesis: Transition-Edge Superconducting Antenna-Coupled Bolometer.

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Thesis: Nanotube and Nanowire Devices.

Anxiao Jiang (*Electrical Engineering*) B.E., Tsinghua University 1999; M.S., California Institute of Technology 2000.
Thesis: Optimized Network Data Storage and Topology Control.

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Thesis: Single-Molecule Detection and DNA Sequencing-by-Synthesis.

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Thesis: Nonlinear Optics in Ultra-high Q Whispering-Gallery Optical Microcavities.

William Scott Klug (*Mechanical Engineering*) B.S., Westmont College 1997; M.S., University of California, Los Angeles 1999.
Thesis: A Director-Field Theory of DNA Packaging in Bacteriophage Viruses.

Swaminathan Krishnan (*Civil Engineering and Business, Economics and Management*) B.Tech., Indian Institute of Technology 1992; M.S., Rice University 1994.
Thesis: Three-Dimensional Nonlinear Analysis of Tall Irregular Steel Buildings Subject to Strong Ground Motion.

Doctor of Philosophy *continued*

Melvin Leok (*Control and Dynamical Systems and Applied and Computational Mathematics*) B.S., California Institute of Technology 2000; M.S., 2000.
Thesis: Foundations of Computational Geometric Mechanics.

Jiao Lin (*Materials Science*) B.S., Peking University 1996; M.S., Chinese Academy of Science 1999; M.S., California Institute of Technology 2001.
Thesis: Mössbauer Diffractometry: Principles, Practice, and an Application to a Study of Chemical Order in $^{57}Fe_3Al$.

Dai Lu (*Electrical Engineering*) B.E., Zhejiang University 1996; M.S., California Institute of Technology 2000.
Thesis: Active Patch Array Design and Indoor Channel Modeling for Future Wireless Communications.

Sanjeev Malhotra (*Aeronautics and Applied and Computational Mathematics*) B.Eng., Carlton University 1994; M.S., University of Tennessee Space Institute 1997.
Thesis: On Combustion Instability in Solid Rocket Motors.

Maribeth Swiatek Mason (*Applied Physics*) B.S., University of Illinois at Urbana-Champaign 1997; M.S., California Institute of Technology 1999.
Thesis: Synthesis of Large-Grained Polycrystalline Silicon by Hot-Wire Chemical Vapor Deposition for Thin Film Photovoltaic Applications.

Mark Meyer *(Computer Science)* B.S. *(Computer Engineering),* B.S. *(Computer Science),* Northwestern University 1997; M.S., California Institute of Technology 2000.
Thesis: Discrete Differential Operators for Computer Graphics.

Paul O'Gorman (*Aeronautics and Applied and Computational Mathematics*) B.S., Trinity College Dublin 1998; M.S., 1999.
Thesis: Theory and Simulation of Passive Scalar Mixing in the Presence of a Mean Scalar Gradient.

Neal Curtis Oldham (*Materials Science*) B.S., University of Tennessee 1999; M.S., California Institute of Technology 2002.
Thesis: Investigation of Spintronic Materials Systems: Deposition and Characterization.

Gerard Kieran O'Reilly (*Aeronautics and Applied and Computational Mathematics*) B.A., M.Sc., Trinity College Dublin 1998.
Thesis: Compressible Vortices and Shock-Vortex Interactions.

Ravi Palanki (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Madras 2000; M.S., California Institute of Technology 2001.
Thesis: Iterative Decoding for Wireless Networks.

Alastair Thomas Preston (*Mechanical Engineering*) B.E., Canterbury University 1995; M.S., California Institute of Technology 1997.
Thesis: Modeling Heat and Mass Transfer in Bubbly Cavitating Flows and Shock Waves in Cavitating Nozzles.

Doctor of Philosophy *continued*

Hongyu Ran *(Mechanical Engineering)* B.S., University of Science and Technology of China 1995; M.S., California Institute of Technology 1996.
Thesis: Numerical Study of the Dynamics and Sound Generation of a Turbulent Vortex Ring.

Marcus Riedel (*Electrical Engineering*) B.E., McGill University 1995; M.S., California Institute of Technology 1997.
Thesis: Cyclic Combinational Circuits.

Matthew James Ringuette (*Aeronautics and Science, Ethics, and Society*) B.S., Rensselaer Polytechnic Institute 1999; M.S., California Institute of Technology 2000.
Thesis: Vortex Formation and Drag on Low Aspect Ratio, Normal Flat Plates.

Robert Cashman Rogan (*Materials Science*) B.S., Boston College 2000; M.S., California Institute of Technology 2002.
Thesis: Investigation of the Multiscale Constitutive Behavior of Ferroelectric Materials Using Advanced Diffraction Techniques.

Shane David Ross (*Control and Dynamical Systems*) B.S., California Institute of Technology 1998.
Thesis: Cylindrical Manifolds and Tube Dynamics in the Restricted Three-Body Problem.

Steven Schkolne (*Computer Science*) B.S., Carnegie Mellon University 1997; M.S., California Institute of Technology 1999.
Thesis: 3-D Interfaces for Spatial Construction.

Jeffrey T. Scruggs (*Applied Mechanics*) B.S., Virginia Polytechnic Institute and State University 1997; M.S., 1999; M.S., California Institute of Technology 2000.
Thesis: Structural Control Using Regenerative Force Actuation Networks.

Rustem Vil Shaikhutdinov (*Applied Mechanics*) B.A., Moscow State University of Technology 1998; M.S., California Institute of Technology 1999.
Thesis: Structural Damage Evaluation: Theory and Applications to Earthquake Engineering.

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Thesis: Fiber-Coupled Ultra-high-Q Microresonators for Nonlinear and Quantum Optics.

Geoffrey A. Swift (*Materials Science*) A.S., John A. Logan College 1995; B.S., Southern Illinois University 1997; M.S., 1999; M.S., California Institute of Technology 2001.
Thesis: Neutron Diffraction Study of *In Situ*-Reinforced Silicon Nitride during Creep.

Michel Tanguay (*Mechanical Engineering*) B.Eng., McGill University 1995; M.Eng., 1997.
Thesis: Computation of Bubbly Cavitating Flow in Shock Wave Lithotripsy.

Andre Tkacenko (*Electrical Engineering*) B.S., California Institute of Technology 1999; M.S., 2001.
Thesis: Optimization Algorithms for Realizable Signal-Adapted Filter Banks.

Doctor of Philosophy *continued*

Bojan Vrcelj (*Electrical Engineering*) Diploma, University of Belgrade 1998; M.S., California Institute of Technology 1999.
Thesis: Multirate Signal Processing Concepts in Digital Communications.

Theodore A. Waniuk (*Materials Science*) B.S., Harvey Mudd College 1996; M.S., California Institute of Technology 1998.
Thesis: Viscosity and Crystallization in a Series of Zr-based Bulk Amorphous Alloys.

Matthew West (*Control and Dynamical Systems*) B.Sc., University of Western Australia 1997.
Thesis: Variational Integrators.

Eric Wintenberger (*Aeronautics*) Diplôme d'Ingénieur, École Centrale Paris 1998; M.S., California Institute of Technology 2000.
Thesis: Application of Steady and Unsteady Detonation Waves to Propulsion.

Catherine Grace Wong (*Computer Science and Electrical Engineering*) B.S., University of Toronto 1999; M.S., California Institute of Technology 2000.
Thesis: High-Level Synthesis and Rapid Prototyping of Asynchronous VLSI Systems.

Qiang Yang (*Aeronautics and Electrical Engineering*) B.E., Dalian University of Technology 1996; M.E., Tsinghua University 1999.
Thesis: Thermomechanical Variational Principles for Dissipative Materials with Application to Strain Localization in Bulk Metallic Glasses.

Tomoyuki Yoshie (*Electrical Engineering and Physics*) B.Eng., Kyoto University 1990; M.Eng., 1992; M.S., California Institute of Technology 2000.
Thesis: Planar Photonic Crystal Nanocavities with Active Quantum Nanostructures.

DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES

Antonin Henri Bouchez (*Planetary Science*) B.A., University of California, Berkeley 1995.
Thesis: Seasonal Trends in Titan's Atmosphere: Haze, Wind, and Clouds.

Javier Favela (*Geophysics*) B.S., California Institute of Technology 1995; M.S., Stanford University 1996.
Thesis: Energy Radiation from a Multi-Story Building.

Xianglei Huang (*Planetary Science and Applied Computation*) B.S., University of Science and Technology of China 1997; M.S., California Institute of Technology 2000.
Thesis: I. Variability of the Outgoing Thermal IR Spectra and Its Application in GCM Validation. II. The Detection of Cloud/Aerosol in the Outgoing Thermal IR Spectra.

Rowena Benfer Lohman (*Geology*) B.S., California Institute of Technology 1998.
Thesis: The Inversion of Geodetic Data for Earthquake Parameters.

Patricia Persaud (*Geophysics*) B.S., University of Houston 1998; M.S., California Institute of Technology 2001.
Thesis: Images of Early Continental Breakup in and around the Gulf of California and the Role of Basal Shear in Producing Wide Plate Boundaries.

Doctor of Philosophy *continued*

Brian Kirk Savage (*Geophysics*) B.A., University of California, Berkeley 1998; M.S., California Institute of Technology 2000.
Thesis: Regional Seismic Wavefield Propagation.

Huiqun Wang (*Planetary Science and Applied and Computational Mathematics*) B.S., University of Science and Technology of China 1997.
Thesis: Global Observations of Martian Clouds with the Mars Orbiter Camera of the Mars Global Surveyor Spacecraft.

Lingsen Zeng (*Geology*) B.S., Nanjing University 1991; M.S., Chinese Academy of Geological Sciences 1994; M.S., California Institute of Technology 2000.
Thesis: Non-Modal Partial Melting of Metasedimentary Pendants in the Southern Sierra Nevada and Implications for the Deep Origin of Within-Pluton Isotopic Heterogeneity.

DIVISION OF HUMANITIES AND SOCIAL SCIENCES

Elena Nikolaeva Asparouhova (*Social Science*) B.Sc., Sofia University 1994; M.Sc., 1996; B.B.A., 1998; M.S., California Institute of Technology 2000.
Thesis: Competition and Equilibration in Financial Markets.

Carla Emily VanBeselaere (*Social Science*) B.A., University of Western Ontario 1995; M.A., 1996; M.S., California Institute of Technology 2002.
Thesis: The Shirking Model–A Theory of How People Answer Survey Questions.

DIVISION OF PHYSICS, MATHEMATICS AND ASTRONOMY

Charlene Sonja Ahn (*Physics*) A.B., Harvard College 1998; M.S., California Institute of Technology 2002.
Thesis: Extending Quantum Error Correction: New Continuous Measurement Protocols and Improved Fault-Tolerant Overhead.

Jay L. Bartroff (*Mathematics*) B.A., University of California, Berkeley 1998.
Thesis: Asymptotically Optimal Multistage Hypothesis Tests.

David E. Beckman (*Physics*) B.S. (*Electrical Engineering*), B.S. *(Engineering Physics)*, University of Illinois at Urbana-Champaign 1992; M.S., California Institute of Technology 2000.
Thesis: Investigations in Quantum Computing: Causality and Graph Isomorphism.

Klejda Adnan Bega (*Physics*) B.S., California Institute of Technology 1999.
Thesis: Measurement of the Weak Mixing Angle in Møller Scattering.

Edo Berger (*Astrophysics*) B.S., University of California Los Angeles 1999.
Thesis: Cosmic Explosions: The Beasts and Their Lair.

Vadim Borokhov (*Physics*) B.S., Moscow Institute of Physics and Technology 1996; M.S., 1998.
Thesis: Monopole Operators and Mirror Symmetry in Three-Dimensional Gauge Theories.

Doctor of Philosophy *continued*

Avery Earl Broderick (*Physics*) B.S., State University of New York at Stony Brook 1999.
Thesis: Radiative Transfer in Accreting Environments.

Keng-Hwee Chiam (*Physics*) B.S.E., University of Michigan 1996.
Thesis: Spatiotemporal Chaos in Rayleigh-Bénard Convection.

Calin A. Ciocarlie *(Physics)* B.S., California Institute of Technology 1997: M.A., Harvard University 1999
Thesis: D-Brane Actions and *N=2* Supergravity Solutions.

Jason Andrew Colwell (*Mathematics*) B.S., University of Alberta 1995; M.S., 1997.
Thesis: The Conjecture of Birch and Swinnerton-Dyer for Elliptic Curves with Complex Multiplication by a Nonmaximal Order.

John Anthony Cortese (*Physics*) B.S., Worcester Polytechnic Institute 1982; M.S., 1985; M.S. (*Applied Mathematics*), California Institute of Technology 1990; Ph.D. (*Electrical Engineering*), 1995; M.S. (*Physics*), California Institute of Technology 2000.
Thesis: Quantum Information Theory - Classical Communication Over Quantum Channels.

Sumit Kumar Daftuar (*Mathematics*) A.B., Harvard College 1996.
Thesis: Eigenvalue Inequalities in Quantum Information Processing.

Samantha Faye Edgington (*Physics*) A.B., Princeton University 1997.
Thesis: A Galaxy Cluster Survey Using the Sunyaev Zel'dovich Effect.

Vineet Gupta (*Mathematics*) A.B. Harvard College 1990.
Thesis: Conformal Laminations.

James William Harrington (*Physics*) B.S., Duke University 1998.
Thesis: Analysis of Quantum Error-Correcting Codes: Symplectic Lattice Codes and Toric Codes.

Xue Ming Henry Huang (*Physics*) B.S., Peking University 1995; M.S., Arizona State University 1997.
Thesis: Ultrahigh and Microwave Frequency Nanomechanical Systems.

Matthew Philip Hunt (*Astrophysics*) B.S., Pennsylvania State University 1998.
Thesis: Faint Optically Selected AGN at $z = 3$.

Gary Mark Jones *(Physics)* B.S., University of Kentucky 1999.
Thesis: A Precision Measurement of the Weak Mixing Angle in Møller Scattering at Low Q_2.

David Lior Ariel Kaplan (*Astrophysics*) B.S., Cornell University 1999.
Thesis: The Diversity of Neutron Stars: Nearby Thermally Emitting Neutron Stars and the Compact Central Objects in Supernova Remnants.

Qiang Lin (*Mathematics*) B.S., University of Science and Technology of China 1992; M.S., 1995.
Thesis: Bloch-Kato Conjecture for the Adjoint of $H^1(X_o(N))$ with Integral Hecke Algebra.

Doctor of Philosophy *continued*

Elliot Lipeles (*Physics*) B.A., University of Chicago 1995.
Thesis: A Study of the Fully Differential Inclusive Semileptonic *B* Meson Decay Rate.

Kimball L. Martin (*Mathematics*) B.S., M.S., University of Maryland, Baltimore 1999.
Thesis: Four-dimensional Galois Representations of Solvable Type and Automorphic Forms.

Peter A. Mastromarino *(Physics)* B.A., Princeton University 1999.
Thesis: A Precision Low-Energy Measurement of the Weak Mixing Angle in Møller Scattering.

Jason Terence Taylor McKeever (*Physics*) B.Sc., University of Toronto 1998.
Thesis: Trapped Atoms in Cavity QED for Quantum Optics and Quantum Information.

Richard William O'Shaughnessy (*Physics*) B.A., Cornell University 1996.
Thesis: Topics in Gravitational-Wave Astronomy.

Arkadas Inan Ozakin (*Physics*) B.Sc., Bogazici University 1997.
Thesis: RG-Flows, ADS/CFT Correspondence and Stability of Black Branes.

Michael Robert Santos (*Astronomy*) A.B., Vassar College 1998.
Thesis: Galaxy Formation Near the Epoch of Reionization.

Fernando J. Selman (*Astronomy*) B.A., University of Chile 1981; M.S., California Institute of Technology 1993.
Thesis: The Initial Mass Function and Star-Formation History in the 30 Doradus Super-Association.

Wenjin Shao (*Physics*) B.S., University of Science and Technology of China 1999; M.S., California Institute of Technology 2001.
Thesis: Studies and Applications of Hyperpolarized ^{129}-Xe.

Jonathan LeRoy Sievers *(Astronomy)* S.B., Massachusetts Institute of Technology 1997.
Thesis: Data Analysis of and Results from Observations of the Cosmic Microwave Background with the Cosmic Background Imager.

Robert Andrew Simcoe (*Astronomy*) A.B., Princeton University 1997.
Thesis: Observations of Intergalactic Heavy-Element Enrichment in the Early Universe.

Patricia Simcoe Udomprasert (*Astronomy*) A.B., Princeton University 1997.
Thesis: H_o from Cosmic Background Imager Observations of the Sunyaev-Zel'dovich Effect in Nearby Clusters.

Luke Sollitt (*Physics*) B.A., University of Maryland, College Park 1990; B.S., 1997; M.S., California Institute of Technology 1999.
Thesis: Ionic Charge States of Solar Energetic Particles.

Ian Bairstow Spielman (*Physics*) B.S., University of Oklahoma 1998.
Thesis: Evidence for the Josephson Effect in Quantum Hall Bilayers.

Robert P. Strittmatter (*Physics*) B.Sc., University of Arizona 1998.
Thesis: Development of Micro-Electromechanical Systems in GaN.

Doctor of Philosophy *continued*

Sergiy Vasylkevych (*Mathematics*) Diploma, B.S., Moscow Institute of Physics and Technology 1999.
Thesis: Poisson Structures for PDEs Associated with Diffeomorphism Groups.

Rebecca Angel Vessenes (*Mathematics*) B.S., University of Chicago 2000.
Thesis: Generalized Foulkes' Conjecture and Tableaux Construction.

Guodong Wang (*Physics*) B.S., University of Science and Technology of China 1999; M.S., California Institute of Technology 2001.
Thesis: Polarizing ^{3}He by Spin Exchange with Potassium.

Xinkai Wu (*Physics*) B.S., Peking University 1998; M.S., California Institute of Technology 2000.
Thesis: Testing Gauge/Gravity Duality: The Eleven-Dimensional PP-Wave.

Sarah Anne Yost (*Physics*) B.Sc., University of Manitoba 1995.
Thesis: Gamma-Ray Burst Afterglows: Constraining Physical Parameters and Fireball Model Assumptions.

Dapeng Zhan (*Mathematics*) B.S., Nankai University 1996.
Thesis: Random Loewner Chains in Riemann Surfaces.

Valentin P. Zhigulin (*Physics*) National Technical University of Ukraine 1996
Thesis: Multiple-Scale Dynamics in Neural Systems: Learning, Synchronization and Network Oscillations.

Prizes and awards are listed only for those students receiving degrees in 2003, and include prizes and awards received by them in previous years.

MILTON AND FRANCIS CLAUSER DOCTORAL PRIZE

Awarded to the Ph.D. candidate whose research is judged to exhibit the greatest degree of originality as evidenced by its potential for opening up new avenues of human thought and endeavor as well as by the ingenuity with which it has been carried out.

Recipient to be announced at commencement.

FREDERIC W. HINRICHS, JR., MEMORIAL AWARD

Awarded to the seniors who, in the opinion of the undergraduate Deans, have made the greatest undergraduate contribution to the welfare of the student body and whose qualities of leadership, character, and responsibility have been outstanding.

2004 *Neda Afsarmanesh, Thomas Fletcher*

MABEL BECKMAN PRIZE

Awarded to an undergraduate woman upon completion of her junior or senior year in recognition of demonstrated academic and personal excellence, contributions to the Institute community, and outstanding qualities of character and leadership.

2004 *Iram Parveen Bilal, Anita Shuk Man Choi*

ROSALIND W. ALCOTT MERIT SCHOLARSHIP, UPPER CLASS MERIT AWARD, CARNATION SCHOLARSHIP, AND JOHN STAUFFER MERIT SCHOLARSHIP

Each year Caltech awards these prizes for academic excellence to undergraduates. They are based solely on merit (selection is made on the basis of grades, faculty recommendations, and demonstrated research productivity) with no consideration given to need or any other nonacademic criteria.

2001 *Caroline Gibbs, Cristian Jitianu*

2002
Caroline Gibbs
Cristian Jitianu
Po-Shen Loh
Lizhou Lisa Wang

2003
Marko Cetina
Anita Shuk Man Choi
Patrick Codd
Koun Han
Paul Hand
James Hegeman
Liang Jiang
Cristian Jitianu
Angel Pui Ying Kong
Robert Li
Eric Lin
Po-Shen Loh
Gautham Nair
Jonathan Simon
Lizhou Lisa Wang
Sina Yeganeh

2004
Brian Aydemir
Brian Bairstow
Marko Cetina
Anita Shuk Man Choi
Rumi Chunara
Patrick Codd
Yile Ding
Andrei Faraon
Koun Han
Paul Hand
Liang Jiang
Cristian Jitianu
Angel Pui Ying Kong
Stephan Lavavej
Jason Kwok-San Lee
Hongyi Li
Robert Li
Ye Li
Eric Lin
Po-Shen Loh
Arvind Murugan
Gautham Nair
Harris Nover
Nicholas Piro
Surjeet Rajendran
John Rice
Jonathan Simon
Matthew Terrel
Jian Yuan Thum
Victor Tsai
Lizhou Lisa Wang
Andrew Yang
Sina Yeganeh

AXLINE AND PRESIDENT'S SCHOLARS

Awarded to selected freshmen whose record of personal and academic accomplishment is judged outstanding among incoming freshmen. These scholarships are renewable, contingent on academic performance.

2000	*Brandon Ballara*	*Megan Guichard*	*Alejandro Muñoz*
	Michael Clemons	*Ali Hassani*	*Melinda Owens*
	Patrick Codd	*William Heltsley*	*James Rebesco*
	Rachel Deco	*Samuel Lindsay-Levine*	*Jonathan Simon*
	Cesar Del Solar	*Dagny Looper*	*David Stafford*
	Vicente Fernandez	*Abbey Major*	*Melissa Strausberg*
	Peter Freddolino	*Francisco Medina*	*Christopher Sung*
	Elaine Gee	*Jason Mitchell*	*Andrew Yang*
2002	*Brandon Ballara*	*William Heltsley*	*Melinda Owens*
	Patrick Codd	*Samuel Lindsay-Levine*	*James Rebesco*
	Rachel Deco	*Po-Shen Loh*	*Jonathan Simon*
	Cesar Del Solar	*Dagny Looper*	*Melissa Strausberg*
	Vicente Fernandez	*Abbey Major*	*Christopher Sung*
	Peter Freddolino	*Francisco Medina*	*Andrew Yang*
	Elaine Gee	*Jason Mitchell*	
	Megan Guichard	*Alejandro Muñoz*	
2003	*Patrick Codd*	*Samuel Lindsay-Levine*	*James Rebesco*
	Cesar Del Solar	*Po-Shen Loh*	*Jonathan Simon*
	Vicente Fernandez	*Dagny Looper*	*Melissa Strausberg*
	Peter Freddolino	*Abbey Major*	*Christopher Sung*
	Elaine Gee	*Francisco Medina*	*Andrew Yang*
	Megan Guichard	*Alejandro Muñoz*	
	William Heltsley	*Melinda Owens*	

CHARLES D. BABCOCK AWARD

Awarded, by vote of the aeronautics faculty, to a graduate student whose achievements in teaching or other assistance to students have made a significant contribution to the aeronautics department.

2004 *Chang Kook Oh*

WILLIAM F. BALLHAUS PRIZE
Awarded to aeronautics students for outstanding doctoral dissertations.

2004 *Kumar Bobba*

BECKMAN SCHOLARS
Awarded to two sophomore students in the divisions of biology and chemistry and chemical engineering on the basis of academic achievement and research potential. Award winners collaborate with a faculty mentor during two summers and the intervening academic year. This award is funded by a grant from the Arnold and Mabel Beckman Foundation.

2002 *Sina Yeganeh, Melinda Owens*

ERIC TEMPLE BELL UNDERGRADUATE MATHEMATICS RESEARCH PRIZE
Awarded to one or more juniors or seniors for outstanding original research in mathematics.

2004 *Po-Shen Loh, Ameera Chowdhury*

BHANSALI PRIZE IN COMPUTER SCIENCE
Awarded to an undergraduate student for outstanding research in computer science in the current academic year.

2004 *Elliott Karpilovsky*

RICHARD G. BREWER PRIZE IN PHYSICS
Awarded to the freshman with the most interesting solutions to the Physics 11 "hurdles," in recognition of demonstrated intellectual promise and creativity at the very beginning of his or her Caltech education.

2001 *Marko Cetina*

ROLF D. BUHLER MEMORIAL AWARD IN AERONAUTICS
Awarded to an aeronautics student for outstanding academic achievement in the Master's program.

2004 *Iván Bermejo Moreno, Manuel Lombardini, Xiao Lu*

FRITZ B. BURNS PRIZE IN GEOLOGY
Awarded to an undergraduate who has demonstrated both academic excellence and great promise of future contributions in the fields represented by the division of geological and planetary sciences.

2003 *Dagny Looper*

THE W. P. CAREY & CO., INC., PRIZE IN MATHEMATICS
Awarded to a student receiving a Doctor of Philosophy degree for an outstanding doctoral dissertation in applied mathematics or pure mathematics.

2004 *Jay Bartroff*

RICHARD BRUCE CHAPMAN MEMORIAL AWARD
Awarded to a graduate student in hydrodynamics who has distinguished himself or herself in research in the division of engineering and applied science.

2004 *Michel Tanguay*

DEANS' CUP AND CAMPUS LIFE AND MASTER'S AWARD
Two awards, selected by the deans, the director of campus life, and the master of student houses, presented to undergraduates whose concern for their fellow students has been demonstrated by persistent efforts to improve the quality of undergraduate life and by effective communication with members of the faculty and administration.

2003 *Iram Bilal,* Dean's Cup

2004 *Harris Nover,* Dean's Cup
Tamara Becher, Jeffrey Cox,William Heltsley, Jeremy Pitts, Campus Life

CONSTANTIN G. ECONOMOU MEMORIAL PRIZE
Awarded to a chemical engineering graduate student distinguished by outstanding research accomplishments and exemplary attitude while fulfilling candidacy requirements for the Ph.D. degree.

1998 *Michael Joseph Gordon*

1999 *Patrick Cirino*

2000 *Ramanathan Sankaran*

EVERHART DISTINGUISHED GRADUATE STUDENT LECTURER AWARD
Awarded to a graduate student who has demonstrated exemplary presentation ability and graduate research.

2003 *Sarah Heilshorn*

2004 *Shane Ross*

DORIS EVERHART SERVICE AWARD
Awarded annually to an undergraduate who has actively supported and willingly worked for organizations that enrich not only student life, but also the campus and/or community as a whole, and who has, in addition, exhibited care and concern for the welfare of students on a personal basis. The award was established in 1999 by Martin and Sally Ridge in honor of Doris Everhart.

2004 *Rachel Deco*

LAWRENCE L. AND AUDREY W. FERGUSON PRIZE
Awarded to the graduating Ph.D. candidate in biology who has produced the outstanding Ph.D. thesis for the past year.

2004 *W. Bryan Smith*

RICHARD P. FEYNMAN PRIZE IN THEORETICAL PHYSICS
Awarded to a senior on the basis of excellence in theoretical physics.

2004 *Liang Jiang*

HAREN LEE FISHER MEMORIAL AWARD IN JUNIOR PHYSICS
Awarded to a junior physics major who demonstrates the greatest promise of future contributions in physics.

2003 *Marko Cetina, Eric Lin*

HENRY FORD II SCHOLAR AWARD
Awarded either to the engineering student with the best academic record at the end of the third year of undergraduate study, or to the engineering student with the best first-year record in the graduate program.

2002 *Xiaofeng Li*

2003 *Angel PuiYing Kong*

JACK E. FROEHLICH MEMORIAL AWARD
Awarded to a junior in the upper 5 percent of his or her class who shows outstanding promise for a creative professional career.

2003 *Cristian Jitianu*

GEORGE W. AND BERNICE E. GREEN MEMORIAL PRIZE
Awarded to the undergraduate student who, in the opinion of the division chairs, has shown outstanding ability and achievement in creative scholarship.

2004 *Isaac Hilburn, Harris Nover*

ARIE J. HAAGEN-SMIT MEMORIAL AWARD
Awarded to a sophomore or junior in biology or chemistry who has shown academic promise and who has made recognized contributions to Caltech.

2003 *Theresa Tiefenbrunn*

BIBI JENTOFT-NILSEN MEMORIAL AWARD
Awarded to an upperclass student who exhibits outstanding qualities of leadership and who actively contributes to the quality of student life at Caltech.

2003 *Neda Afsarmanesh*

2004 *Rumi Chunara*

SCOTT RUSSELL JOHNSON PRIZE FOR EXCELLENCE IN GRADUATE STUDY IN MATHEMATICS
Awarded to continuing graduate students for excellence in one or more of the following: extraordinary progress in research, excellence in teaching, or excellent performance as a first-year graduate student.

2002 *Jay Bartroff*

2003 *Kimball Martin*

SCOTT RUSSELL JOHNSON GRADUATE DISSERTATION PRIZE IN MATHEMATICS
Awarded for the best graduate dissertation in mathematics.

2003 *Qiang Lin*

2004 *Kimball Martin, Dapeng Zhan*

SCOTT RUSSELL JOHNSON UNDERGRADUATE MATHEMATICS PRIZE
Awarded for the best graduating mathematics major. Special consideration is given to independent research done as a senior thesis or SURF project.

2004 *Po-Shen Loh, Megan Guichard*

D. S. KOTHARI PRIZE IN PHYSICS
Awarded to a graduating senior in physics who has produced an outstanding research project during the year.

2004 *Arvind Murugan*

MARGIE LAURITSEN LEIGHTON PRIZE
Awarded to one or two undergraduate women who are majoring in physics or astrophysics, and who have demonstrated academic excellence.

2002 *Lizhou Lisa Wang*

THE HERBERT NEWBY McCOY AWARD
Awarded to chemistry doctoral students for outstanding contributions to the science of chemistry.

2004 *Tae-Lim Choi*

MARY A. EARL McKINNEY PRIZE IN LITERATURE
Awarded to undergraduate students for excellence in writing in three categories: poetry, prose fiction, and nonfiction essays.

2003 *Isaac Hilburn*

2004 *Elliott Karpilovsky*

ROBERT L. NOLAND LEADERSHIP SCHOLARSHIP
Awarded to undergraduate students who exhibit qualities of outstanding leadership, which are most often expressed as personal actions that have helped other people and that have inspired others to fulfill their capabilities.

1998 *Neda Afsarmanesh*

2004 *Megan Greenfield, Katherine Ann Homann, Joseph Jewell, Jessie Kneeland*

RODMAN W. PAUL HISTORY PRIZE
Awarded to a junior or senior who has displayed an unusual interest in and talent for history.

2004 *Joseph Jewell*

HOWARD REYNOLDS MEMORIAL PRIZE IN GEOLOGY
Awarded to an undergraduate student who demonstrates the potential to excel in the field of geology and who actively contributes to the quality of student life at Caltech.

2004 *Natalia Deligne*

HERBERT J. RYSER MEMORIAL SCHOLARSHIPS
Awarded to undergraduate students for academic excellence, preferably in mathematics.

2003 *Megan Guichard, Po-Shen Loh, Arvind Murugan, Andrew Yang*

RICHARD P. SCHUSTER MEMORIAL PRIZE
Awarded to one or more juniors or seniors in chemistry or chemical engineering on the basis of financial need and academic promise.

2003 *Cristian Jitianu, Nicholas Piro*

2004 *Gautham Nair, Nicholas Piro*

ELEANOR SEARLE PRIZE IN LAW, POLITICS, AND INSTITUTIONS
The Eleanor Searle Prize was established in 1999 by friends and colleagues to honor Eleanor Searle. The prize is awarded annually to an undergraduate or graduate student whose work in history or the social sciences exemplifies Eleanor Searle's interests in the use of power, government, and law.

2004 *Kirsten Welge*

DON SHEPARD AWARD

Awarded to students who would find it difficult, without additional financial help, to engage in extracurricular and cultural activities. The recipients are selected on the basis of their capacity to take advantage of and to profit from these activities rather than on the basis of their scholastic standing.

1997 *Jeremy Kemper*

2002 *Christopher Flatt*
Graham Free
Angel Pui Ying Kong
Veasna Sok
Lizhou Lisa Wang

2003 *Yile Ding*
Kathryn Dyl
Christopher Flatt
James Rebesco
John Rice
Anna Sczaniecka
Kristin Shantz
Daniel Li-Shuan Wu

SIGMA XI AWARD

Awarded to a senior selected for an outstanding piece of original scientific research.

2004 *Peter Freddolino*

JOHN STAGER STEMPLE MEMORIAL PRIZE IN PHYSICS

Awarded to a graduate student in physics for outstanding progress in research as demonstrated by an excellent performance on the oral Ph.D. candidacy examination.

1999 *Elliot Lipeles*

2003 *Benjamin Toner*

PAUL STUDENSKI MEMORIAL FUND PRIZE

A travel grant awarded to a Caltech undergraduate who would benefit from a period away from the academic community in order to obtain a better understanding of self and his or her plans for the future.

2002 *Katherine Ann Homann*

2003 *Iram Bilal*

FRANK TERUGGI MEMORIAL AWARD

Awarded to an undergraduate student who honors the spirit of Frank Teruggi's life through participation "in the areas of Latin American studies, radical politics, creative radio programming, and other activities aimed at improving the living conditions of the less fortunate."

2003 *Katherine Ann Homann*

MORGAN WARD PRIZE

Awarded for the best problems and solutions in mathematics submitted by a freshman or sophomore.

2001 *Po-Shen Loh*

2002 *Po-Shen Loh*

CHARLES WILTS PRIZE

Awarded to a graduate student for outstanding independent research in electrical engineering leading to a Ph.D.

2004 *Marcus Riedel, Andre Tkacenko*

FREDRICK J. ZEIGLER MEMORIAL AWARD

Awarded to an outstanding sophomore or junior in pure or applied mathematics, for excellence in scholarship as demonstrated in class activities or in the preparation of an original paper or essay in any subject area.

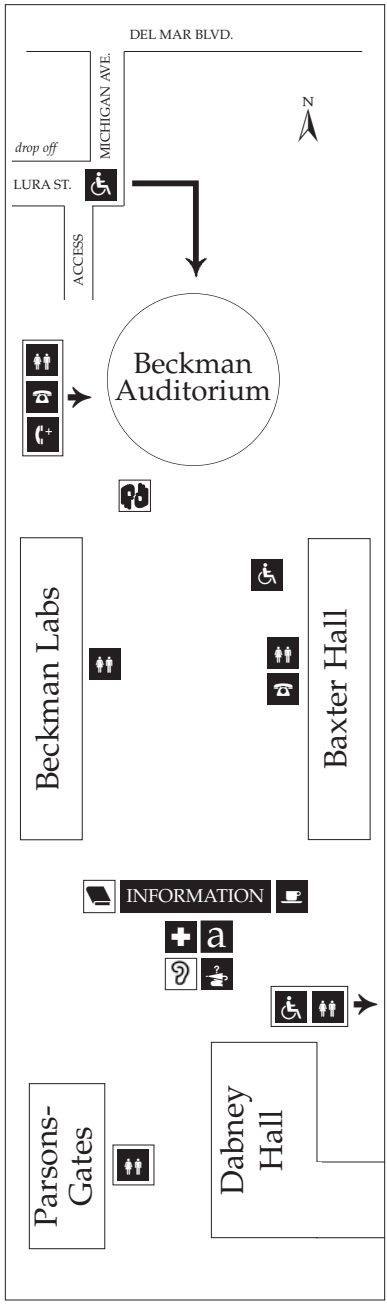
2002 *Po-Shen Loh*

Hail CIT

(Caltech Alma Mater)

by Manton Barnes, BS '21 EE

In Southern California with grace and splendor bound,
Where the lofty mountain peaks look out to lands beyond,
Proudly stands our Alma Mater, glorious to see;
We raise our voices proudly, hailing, hailing thee.
Echoes ringing while we're singing over land and sea,
The halls of fame resound thy name, noble CIT.



SERVICES FOR COMMENCEMENT GUESTS

PUBLIC TELEPHONES are available in Baxter Hall and Beckman Auditorium.

RESTROOMS are available in Baxter Hall, Beckman Labs, Parsons-Gates Hall of Administration, and Beckman Auditorium.

Information about the nearest location for FIRST AID SERVICES is available at the Information Center.

LOST AND FOUND items may be reported and/or claimed at the Information Center.

Complimentary COFFEE and PUNCH (beginning at 8:30 a.m.)

CALTECH BOOKSTORE sells souvenirs, film, and other items. ATHENAEUM luncheon tickets on sale 8–10 a.m.

SPECIAL SERVICES FOR PERSONS WITH DISABILITIES

ASSISTIVE LISTENING DEVICES are available at the Information Center. A driver's license or state-issued ID card is required.

LARGE-TYPE PROGRAMS (abridged) are available at the Information Center.

AMERICAN SIGN LANGUAGE (ASL) interpreters are stationed at the west front of the Ceremony seating area.

PEOPLE WHO USE WHEELCHAIRS, and their guests, will find a special section near the east front of the Ceremony seating area.

RESTROOMS ACCESSIBLE TO PEOPLE WHO USE WHEELCHAIRS are located in the Sherman Fairchild Library, just east of Dabney Hall.

AMPLIFIED TELEPHONE is available in Beckman Auditorium.