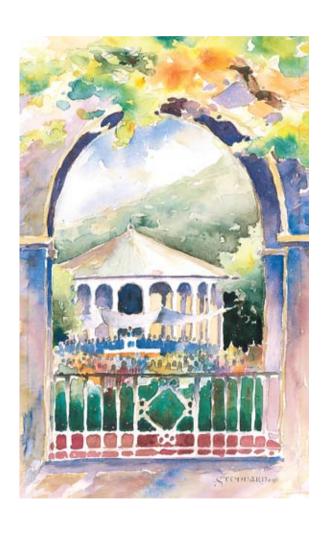


CALIFORNIA INSTITUTE of TECHNOLOGY

One Hundred Sixteenth Annual Commencement June 11, 2010



Cover: Caltech's commencement ceremony, by Joseph Stoddard					
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Editor: Sara Arnold Contributors: Gloria Brewster, Natalie Gilmore, Charlotte Erwin					

CALIFORNIA INSTITUTE of TECHNOLOGY

One Hundred Sixteenth Annual Commencement

Friday Morning at Ten O'Clock June Eleventh, Two Thousand Ten 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. 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, they 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, Art Collections, and Botanical Gardens, 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.

And amazing things indeed have happened at Caltech over the years. Theodore von Kármán developed the principles that made jet flight possible, Charles Richter published his logarithmic scale for measuring the magnitude of earthquakes, and astronomer Maarten Schmidt discovered the nature of quasars. Here Linus Pauling determined the nature of the chemical bond, Max Delbrück conducted the studies of bacterial viruses that led to a new branch of biology called molecular genetics, Murray Gell-Mann theorized that all particles are made up of quarks and anti-quarks, and Roger Sperry developed new insights into the implications of right-brain and left-brain functions.

It was not just faculty but also Caltech alumni who came to have great impact on the world. Alumnus Charles Townes developed the laser; Chester Carlson invented Xerography; David Ho did landmark work in creating an effective AIDS drug treatment; Gordon Moore helped found the semiconductor industry. Many alumni, such as Simon Ramo and Ben Rosen, have gone on to make substantial marks in the business world, while others have become astronauts, university presidents, government leaders, and even authors, directors, and performance artists of note. Caltech's reach has certainly been wide and long-lasting.

Caltech today has a 124-acre campus and operates seven off-campus astronomical, seismological, and marine biological facilities, and also administers NASA's Jet Propulsion Laboratory. At present, the Institute has an enrollment of some 2,100 students, more than half of whom are in graduate studies; about 300 professorial faculty members, including five Nobel laureates and two Crafoord laureates; and 46 research faculty members. Today, Caltech will award 192 students the B.S. degree; 118 students the M.S. degree; 2 scholars the degree of Engineer; and 179 doctoral candidates the Ph.D. degree, for a total of 491 graduates—quite a leap from the one man and one woman who constituted the first collegiate graduating class of Throop Polytechnic Institute.

This year's commencement coincides with the 100th anniversary of Caltech's move to its current location, marked by the dedication of Throop Hall in June 1910. The complex of six schools that formed Throop Polytechnic Institute broke apart in 1910, and Throop Hall, the first building of the reconstituted school and the center of its new campus, was dedicated on June 8 of that year. The mission-style building—capped with a distinctive dome, its austere façade softened by a set of high-relief sculptures by Alexander Stirling Calder set over the arched entryway—remained there until 1971, when it was irretrievably damaged by the San Fernando earthquake.

Throop Hall's architects, Myron Hunt and Elmer Grey, intended the campus to evolve in a similar style—a scheme reflected today in the oldest buildings in the southwest quadrant. The Calder arches were rescued following the hall's demolition and were relocated in 1986 to the bridge between the Crellin and Church chemistry laboratories. Additional sculptural details from old Throop Hall occupy quiet corners of campus today, reminding us of dreams and aspirations that set Caltech on its present course in the past century.

These tribal rites have a very long history. They go back to the ceremony of initiation for new university teachers in medieval 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 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 medieval 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 (1917–2007) Professor of History, Emeritus C HARLES F. BOLDEN, the 12th Administrator of the National Aeronautics and Space Administration, is no stranger to firsts. As a member of NASA's Astronaut Office from 1980 to 1994, he flew aboard the space shuttle four times, logging more than 680 hours in Earth orbit. He piloted the 1990 mission that deployed the Hubble Space Telescope and set a record shuttle altitude of 400 nautical miles. He later commanded both the first Spacelab mission dedicated to NASA's Mission to Planet Earth (1992) and the historic first joint U.S.-Russian shuttle flight (1994). In July 2009 he was appointed NASA's first African American Administrator. And today, he becomes the first astronaut to speak at a Caltech commencement.

Born in Columbia, South Carolina, Bolden attended the United States Naval Academy, receiving his B.S. degree in electrical science in 1968. He was commissioned as a second lieutenant in the Marine Corps and trained as a naval aviator. From 1972 to 1973, he flew more than 100 combat missions over North and South Vietnam, Laos, and Cambodia. Returning to the United States after the war, he served in a variety of positions with the Marine Corps in California while earning an M.S. in systems management from USC. In 1977 he was assigned to the Naval Test Pilot School in Patuxent River, Maryland. He completed his training in 1979 and tested ground-attack aircraft until he was selected as an astronaut candidate in 1980.

In addition to four shuttle missions, Bolden's astronaut career included service as special assistant to the director of the Johnson Space Center; chief of the safety division at Johnson, where he oversaw safety efforts for the shuttle's return to flight after the 1986 *Challenger* accident; and assistant deputy administrator at NASA headquarters. After his final spaceflight in 1994, he returned to active duty with the Marine Corps as deputy commandant of midshipmen at the U.S. Naval Academy. He was deputy commanding general of the 1st Marine Expeditionary Force in the Pacific in 1997, and in 1998 he served as commanding general of the 1st Marine Expeditionary Force Forward in support of Operation Desert Thunder in Kuwait. He was commanding general of the 3rd Marine Aircraft Wing at Miramar from 2000 to 2002 before retiring from the Marine Corps in 2003. He then served as CEO of JACKandPANTHER LLC, a small business enterprise providing leadership, military and aerospace consulting, and motivational speaking, until being named NASA Administrator in 2009.

Among his many military decorations are the Defense Superior Service Medal and the Distinguished Flying Cross. He was inducted into the U.S. Astronaut Hall of Fame in 2006.

Bolden and his wife, Jackie, live in Houston, Texas. They have a son, Anthony, who is a lieutenant colonel in the Marine Corps, and a daughter, Kelly, an M.D. now serving a plastic-surgery fellowship. Chief Marshal
Cindy A. Weinstein, Ph.D.

Marshals
Paul D. Asimow, Ph.D.
Judith L. Campbell, Ph.D.
Scott E. Fraser, Ph.D.
Barbara C. Green, Ph.D.
John F. Hall, Ph.D.
Melany L. Hunt, Ph.D.

Faculty Officers

Dennis A. Dougherty, Ph.D.

Sossina M. Haile, Ph.D.

Fiona Cowie, 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

$P \mathrel{R} \mathrel{O} \mathrel{G} \mathrel{R} \mathrel{A} \mathrel{M}$

Organ Prelude Leslie J. Deutsch, Ph.D.

PROCESSIONAL The Caltech Convocations Brass

and Percussion Ensemble

William W. Bing, M.M., Conductor

Presiding Kent Kresa

Chairman of the Board of Trustees California Institute of Technology

COMMENCEMENT SPEAKER Charles F. Bolden

Commencement Address Administrator, National Aeronautics

and Space Administration

CHORAL SELECTION The Caltech Glee Club, the Caltech

Gaudeamus Igitur Convocations Brass and Percussion Traditional college song, arr. Ensemble, and Organ

Robert A. M. Ross Nancy Sulahian, M.M., Conductor

CONFERRING OF DEGREES Jean-Lou Chameau, Ph.D.

President

California Institute of Technology

PRESENTATION OF CANDIDATES FOR DEGREES

For the Degree of Bachelor of Science John F. Hall, Ph.D.

Dean of Students

For the Degree of Master of Science Joseph E. Shepherd, Ph.D. and the Degree of Engineer Dean of Graduate Studies

For the Degree of Doctor of Philosophy

(Lyrics are on page 58.)

Biology Raymond Deshaies, Ph.D.

Professor of Biology and Executive Officer

for Molecular Biology

Chemistry and Chemical Engineering

Jacqueline K. Barton, Ph.D. Division Chair

Engineering and Applied Science

Ares J. Rosakis, Ph.D.

Geological and Planetary Sciences

Kenneth A. Farley, Ph.D.

Division Chair

Division Chair

Humanities and Social Sciences

Jonathan N. Katz, Ph.D.

Division Chair

Physics, Mathematics and Astronomy

B. Thomas Soifer, Ph.D.

Division Chair

Announcement of Awards and Concluding Remarks

President Chameau

ALMA MATER
"Hail CIT"
by Manton Barnes, B.S. '21
(The audience may join in;
lyrics are on page 59.)

The Caltech Glee Club, the Caltech Convocations Brass and Percussion Ensemble, and Organ

RECESSIONAL

The Caltech Convocations Brass and Percussion Ensemble

Organ Postlude "The Throop Institute March," composed by E. C. Kammermeyer in 1900 for the Throop Institute Guitar and Mandolin Society Dr. Deutsch

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

Bachelor of Science

Aamir Mohammed Ali* Beaver Dam, Wisconsin Physics

Dannah Mikaela Almasco San Diego, California Mechanical Engineering and Business Economics and Management

Daniel Andres Alvarez *Newbury Park, California* Mechanical Engineering and Business Economics and Management

Veronica Jacqueline Anderson Calabasas, California Geophysics

Joseph Antognini* Sacramento, California Astrophysics

Vadim Baidin* Almaty, Kazakhstan Chemistry

Maria Belyi Newton, Massachusetts Biology

Daniel Joshua Beylkin* Boulder, Colorado Applied and Computational Mathematics and Control and Dynamical Systems (Minor)

Swati Bhanderi Dumont, New Jersey Mechanical Engineering and Structural Mechanics (Minor)

Aditya Bhujle* *Bombay, India* Mechanical Engineering and Business Economics and Management

Edward Hing Bramston-Cook† Long Beach, California Chemical Engineering (Process Systems)

Bruce X. Brewington Fairport, New York Economics and Mathematics

Abraham Nataniel Buditama St. Charles, Illinois Chemistry

Daniel Chang Walnut, California Biology

Stephanie S. Chang West Covina, California Chemical Engineering (Biomolecular)

ZeNan Li Chang* Santa Monica, California Biology

Isaac Jushiang Chao* Irvine, California Computer Science

Bettina Jade-ming Chen Renton, Washington Electrical Engineering

Edward Hong Chen* San Gabriel, California Physics

Huiling Chen† Republic of Singapore Physics

Jeddy Chen Setauket, New York Economics and Geological and Planetary Sciences (Minor)

Lu Chen* Rockville, Maryland Biology

William Chen* Highland Heights, Ohio Mathematics

Xi Chen* San Antonio, Texas Applied and Computational Mathematics and Physics

Xi (Cece) Chen† Troy, Michigan Mechanical Engineering

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

[†] Students whose names are followed by a dagger are close to completion and will receive diplomas at the end of the academic year in which all graduation requirements are met.

Eric Michael Chin *Memphis, Tennessee* Engineering and Applied Science (Computation and Neural Systems)

Anthony Yu-Yong Chong† Saratoga, California Computer Science

Evelyn S. Chou New City, New York Biology

Stephen James Chou Somerset, New Jersey Applied and Computational Mathematics and Business Economics and Management

Victor Chu Plainsboro, New Jersey Electrical Engineering

Kangway V. Chuang* Urbana, Illinois Chemistry

Sunny Chun New York City, New York Chemistry

Jaeyoon Chung* Daegu, Republic of Korea Chemistry

Christian Dwain Clanton* Bethany, Oklahoma Applied Physics

Daryl Bennett Coleman* Aiken, South Carolina Chemical Engineering (Materials)

Anthony James Cressman Jr. Bowie, Maryland Physics

Daniel Francis Cullina* Chicago, Illinois Electrical Engineering and Business Economics and Management

James Farris Dama* Tallahassee, Florida Chemical Engineering (Materials)

Alan Deng New York, New York Chemistry

Domenic Denicola* Los Gatos, California Mathematics

Christopher M. Dewan* Rochester, New York Physics

Fabian Jahan Dias* Cypress, Texas Mathematics and Computer Science

Diana Remy Dou* Rosemead, California Biology and Business Economics and Management and English (Minor)

Catherine Douglass Petaluma, California Physics

Garrett Korda Drayna* Potomac, Maryland Physics

Ning Du* Yantai, People's Republic of China Engineering and Applied Science (Environmental Science and Engineering)

Luke David Durant* Mobile, Alabama Computer Science

Ali Ebrahim* San Jose, California Chemistry

Jonathan Einav* Austin, Texas Applied and Computational Mathematics and Business Economics and Management

Eythan Familier* San José, Costa Rica Electrical Engineering

William Fan *Portland*, *Oregon* Electrical Engineering and Business Economics and Management

Matthew J. Feldman *Solana Beach, California* Planetary Science and Business Economics and Management

Benjamin Jack Flora *Colorado Springs, Colorado* Computer Science and Business Economics and Management

John C. Forbes II* Villa Park, Illinois Physics

Riley Lynn Franks Santa Monica, California Applied and Computational Mathematics

Andrew Michael Freddo* Colts Neck, New Jersey Chemistry and Biology

Adi Wijaya Gani* Jakarta, Indonesia Electrical Engineering

Connie Gao* Los Alamos, New Mexico Chemical Engineering (Process Systems)

Evan S. Gawlik* *Glendale, Arizona* Applied and Computational Mathematics and Control and Dynamical Systems (Minor)

Alan Ho-Yin Gee Frederick, Maryland Applied and Computational Mathematics

Michael J. Gherini Orinda, California Mechanical Engineering

Giri Gopalan* Marlboro, New Jersey Applied and Computational Mathematics

Julianne Marie Gould* Beavercreek, Ohio Mechanical Engineering

Marshall C. Grinstead* Swarthmore, Pennsylvania Mechanical Engineering and Geophysics

Christian Daniel Griset* Rancho Cucamonga, California Physics

Abhi Gulati Bloomington, Illinois Mathematics

Hassan Ibrahim Guled† *Mogadishu*, *Somalia* Economics and Applied and Computational Mathematics

Kathryn Harris Gunn Davidson, North Carolina Chemistry and English

Jiaqi Guo* Republic of Singapore Applied Physics

Thomas Oren Gwinn Jr.* Winter Park, Florida Electrical Engineering

Ryan Hamerly* Louisville, Colorado Physics

Oren Hazi Los Angeles, California Electrical Engineering

Jie He Burlington, California Business Economics and Management

Steve Sidi He* Oceanside, California Chemical Engineering (Materials)

Brandon Scott Hensley* Barboursville, West Virginia Physics

Kimberley Phoebe Ho Palos Verdes Estates, California Chemistry

Steven Pier Hoekstra Long Beach, California Engineering and Applied Science

Annie Van Hong* La Puente, California Biology

Fan Huang* Urbana, Illinois Applied and Computational Mathematics

Li Hong Huang† Cupertino, California Computer Science

Sarah Hunt Yorktown Heights, New York Chemical Engineering (Biomolecular)

Joshua David Hutchins Carmel, Indiana Mechanical Engineering and Aerospace Engineering (Minor)

Misha Imtiaz Karachi, Pakistan Chemical Engineering (Biomolecular) and History (Minor)

Noah Michael Jakimo Woodbury, New York Computer Science

Tony Z. Jia* *Naperville, Illinois* Chemistry and Business Economics and Management William Maxwell Jones *Houston, Texas* Physics

Ram Kandasamy* Fremont, California Computer Science and Business Economics and Management

Robert Bryant Kaspar Santa Cruz, California Chemical Engineering (Process Systems) and Philosophy

Brett Kassof† Baldwin, New York Applied and Computational Mathematics

Michael Wallis Kaye Wayland, Massachusetts Physics

Charles Donald Kilpatrick* Cary, North Carolina Astrophysics and History (Minor)

Heejae Kim* Closter, New Jersey Chemical Engineering (Process Systems)

Jeffrey Michael Kiner† Kirkland, Washington Mathematics

Albert Ko* Setauket, New York Computer Science and Business Economics and Management

Simon John Kornblith* *Oberlin, Ohio* Engineering and Applied Science (Computation and Neural Systems) and History and Philosophy of Science

Natalya Kostandova* Sevastopol, Ukraine Applied and Computational Mathematics and English

David Kratz* Telford, Pennsylvania Chemical Engineering (Process Systems) and Business Economics and Management

Jeffrey Kuan* Chicago, Illinois Mathematics

Ruslan Kurdyumov* Sacramento, California Mechanical Engineering and Business Economics and Management

Amy Tsui-Chi Lam* Pleasanton, California Applied Physics

Hailey Lam Cupertino, California Computer Science

David Timothy Lee* Saratoga, California Electrical Engineering

Ga-Il Lee* Seoul, Republic of Korea Mechanical Engineering

Ji Young Lee* Seoul, Republic of Korea Electrical Engineering

Jeremy Landon Leibowitz Las Vegas, Nevada Applied and Computational Mathematics and Business Economics and Management

Daniel Leighton Livingston, New Jersey Biology

Brian James Lester* Greensboro, North Carolina Physics

Philip Leszczynski Cortlandt Manor, New York Applied and Computational Mathematics and Business Economics and Management

Bobo Li† Plano, Texas Computer Science

Changyi Li* Guanqzhou, People's Republic of China Chemical Engineering (Materials)

Gongjie Li* Anhui, People's Republic of China Astrophysics

Jennifer Si Li* Edmond, Oklahoma Biology

Sarah Yun Yun Li Garland, Texas Mechanical Engineering

Victor Li* Quincy, Massachusetts Computer Science and Business Economics and Management

Yicheng Li† Devens, Massachusetts Electrical Engineering

Patrick Liang Edison, New Jersey Computer Science

Benjamin Lin* Torrance, California Chemistry

Chao Liu* Geneva, Illinois Physics

Christopher M. Liu Chandler, Arizona Applied Physics

Xueliang (Leon) Liu* Nanjing, People's Republic of China Applied Physics

Guglielmo Paul Lockhart* Lodi, Italy Physics

Jason Robert Lunn Miami, Florida Biology

Micah John Manary* St. Louis, Missouri Biology and History

Olga Mandelshtam* Irvine, California Mathematics

Sujitha Catherine Martin Mira Loma, California Electrical Engineering

Andrew Martin Matuschak St. Louis, Missouri Computer Science

Matthew Ryan Maurer* Burnsville, Minnesota Computer Science

Mark McDuff* Snohomish, Washington Computer Science

Benjamin Blake McMillan* Carrboro, North Carolina Mathematics

Jayson Dean Michilena Messenger Layton, Utah Electrical Engineering

Eric Thomas Mintun* St. Louis, Missouri Physics

Ankita Mishra Seattle, Washington Chemical Engineering (Biomolecular)

Walter Alexander Mostowy West Windsor, New Jersey Computer Science

Caleb Enoch Ng Libertyville, Illinois Chemistry

Justin Ng* San Marino, California Electrical Engineering

Vinh Thanh Nguyen Ho Chi Minh City, Vietnam Mathematics

Noele R. Norris* *Miami, Florida* Electrical Engineering and Control and Dynamical Systems (Minor)

Daniel Stuart Obenshain† Glyndon, Maryland Computer Science and English (Minor)

Akinyinka Oreoluwa Omigbodun Osogbo, Osun State, Nigeria Electrical Engineering

Matthew Stix Ornelas-Kuh Palm Desert, California Business Economics and Management

Francis Julian Panetta* College Station, Texas Computer Science

Robert Eugene Paolini* Saratoga, California Mechanical Engineering

Doo Sung Park* Anyang, Republic of Korea Mathematics

Jason Bhojraj Paryani Jacksonville, Florida Computer Science

Hetul Patel Wilmington, Delaware Physics and Engineering and Applied Science (Computation and Neural Systems)

Liuyi Pei Tucson, Arizona Astrophysics

James Price Pellegren Los Angeles, California Chemical Engineering (Materials)

Stanislava Yoshkova Petkova* Sofia, Bulgaria Mechanical Engineering

Jan Petykiewicz* Baton Rouge, Louisiana Electrical Engineering

Lev Vlad Pisarsky Sunnyvale, California Applied and Computational Mathematics

Eugeniu Plamadeala* Anenii Noi, Republic of Moldova Physics

Diane Jennifer Plummer* Pasadena, California Chemistry

Benjamin Zaaron Reinhardt* Chapel Hill, North Carolina Mechanical Engineering and History

Robert Warren Robertson† Blossom, Texas Physics

Japheth Kiplangat Cheruiyot Rono Nairobi, Kenya Chemical Engineering (Materials)

Nicholas Rosa† Tupelo, Mississippi Chemistry and Biology

Thomas Robert Rose* Sarasota, Florida Applied and Computational Mathematics and Business Economics and Management

Kausteya Roy Calcutta, India Physics

Dane Nenad Rukavina Belgrade, Serbia Computer Science

Rebecca Lynn Russell* San Diego, California Physics

Ernest K. Ryu* Daejeon, Republic of Korea Electrical Engineering and Physics

Sitanun Sakulkaew* Bangkok, Thailand Mechanical Engineering

Joe Peter Salamon* San Diego, California Physics

Daniel Roland Sanchez† Miami, Florida Chemistry

Mallika Saran* *Mumbai, India* Mechanical Engineering and Business Economics and Management

Erik Schaeffer Potomac, Maryland Computer Science

John D. Schulman* Great Neck, New York Physics

Stephanie Elizabeth Stangl Schulze* Des Moines, Iowa Chemical Engineering (Materials)

Kimberly Megan Scott* *Pasadena*, *California* Engineering and Applied Science (Computation and Neural Systems)

Seung Woo Shin* Seoul, Republic of Korea Computer Science and Mathematics

Wendy Shin Hye Shin *Riverside, California* Applied and Computational Mathematics and Business Economics and Management

Christina Yi Shin Shu Taiwan (ROC) Applied Physics

Esther Shyu* Naperville, Illinois Biology

Constantine Sideris* Pasadena, California Electrical Engineering

Michael T. Smith* Portland, Oregon Mathematics

Cherrie Soetjipto* Jakarta, Indonesia Chemical Engineering (Process Systems)

Dahye Song* Seoul, Republic of Korea Applied and Computational Mathematics

Dan Song* Alhambra, California Physics

Eric Marshall Stansifer* Melbourne Beach, Florida Mathematics

Benjamin Steele* Oak Park, California Biology and History (Minor)

Minkyung Christine Suh† Seoul, Republic of Korea Applied and Computational Mathematics and Business Economics and Management

Siripat Sumanaphan* Chiang Mai, Thailand Electrical Engineering

Tamas Szalay* Baltimore, Maryland Physics and Computer Science

Noah Tanabe Seattle, Washington Applied and Computational Mathematics and Business Economics and Management

Elaine E. To* North Hollywood, California Biology

Michelle H. Ton* *Paramus, New Jersey* Applied and Computational Mathematics and Business Economics and Management

Leslie Mae Tong* Ventura, California Biology

Jonathan Michael Tsai* Saratoga, California Biology

Tzong-Lian Grace Tsay San Diego, California Mechanical Engineering

Amber Wai Valdes Santa Ana, California Chemical Engineering (Process Systems)

Carolyn Nicole Valdez* Littlerock, California Chemistry and English (Minor)

Narain Kumar Vijayashanker* Fairview, Oregon Electrical Engineering and Business Economics and Management

Carol Wang* Atlanta, Georgia Mathematics and Computer Science

Kevin Thomas Welch† Austin, Texas Bioengineering (Synthetic Biology) and English

Heather Nicole Widgren Lake Orion, Michigan Chemistry

Tatjana Sophie Wiese* Potomac, Maryland Mathematics

Stephen Kenneth Wilke* Columbus, Nebraska Chemical Engineering (Materials)

Auvergne Ransom Williams Jackson, Mississippi Mathematics

Edmond C. Wong North Hampton, New Hampshire Mechanical Engineering

Christine Michelle Woodin Orinda, California Applied and Computational Mathematics

Yi Wu Stamford, Connecticut Applied and Computational Mathematics and Business Economics and Management

David Ye* Shelby, North Carolina Computer Science

Lisa Yee* Los Angeles, California Biology

Andy Yen* Huntington Beach, California Physics and Business Economics and Management

Yeoil Yoon† Seoul, Republic of Korea Mathematics

Feiqiao Yu* Edmonton, Alberta, Canada Electrical Engineering

Lisa D. Zang Albany, California Biology and Business Economics and Management

Benjamin Zax* Ithaca, New York Mathematics

Ilya Alexandrovich Zilberter *Apex*, *North Carolina* Engineering and Applied Science (Aerospace)

Master of Science

Artemis Ailianou (Chemical Engineering) B.S., The University of Texas at Austin 2008.

Vanessa Marie Andrews (Geophysics) B.S., University of Tulsa 2008.

Asghar Aryanfar (Mechanical Engineering) B.S. (Civil Engineering), Sharif University of Technology 2008; B.S. (Mechanical Engineering), 2009.

Jeffrey Robert Atwell (Physics) B.S., The Ohio State University 2002.

Jennifer Sigrid Barklund (Chemistry) B.A., The College of St. Catherine 2008.

Konstantin Y. Batygin (*Planetary Science*) B.S., University of California, Santa Cruz 2008

Yashodhan Bhawe (Chemical Engineering) B.S., University of California, Berkeley 2008.

Arnar Bjorn Bjornsson (Civil Engineering) B.Sc., University of Iceland 2009.

Jason Nathaniel Bode (Physics) B.A., Knox College 1997.

Joshua Micah Brown (Biochemistry and Molecular Biophysics) B.S., University of California, San Diego 2006.

Arthur Hsu Chen Chang (Electrical Engineering) B.S., California Institute of Technology 2009.

Chieh-feng Chang (Electrical Engineering) B.S., National Taiwan University 2001; M.S., University of California, Los Angeles 2005.

Daphne Yun-Hsuan Chang (Physics) B.S., Duke University 2005.

Han-Chieh Chang (Electrical Engineering) B.S., National Taiwan University 2004; M.S., 2006.

Melanie B. Channon (Geochemistry) B.S., Arizona State University 2007.

Tong Chen (Applied Physics) B.S. (Physics), B.S. (Statistics), Peking University 2007.

Rico Ngan Suen Chiu (Electrical Engineering) B.S., California Institute of Technology 2009.

Stephanie Alexandra Coronel (Aeronautics) B.S., The University of Texas at Arlington 2009.

Keenan Michael Crane (Computer Science) B.S., University of Illinois at Urbana-Champaign 2006.

Jill Suzanne Craven (Chemical Engineering) B.S., University of Arizona 2007.

Kaushik Dasgupta (Electrical Engineering) B.Tech., M.Tech., Indian Institute of Technology, Kharagpur 2008.

Charles Meno Theodore DeBoer (Electrical Engineering) B.A., Occidental College 2001; B.S., California Institute of Technology 2001.

Michael Gardner Deceglie (Applied Physics) B.S., Dickinson College 2006; M.Phil., University of Queensland 2007.

Gerry Vincent Della Rocca (Mechanical Engineering) Sc.B., Brown University 2009.

Domenic Anthony Denicola (*Physics*) B.S., California Institute of Technology 2010.

Thomas Anthony Desautels (Mechanical Engineering) B.S., University of California, Davis 2008.

† Students whose names are followed by a dagger are close to completion and will receive diplomas at the end of the academic year in which all graduation requirements are met.

Jocelyn Emeric Antoine Etienne Escourrou (Aeronautics) Diplôme d'Ingénieur, École Polytechnique 2008.

Panna Delora Felsen (Electrical Engineering) B.S., California Institute of Technology 2009.

Jeffrey Michael Flanigan (Physics) B.S. (Mathematics), B.S. (Physics), University of California, Santa Barbara 2007.

Mihai Florian (Computer Science) Diploma, Politehnica University of Bucharest 2007.

Landry Fokoua Djodom (Aeronautics) Diplôme d'Ingénieur, École Polytechnique 2009.

Peter William Foley (Social Science) B.S., California Institute of Technology 2006.

Andrew James Galvin (Aerospace Engineering) B.S., United States Naval Academy 2009.

Eleftherios E. Gdoutos (Aerospace Engineering) B.S. (Computer Science), B.S. (Mechanical Engineering), Northwestern University 2009.

Sarah Knox Gillespie (Biology) B.A., Washington University in St. Louis 2004.

Benjamin Gojman (Computer Science) Sc.B., Brown University 2005.

Ragavendran Gopalakrishnan (Computer Science) B.Tech., Indiana Institute of Technology, Madras 2008.

Amanda Marie Grantz (Chemical Engineering) B.S., Rose-Hulman Institute of Technology 2008.

Sonja Danielle Barnard Graves (*Planetary Science*) B.A., B.S., University of California, Santa Cruz 2005.

Bao Nguyen Quoc Ha (Applied Physics) B.A., Lawrence University 2007.

Shima Hajimirza (Bioengineering) B.S., Mazandaran University 2003; M.S., Southern Illinois University 2007.

Hamed Hamze Bajgiran (Electrical Engineering) B.S. (Computer Engineering), B.S. (Mathematics), Sharif University of Technology 2008.

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Zachary James Williams (Chemical Engineering) B.S., University of Pennsylvania 2006.

Min-Hao (Matt) Wu (Computer Science) B.S., The University of Texas at Austin 2007.

Wentao Yan (Electrical Engineering) B.Eng., University College London 2007.

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Lindsay Diana Yee (Environmental Science and Engineering) B.S., University of California, Riverside 2008.

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Dongzhou Zhang (Geophysics) B.S., Peking University 2008.

Jun Zhou Zhang (Physics) B.A., Cornell University 2008.

Zan Zhang (Electrical Engineering) B.E., Wuhan University 2005.

Sinan Zhao (Electrical Engineering) B.S., Peking University 2009.

Degree of Engineer

Inki Choi (Aeronautics) B.S., Seoul National University 2005; M.S., California Institute of Technology 2008.

Eugene Leo Draine Mahmoud (Mechanical Engineering) B.S., University of California, San Diego 2002; M.S., California Institute of Technology 2004.

Doctor of Philosophy

DIVISION OF BIOLOGY

- Holly C. Beale (*Biology*) B.A., Columbia College at Columbia University 1991. Thesis: Synaptic Signal Transduction and Transcriptional Control.
- Paola A. Betancur (Biology) A.S., Suffolk Community College 2002; B.S., Stony Brook University 2003.
 - Thesis: Cis-regulatory Analysis of the Key Developmental Gene, SOX1O, in Neural Crest and Ear.
- Gil Bastos de Carvalho (*Biology*) M.D., University of Lisbon Medical School 2002. Thesis: *Drosophila* Feeding Behavior and Demographic Mechanisms of Lifespan Extension.
- Chiraj Kiran Dalal (Biochemistry and Molecular Biophysics) B.A., University of Pennsylvania 2003.
 - Thesis: Causes and Consequences of Gene Expression Noise.
- Daniel A. Gold (Biology) B.A., Cornell University 2000.
 - Thesis: Molecular Characterization of the Dbf4/Drf1-Dependent Kinase (DDK) and the DNA Replication Checkpoint Mediator Claspin in *Xenopus* Egg Extracts.
- Jennifer Jin Lee Hodas (Biochemistry and Molecular Biophysics) B.A., B.S., Yale College 2004.
 - Thesis: Elucidating the Hippocampal Dopaminergic Subproteome with Novel Bioorthogonal Techniques.
- Hiroshi Ito (Biology) M.D., Kyoto University 2003.
 - Thesis: Neuromodulator-mediated Control of Spatial and Nonspatial Information Processing in the Hippocampus.
- Tinh Nghi Luong (*Biology*) B.A., University of California, Berkeley 1997. Thesis: Signaling Proteins in the Post-Synaptic Density.
- Amy Jeanette McMahon (*Biology*) B.S., University of Washington 2005.

 Thesis: Fibroblast Growth Factors Influence Collective Cell Behavior during Mesoderm Migration.
- Maria Papadopoulou (Biology) B.A., Smith College 2001.
 - Thesis: Gain Control and Sparse Representations in the Olfactory System of the Locust and Fly.
- Juan S. Ramírez-Lugo (*Biology*) B.S., University of Puerto Rico, Mayaguez 2001. Thesis: The Activation of ATR in Response to Double-Stranded DNA Breaks.
- Dinesh Subba Rao (*Biology*) B.S., Case Western Reserve University 1995; M.D., 2000. Thesis: Small RNAs Play Big Roles in Hematopoietic Development.
- Alice Anne Pennoyer Robie (Biology) B.S., Brandeis University 2002.

 Thesis: Multimodal Sensory Control of Exploration by Walking Drosophila melanogaster.

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

- Jasper Chen Simon (Biology) B.A., California State University, Fullerton 1996.
 - Thesis: Behavioral Analysis of Exploration and Dispersal in Drosophila.
- Karen Elizabeth Wawrousek (Biochemistry and Molecular Biophysics) B.S., The College of Saint Rose 2001.
 - Thesis: Contributions of DNA2 and the Tim/Tipin Complex to Genomic Stability.
- Ashley Palani Wright (Biology) B.S., The University of Utah 1999.
 - Thesis: Genetic Analysis of Axon Guidance in Drosophila melanogaster.
- Suzuko Yorozu (Biology) B.S., Concordia University 2001; M.S., University of Toronto 2004.
 - Thesis: Distinct Sensory Representations of Wind and Near-Field Sound in the *Drosophila* Brain.
- Mark Andrew Zarnegar (*Biology*) B.A., B.S., University of California, San Diego 1998. Thesis: Investigating the Transcriptional Mechanisms Controlling *Sfpi1*, a Critical Regulatory Node within Multiple Lineage Specifying Subcircuits of the Hematopoietic Gene Regulatory Network.

DIVISION OF CHEMISTRY AND CHEMICAL ENGINEERING

- Heather Dawn Agnew (Chemistry) B.S., The Pennsylvania State University 2003.

 Thesis: Rapid Construction of Protein Capture Agents with Chemically Designed Stability and Antibody-Like Recognition Properties.
- Kevin McCormack Allan *(Chemistry)* B.S., University of California, Berkeley 2004. Thesis: Development of Versatile Strategies for Aryne Annulation: Applications in Methodology and Natural Product Total Synthesis.
- Amos Gerald Anderson (Chemistry) B.S., University of Minnesota 2003.
 - Thesis: Quantum Monte Carlo: Faster, More Reliable, and More Accurate.
- Kiowa S. Bower (Biochemistry and Molecular Biophysics) B.S., University of California, Santa Cruz 2001.
 - Thesis: Chemical-Scale Studies of the 5-HT, and D2 Dopamine Receptors.
- Rogier Braakman (Chemistry) B.S., Universiteit van Amsterdam 2003.
 - Thesis: Gas-Phase Terahertz Spectroscopy and the Study of Complex Interstellar Chemistry.
- Jenelle Kiara Bray (Chemistry) B.S., University of Oregon 2003.
 - Thesis: The Development and Application of Computational Methods for the Prediction of G Protein-Coupled Receptor Structures.
- Nicholas Anthony Brunelli (Chemical Engineering and Applied Physics) B.S., The Ohio State University 2004.
 - Thesis: Sizing Aerosol Particles between One and Three Nanometers.

- Morgan Leigh Cable (Chemistry) B.A., Florida Atlantic University 2005.
 - Thesis: Life in Extreme Environments: Lanthanide-Based Detection of Bacterial Spores and Other Sensor Design Pursuits.
- Tammy Y. Campbell (*Chemistry*) B.S., University of California, Los Angeles 2001; M.S., San Francisco State University 2004.
 - Thesis: Sonochemical Decomposition of Perfluorinated Surfactants: Chain Length Effects.
- Martina Nini Carbone (Chemical Engineering) B.S., The University of Wisconsin, Madison 2005; M.S., California Institute of Technology 2007.
 - Thesis: Characterization of the Functional Diversity and Evolvability of Chimeric Enzymes Assembled by Structure-Guided SCHEMA Recombination.
- John Reeves Carpenter, III (Chemical Engineering) B.S., North Carolina State University 2002; M.S., California Institute of Technology 2006.
 - Thesis: I. Synthesis and Testing of a Supported Shilov Oxidation Catalyst and II. Influence of Structural Features on Zeolite Characterization by Constraint Index Testing.
- Diane Elizabeth Carrera (Chemistry) B.S., Stanford University 2002.
 - Thesis: The Development of Bronsted Acid Catalysis Technologies and Mechanistic Investigations Therein.
- Arthur Wing Hong Chan (Chemical Engineering and Environmental Science and Engineering) B.S., University of Pennsylvania 2005; M.S., California Institute of Technology 2007.
 - Thesis: Chamber Studies and Modeling of Secondary Organic Aerosol Formation.
- George Shuxiong Chen (Chemistry) A.B., Dartmouth College 2004.
- Thesis: Mechanisms of C–H Bond Activation by Platinum(II). Michelle E. Farkas (*Chemistry*) B.A., Wellesley College 2001.
 - Thesis: Structural Variations on the Turn Unit of DNA-Binding Hairpin Py-Im Polyamides.
- Daniel Ross Fisher (Chemistry) B.A., Wesleyan University 2001.
 - Thesis: Development and Applications of Quantum Monte Carlo.
- Anna Barr Folinsky (Chemistry) S.B., Massachusetts Institute of Technology 2002. Thesis: Investigating Molecular Size Variations in Thin Film Chemical Vapor Sensors.
- Alexander C. Gagnon (Chemistry) B.S. (Chemistry), B.S. (Molecular Biology), University of California, Berkeley 2002.
 - Thesis: Geochemical Mechanisms of Biomineralization from Analysis of Deep-Sea and Laboratory Cultured Corals.
- Joseph Charles Genereux (Chemistry) B.A., Swarthmore College 2001; B.S., University of California, Irvine 2002.
 - Thesis: Exploring DNA-Mediated Charge Transport with Fast Radical Traps.

- Kristin Rule Gleitsman (Chemistry) B.A., Vassar College 2002.
 - Thesis: Chemical-Scale Studies of the Nicotinic Acetylcholine Receptor: Insights from Amide-to-Ester Backbone Mutagenesis.
- Suzanne R. Golisz (Chemistry) B.S., The University of Rochester 2005.

 Thesis: Organometallic Reaction Mechanisms: Olefin Polymerization Catalysis

and C-H Bond Activation by Early Transition Metal Bisphenolate Complexes and Protonolysis of Bipyrimidine Platinum Methyl Complexes.

- Heather Kristine Hunt (Chemical Engineering) B.S., Iowa State University 2004; M.S., California Institute of Technology 2007.
 - Thesis: I: Development of Facile Route to Fluoride-Mediated, Pure-Silica Zeolite Thin Films. II: Removal of Structure-Directing Agents from Molecular Sieves via the Use of Photolabile Structure-Directing Agents.
- Michael Raymond Krout *(Chemistry)* B.S., Indiana University of Pennsylvania 2002. Thesis: Progress toward the Asymmetric Total Synthesis of Variecolin and Gas-Phase Studies of the Twisted Amide 2-Quinuclidone.
- Kevin Michael Kuhn (Chemistry) B.S., Miami University 2004.
 - Thesis: Understanding and Improving Efficiency in Ruthenium Olefin Metathesis.
- Paul Eulehwann Lee (Chemistry) B.A., Dartmouth College 2003.
 - Thesis: Activation of Transcription from a Distance: Investigations on the Oxidation of SoxR by DNA-Mediated Charge Transport.
- Yu Liu (*Chemistry*) B.S., University of Science and Technology of China 2003. Thesis: Biochemical Reactions in Confined Space.
- Brendan Cahill Mack (Chemical Engineering) B.S., Carnegie Mellon University 2004. Thesis: Biodegradable Filaments for Controlled Ophthalmic Drug Delivery.
- Neal P. Mankad *(Chemistry)* S.B., Massachusetts Institute of Technology 2004. Thesis: Copper and Iron Complexes with Unusual Coordination Geometries Enforced by Phosphine Chelates.
- John B. Matson (Chemistry) B.S., Washington University in St. Louis 2004. Thesis: Applications and Extensions of Living Ring-Opening Metathesis Polymerization.
- Andrew Friedrich May (Chemical Engineering and Materials Science) B.S., The Pennsylvania State University 2004; M.S., California Institute of Technology 2007. Thesis: High-Temperature Transport in Lanthanum Telluride and Other Modern Thermoelectric Materials.
- Kathryn Anna McMenimen (*Chemistry*) B.A., Mount Holyoke College 2003. Thesis: Chemical-Scale Studies of Ligand-Gated Ion Channels.
- Justin Thomas Mohr (Chemistry) A.B., Dartmouth College 2003.
 - Thesis: Enantioselective Reactions of Palladium Enolates.

- Jonathan Edward Mueller (Chemistry) B.A., Wheaton College 2005; M.S., California Institute of Technology 2010.
 - Thesis: Structures, Energetics and Reactions of Hydrocarbons on Nickel.
- Evan Lyle Neidholdt (Chemistry) B.A., Concordia University 2005; M.S., California Institute of Technology 2010.
 - Thesis: Novel Pyroelectric and Switched Ferroelectric Ion Sources in Mass Spectrometry: Implementation and Applications.
- Aaron Craig Noell *(Chemistry)* B.A., New York University 2002.

 Thesis: Laboratory Studies of the Self and Cross Reactions of Atmospheric Peroxy Radicals.
- Valerie Ann Norton *(Chemistry)* B.S., University of California, Santa Barbara 1999. Thesis: Efficient Generation of Hyperpolarized Molecules Utilizing the Scalar Order of Parahydrogen.
- Tod Augustin Pascal (Chemistry) B.S., Lincoln University 2002.
 Thesis: New Approaches to Accurate Predictions of Free Energies: From Proteins to Organic Nanostructures.
- Cindy Ann Puckett *(Chemistry)* B.S., California State University, Northridge 2002. Thesis: The Cellular Uptake of Luminescent Ruthenium Complexes.
- Morgan C. Putnam *(Chemical Engineering)* B.S., Cornell University 2005; M.S., California Institute of Technology 2008.
 - Thesis: Si Microwave-Array Solar Cells.
- Jennifer Lyn Roizen (Chemistry) B.A., Williams College 2003.
 - Thesis: Progress toward an Enantioselective Total Synthesis of Ineleganolide.
- Diana Sergeievna Smirnova (Chemical Engineering) B.S., The Johns Hopkins University 2005.
 - Thesis: Application of Two-Dimensional Correlation Analysis to Explosives Detection and Polymer Crystallization.
- Joshua Michael Spurgeon (Chemical Engineering) B.S., University of South Carolina 2004; M.S., California Institute of Technology 2006.
 - Thesis: Wire Array Solar Cells: Fabrication and Photoelectrochemical Studies.
- Jason Douglas Surratt (Chemistry) B.A., B.S., North Carolina State University 2003. Thesis: Analysis of the Chemical Composition of Atmospheric Organic Aerosols by Mass Spectrometry.
- James W. Swan *(Chemical Engineering)* B.S., University of Arizona 2004; M.S., California Institute of Technology 2007.
 - Thesis: Colloids in Confined Geometries: Hydrodynamics, Simulation and Rheology.
- Manuj Swaroop (Chemical Engineering) B.Tech., Indian Institute of Technology, Kanpur 2002; M.S., Syracuse University 2004.
 - Thesis: The Bulk Viscosity of Suspensions.

Hwan-Ching Tai (Chemistry) B.S., National Taiwan University 2000.

Thesis: Characterization of the Brain Proteasome and Its Interacting Proteins and their Regulation by Neuronal Activity.

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Thesis: The T-Shaped Anisotropic Molecule Model: A Unique Perspective on the Glass Transition and Gelation in Low Valence, Directional, Network Forming Liquids.

Yan Xia (Chemistry) B.S., Peking University 2002; M.S., McMaster University 2005. Thesis: Syntheses of Polymers with Diverse Architectures via Metathesis Polymerization and Investigation of Their Structure-Property Relationships.

Melanie Anne Pribisko Yen *(Chemistry)* B.S., The University of North Carolina at Chapel Hill 2001.

Thesis: Unfolded States of Heme Proteins.

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Thesis: Photochemical and Dynamics Studies of Oxygen Isotope Exchange Reactions of CO₂.

Brian Matthew Zeglis (Chemistry) B.S., Yale College 2004.

Thesis: Investigations into the Generality of Metalloinsertion at DNA Defects.

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DIVISION OF ENGINEERING AND APPLIED SCIENCE

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Thesis: Effects of Polydispersity in Bubbly Flows.

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Thesis: Spark Ignition: Experimental and Numerical Investigation with Application to Aviation Safety.

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Thesis: Control Theoretic Analysis of Autocatalytic Networks in Biology with Applications to Glycolysis.

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Thesis: Chemical Fractionation at Environmental Interfaces.

- Harry Ming Tak Choi (*Bioengineering*) B.S., University of California, Berkeley 2003. Thesis: Programmable In Situ Amplification for Multiplexed Bioimaging.
- Jina Choi (Environmental Science and Engineering) B.S., Ewha Woman's University 2000;M.S., Pohang University of Science and Technology 2002.Thesis: Development of Visible-Light-Active Photocatalyst for Hydrogen

Production and Environmental Application.

- Chia-Chieh Chu (Applied and Computational Mathematics) B.S., National Tsing Hua University 2000; M.S., 2003.
 - Thesis: Multiscale Methods for Elliptic Partial Differential Equations and Related Applications.
- Tao Cui (Electrical Engineering) B.E., Xi'an Jiaotong University 2003; M.S., University of Alberta 2005; M.S., California Institute of Technology 2006.
 Thesis: Coding for Wireless Broadcast and Network Secrecy.
- Xiquan Cui (Electrical Engineering) B.S., Zhejiang University 2000; M.S., 2003; M.S., Portland State University 2005.
 - Thesis: Optofluidic Microscopy and Wavefront Microscopy: Innovations in Biological Imaging.
- Kenneth Alexander Diest (Materials Science) B.S., Cornell University 2002; M.S., California Institute of Technology 2006.
 - Thesis: Active Metal-Insulator-Metal Plasmonic Devices.
- Noel Eduard Du Toit (Mechanical Engineering) B.S., University of Stellenbosch 2001; S.M., Massachusetts Institute of Technology 2005.
 - Thesis: Robot Motion Planning in Dynamic, Cluttered, and Uncertain Environments: The Partially Closed-Loop Receding Horizon Control Approach.
- Philip Christopher Du Toit (Control and Dynamical Systems) B.S., Brigham Young University 2001; M.S., The University of Michigan 2004.
 - Thesis: Transport and Separatrices in Time-Dependent Flows.
- Eileen Fong (Bioengineering) B.Eng., Nanyang Technological University 2003. Thesis: Wound Healing on Artificial Extracellular Matrix Proteins.
- Dennice F. Maynard Gayme (Control and Dynamical Systems) B.E., McMaster University 1997; M.Sc., University of California, Berkeley 1998.
 - Thesis: A Robust Control Approach to Understanding Nonlinear Mechanisms in Shear Flow Turbulence.
- Ming Gu (Computation and Neural Systems) B.A., Grinnell College 2003.

 Thesis: Interactions between Hippocampal Areas CA3 and CA1 during Slow-Wave
 - Thesis: Interactions between Hippocampal Areas CA3 and CA1 during Slow-Wave Sleep.
- Kristjan Gudmundsson (Mechanical Engineering) B.S., University of Iceland 2002; M.S., California Institute of Technology 2005.
 - Thesis: Instability Wave Models of Turbulent Jets from Round and Serrated Nozzles.

- Jeffrey Hanna (Mechanical Engineering) B.S., Colorado School of Mines 2002; M.S., 2004; M.S., California Institute of Technology 2006.

 Thesis: Solid-Oxide Fuel Cell Electrode Microstructures: Making Sense of the
 - Thesis: Solid-Oxide Fuel Cell Electrode Microstructures: Making Sense of the Internal Framework Affecting Gas Transport.
- Michael David Henry (Applied Physics) B.S. (Electrical Engineering), B.S. (Mathematics), University of Arizona 2003; M.S., California Institute of Technology 2006. Thesis: ICP Etching of Silicon for Micro and Nanoscale Devices.
- Carrie Elizabeth Hofmann (Materials Science) B.S., University of Florida 2003; M.S., California Institute of Technology 2006.
 - Thesis: Optics at the Nanoscale: Light Emission in Plasmonic Nanocavities.
- Won Tae Joe (*Mechanical Engineering*) B.S., University of California, San Diego 2004; M.S., California Institute of Technology 2006.
 - Thesis: Optimized Feedback Control of Vortex Shedding on an Inclined Flat Plate.
- Glenn Evans Jones (Electrical Engineering) B.S., California Institute of Technology 2003; M.S., 2005.
 - Thesis: Instrumentation for Wide Bandwidth Radio Astronomy.
- James Alan Karnesky (Aeronautics and Applied Physics) B.S. (Aeronautical Engineering),
 B.S. (Mathematics), B.S. (Mechanical Engineering), Rensselaer Polytechnic Institute
 2003; M.S., California Institute of Technology 2004.
 Thesis: Detonation Induced Strain in Tubes.
- Michael David Kelzenberg (*Electrical Engineering*) B.S., Iowa State University 2005; M.S., California Institute of Technology 2006.

 Thesis: Silicon Microwire Photovoltaics.
- Uday Kiran Khankhoje (Electrical Engineering and Applied Physics and Physics) B.Tech., Indian Institute of Technology, Bombay 2005; M.S., California Institute of Technology 2010.
 - Thesis: Photon Confinement in Photonic Crystal Cavities.
- Liliya Kharevych (Computer Science) B.S., University of Maryland, College Park 2002; M.S., California Institute of Technology 2006.
 - Thesis: Geometric Interpretation of Physical Systems for Improved Elasticity Simulations.
- Daegyoum Kim (Aeronautics) B.S., Seoul National University 2003; M.S., California Institute of Technology 2007.
 - Thesis: Characteristics of Three-Dimensional Vortex Formation and Propulsive Performance in Flapping Locomotion.
- Jin-Hong Kim $\mbox{\it (Bioengineering)}\ B.S.,$ University of Minnesota 2005.
 - Thesis: State Diagram for Contact-Inhibition of Proliferation: A Quantitative Framework for Modulating Growth Patterns in Epithelial Cell Clusters.

- Suk Won Kim (*Electrical Engineering*) B.E., Seoul National University 2005; M.S., California Institute of Technology 2007.
 - Thesis: Network Coding for Resource Optimization and Error Correction.
- Chih-Kai Ko (*Electrical Engineering*) B.S., University of Colorado 2002; M.S., California Institute of Technology 2004.
 - Thesis: On Matrix Factorization and Scheduling for Finite-time Average-consensus.
- Jeffrey James Krimmel (Mechanical Engineering) B.S., The University of Texas at Austin 2003; M.S., California Institute of Technology 2005.
 - Thesis: Numerical Simulation of Wave Focusing and Scattering in Shock Wave Lithotripsy.
- Leslie Elise Lamberson (Aeronautics) B.S., The University of Michigan 2003; M.S., Georgia Institute of Technology 2006.
 - Thesis: Dynamic Optical Investigations of Hypervelocity Impact Damage.
- Cheng-Chung Lee (Bioengineering) B.S., Harvey Mudd College 2002.
 - Thesis: Chemical Synthesis in Elastomer-Based Integrated Microfluidics.
- Xiaobai Li (Mechanical Engineering) B.E., University of Science and Technology of China 2001; M.E., 2004; M.S., California Institute of Technology 2006. Thesis: An Experimental and Numerical Study of Normal Particle Collisions in a
 - Viscous Liquid.
- Mike Chia-Chung Liu (*Bioengineering*) B.S., University of California, Berkeley 2004. Thesis: Integrated Microfluidic Devices for Cell Culture and Assay.
- Jeremy Chee-Ming Ma (Mechanical Engineering) B.S., University of California, Los Angeles 2004; M.S., California Institute of Technology 2005.
 - Thesis: Real-Time Applications of 3D Object Detection and Tracking.
- Emily Jayne McDowell (*Bioengineering*) B.S.E., Duke University 2005; M.S., California Institute of Technology 2009.
 - Thesis: Low Optical Signal Detection in Biological Materials: SNR Considerations and Novel Techniques.
- Anusha Narayan (Computation and Neural Systems) B.E., BMS College of Engineering 2002.
 - Thesis: Transfer at *C. elegans* Synapses.
- Dirk Neumann (Computation and Neural Systems and Genetics) B.S., Humboldt University 1998; M.S., Eberhard Karls University 2001; M.S., Munich University of Technology 2003.
 - Thesis: Connectivity of the Brain from Magnetic Resonance Imaging.
- Adam Keith Norman (*Aeronautics*) B.S., The University of New Mexico 2005; M.S., California Institute of Technology 2006.
 - Thesis: Effect of Surface Morphological Changes on Flow over a Sphere.

- David N. Pekarek (Mechanical Engineering) B.S.E., The University of Michigan 2004; M.S.E., 2005.
 - Thesis: Variational Methods for Control and Design of Bipedal Robot Models.
- Jifeng Peng (Bioengineering) B.S., University of Science and Technology of China 2002; M.S., State University of New York at Stony Brook 2004.
 - Thesis: A Lagrangian Approach to Transport of Momentum and Biomass in Aquatic Biological Systems.
- Melissa Davis Pope (Bioengineering) B.S., University of California, Irvine 2003.
 - Thesis: Dynamics of Multicellular Aggregation and Disaggregation: Implications for Tissue Engineering and Cancer Metastasis.
- Justin Purewal (Materials Science) B.S., California Institute of Technology 2005; M.S., 2006.
 - Thesis: Hydrogen Adsorption by Alkali Metal Graphite Intercalation Compounds.
- Quoc Chan Quach (Bioengineering) B.S., University of California, Berkeley 2002; M.E., University of California, San Diego 2003.
 - Thesis: A Parylene Real Time PCR Microdevice.
- Jessie Rosenberg (Applied Physics) B.A., Bryn Mawr College 2004.
 - Thesis: Applications of Micro/Nanoscale Optical Resonators: Plasmonic Photodetectors and Double-Disk Cavity Optomechanics.
- Farshid Roumi (Mechanical Engineering) B.S., Sharif University of Technology 2001; M.S., 2004.
 - Thesis: Shape Changing Transformations: Interactions with Plasticity and Electrochemical Processes.
- Anthony Mathew Roy (Mechanical Engineering) B.S., The Ohio State University 2002; M.S., 2004.
 - Thesis: Neuro-Evolution Using Recombinational Algorithms and Embryogenesis for Robotic Control.
- Lydia Ann Ruiz (Mechanical Engineering) B.S., University of California, Los Angeles 2003; M.S., California Institute of Technology 2005.
 - Thesis: The Role of Unsteady Hydrodynamics in the Propulsive Performance of a Self-Propelled Bioinspired Vehicle.
- Kenji Alexander Sasaki (Materials Science) B.S., Oregon State University 2002; M.S., California Institute of Technology 2004.
 - Thesis: Electrochemical Characterization of Solid Acid Fuel Cell Electrodes.
- Joseph Paul Schramm (Materials Science) B.S., M.S., Iowa State University 2002.
 - Thesis: Mechanical Performance of Amorphous Metallic Cellular Structures.
- Michael Joseph Shearn II (Applied Physics) B.S. (Mathematics), B.S. (Physics), B.S. (Electrical Engineering), Southern Methodist University 2004; M.S., California Institute of Technology 2006.
 - Thesis: Silicon Integrated Optics: Fabrication and Characterization.

Kai Shen (Computation and Neural Systems) B.S., University of Western Australia 2000;

B.E., 2002.

Thesis: Neural Encoding of Mixtures and Stimulus Generation in the Insect Brain.

Regina Mariko Sullivan (Aeronautics) S.B., Massachusetts Institute of Technology 2005; M.S., California Institute of Technology 2006.

Thesis: The Physics of High-Velocity Ions in the Hall Thruster Near-Field.

Xiankai Sun (Applied Physics) B.S., University of Science and Technology of China 2004; M.S., California Institute of Technology 2006.

Thesis: Supermode Si/III-V Lasers and Circular Bragg Lasers.

Suvir Venkataraman (Bioengineering) B.Eng., Imperial College, London 2003.

Thesis: Engineering Mechanical Nucleic Acid Systems.

Nathalie Maria Vriend (Mechanical Engineering and Geophysics) B.S., University of Twente 2001; M.S., 2004; M.S., California Institute of Technology 2005. Thesis: Booming Sand Dunes.

Christopher Walker (*Electrical Engineering*) B.S., California Institute of Technology 1998; M.S., 2007.

Thesis: Fabrication of Microfluidic Structures by Automated Laser Ablation and Automation of Optical Testing.

Aaron Wiest (Materials Science) A.A., Cerritos College 1999; B.S., California Institute of Technology 2005; M.S., 2006.

Thesis: Thermoplastic Forming and Related Studies of the Supercooled Liquid Region of Metallic Glasses.

Tichakorn Wongpiromsarn (Mechanical Engineering and Control and Dynamical Systems) B.S., Cornell University 2005.

Thesis: Formal Methods for Design and Verification of Embedded Control Systems: Application to an Autonomous Vehicle.

David Dah-wei Wu (Bioengineering) B.S., The University of Chicago 2001; M.D., University of California, Los Angeles 2010.

Thesis: Biomechanical Information Transfer.

Klaus Wunderlich (Computation and Neural Systems) Vordiplom, University of Hagen 2002; Vordiplom, University of G ttingen 2003; M.S., Max-Planck Research School 2005.

Thesis: Multiple Forms of Valvations in the Human Brain.

Weiyu Xu (Electrical Engineering and Applied and Computational Mathematics) B.E., Beijing University of Posts and Telecommunications 2002; M.S., Tsinghua University 2005; M.S., California Institute of Technology 2006.

Thesis: Compressive Sensing for Sparse Approximations: Constructions, Algorithms, and Analysis.

Wanwan Yang (Environmental Science and Engineering) B.E., Tsinghua University 2001; M.S., California Institute of Technology 2004.

Thesis: Fast Viability Assessment of *Clostridium* Spores—Survival in Extreme Environments.

Kakani Katija Young (Bioengineering) A.A.S., Edmonds Community College 2000; B.S.A.A., University of Washington 2004; M.S., California Institute of Technology 2005.

Thesis: Effect of In Situ Animal-Fluid Interactions on Transport and Mixing. Joseph N. Zadeh (*Bioengineering*) B.S., Northwestern University 2003.

Thesis: Algorithms for Nucleic Acid Sequence Design.

David Yu Zhang (Computation and Neural Systems) B.S., California Institute of Technology 2005.

Thesis: Dynamic DNA Strand Displacement Circuits.

Xinning Zhang (Environmental Science and Engineering) B.S., Cornell University 2004.

Thesis: I. Formate Dehydrogenase Gene Diversity in Lignocellulose-feeding Insect Gut Microbial Communities. II. Metabolic Impacts on the Hydrogen Isotope Content of Bacterial Lipids.

DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES

William Henry Amidon (Geology) B.A., Carleton College 2001; M.S., University of California, Santa Barbara 2004.

Thesis: Cosmogenic ³He and ²¹Ne Dating in Accessory Mineral Phases.

Joseph Brian Balta (Geology) B.S., Indiana University 2002; M.S., California Institute of Technology 2009.

Thesis: I. Experimental Investigation of Hydrous Melting of the Earth's Upper Mantle, and 2. Olivine Abundances and Compositions in Hawaiian Lavas.

Michael William Busch (*Planetary Science*) B.S. (*Astrophysics*), B.S. (*Physics*), University of Minnesota 2005; M.S., California Institute of Technology 2007.

Thesis: Shapes and Spins of Near-Earth Asteroids.

Christopher John DiCaprio (Geophysics) B.S., Cornell University 2001.

Thesis: Measuring and Modeling Viscoelastic Relaxation of the Lithosphere with Application to the Northern Volcanic Zone, Iceland.

Nicholas Gray Heavens (*Planetary Science*) B.S., The University of Chicago 2005; M.S., California Institute of Technology 2007.

Thesis: The Impact of Mesoscale Processes on the Atmospheric Circulation of Mars.

- Amy Elizabeth Hofmann (Geochemistry) B.A., Franklin and Marshall College 2004; M.S., California Institute of Technology 2008.
 - Thesis: Micron- to Sub-micron-scale Trace Element Zonations in Zircon and Olivine.
- Ravi V. S. Kanda (Geophysics) B.Tech., Indian Institute of Technology, Bombay 1994; M.S., University of Cincinnati 1997; M.S. University of Kentucky 2003; M.S., California Institute of Technology 2005.
 - Thesis: Mechanical Models for Inter-Seismic Deformation in Subduction Zones.
- Lijun Liu (Geophysics) B.S., University of Science and Technology of China 2003; M.S., The Johns Hopkins University 2005; M.S., California Institute of Technology 2009.
 - Thesis: Linking Surface Evolution with Mantle Dynamic Processes Using Adjoint Models with Data Assimilation.
- Margarita M. Marinova (*Planetary Science*) S.B., Massachusetts Institute of Technology 2003; M.S., California Institute of Technology 2006.
 - Thesis: Inquiries into the Consequences of Planetary-Scale Impacts and the Implications of Carbonates in the Hyper-Arid Core of the Sahara.
- Aron Jeffrey Meltzner (Geology) B.S., California Institute of Technology 2000; M.S., San Diego State University 2003.
 - Thesis: Earthquake Recurrence, Clustering, and Persistent Segmentation near the Southern End of the 2004 Sunda Megathrust Rupture.
- Joannah Marie Metz (Planetary Science) B.S. (Geophysics), B.S. (Physics), University of Illinois at Urbana-Champaign 2004; M.Phil., University of Cambridge 2006; M.S., California Institute of Technology 2008.
 - Thesis: A Study of the Record of Ancient Sedimentary Rocks on Mars Using MER, HiRISE and CRISM Images.
- Sarah Ellen Minson (*Geophysics*) B.A., University of California, Berkeley 2003; M.S., California Institute of Technology 2005.
 - Thesis: A Bayesian Approach to Earthquake Source Studies.
- Kaveh Pahlevan (*Planetary Science*) B.S., University of Maryland, College Park 2004; M.S., California Institute of Technology 2006.
 - Thesis: Chemical and Isotopic Consequences of Lunar Formation via Giant Impact.
- Ying Wang (*Geochemistry*) B.S., University of Science and Technology of China 2004. Thesis: Equilibrium ²H/¹H Fractionations in Organic Molecules.

DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

Christoph Brunner (Social Science) Diplôme, Institut d'Études Politiques de Paris 2000; Lizentiat, Universität St. Gallen 2003; M.S., California Institute of Technology 2006. Thesis: Information Aggregation and Allocative Efficiency in Complex Environments.

Min Jeong Kang (Social Science) B.A., Yonsei University 2002; M.S., California Institute of Technology 2006.

Thesis: Three Experimental Studies of Reward and Decision Making.

Gabriel Katz (Social Science) Licenciado, Universidad de la República 2005; M.S., California Institute of Technology 2007.

Thesis: Essays in Electoral Behavior and Bayesian Data Analysis.

Sera Linardi (Social Science) B.S., Stanford University 1999; M.S., California Institute of Technology 2006.

Thesis: Eliciting Information and Effort in Noisy Environments.

Guido Tullio Andrea Maretto (Social Science) Laurea, Universitá Commerciale Luigi Bocconi 2003; M.S., California Institute of Technology 2006.

Thesis: Contracts and Markets.

Margaret Anne McConnell (Social Science) B.A., Wesleyan University 2003; M.S., California Institute of Technology 2007.

Thesis: Social Interactions and Giving.

Julian Neukom Romero (Social Science) B.A. (Economics), B.A. (Mathematics), Northwestern University 2005; M.S., California Institute of Technology 2007. Thesis: Essays on Cooperation and Coordination.

DIVISION OF PHYSICS, MATHEMATICS AND ASTRONOMY

Lotty Ackerman Mayer (*Physics*) Licenciado en Fisica, Universidad Simón Bolivar 2000; Diploma, Abdus Salam International Center for Theoretical Physics 2001; M.S., California Institute of Technology 2004.

Thesis: A Quest for the Physics beyond the Cosmological Standard Model.

Milan Bogosavljević (Astrophysics) B.Sc., University of Belgrade 2001.

Thesis: Lyman Continuum and Lyman α Emission from Galaxies at High Redshift.

Wan Keng Cheong (*Mathematics*) B.S., National Cheng Kung University 2003.

Thesis: Gromov-Witten Invariants: Crepant Resolutions and Simple Flops.

Tudor Dan Dimofte (*Physics*) A.B., Princeton University 2004.

Thesis: Refined BPS Invariants, Chern-Simons Theory, and the Quantum Dilogarithm.

Matt Eichenfield (*Physics*) B.S., University of Nevada, Las Vegas 2004; M.S., California Institute of Technology 2007.

Thesis: Cavity Optomechanics in Photonic and Phononic Crystals: Engineering the Interaction of Light and Sound at the Nanoscale.

Vaibhav Gadre (Mathematics) B.Tech., Indian Institute of Technology, Mumbai 2001. Thesis: Dynamics of Non-Classical Interval Exchanges.

Moira I. Gresham (Physics) B.S., Reed College 2004.

Thesis: Lorentz Symmetry Breaking in a Cosmological Context.

Daniel Grin (Astrophysics) A.B., Princeton University 2003.

Thesis: The Lukewarm Frontier: Some Cosmological Consequences of "Low Energy" Physics.

Cameron Richard Hughes *(Physics)* B.S., University of California, Santa Barbara 2002; M.S., California Institute of Technology 2008.

Thesis: Investigations of Nanoscale Variations in Spin and Charge Transport in Manganites and Organic Semiconductors Using Spin Polarized Scanning Tunneling Spectroscopy.

Rostyslav Kozhan (*Mathematics*) B.S., Lviv National University 2005; M.S., 2006. Thesis: Asymptotics for Orthogonal Polynomials, Exponentially Small Perturbations, and Meromorphic Continuations of Herglotz Functions.

Adam L. Kraus (Astrophysics) B.S., University of Kansas 2003.

Thesis: Multiple Star Formation.

Christopher Michael Lyons (Mathematics) B.S., University of California, Los Angeles 2005.

Thesis: The Arithmetic and Geometry of a Class of Algebraic Surfaces of General Type and Geometric Genus One.

Anna Victoria Maltsev (*Mathematics*) B.S., The University of Michigan 2005.

Thesis: Universality Limits of a Reproducing Kernel for a Half-Line Schr dinger Operator and Clock Behavior of Eigenvalues.

Hui Khoon Ng (*Physics*) B.S., Cornell University 2002; M.E., 2003.Thesis: Information amidst Noise: Preserved Codes, Error Correction, and Fault Tolerance in a Quantum World.

Juan Pedro Ochoa Ricoux (Physics) Ingeniero, Instituto Tecnológico y de Estudios Superiores de Monterrey 2003; M.S., California Institute of Technology 2007. Thesis: A Search for Muon Neutrino to Electron Neutrino Oscillations in the MINOS Experiment.

Chang-Soon Park (*Physics*) B.S., Seoul National University 2005.

Thesis: Topics in Supersymmetry Breaking and Gauge/Gravity Dualities.

- Brian Leroy Schroeder (Mathematics) B.S. (Computer Science), B.S. (Mathematics), M.S., Michigan State University 2003.
 - Thesis: On Elliptic Semiplanes, an Algebraic Problem in Matrix Theory, and Weight Enumeration of Certain Binary Cyclic Codes.
- Heywood Tam (Physics) B.A.Sc., The University of British Columbia 2005.
 - Thesis: An Investigation of Spontaneous Lorentz Violation and Cosmic Inflation.
- Rafael Torres Ruiz (Mathematics) M.Sc., CINVESTAV 2006.
 - Thesis: Geography and Botany of Irreducible Symplectic 4-Manifolds with Abelian Fundamental Group.
- Ketan D. Vyas (Physics) S.B. (Electrical Engineering and Computer Science), S.B. (Physics), Massachusetts Institute of Technology 2003.
 - Thesis: Topics in Topological and Holomorphic Quantum Field Theory.
- Robert Lawrence Ward (*Physics*) B.S., The University of New Mexico 2000; M.Sc., Merton College, Oxford University 2001; M.A., King's College, London 2002. Thesis: Length Sensing and Control of a Prototype Advanced Interferometric Gravitational Wave Detector.

Prizes and awards are listed only for those students receiving degrees in 2010, 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.

Name of 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.

2010 Anthony Yu-Yong Chong, Xueliang (Leon) Liu

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.

2010 Carolyn Nicole Valdez

GEORGE W. HOUSNER AWARD

Formerly the Sigma Xi Award, awarded to a senior selected for an outstanding piece of original scientific research.

2010 Evan S. Gawlik, Andy Yen

The prizes above are announced at the commencement ceremony.

UPPER CLASS MERIT AWARD/PRIZE (ROSALIND W. ALCOTT MERIT SCHOLARSHIP, CARNATION SCHOLARSHIP, AND JOHN STAUFFER MERIT SCHOLARSHIP)

Caltech awarded the Upper Class Merit Award/Prize based solely on merit (selection was made on the basis of grades, faculty recommendations, and demonstrated research productivity) with no consideration given to need or any other nonacademic criteria.

2008	Daniel Joshua Beylkin ZeNan Li Chang	Caleb Enoch Ng Benjamin Zax	
2009	ZeNan Li Chang Lu Chen Luke David Durant Andrew Michael Freddo Connie Gao	Thomas Oren Gwinn Jr. Ryan Hamerly Simon John Kornblith Gongjie Li Benjamin Lin	Guglielmo Paul Lockhart Caleb Enoch Ng Rebecca Lynn Russell Ernest K. Ryu Constantine Sideris
2010	Daniel Joshua Beylkin ZeNan Li Chang Lu Chen Luke David Durant Christian Daniel Griset Thomas Oren Gwinn Jr.	Fan Huang Simon John Kornblith David Timothy Lee Gongjie Li Chao Liu Guglielmo Paul Lockhart	Constantine Sideris Esther Shyu Tamas Szalay Jonathan Michael Tsai Stephen Kenneth Wilke Andy Yen

AXLINE MERIT 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.

2006	Abhi Gulati Noah Michael Jakimo Olga Mandelshtam	Caleb Enoch Ng	
2007	ZeNan Li Chang Evan S. Gawlik Abhi Gulati	Jeffrey Kuan Olga Mandelshtam Caleb Enoch Ng	John D. Schulman Kimberly Megan Scott
2008	ZeNan Li Chang Evan S. Gawlik Abhi Gulati	Jeffrey Kuan Olga Mandelshtam Caleb Enoch Ng	John D. Schulman Kimberly Megan Scott
2009	ZeNan Li Chang Evan S. Gawlik Abhi Gulati	Jeffrey Kuan Olga Mandelshtam Caleb Enoch Ng	John D. Schulman Kimberly Megan Scott
2010	ZeNan Li Chang Evan S. Gawlik Jeffrey Kuan	Olga Mandelshtam John D. Schulman Kimberly Megan Scott	

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.

2009 Emily Jayne McDowell

ROBERT P. BALLES CALTECH MATHEMATICS SCHOLARS AWARD

Awarded to the mathematics major entering his or her senior year who has demonstrated the most outstanding performance in mathematics courses completed in the student's first three years at Caltech.

2009 Doo Sung Park

WILLIAM F. BALLHAUS PRIZE

Awarded to aeronautics students for outstanding doctoral dissertations.

2010 Sally Page Moffett Bane, Daegyoum Kim

ERIC TEMPLE BELL UNDERGRADUATE MATHEMATICS RESEARCH PRIZE

Awarded to one or more juniors or seniors for outstanding original research in mathematics.

2009 Jeffrey Kuan

2010 Domenic Denicola

BHANSALI PRIZE IN COMPUTER SCIENCE

Awarded to an undergraduate student for outstanding research in computer science in the current academic year.

2009 Robert Daniel Barish

2010 Isaac Jushiang Chao

AMASA BISHOP SUMMER STUDY ABROAD PRIZE

Awarded to one or more freshmen, sophomores, or juniors to fund summer study abroad in an organized program with the aim of gaining exposure to foreign language and international issues or cultures, including global issues in the sciences and engineering.

2009 Julianne Marie Gould, Tony Z. Jia

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.

2007 Ryan Hamerly

ROLF D. BUHLER MEMORIAL AWARD IN AERONAUTICS

Awarded to an aeronautics student for outstanding academic achievement in the master's program.

2007 Daegyoum Kim

2010 Landry Fokoua Djodom, Xin Ning

THE W. P. CAREY & CO., INC., PRIZE IN APPLIED MATHEMATICS

Awarded to a student receiving a Doctor of Philosophy degree for an outstanding doctoral dissertation in applied mathematics or pure mathematics.

2010 Chia-Chieh Chu

BONNIE CASHIN PRIZE FOR IMAGINATIVE THINKING

Awarded each year to the entering freshman who has written the most imaginative essays in the Application for Freshman Admission.

2007 Philip Leszczynski

2008 Carol Wang

CENTENNIAL PRIZE FOR THE BEST THESIS IN MECHANICAL ENGINEERING

Awarded each year to a candidate for the degree of Doctor of Philosophy in mechanical engineering whose doctoral thesis is judged to be the most original and significant by a faculty committee appointed annually by the executive officer for mechanical engineering. The prize consists of a citation and a cash award of \$1,000 and was established with gifts from alumni following the division's centennial celebration in 2007.

2010 Nathalie Maria Vriend

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.

2010 Kristjan Gudmundsson

DONALD S. CLARK MEMORIAL AWARD

Awarded to two juniors in recognition of service to the campus community and academic excellence. Preference is given to students in the Division of Engineering and Applied Science and to those in Chemical Engineering.

2009 Daryl Bennett Coleman, Julianne Marie Gould

THE DONALD COLES PRIZE IN AERONAUTICS

Awarded to the graduating Ph.D. student in aeronautics whose thesis displays the best design of an experiment or the best design for a piece of experimental equipment.

2010 Adam Keith Norman

DEANS' CUP AND STUDENT LIFE AND MASTER'S AWARDS

Two awards, selected by the deans, the director of student 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.

2010 Marshall C. Grinstead, Dean's Cup Daryl Bennett Coleman, David Kratz, Daniel Stuart Obenshain, Lisa D. Zang, Student Life

DEMETRIADES-TSAFKA-KOKKALIS PRIZE IN BIOTECHNOLOGY OR RELATED FIELDS

Awarded annually to a Ph.D. candidate for the best thesis, publication, or discovery in biotechnology or related fields at the Institute in the preceding 12 months. Winners are selected by the bioengineering faculty. This prize is made possible by a gift from Anna Kokkalis Demetriades and Sterge T. Demetriades, Eng '58.

2010 Xiquan Cui

DEMETRIADES-TSAFKA-KOKKALIS PRIZE IN ENTREPRENEURSHIP OR RELATED FIELDS

Awarded annually for the best business plan or proposal, start-up, thesis, publication, discovery, or related efforts by student(s) in entrepreneurship or related fields at the Institute in the preceding 12 months. This prize is made possible by a gift from Anna Kokkalis Demetriades and Sterge T. Demetriades, Eng '58.

2010 Morgan C. Putnam

DEMETRIADES-TSAFKA-KOKKALIS PRIZE IN ENVIRONMENTALLY BENIGN RENEWABLE ENERGY SOURCES OR RELATED FIELDS

Awarded annually to a Ph.D. candidate for the best thesis, publication, discovery, or related efforts in benign renewable energy sources or related fields at the Institute in the preceding 12 months. This prize is made possible by a gift from Anna Kokkalis Demetriades and Sterge T. Demetriades, Eng '58.

2009 Joshua Michael Spurgeon

2010 Andrew Friedrich May

DEMETRIADES-TSAFKA-KOKKALIS PRIZE IN NANOTECHNOLOGY OR RELATED FIELDS

Awarded annually to a Ph.D. candidate for the best thesis, publication, or discovery in nanotechnology or related fields at the Institute in the preceding 12 months. This prize is made possible by a gift from Anna Kokkalis Demetriades and Sterge T. Demetriades, Eng '58.

2010 Matt Eichenfield

EVERHART DISTINGUISHED GRADUATE STUDENT LECTURER AWARD

Awarded to a graduate student who has demonstrated exemplary presentation ability and graduate research.

2010 Sally Page Moffett Bane, Matt Eichenfield

LAWRENCE L. AND AUDREY W. FERGUSON PRIZE

Awarded to the graduating Ph.D. candidate in biology who has produced the outstanding doctoral thesis for the past year.

2010 Paola A. Betancur

RICHARD P. FEYNMAN PRIZE IN THEORETICAL PHYSICS

Awarded to a senior on the basis of excellence in theoretical physics.

2010 Ryan Hamerly

HAREN LEE FISHER MEMORIAL AWARD IN JUNIOR PHYSICS

Awarded to a junior physics major who demonstrates the greatest promise of future contributions in physics.

2009 Andy Yen

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.

2009 Evan S. Gawlik

JACK E. FROEHLICH MEMORIAL AWARD

Awarded to a junior in the upper five percent of his or her class who shows outstanding promise for a creative professional career.

2009 ZeNan Li Chang

GRADUATE DEANS' AWARD FOR OUTSTANDING COMMUNITY SERVICE

Awarded to a Ph.D. candidate who, throughout his or her graduate years at the Institute, has made great contributions to graduate life and whose qualities of leadership and responsibility have been outstanding.

2010 Arthur Wing Hong Chan, Nathalie Maria Vriend

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.

2010 Brandon Scott Hensley, Jeffrey Kuan

LUCY GUERNSEY SERVICE AWARD

Awarded to one or two students who have provided exceptional service to the Caltech Y and/or the community, are involved with service projects, have demonstrated leadership in community and volunteer service efforts, and who exemplify a spirit of service.

2006 Kai Shen

2008 Karen Elizabeth Wawrousek

2009 Sunny Chun

2010 Jason Robert Lunn

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.

2008 Caleb Enoch Ng

2009 Andrew Michael Freddo

ALEXANDER P. AND ADELAIDE F. HIXON PRIZE FOR WRITING

Awarded annually in recognition of the best writing in freshman humanities courses.

2007 Amy Tsui-Chi Lam

HANS G. HORNUNG PRIZE

Awarded for the best oral Ph.D. defense presentation by a student advised by aerospace faculty. The decision is made by a committee of students who attend all thesis presentations for the year.

2010 James Alan Karnesky

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.

2010 Benjamin Lin

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.

2007, 2009 Rostyslav Kozhan

SCOTT RUSSELL JOHNSON GRADUATE DISSERTATION PRIZE IN MATHEMATICS

Awarded for the best graduate dissertation in mathematics.

2010 Wan Keng Cheong, Rostyslav Kozhan, Christopher Michael Lyons

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.

2010 William Chen, Jeffrey Kuan

KALAM PRIZE FOR AEROSPACE ENGINEERING

Awarded to a student in the aerospace engineering master's program whose academic performance was exemplary and who shows high potential for future achievements at Caltech. This prize was made possible through the generosity of Dr. Abdul Kalam, the 11th president of India, himself an aerospace engineer.

2010 Juan Pedro Mendez Granado

D. S. KOTHARI PRIZE IN PHYSICS

Awarded to a graduating senior in physics who has produced an outstanding research project during the year.

2010 Christian Daniel Griset

MARGIE LAURITSEN LEIGHTON PRIZE

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

2008 Rebecca Lynn Russell

HARRY LEITER MEMORIAL MECHANICAL ENGINEERING PRIZE

Awarded to a candidate for the degree of Bachelor of Science in mechanical engineering who has demonstrated extraordinary creativity as judged by a faculty committee appointed each year by the executive officer for mechanical engineering. The prize consists of a citation and a cash award and was made possible by a gift from Dr. Symme Leiter.

2010 Robert Eugene Paolini

THE LEMELSON-MIT CALTECH STUDENT PRIZE

Awarded through an annual competition to a senior or graduate student who has created or improved a product or process, applied a technology in a new way, redesigned a system, or in other ways demonstrated remarkable inventiveness. The winner receives \$30,000.

2010 Heather Dawn Agnew

MARI PETERSON LIGOCKI ('81) MEMORIAL AWARD

Awarded to a student who has improved the quality of student life at Caltech through his or her personal character.

2009 Natalya Kostandova

2010 Stephen Kenneth Wilke

DOROTHY B. AND HARRISON C. LINGLE SCHOLARSHIP

Awarded to an incoming freshman in recognition of interest in a career in science or engineering, outstanding academic record, demonstrated fair-mindedness, and unquestioned integrity. This prize is renewable, contingent on academic performance.

2006 Caleb Enoch Ng
2007 Jeffrey Kuan, Caleb Enoch Ng, Kimberly Megan Scott
2008 Jeffrey Kuan, Caleb Enoch Ng, Kimberly Megan Scott
2009 Jeffrey Kuan, Kimberly Megan Scott
2010 Jeffrey Kuan, Kimberly Megan Scott

GORDON MCCLURE MEMORIAL COMMUNICATIONS PRIZE

Awarded to undergraduate students for excellence in essay writing in three subjects: English, history, and philosophy.

2010 Noah Michael Jakimo, Robert Bryant Kaspar

THE HERBERT NEWBY MCCOY AWARD

Awarded to chemistry doctoral students for outstanding contributions to the science of chemistry.

2010 Morgan Leigh Cable, Xin Zhang

MARY A. EARL MCKINNEY PRIZE IN LITERATURE

Awarded to undergraduate students for excellence in writing, in two categories: poetry and prose fiction.

2008 Kimberly Megan Scott

2010 Carol Wang

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.

2009 Caleb Enoch Ng, Tzong-Lian Grace Tsay

2010 ZeNan Li Chang, Sunny Chun

PRESIDENT'S SCHOLARS

Awarded to selected freshmen to promote the breadth and diversity of the Caltech undergraduate student body. The scholarships are renewable, contingent on academic performance.

2007	Annie Van Hong	Natalya Kostandova	Caleb Enoch Ng
	Sarah Hunt	Jeffrey Kuan	Diane Jennifer Plummer
	Noah Michael Jakimo	Noele R. Norris	Kimberly Megan Scott
2008	Annie Van Hong	Noele R. Norris	
	Sarah Hunt	Diane Jennifer Plummer	
	Natalya Kostandova		
2009	Annie Van Hong	Noele R. Norris	
	Sarah Hunt	Diane Jennifer Plummer	
	Natalya Kostandova		
2010	Annie Van Hong	Noele R. Norris	
	Sarah Hunt	Diane Jennifer Plummer	
	Natalya Kostandova	-	

HERBERT J. RYSER MEMORIAL SCHOLARSHIPS

Awarded to undergraduate students for academic excellence, preferably in mathematics.

2009 William Chen, Doo Sung Park, Seung Woo Shin

SAN PIETRO TRAVEL PRIZE

Awarded to one or more sophomores, juniors, or seniors to fund an adventurous and challenging summer travel experience that expands the recipient's cultural horizons and knowledge of the world.

2009 Esther Shyu, Tzong-Lian Grace Tsay

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.

2010 Vadim Baidin, James Farris Dama, Carolyn Nicole Valdez

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.

2010 Veronica Jacqueline Anderson

ERNEST E. SECHLER MEMORIAL AWARD IN AERONAUTICS

Awarded to an aeronautics student who has made the most significant contribution to the teaching and research efforts of GALCIT (Graduate Aerospace Laboratories of the California Institute of Technology). Preference is given to students working in structural mechanics.

2009 Leslie Elise Lamberson

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.

2008 Domenic Denicola, Garrett Korda Drayna, Annie Van Hong

2009 Connie Gao, Michael J. Gherini

2010 Evan S. Gawlik, Xueliang (Leon) Liu

HALLETT SMITH PRIZE

Established in 1997 to commemorate Professor Smith's long career as one of the 20th century's most distinguished Renaissance scholars. The cash prize is given annually by the literature faculty to the undergraduate student who writes the finest essay on Shakespeare.

2010 Ga-Il Lee

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.

2006 Juan Pedro Ochoa Ricoux

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.

2009 Sarah Hunt

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."

2009 Xueliang (Leon) Liu

CHARLES AND ELLEN WILTS PRIZE

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

2010 Weiyu Xu

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.

2008 Evan S. Gawlik, Jeffrey Kuan

Gaudeamus Igitur

(Traditional college song)

arr. Robert A. M. Ross

Gaudeamus igitur
Juvenes dum sumus.

Post jucundum juventutem,
Post molestam senectutem,
Nos habebit humus.

Ubi sunt qui ante nos In mundo fuere? Transeas ad superos, Abeus ad inferos, Quis si vis videre.

Vita nostra brevis est, Brevi finietur. Venit mors velociter, Rapit nos atrociter, Nemini parcetur.

Vivat academia!
Vivant professores!
Vivat membrum quodlibet!
Vivant membra quaelibet!
Semper sint in flore!

Therefore let us rejoice
While we are young.
After pleasant youth,
After troublesome old age,
The earth will have us.

Where are they who before us Were in the world?
You can cross the heavens,
You can go to hell,
If you wish to see them.

Our life is brief, Shortly it will end. Death comes quickly, It snatches us cruelly, No one is spared.

Long live the academy!
Long live the professors!
Long live each student!
Long live all students!
May they always flourish!

Hail CIT

(Caltech alma mater)

by Manton Barnes, B.S. '21

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.